AN EMPIRICAL ANALYSIS OF DOLLARIZATION ON FINANCIAL DEVELOPMENT IN THE DEVELOPING ECONOMIES

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Approval of the Institute of Social Sciences

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ABSTRACT

AN EMPIRICAL ANALYSIS OF DOLLARIZATION ON FINANCIAL DEVELOPMENT IN THE DEVELOPING ECONOMIES

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One of the important issues in developing countries is currency substitution, which can also be called dollarization. The concept of dollarization has evolved over the years with many changes in the financial world such as the growing international trade, the removing of legal restrictions on foreign currency deposits, and the integration of economy's domestic financial system with the global financial markets.

The existing literature concerning dollarization issues has tried to concentrate on economies with high inflation in which the use of strong foreign currencies have gained significance for nearly three decades. In this vein, the existing studies on currency substitution have focused on the link between dollarization and the dynamics of money demand, institutional quality, inflation, and exchange rate. However, little research has been done on assessing directly the effects of dollarization on financial development. For this reason, the purpose of this study is to empirically investigate the impacts of dollarization on financial deepening using panel data analysis of 60 selected transition and developing economies over the period 2004-2012. The results of study revealed that dollarization has the positive impacts of dollarization on financial development in countries with high inflationary environments.

Keywords: Dollarization, Financial Development, Panel Data Analysis

ÖZET

GELİŞMEKTE OLAN EKONOMİLERDE FİNANSAL GELİŞME ÜZERİNE DOLARİZASYONUNUN AMPİRİK ANALİZİ

Şahinler, Ayşe Nur

Yüksek Lisans, İktisat Bölümü

Danışman: Doç. Dr. Abdulkadir DEVELİ

Haziran 2017, 161 sayfa

Gelişmekte olan ülkelerde en önemli sorunlardan biri dolarizasyon olarak da tanımlanan para ikamesidir. Dolarizasyon olgusu, sermaye piyasalarının entegre olması, artan uluslararası ticaret, yabancı para mevduatları üzerinde yasal kısıtların kaldırılması gibi finansal dünyada yaşanan birçok değişimle birlikte başlamıştır.

Dolarizasyonla ilgili var olan literatür yaklaşık otuz yıldır güçlü yabancı paraların kullanımının önem kazandığı yüksek enflasyona sahip olan ekonomileri ele almaya çalışmıştır. Bu noktada, dolarizasyon üzerine var olan çalışmalar, döviz kuru, enflasyon, kurumların kalitesi ya da para talebinin dinamikleri ve dolarizasyon arasındaki ilişkiye odaklanır. Fakat finansal gelişme üzerine dolarizasyonun etkilerini doğrudan ele alan çok az çalışma yapılmıştır. Bu sebeple, 2004-2012 yıllarını kapsayan bu çalışmada, gelişmekte olan 60 ülke için panel veri analizi kullanarak finansal derinleşme üzerine dolarizasyonun etkilerini incelenmesi amaçlanmıştır. Ampirik analizlerden elde edilen bulgular yüksek enflasyona sahip ülkelerde finansal derinleşme üzerine dolarizasyonun pozitif bir etkiye sahip olduğuna dair kanıtlar sunmaktadır.

Anahtar Kelimeler: Dolarizasyon, finansal gelişme, panel veri analizi

DEDICATION

TO MY FAMILY

ACKNOWLEDGEMENTS

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LIST OF ABBREVIATIONS

ARDL   Autoregressive Distributed Lag

CADF   The Cross-sectional Augmented Dickey-Fuller

CLMR   The Classical Linear Regression Model

CM   Capital Mobility

CMIR   The Currency and Monetary Instruments Reports

CPI   Consumer Price Index

CS   Currency Substitution

DCS   Direct Currency Substitution

ECM   Error Correction Model

EG   Economic Growth

FC   Foreign Currency

FCC   Foreign currency circulation

FCD   Foreign currency deposits

FCL   Foreign currency loans

FD   Financial development

FEM   The Fixed-Effects Model

FGLS   Feasible Generalized Least Squares

GDP   Gross Domestic Product

IADB   Inter-American Development Bank

ICS   Indirect Currency Substitution

INF   Inflation Rate

IMF   International Monetary Found

LCD   Local currency deposits

LM   Lagrange Multiplier

LSDV   The Least-Squares Dummy Variable

MENA   Middle East and North Africa

MVP   Minimum Variance Portfolio

NER   Nominal exchange rate

OECD   The Organization for Economic Co-operation and Development

OLS   Ordinary Least Squares

OSD   Offshore deposit

PMG   Pooled Mean Group

REM   The Random-Effects Model

RER   Real exchange rate

SLR   Strength Legal Rights

SUR   The Seemingly Unrelated Regression

2SLS   Two-stage least square

1. INTRODUCTION

Each country has traditionally issued and circulated its own money. A currency is a form of fiat money used within a certain economic region and issued by its government. Money is expected to have three basic classical roles. These roles are being a store of value (to save, and smooth consumption), unit of account (to keep track of revenue, cost and profit), and medium of exchange (to sell and buy goods and services) (Ozsoz and Rengifo, 2016: 1). These functions of money are completely or partially associated with the stability of the purchasing power of money (inflation) used in a country. In this regard, dollarization occurs because local currency does not serve to fulfill one or all the three basic functions of money in the local economy (Sarı, 2006: 1).

The concept of dollarization has existed in developing countries for decades. Especially, the collapse of Bretton Woods exchange rate system in the early 1970s, many changes in the financial world such as the growing international trade, removing legal restrictions on foreign currency, the integration of a country' local financial system with the global institutions and financial markets have encouraged portfolio diversification and allowed for a reduction in risk because of high and volatile levels of inflation. Therefore, economic agents have started to use foreign currency and to get operating in different currencies for transaction purposes. These changes have contributed to the concept of currency substitution and dollarization. Many developing countries have faced substitution process from local currency to foreign currency in a period of more than two decades.

In the 1980s, developing countries (especially in Latin American countries such as Bolivia, Argentina, Peru, Paraguay, and Uruguay) experienced macroeconomic instabilities such as high and varying inflation rates, large-scale depreciation of local currencies. In countries that have suffered these problems, local residents tend to the use of hedging instruments like a strong foreign currency against possible risks. Actually, the demand for foreign currency can be for different requirements like international trade and tourism by domestic agents of a country. For this reason, there can be five different

reasons for using a foreign currency: convenience in international transactions; general use in domestic transactions; use as a medium of saving; speculation against exchange rate fluctuation; and as a store value under inflationary conditions (Krueger and Ha, 1996). When these requirements of the demand for foreign currency are considered, firms and individuals under environments of the high and volatility of inflation will stop using domestic currency since they would like to search for available hedging alternatives due to the fact that inflation rate increases the cost of holding local currency for transactions purposes. The issue of dollarization generally arises under these conditions.

In general, the concept of dollarization can be defined as the use of another economy's currency (strong currencies like the euro and the US dollar are at the center of having a good reputation as internationally and stable accepted) as part of its own local currency. Traditional literature on dollarization has focused on asset substitution which is defined as the situation of willingly choosing to hold foreign rather than local denominated monetary assets as a store of value by firms and individuals. This typically arises from risk and return considerations about foreign assets and domestic assets. Firms and individuals under macroeconomic risk like price instability and prolonged depressions prefer to hold foreign assets since foreign currency denominated asset can serve as an insurance against risk. However, recent literatures have especially emphasized the role of financial dollarization of the economy owing to countless financial crises in emerging countries. Macroeconomists have investigated whether dollarization has actually contributed to currency and financial crisis. They explained that the importance of financial dollarization on financial fragility comes from balance-sheet effect.

The essence of this study is to model the empirical link between financial development and partial dollarization. Partial dollarization is expected to have a negative effect on the financial development because it undermines credit extension by facing with series of the currency and maturity mismatches in their balance sheets. Consistent with the expectation, the estimation results demonstrate that an increase in deposit dollarization leads to a shallow financial system by increasing the use of foreign currency because dollarization can make the banking system vulnerable to exchange rate risks. However, when inflation and dollarization are added as an interaction term in the regression, the

result shows that deposit dollarization has a moderating effect on the banking system in high inflationary environment because it is known that inflation and financial development are negatively correlated. An increase in inflation rate causes a reduction in financial sector development because of decreasing in the real value of the saving. At this point, foreign currency can help as an instrument to protect negative effect of inflation. Therefore, dollarization can reduce an adverse effect of inflation on financial development.

The study is organized as follows: In chapter two, the concept of different types of dollarization has been explained in detail. For this reason, this chapter is divided into two main sections. In the first section, the definition and different types of partial dollarization such as payment dollarization also known as currency substitution, financial dollarization and real dollarization are presented. Different explanations are discussed in the literature. In the second section, official dollarization is discussed. It gives brief information that there can be several ways to fulfill official dollarization, which can be divided into a unilateral decision and bilateral agreement. Chapter three aims to provide an information about the macroeconomic environments leading to the problem of dollarization and also to reveal that there are some consequences of dollarization on the financial systems and monetary policy. Chapter four aims to discuss different measurements of partial dollarization and financial development. It is shown that there is no exact indicator to measure both financial services and their development and partial dollarization. Chapter five on the other hand is associated with the empirical literature on dollarization and financial development. This chapter is divided into six sections: financial development and inflation, financial development and output growth, the determinants of dollarization, the empirical literature review on the consequences of dollarization, the effects of dollarization on financial fragility, critical review on financial development and dollarization. In chapter six, the impacts of deposit dollarization on financial development are analyzed with econometric methods and findings are presented. Finally, this study ends up with the conclusion chapter.

2. CONCEPT OF DOLLARIZATION

2.1 Definition of Dollarization

Dollarization does not have a unique definition. There is a wide range of definitions that can be taken into consideration to find out what currency substitution and dollarization imply in the literature. For example,

> some use the term CS or dollarization to describe the occurrence of capital flight (Agenor and Khan, 1992; Marquez, 1987), others to explain the dynamics of the parallel (black) market exchange rate (Canto, 1985; Canto and Nickelsburg, 1987), and yet another group a majority- to call attention to the widespread use of foreign money as a store of value, unit of account and/or medium of exchange within the domestic economy (Ramirez-Rojas, 1985; Melvin, 1988) (Savastano, 1996: 1).

The early theoretical literature on explaining the concept of dollarization has focused on the currency substitution view. This focus is widely known as currency substitution in the literature. According to this view, one of the primary reasons causing dollarization is the losing of money's function as a store of value. Therefore, it investigated the link between dollarization and money demand's dynamics, the inflation or exchange rate.

In many literatures, different definitions have been associated with dollarization. These definitions are based on different views of the role of foreign currency in domestic economies. In general, dollarization occurs when residents substitute a foreign currency for a local currency to fulfill essentially the functions of money

Mueller (1994) explained the concept of currency substitution and dollarization. He assumed that there is a difference between these two definitions based on the reversibility in the substitution process. According to the author, currency substitution is defined to exist within an economy when the substitution process can be considered as being symmetrical and reversible. Therefore, the substitution can go from local currency to foreign currency or vice versa. On the other hand, an economy is defined as dollarized when an asymmetric reaction to the use of foreign currency to changes in the determinants

is observed. This implies that, for example, in an economy with dollarization problem, the demand for foreign currency increases when the domestic currency depreciates, however, the demand for foreign currency decreases by a lesser extent when the domestic currency appreciates.

To interpret and understand the main issues on different types of the dollarization phenomenon, Figure 1 provides a definitional introduction to terminologies of dollarization. The dollarization phenomenon can be in two main forms, official (de jure) and unofficial (de facto). There are also distinctions related to the types of unofficial (de facto) dollarization, namely payment dollarization or currency substitution, financial dollarization (asset and liability substitution) and real dollarization.

DOLLARIZATION			
DE JURE DOLLARIZATION	DE FACTO DOLLARIZATION		
OFFICIAL DOLLARIZATION	PAYMENT DOLLARIZATION	FINANCIAL DOLLARIZATION	REAL DOLLARIZATION
All money functions (legal tender)	Means of payments (Currency substitution)	Store of value (asset and liability substitution)	Unit of account (directly and indexed)
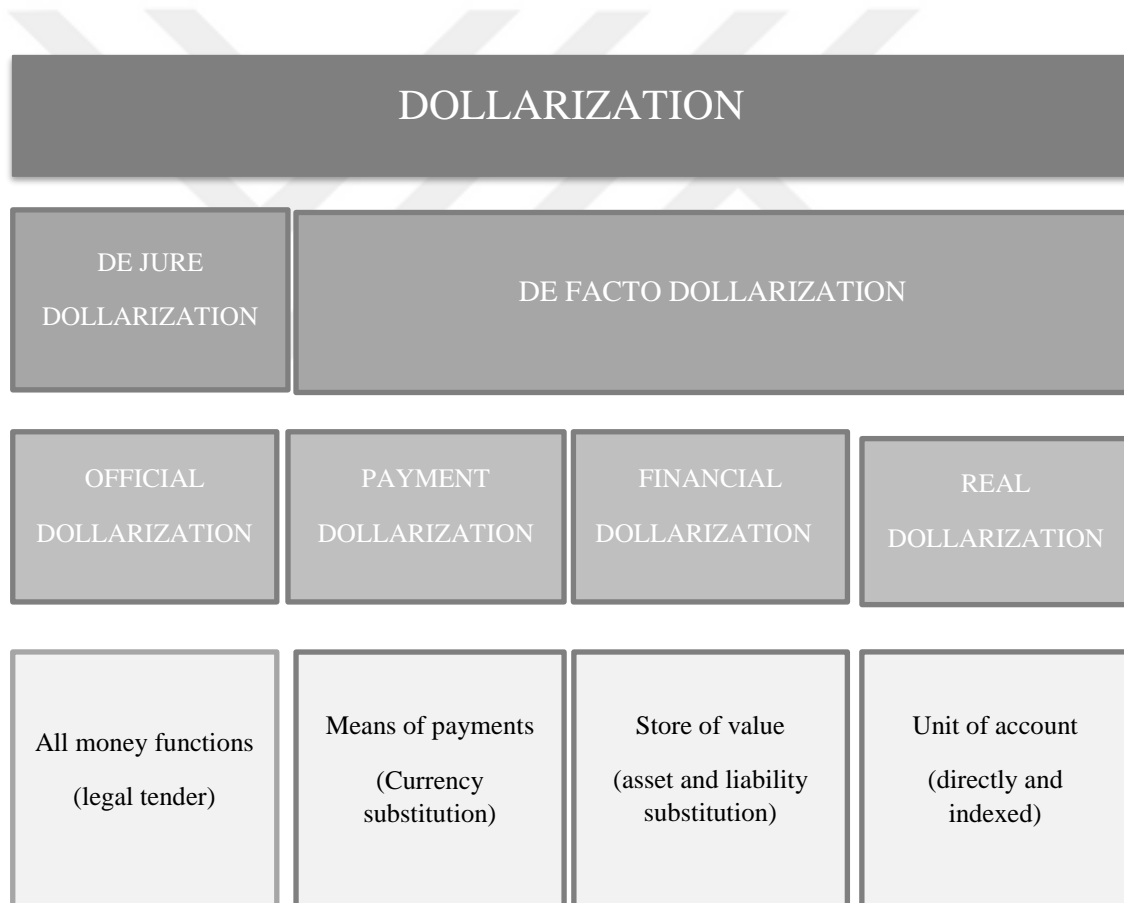
Figure 1 Terminology of Dollarization

Source: Schaub, 2009

2.2   De-facto Dollarization

According to De Nicola (2005), unofficial dollarization (''de facto'' or ''partial'') is specified by three features, which are ''payment dollarization'', ''financial dollarization'' and ''real dollarization''. The distinction between these three generic concepts of dollarization relies on money and money's three functions.

2.2.1   Payment Dollarization

Payment dollarization is known as currency substitution in the literature. It refers only to the using of foreign currency in the form of reserves at the central bank, in cash, or demand deposits for transactions.

2.2.1.1   Currency Substitution

The demand for foreign currency can be for different requirements like international trade and tourism by domestic agents of a country. According to Krueger and Ha (1996), there are five different reasons for using a foreign currency: convenience in international transactions; general use in domestic transactions; use as a medium of saving; speculation against exchange rate fluctuation; and as a store of value under inflationary conditions. However, the reasons of using foreign currency can be for different purposes in advanced and developing countries. On one hand, industrial countries have used foreign currency as a result of portfolio diversification or as a means of reducing transaction costs in international exchanges. And on the other hand, developing economies have used foreign denominated currency as a result of macroeconomic instability.

The negativity that occurs in the economy (such as inflation) may result in the loss of the national currency to fulfill three functions of money as well as more stable and strong foreign currency or currencies may serve to fulfill any or all the basic functions of money in the local economy. In this case, the term currency substitution is frequently used by some authors. However, in the literature on dollarization, there are different definitions according to which the functions of money can be replaced. Currency substitution from dollarization is distinguished by these uses of money. In most of the studies, dollarization

is usually used to refer to the use of foreign currency as a store of value and a unit of account. On the other hand, currency substitution is used to refer to the use of foreign currency as a medium of exchange. Currency substitution is therefore associated with the cost of doing transactions in domestic money as a result of inflationary pressures. Foreign currency provides a higher degree of purchasing power stability, thereby making the use of foreign currency more desirable than local currency.

There are also different approaches on currency substitution. For example, McKinnon (1985) provides two distinctive classification of currency substitution, which are ''direct'' currency substitution and ''indirect'' currency substitution. Direct currency substitution occurs when two or more currencies compete as a means of payments and people switch between them within the same commodity domain. Indirect currency substitution on the other hand occurs when domestic agents switch between currencies and non-monetary financial assets like bonds, denominated in different currencies and currency (notes and coins). Domestic agents attempt to substitute assets of more liquidity for assets of lesser liquidity like substituting domestic currency for domestic bonds. For example, if an exogenous shock hits the economy under a fixed exchange rate regime and when domestic currency is expected to depreciate, the domestic interest rate will increase to sustain the uncovered interest parity. Because the hold of domestic assets is more desirable than the hold of the domestic currency, however this exchange will be lower than the domestic interest rate and lead to asset arbitrage. In this case, a capital outflow from domestic country takes places due to increasing demand for foreign currency and decreasing demand for domestic currency. Hence, currency substitution occurs indirectly.

On the other hand, Calvo and Rodriguez (1977), Cuddington (1989) argue about the concept of currency substitution in a different way. According to the authors, domestic residents are assumed to hold both foreign currency and local currency that are used to a significant extent in facilitating domestic economic transactions and they have rational expectations. The concept of currency substitution should focus on the transactions demand for domestic and foreign currencies, not primarily assets and portfolio balances motives. They distinguish the phenomenon of currency substitution from the more general phenomena of capital mobility and international portfolio diversification that is used when there is a switch between domestic and foreign interest-bearing assets.

Figure 2 shows that there is difference between these two approaches. For McKinnon, there are movements from I. to II. or from II. to I. These movements are called as direct currency substitution. At the same time, there can be movements from II. to IV. or from IV. to II. These movements are called as indirect currency substitution. On the other hand, according to Calvo and Rodriguez, and Cuddington, the movements are only from I to II and from I. to IV (these movements are called as currency substitution) and movements from III. to IV. (These movements are called as capital mobility).
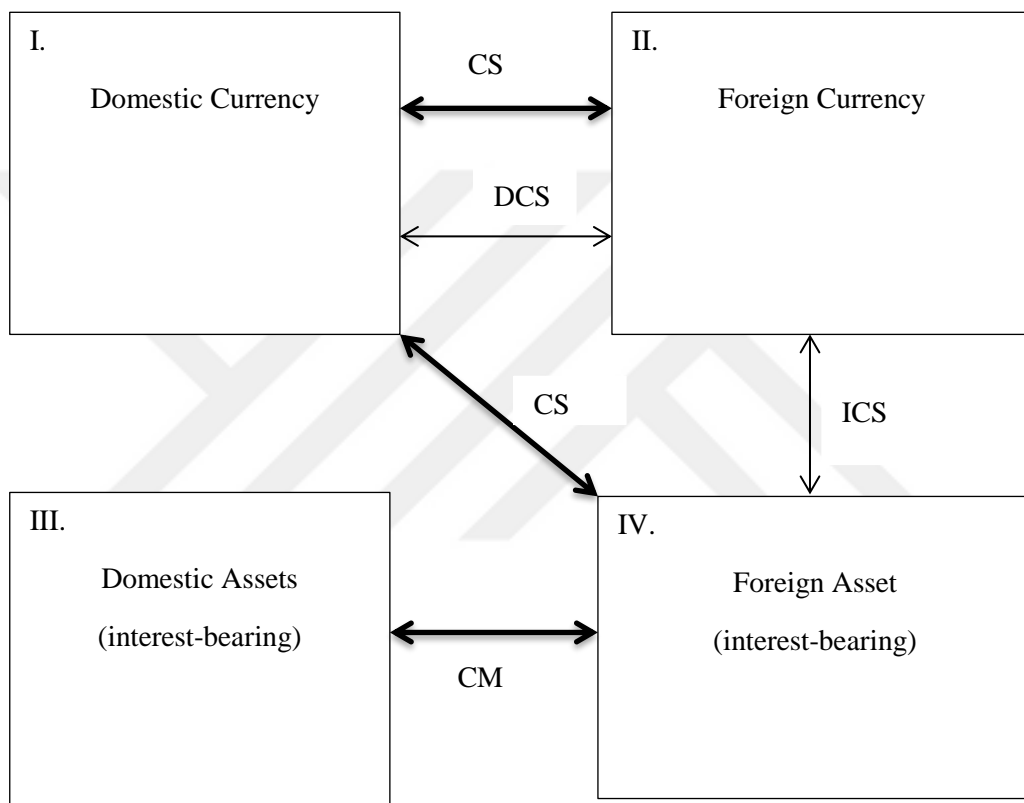
where:

DCS: Direct Currency Substitution

ICS: Inderect Currency Substitution

CS: Currency Substitution

CM: Capital Mobality

Figure 2 Direct and Indirect Currency Substitution

Source: Arce-Catacora, 1997

One of the issues related to the concept of currency substitution is also concerned with the supply-side or demand-side. On one hand, currency substitution on supply side

depends on exchange rate policy implemented in a country. When a country decides to choose fixed exchange regime, it will make its domestic currency a perfect substitute for foreign currency on the supply side of the market. Domestic currency is converted easily into foreign currency via central bank interventions. It is also regarded as official dollarization. On the other hand, currency substitution on demand side is usually driven by market forces. Economic agents can convert their wealth from their domestic currency to foreign currency without requiring any services of the central bank. It can also be called unofficial dollarization.

Another definition concerning the currency substitution can also be made in the broad and in the narrow explanations. Currency substitution in the narrow explanation means a situation where local residents choose to use foreign currency or currencies as substitute for domestic currency. In a broad sense, currency substitution means a situation where residents choose to use foreign currency denominated assets as substitutes for all domestic asset.

Giovannini and Turtelboom (1992) have also explained the concept of currency substitution focusing on two alternative concepts ''substitution'' and substitutability''. According to the authors, three traditional functions of domestic currency affect the concept of currency substitutability. Currency substitutability is the process of one currency becoming a substitute for another currency but does not completely replace it. Currencies may be substitutable but not substituted. Although two or more currencies are close substitutes, economic agents can choose to hold one currency rather than the other. Therefore, these currencies are substitutable. Currency substitution is (partial or complete) replacement of one currency with another. In most cases with the presence of inflation, a stronger and reliable foreign currency can be used as a unit of account or a store of value or /and just afterwards as a medium of exchange. In this case, currency substitution can be seen as the dollarization process' last stage. Two alternative concepts lead to opposite kinds of research. In the study of currency substitutability, the potential effects are explored, by contrast in the study of currency substitution, the size and causes of the phenomenon are explored.

Another different definition on currency substitution belongs to Ramirez-Rojas (1985). He has mentioned the difference between the meanings of the terms symmetrical and asymmetrical (non-symmetrical) currency substitution. Symmetrical currency

substitution is defined as a situation where local resident and foreign resident hold domestic and foreign currency simultaneously. Asymmetrical currency substitution is defined as a situation where local resident demand foreign money which is not accompanied by a demand for the weak currency by foreign resident. According to El-Erian (1988), currency substitution refer to a situation where foreign-denominated money has replaced, either wholly or in part, domestic money in performing the roles of money. In the literature, currency substitution is referred to as non-symmetrical. Currency substitution arises under conditions of effectiveness of various economic and financial policies, particularly monetary, fiscal, financial intermediation, and exchange rate policies. Therefore, currency substitution seen in Latin American countries are asymmetrical. In these countries, while the US dollar in local currency is strongly substituted, local currency of the country in question is not required by economic agents in the United States and symmetrical currency substitution process is also being experienced in developed countries.

2.2.2 Financial Dollarization

The traditional definition of dollarization has changed over time and new definition has emerged called financial dollarization. According to Arteta (2003), dollarization should include assets and liabilities concerning using foreign currency. Therefore, he has defined financial dollarization or bank dollarization as an extensive presence of dollar, credits, and deposits on the balance sheets because there are different sides of the balance sheets of the banks, individuals, governments, and firms.

Financial dollarization corresponds to using foreign currency to index financial contracts on both asset and liability side. Furthermore, this type of dollarization can be of external nature or domestic that depend on the claim of local residents and/or foreign resident against the government and residents. At this point, the study of Ize and Levy Yeyati (2005) has indicated a distinction between external and domestic dollarization. Domestic dollarization covers financial contracts such as onshore foreign currency loan and deposit belonging to local residents. External dollarization covers financial contract such us externally bonded debt made between domestic and external residents. Despite their distinctive classification, there are a significant point of intersection between domestic

and external dollarization as well as between currency and asset substitution that cannot be ignored.

There are two types of dollarization namely, asset dollarization and liability dollarization Asset dollarization is used as opposed to liability dollarization. Asset dollarization typically arises from return and risk consideration about foreign assets and domestic assets. Firms and individuals under macroeconomic risk like price instability and prolonged depressions would prefer to hold foreign assets since foreign currency denominated asset could serve as an insurance against the risk. On the other hand, liability dollarization stresses the role that local borrowing denominated in or indexed to foreign currencies rather than domestic currency by the households, firms, banks and government. If there is no integration of domestic financial system with global financial market in a country and the sharing of international trade, then one can conceive of plausible circumstances in which liability dollarization is negligible (Calvo, 1999: 16).

Reinhart et al. (2003) also indicate that these two concepts of dollarization has focused upon different sides of the balance sheet of the economic agents. The great number of works that have already been done on the economic implications of dollarization until the late 1990s was defined as economic agents holding of foreign currency or foreign currency denominated financial assets as part of their asset portfolios. On the other hand, the newer works focused on liability dollarization. The concept of liability dollarization deals with the right-side column, which focuses on the external foreign currency liability of banks, firms, households, the government, and the central bank (see figure 3).

A.Private Sector

ASSETS   LIABILITIES

| Households |

| Foreign currency (FC) cash holdings |

| Foreign currency bank loans |

| FC bank deposits |

| FC assets held abroad (incl. bank deposits) |

| Firms |

| FC-linked government debt |

| FC bank loans |

| Domestic FC bonds |

| External FC debt (bonds and loans) |

| Banks |

| FC assets abroad |

| FC deposits (households, firms) |

| FC credit to households and firms |

| External FC debt (bonds, loans) |

B. Public Sector

| FC net credit to the government |

| Reserve requirement on FC bank deposits |

| Central Bank |

| FC-linked government |

| Net FC bank |

| Government |

| Net International Reserves |

| FC-linked domestic debt |

| FC assets held abroad (incl. bank deposits) |

| External FC debt |

Figure 3 Foreign Currency Balance Sheet of a Partially Dollarized Economy

Source: Reinhart et al. (2003)

2.2.3 Real Dollarization

Real dollarization is the use of foreign currency to index the local price, wage, and other real contracts to a foreign currency in the way of formal or de facto.

According to Luca and Petrova (2003), real dollarization is defined as the match between the currency composition of cots and revenues of production firms in foreign currencies by firms. That is, firms may want to use imported intermediate good in the production of the final goods or might want to export activities (their returns denominated in foreign currencies). Therefore, they tend to search for available hedging alternatives against exchange rate changes or currency risk. At this point, real dollarization naturally leads to financial dollarization

In the work of Ize and Parrado (2002), they explained how real and financial dollarization types of de facto dollarization interact in open-economy with real shocks. The authors mention three alternative classifications to dollarization including payment dollarization, financial dollarization, and real dollarization. Financial dollarization is the use of the foreign currency to index loan, deposit, and other financial contracts. Payment dollarization is not different from currency substitution. Real dollarization is the use of dollar to index price of goods, wage of workers, and other real contracts. Firms and workers face similar portfolio decisions as investors or borrowers due to nominal rigidities in the real dollarization when they decide to whether to set wages or prices in local or foreign currency. If firms and workers prefer the dollar rather than local currency in an environment where the real exchange rate can be expected to remain more stable than inflation, their real incomes are better protected against unexpected macroeconomic disturbances.

2.3   De-jure (Official) Dollarization

Another type of dollarization is official dollarization. Official dollarization means that one country adopts a foreign currency as a legal tender in replacement of its domestic currency. In other words it occurs when a country fully quits the use of the local currency and adopts foreign currency such as the U.S dollar, the Euro, Yen and the Swiss franc etc.

Domestic currency can be used once a country decide to choose officially foreign currency but at a secondary level.

In the literature, a distinction is also made between unofficial also called de facto or partial dollarization and official also called de jure or full dollarization. Official dollarization means only in practice lawful or official in Latin, whereas unofficial dollarization or de facto dollarization means that a country use foreign currency as part of its own domestic currency.

At the end of the 1990s, the existing studies focused upon the issue de jure dollarization. Many countries like Ecuador, El Salvador, and Panama experienced official (full, de jure) dollarization. Panama is the most well-known example of official dollarization. It has been officially dollarized since 1904. Ecuador in 2000, El Salvador and Guatemala in 2001 adopted foreign currency as legal tender. These countries decided to give up their own local currency and to use foreign currency in both private entity transactions and government payments.

Table 1 shows a list of the officially dollarized economies in existence. Some of these countries officially use dollar or another foreign currencies include the euro, Australian dollar, Spanish peseta, Italian lira, French franc, Liberian dollar. Some of the countries are also members of The International Monetary Fund (IMF); Panama, Palau, Kiribati, San Marino, Micronesia and the Marshall Islands. All of these countries' average GDP does not exceed 3.6 billion dollars. Official dollarization is rarely implemented among developed and developing countries because of the political symbolism of national currency, and the central bank's loss of authority in using monetary and exchange rate policies independently.

Table 1 Independent Countries Officially Dollarized or Having a Dual Currency

Countries	Population 2002	GDP* 2002	Legal Currency	Local coins	Since
Kiribati (Gilbert Islands)	82 000	0.1	Sterling pound replaced by the Australian dollar		2001
Liberia	3 300 000	0.5	Dual currency: American dollar and Liberian dollar		1945
Panama	2 900 000	9.5	U.S. dollar	X	1904
El Salvador	6 500 000	13.0	U.S. dollar		2001
Guatemala	12 000 000	23.2	Dual currency : American dollar and the quetzal		2001
Ecuador	13 100 000	24.3	U.S. dollar	X	2000
Marshall Islands	61 000	0.1	U.S. dollar		1944
Liechtenstein	31 000	0.7	Suisse Franc		1921
Tuvalu (Ellice Islands)	11 000	0.0	Australian dollar		1892
Micronesia	120 000	0.2	U.S. dollar		1944
Monaco	32 000	0.8	French franc replaced by the Euro	X	2002 (euro) 1865 (franc)
East Timor	857 000	0.2	U.S. dollar		2000
Palau	19 000	0.2	U.S. dollar		1944
San Marino	26 000	0,1	Italian lira replaced by the Euro	X	2002 (euro) 1897 (lira)
Nauru	11 000	0.1	Australian dollar		1914
Vatican City	1000	0.0	Italian lira replaced by the Euro	X	2002 (euro) 1929 (lira)

Source: Minda, 2005

Some developing countries have already fully substituted their domestic currency for a foreign currency. However, causes of full dollarization can differ from country to country and from case to case. For example, Ecuador has dollarized its economy in order to reduce inflation and to maintain economic stability, whereas El Salvador dollarized to promote financial integration in international markets.

Official dollarization can be seen as a member of exchange rate regime. As can be observed from Figure 4, it indicates a classification of the competing types of exchange rate regimes that can be divided into hard pegs, intermediate and floating exchange regimes. These types of exchange rate regimes can sub-divide into different forms that countries can choose. Intermediate regimes including soft pegs (conventional fixed pegs, horizontal bands, crawling bands, and crawling pegs) as well as tightly managed floats are between hard pegs and floating rates. These types of exchange regime are represented by regimes like fixed but adjustable pegs. The central bank can intervene by buying or selling currency (domestic or foreign currency).

In floating exchange regime, national currency values are determined by demand and supply. In hard pegs exchange regimes, a national currency value are tied to each other at publicly announced rates and does not vary from day to day. However, they might be periodically adjusted. These are represented currency board arrangement, formal dollarization, and currency union. Within the types of hard pegs exchange rate regimes, the extreme case is official (de jure) dollarization. Official dollarization is a member of the family of hard pegs exchange rates. In this case, it requires the use of foreign currency, typically the US dollar as domestic currency.
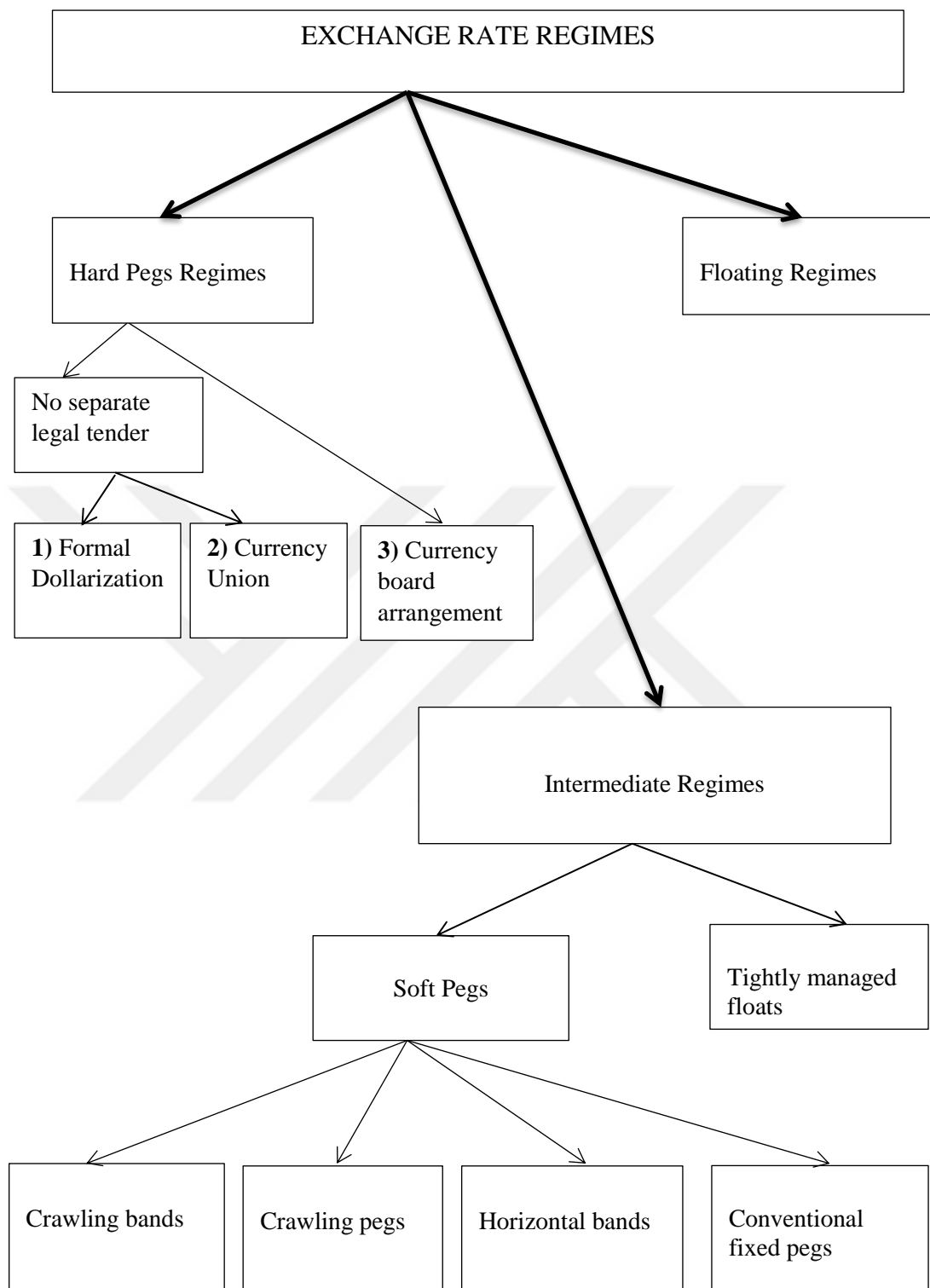
Figure 4 Types of Exchange Regimes

Source: Yorukoglu (2006), Economic Convergence and Exchange Rate Regimes, International Conference On Dollarization: Consequences And Policy Options, Istanbul

Even if official dollarization is seen like a special case of hard pages, it displays more permanent character compared to fixed exchange rate regime because changes in fixed exchange rate can be made by monetary authorities and fixed exchange rate harbors future risks, but official dollarization can remove risks derived from exchange rate entirely.

There are several ways to fulfill this, which is divided into unilateral decision and bilateral agreement when a country to completely give up local currency.

2.3.1 Unilateral Dollarization

Unilateral dollarization occurs when the home country decides to adopt a policy of dollarization without consultation or agreement with the foreign country. In this system, there is no obligation to the foreign country of providing its own currency. One country could implement this type of dollarization without spending anytime in negotiation or agreement with the foreign country government (Curutchet, 2001: 7).

Examples of dollarized countries are Panama, Northern Mariana Islands, Marshall Islands, Guam, Virgin Islands, Puerto Rico etc.

Unilateral dollarization has the advantage of immediate implementation without spending anytime in negotiation with the U.S government. However, it has the disadvantage that there would not be any formal agreement with the U.S. Thus, many of the advantages of bilateral dollarization would be lost, such as the sharing of seigniorage revenue and transferred to foreign country as well as the possibility of acting as a last resort lender (Curutchet, 2001: 7).

2.3.2 Bilateral Dollarization

Bilateral dollarization occurs by pursuing dollarization by making a treaty with the issuing country in which the parties will specify the conditions of dollarization like the sharing of the seigniorage revenue, the access to the central bank discount window. Countries can easily change their laws, adopt a new currency and re-establish its Central Bank compared with unilateral dollarization. (Curutchet, 2001: 7).

In this type of official dollarization, foreign country supply of bills and coins to the home country is guaranteed due to prior agreement. Home country and foreign country share seigniorage revenue and they might conduct negotiation transfer and distribution of seigniorage between both countries. However, since the decision of applying a policy of bilateral dollarization is made in the foreign country, its negotiation scope enters the negotiation round, with the foreign country, already handicapped.

3. CAUSES AND EFFECTS OF DOLARIZATION

This chapter is arranged as follows. It starts with a brief theoretical consideration about the main causes and determinants of partial dollarization. This is followed by the consequences of unofficial dollarization across different regions and specific countries. And then, we evaluate cost and benefits associated with de jure dollarization. Lastly, we focus on the issue of dollarization hysteresis and de-dollarization strategies.

3.1 Causes of Dollarization

3.1.1 Inflation and Exchange Rate

Existing empirical and theoretical evidence suggest that high rate of inflation and domestic currency depreciation causes dollarization because the real value of saving and the purchasing power of economic agents decrease. Therefore, there is a strong correlation between inflation, exchange rate, and dollarization.

Calvo and Vegh (1992) claim that there is a strong link between dollarization and inflation, and that consumers do not need foreign exchange as a store of value in case there is no inflation. The more a country's inflation increases, the more the demand for foreign money increases. At this point, dollarization process usually begins as a store of value when foreign currency is substituted instead of domestic currency. Domestic currency gradually loses its function as a store of value when there is inflation. However, domestic currency maintains its functions as a medium of exchange and a unit of account for almost non-durable goods.

Figure 5, 6, 7, and 8 demonstrate the link between the degree of inflation rate and dollarization in selected countries including Costa Rica, Turkey, Kazakhstan, Kyrgyz Republic.

The access of foreign currency deposits for Turkey was in 1983. Figure 5 below shows that Turkey's level of deposit dollarization continued increasing substantially from about

18 percent in 1986 to about 58 percent in 2001 in the economy from that time due to high and volatile rates of inflation. Dollarization ratio reached its first peak with 50.06 percent as of 1994. However, second and the highest level of dollarization of 58 percent occurred in 2001, as a result of financial crisis. These higher levels of deposit dollarization were not surprising because it was affected by inflation and a substantial devaluation of the Turkish lira. Dollarization ratio started to decline gradually over the period aftermath of the 2001 economic crisis. As inflation rate declined, dollarization ratio also declined. However, this reduction in dollarization was relatively small compared with decreasing inflation. Therefore, the phenomenon of dollarization can gain persistence because of past policy mismanagement.
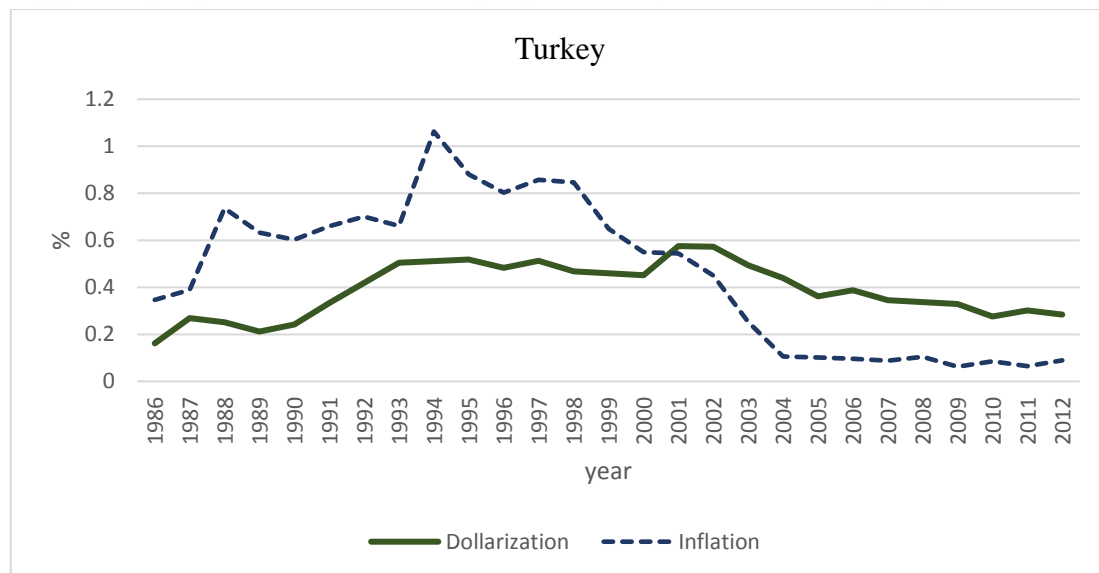
Figure 5 Inflation and Dollarization: Turkey

Source: Author's computations based on data from IMF country report and World Bank, (2014)

Figure 6 indicates that deposit dollarization in Kazakhstan has been rapidly increasing from 36.4 percent in 1998 to almost 60 percent in 2002. The sharp rise in the dollarization in Kazakhstan was due to the domestic currency' depreciations because of the Russian financial crisis. However, dollarization started to decrease slowly over the period until 2007. Furthermore, rise in the foreign currency may be associated with the increasing public credit to the domestic banking system and rising revenue of the oil sectors denominated in the foreign currency. For these reasons, not only increasing export sectors but also growing volume of foreign currency deposits might have been the cause of gradual increase in the level of dollarization until 2001 in the country. The reason for

decrease in the level of dollarization could be connected with gradual tendency of de-dollarization and the stronger position of domestic currency (Asel, 2010: 16).
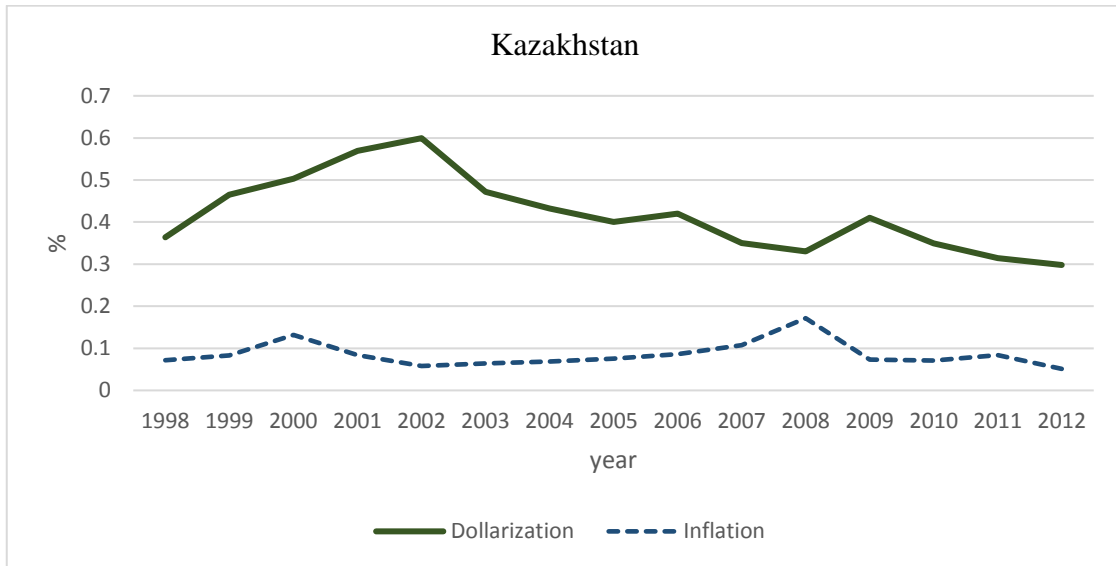
Figure 6 Inflation and Dollarization: Kazakhstan

Source: Author's computations based on data from Moody's, World Bank, and Levy-Yeyati (2006)
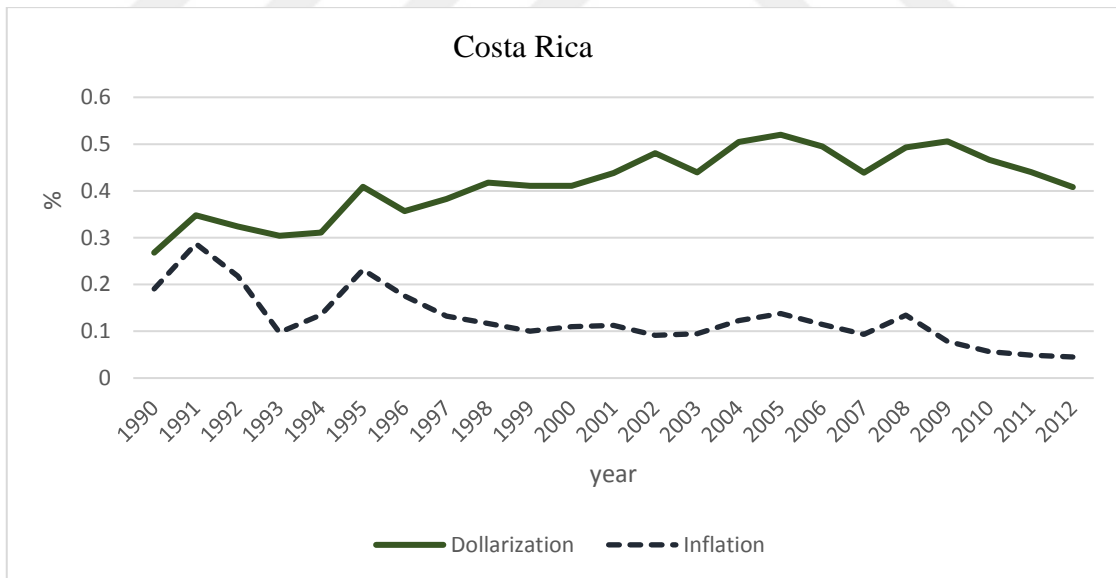
Figure 7 Inflation and Dollarization: Costa Rica

Source: Author's computations based on data from Moody's, World Bank, and Levy-Yeyati (2006)

As can be seen from Figure 7 Costa Rica like other highly dollarized economies-Argentina, Uruguay, Bolivia, Honduras, Nicaragua, Paraguay and Peru, deposit dollarization has increased to shares of about 40 and 50 percent. Generally, Latin

American countries were characterized by unusually high and volatility of inflation rate during the period of 1990. In the years of inflation such as the year of 1991-1994, dollarization level also increased in Costa Rica.
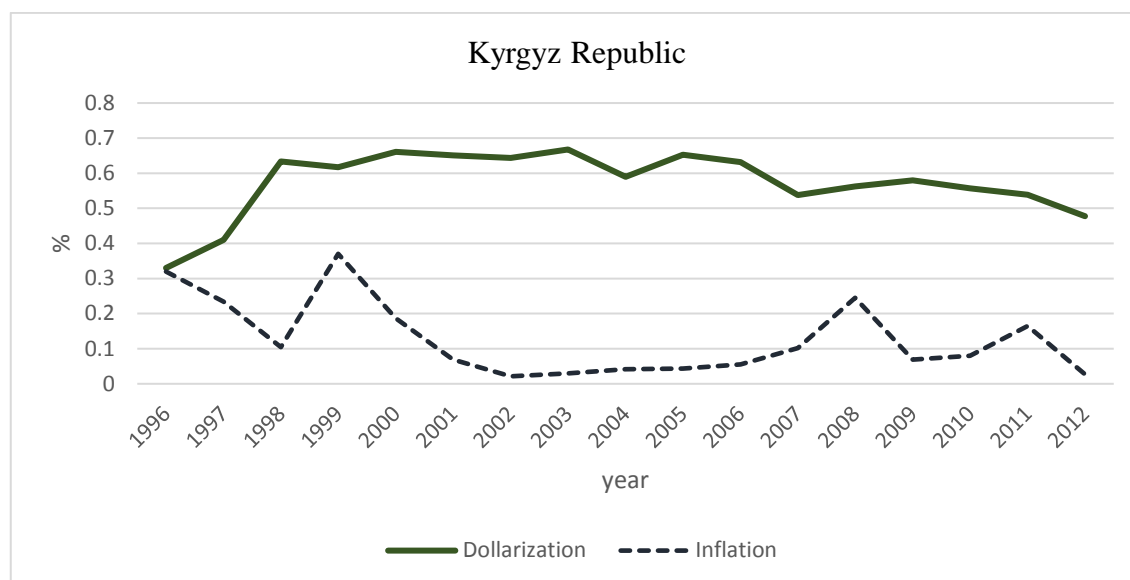
Figure 8 Inflation and Dollarization: Kyrgyz Republic

Source: Author's computations based on data from Levy-Yeyati (2006), Moodys (2013), and World Bank

Figure 8 is associated with Kyrgyz Republic, it indicates that dollarization has been rapidly increasing from about 30 percent to in 1996 to almost 60 percent in 1998 when it started to stable at around 60 percent during the period of 2000 until 2003. Asel (2010) explains that the sharp increase in the degree of dollarization could be explained by a sharp increase in remittances inflows in the country. A part of the remittances could come through the banking system and remain on the bank accounts of the residents who opened bank account for the aim of receiving money transfers. Decline in dollarization can be explained by the domestic currency' appreciations and little improvement in the public's confidence towards local banks.

Inter-American Development Bank (IADB) (2005) also explains the link between inflation, exchange rate and dollarization. To explain this relationship, it is assumed that indexed instruments and contracts are not readily available for economic agents (individuals, firms and governments). They should choose nominal national currency or

foreign currency. Indeed, this assumption may not be realistic but this assumption is only simplification of the portfolio decision of a consumer.

IADB explains the cause of emergence of dollarization with the changes in the inflation and real exchange rates. Let us consider the state of uncovered interest parity. Consumers are mostly interested in real returns of national and foreign money. When consumers derive profit as much as R from domestic currency by the end of year, the derived real return;

$$r_p = R - \pi \tag{1}$$

where r_p is real return over the year for national currency

where π is inflation rate during the year

If consumers keeps their savings in foreign currency instead of local currency, the derived real return;

$$r_d = R^* + dev - \pi \tag{2}$$

where r_d is real return over the year for foreign currency

R^* is nominal return for foreign currency

dev is the nominal exchange rate

In this case, $dev - \pi$ represents the real exchange rate. Therefore;

$$r_d = R^* + rer \tag{3}$$

Where rer is real exchange rate.

In the light of the equations given above, consumer's preferences will emerge depending on the changes in the inflation and real exchange rates. Should real exchange rates be more stable than inflation, individuals will choose foreign currency instead of domestic currency. On the contrary, if inflation is more stable than real exchange rates, then individuals will give up using foreign currency and prefer to use domestic currency.

Thomas (1985) has revealed that the level of dollarization depends on the relative incomes of portfolio assets and risks. He also indicates that the changes in the inflation and real exchange rates are the sources of dollarization. A possible rise in inflation rate and an

expected decrease in the real exchange rates will cause consumers to abstain from domestic currency as well as opt for foreign currency.

Ize and Levy Yeyati (1998) have focused on minimum variance portfolio (MVP) theory. MVP is depended on the relative volatilities of inflation and the real exchange rate.

According to MVP theory, depositor can choose three types of assets

- Local currency deposits
- Foreign currency deposits
- Foreign currency held cross border

These assets' real return in terms of local consumer price index (CPI) are r^h, r^f and r^c. In that case, the real return in the portfolio can be expressed as follows:

$$r^h = E(r^h) - \mu_\pi + \mu_c \tag{4}$$

$$r^f = E(r^f) - \mu_s + \mu_c \tag{5}$$

$$r^c = E(r^c) + \mu_s \tag{6}$$

where μ_π, μ_c, μ_s and E represent risks corresponding to inflation, country risk, the real exchange risks and the expectation operator, respectively.

Depositor preferences can be described as;

$$U_d = E(r_d) - c_d \, var(r_d) \, / \, 2 \tag{7}$$

Where r_d and $var(r_d)$ reflect the average real return of deposit, variance operator, respectively. c_d is greater than zero and constant. It reflects aversion to risk

The authors assumed that nominal the rate of interest is fixed throughout the deposit life or the contract loan, hence uncertainty about real rates of return occurs from the volatility of real exchange rate or the inflation volatility. Using these assumptions as follow:

$$R^h \approx r^h - \pi \tag{8}$$

$$R^f \approx r^f + dev - \pi \tag{9}$$

In this case, $dev - \pi$ represents the real exchange rate ($s = dev - \pi$)

R^h, r^h, R^f, r^f, s , dev, and π are real deposit rate, nominal deposit rate in home, real foreign currency, nominal foreign currency, real exchange rate, nominal exchange rate and the rate of inflation, respectively.

MVP allocation might be determined as a function of inflation and exchange risk:

$$\lambda^* = (S_{\pi\pi} + S_{\pi s}) / (S_{\pi\pi} + S_{ss} + S_{\pi s}) \tag{10}$$

$S_{\pi\pi}$, $S_{\pi s}$, S_{ss} are the variance of inflation, the covariance between inflation and real depreciation, and the variance of real depreciation, respectively.

λ^* is specified to reflect the share of foreign currency deposits (minimum variance portfolio dollarization). MVP dollarization is measured as the volatility of inflation and the real exchange rate rather than level of inflation and real exchange rate.

The ratio of MVP dollarization increases when domestic residents expect that volatility of the real exchange rate is stable and volatility of inflation rate is high, MVP dollarization ratio increase because they choose foreign currency instead of local currency.

The level of dollarization is lower in the countries where fluctuating exchange rate is chosen and inflation is stable. When central banks adopt inflation targeting policy, as this reduces macroeconomic risks, credibility of domestic currency will increase and use of foreign currency will decrease, thus the level of dollarization will be lower.

Dollarization level is higher in the countries where fixed exchange rate is chosen and inflation is higher. Since the implementation of fixed exchange rate will remove the volatility in the country's exchange rate, volatilities in the inflation will cause people to lose their trust in the domestic currency and to use foreign currency. People will tend to use foreign currency instead of domestic currency so as to protect savings. At the same time, external borrowing will become more attractive since borrowing foreign currency's risk will disappear and there will not be a change in the exchange rate this situation will cause liability dollarization level to increase. One of the factors that causes liability dollarization level to increase is the expectation of devaluation occurring in the fixed exchange rate system. As devaluation increases the banks' level of foreign exchange rate, it will cause banks to credit in foreign currency instead of local currency. In this case, as people will get credits in foreign currency, there shall be an increase in the liability dollarization.

IADB (2005) explains partial dollarization in terms of loan dollarization. Since borrowers and consumers have the same preferences, under the expectation of zero difference between domestic interest rates and foreign interest rates, elements that will determine optimal debt preference will be the relative variance of inflation and real exchange rates. As seen in Figure 9, MVP at optimum equilibrium point shows the dollarization level. An increase in the inflation and real exchange rates will cause MVP to increase.
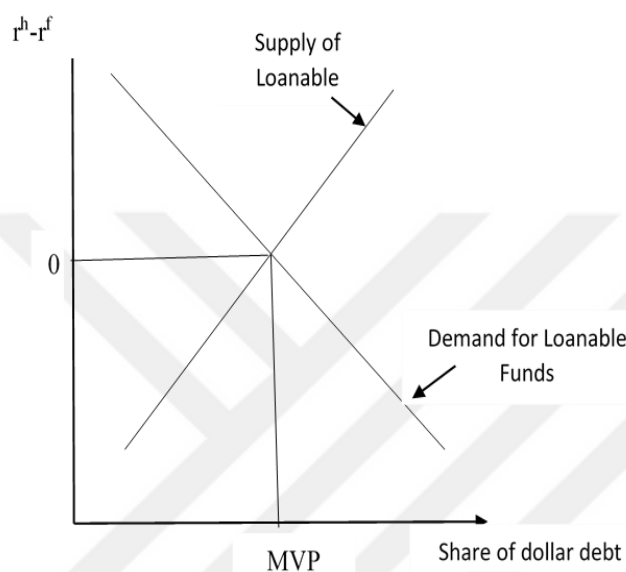
Figure 9 The basic framework: Dollarization level

Source: Inter-American Development Bank, 2005: 57

When MVP is in positive relation with inflation variance, it is in negative relation with real exchange rate variance. As seen in Figure 10, an increase in the inflation variance, raises the relative risk of assets, this will lead to a transition from domestic currency to foreign currency, and hence supply and demand curves shift to the right. When interest rate difference is equal to zero, in order for MVP to be in equilibrium state, it needs to increase MVP[1].
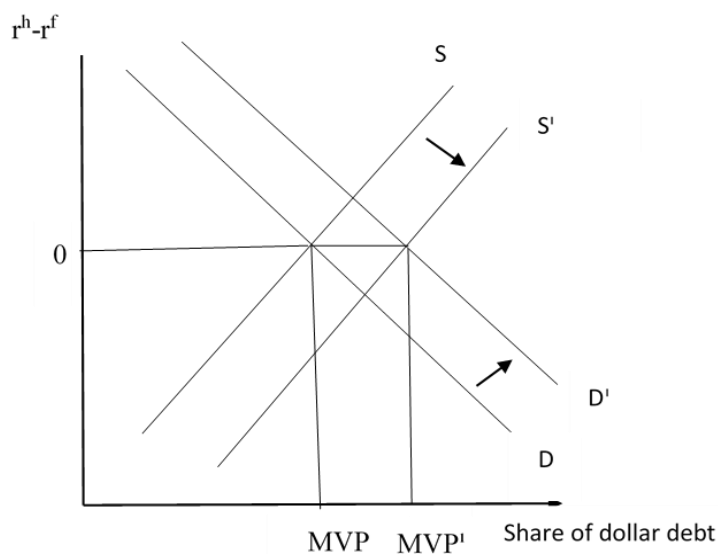
Figure 10 A rise in the relative variance of inflation

Source: Inter-American Development Bank, 2005: 57

3.1.2 Interest Rate Differential

According to Agenor and Khan (1996), a demand function for currency ratio relates marginal rate of substitution between local currency and foreign currency inversely to the ratio of their opportunity cost. Because economic agents also use foreign currency as a means of the alternative medium of exchange.

As discussed in the studies of Catão and Terrones (2000, 2016), dollarization can be shaped by a potentially important driver such as the world interest rate. A decline in the external interest rate encourages dollar-denominated offshore borrowing for countries with low or semi-dollarization. Lower external interest rates induce banks to fund their loans from abroad, and since all external borrowing is in foreign currency, banks will also be more inclined to lend domestically in the US dollars relative to lending in domestic currency, as they seek to hedge against a devaluation risk. Similarly, Basso et al. (2007) explain that a wider interest rate differential on domestic financial assets compared to foreign financial assets causes a reduction in deposit dollarization. There is a trade-off between deposit dollarization and interest rate, however, this would tend to increase the loan dollarization.

Ramirez-Rojas (1985) explained that, in some developing countries, a policy intervention that results in a fixed nominal interest rate for a long time, irrespective of the level of inflation, has widely been employed; in such cases, a highly negative real domestic interest rate will surely exacerbate deposit dollarization. The author also mentions that currency substitution is the difference between foreign and domestic interest rate, not the level of foreign interest rates.

3.1.3   Institutional Factors and Policy Credibility

Ize and Levy-Yeyati (2005) admitted that MVP depending upon relative volatility of the real exchange rate and the rate of inflation clarifies only a limited share of dollarization in cross-country estimate of deposit and/or loan dollarization. In addition to the factors explained interest rate differentials, real exchange rate, as well as inflation, cause of dollarization can also be explained by institutional factors. The work of Savastano (1996) which is among early empirical literature has demonstrated that the country's institutional framework has strong effects on the process of dollarization. Countries with better quality of institutions are shown to be less dollarized to the effect that institutions proxy for the credibility of monetary policy (De Nicolo et al. (2005), Rajan and Tokatlidis (2005), Rennhack and Nozaki (2006), Honig (2006), Levy-Yeyati (2006), Weymuth (2007), Mwase and Kumah (2015).

The basic argument lies on the credibility of government policies. To the extent that, countries with weak institutions can send signals to local residents about government policies' unreliability. They realize that enforcement of contract may have many problems owing to a weak form of governance. The reckless behavior of the executive arm of governance who in a bid to finance the deficit and create short-run growth, resort to the printing of new currencies, thereby exert inflationary pressure on the economy and thus, causes dollarization (Raheem and Asongu, 2016: 17).

Underdeveloped institutions can be among the key drivers of dollarization hysteresis. One of the reasons is that myopic politicians eager to increase short-run output can enact inflationary policy, either through monetary or fiscal policy, that has the long-run effect of losing confidence in the local currency, thus promoting the use of foreign currency.

Moreover, reckless fiscal policy puts pressure on the monetary authorities to monetize the debt, producing high inflation. Because it is reasonable to suppose that well-run governments are able to control fiscal imbalances, it thereby follows that they restrain inflation and dollarization as well (Honig, 2009: 202).

The studies of Sahay and Vegh (1995), and Savastano (1996) mentioned institutional arrangement as institutional factors related to dollarization. Foreign currency demand can be determined by the availability of foreign currency which depends substantially on local institutional constraints. Naturally, the authors show that legal restrictions on foreign currency deposits lead to low dollarization or the fast decreasing in the dollarization ratio[1]. However, when countries with implementation restrictions are allowed to use of foreign currency, dollarization ratio arises during the first couple of years of reform. One of the reasons can be shown as lack of public confidence. At this point, a weak institution diminishes policies' credibility because economic agents fear that government can erode the financial assets' value by producing unexpected inflation. Lack of well-developed institutions may also increase doubts about the enforceability of contracts and encourage economic agents to cut down the duration of contracts or undertake transactions offshore dollar contracts in economies with more secure legal frameworks (Rennhack and Nozaki, 2006: 71).

3.1.4   Financial Development

Economic agents cannot successfully hedge against the pressure of inflation by a narrow range of domestic financial instruments in countries with an underdeveloped financial system. Generally, this problem is seen in developing countries.

The well-developed financial system offers a variety of sophisticated financial products hedge against inflation for residents. Therefore, residents can easily find good instruments to protect their assets value and they do not need the use of foreign currency as a store of value. However, wide ranges of financial products to the public in developing countries are not available. Apparently, this leads to increase in the use of foreign currency or currencies where residents voluntarily substitute different strong foreign currencies for

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[1] Poland imposed such restrictions on foreign currency deposits in 1990 and Estonia in 1992

domestic currency due to the lack of sufficient financial products. A strong foreign currency like dollar protects agents against inflation.[2]

Financial liberalization or removal of restriction on financial activities may also generate a process of dollarization even without a significant change in the rate of inflation because financial liberalization reduces the marginal costs of adopting a foreign currency for transaction purposes. Therefore, this causes increase in the use foreign currency (Guidotti and Rodriguez, 1990: 17).

3.1.5   Original Sin Problem

Most of developing countries cannot borrow in local currency from abroad. They are able to only borrow in foreign currency like the US dollar, euros or other internationally accepted strong currencies. This is known as 'original sin' phenomenon in the economic literature.

Eichengreen and Hausmann (1999) were first to introduce original sin problem which is the situation where developing countries finds it difficult to borrow from international financial markets in their own currencies and/or to borrow in their local currency at long maturities at home.

Countries with original sin problem, which presumably have a greater need for foreign capital, are unlikely able to attract a foreign investor to their domestic currency bonds. This difficulty to attract foreign investors have caused a reliance on short-term or foreign currency denominated debt to finance these needs for foreign capital (Burger and Warnock, 2007: 291-192).

Calvo et al (2004) differentiated the domestic component of dollarization, the inadequacy to borrow locally in domestic currency, from external liability dollarization. The reasons of domestic dollarization can be different from foreign liability dollarization. For

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[2] Neanidis and Savva (2013), Basso et al. (2007), Barajas and Morales (2003), Piontkovsky (2003), who investigate one of the determinants of dollarization, use the indicators of financial sector development.

instance, a history of high and volatile inflation rates can end up with domestic dollarization, however, would likely not predict the external debt of an economy. In general, foreign liability dollarization exits due to original sin phenomenon.

3.2 Effects of Dollarization

In order to understand the importance of dollarization in the economy, this part tries to investigate how dollarization influences monetary policy, financial development, and financial fragility. Firstly, we focus on the effects of dollarization on monetary policy. Secondly, it mentions the link between financial development and dollarization. Finally, we try to explain how dollarization causes financial fragility.

3.2.1 Monetary Policy

As pointed out in the previous chapter, economic agents would like to diversify the composition of their portfolio under exchange rate regime. As individuals and firms tend to hold foreign currency, monetary instability may show up as a consequence of foreign currency holdings by economic agents. As mentioned by Balino et al. (1999; page 14), ''*the phenomenon of dollarization poses a challenge to the pursuit of a coherent and independent monetary policy*''[3]

According to Ortiz (1983), effect of dollarization on economic activity depends on the degree to which local currency is being displaced by foreign currency. When the process of substitution goes to the extreme of eliminating or significantly decreasing the circulation of domestic currency and coin, the monetary habitat of the country will be changed. Under this condition, local economy might no longer have monetary autonomy even under floating exchange rates, because economic agents demand both foreign and local currencies. When the monetary authority raises money supply, assuming that other economies keep their money supply constant, then residents will expect depreciation of local currency. Because the central bank does not intervene, expected depreciation increases the opportunity cost of holding local currency relative to foreign currency. As a result, economic agents of both domestic country and foreign country will hold less

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[3] In theoretical and empirical literature, some studies that mention the effects of dollarization on monetary policy can be found Miles, 1978; Ortiz, 1983; Giovannini and Turtelboom, 1994; Balino et al. 1999; Reinhart et al., 2014; Marcelin and Mathur, 2016

currency of the local country when depreciation is expected owing to rising money supply. Thereby, a change in monetary policy of a country will influence local and foreign demand for money even if it is under fluctuations exchange rate. When local country with the higher degree of dollarization does not consider the impact of money demand changes, it can cause to inappropriate policy actions (Sarı, 2006: 22).

The most important and primary objective of the central bank is to provide price stability. When central bank aims to reach and keep price stability, dollarization can be serious problem for the economy. If the switch from local currency to foreign currency is less costly, the demand for local currency will be more sensitive to fluctuations of exchange rate. Expectations of residents are shaped by the degree of foreign exchange rates. Therefore, a country with high degree of dollarization can create more inflation since the pass through effect from exchange rate to prices is high. In highly dollarized economies, some of prices such as rents, wages, some big transactions etc. are directly determined by foreign currency (Sarı, 2006: 18). Honohan and Shi (2001) have demonstrated this pass through effect. A rise of ten percent in dollarization level raises estimated pass through by six percent. Therefore, they conclude that there is positive relationship between dollarization and speed of pass through from exchange rate to inflation.

Another consequence related to the effects of partial dollarization in an economy is that, the central bank loses all or part of seigniorage of money creation because of the lower demand for local currency at any given inflation rate. In the absence of dollarization problem, its seigniorage revenues will be higher because demand for local currency will increase. However, under the high dollarization level, the used currency's country instead of local country will have all or part of seniorage incomes.

3.2.2 Financial Development

As it will be stated in next chapter, a growing empirical literature have mentioned how inflation might affect financial development. Inflation hampers financial sector development and results in financial repression. Therefore, it have been found that, there is a negative link between inflation and financial intermediation. Generally, in countries with an inflationary environment, residents have lower long-term real rates of return on their assets. Typically, residents will not tend to save in local assets with the volatile real

returns; financial intermediaries will be less eager to provide long-term financing for capital formation and growth; both lenders and borrowers will less be willing to enter long-term nominal contracts.

When indexed instruments are readily unavailable, high and volatile inflation will cause financial disintermediation because of allocating less capital (IADB, 2005: 59). The first study by Boyd et al. (1996) provides empirical support for this hypothesis, assessing the relationship between chronic inflation and financial sector performance. They investigated the determinants of cross country financial sector developments and different measurement of financial depth focusing on the role of inflation[4] and concluded that inflation has a negative effect on financial development.

Moore (1986) points out the fact that it is usually expected that when returns on savings are reduced, economic agents tend to reduce savings, and then banks lend less and allocate capital less effectively, when a country has a high inflation rate. The desire of individuals is to protect their asset values in terms of purchasing power. At this point, residents has started to use foreign currency to avoid the erosion of money's function as a store of value. Residents see other currencies as a higher quality investment and sell the local currency to buy foreign currencies in economies with high and chronic inflation, hence it causes high dollarization ratio. When a country impose a restriction on foreign currency in inflationary environment, it may lead to open accounts outside their countries, thereby offshoring deposits and financial disintermediation as residents seek an alternative vehicle to protect their assets value.

The use of a strong foreign currency provides a protecting tool from inflation to economic agents and offers savers with an opportunity to retain their savings' value. As Feige (2003) stated, dollarization reflects a revealed preference for holding foreign money as a means of decreasing the risks of domestic inflation and exchange rate devaluations, it helps the efficiency gain from portfolio diversification and also prevents capital flight from emerging economies.

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[4]The authors additionally include political stability such as the black market exchange rate premium, the number of revolutions and coups, the initial secondary school enrollment to control for price distortions, the initial level of income per capita, government expenditure divided by nominal income as control variables. However, the authors do not include institutional variables found to be substantial determinants for the development of financial sector which can be correlated with inflation.

One way to prevent capital flight is to allow banks to accept deposits in foreign currencies. Removal of restriction on foreign currency accounts increases the volume of savings in an economy. In return, these savings allow banks to extend credit to businesses and consumers, enabling firms to expand, consumers, to spend and eventually generating economic growth. From this perspective, de facto dollarization can be a promoter of financial deepening in an economy with an inflationary environment (Ozsoz and Rengifo, 2016: 39).

3.2.3   Financial Fragility

''*The world has witnessed the onset of numerous banking and currency crises in developing countries during the past two decades, many of which were very costly. As a result, the study of their determinants has been an important priority in academic and policy settings*'' (Arteta, 2003: 1). The main question that arises with the fragility of the financial system is whether dollarization has actually contributed to currency and financial crisis. Empirical literature investigating the link between crisis and dollarization has focused on the role played by foreign currency borrowing and currency mismatches in developing countries. In economies with high degrees of deposit and credit dollarization, the financial system has been confronted with problems stemming from the liquidity solvency risk.

The instability of financial system results from currency mismatch of the balance sheets of the banking sector in case of rapid and large depreciation of domestic currency. When banks accept foreign currency deposits from economic agents, they would be undertaking foreign exchange risk under floating exchange rate regime. When they make foreign currency loans to domestic businesses and households who earn their revenue in a local currency, this hedge can be only partial. In the situation of large depressions, the quality of their portfolio is undermined. Banks only replace currency risk with foreign currency loan default. However, they do not hedge their foreign exchange exposure; they only replace currency risk with dollar loan default risk. In other words, foreign currency lending to economic agents create a source of non-performing loans as large depreciations might leave the firm inability to repay the dollar loan, thus increasing the potential for a banking crisis. Thereby, not only deposit dollarization but also credit dollarization could

play an important role in developing countries having experienced severe banking crises (Honig, 2006: 1124).

Honohan and Shi (2001) point out the impacts of deposit dollarization on bank lending. When a country experiences or has a risk of sharp depreciation, this triggers deposit dollarization and leads to increase liability dollarization. However, a shift by depositors in favor of foreign currency may not necessarily be related with a corresponding one-for-one shift in the currency composition of the banks' lending. Banks need to hedge a rise in foreign currency deposits when they want to avoid the sizable risk of an open foreign exchange position. There can be two options, one they could denominate reinvest some of the deposited dollars abroad and two they can denominate more of their loans in dollars. There is a limit to which the first route can be done safely: consequently, foreign currency-denominated loans to local firms is an imperfect hedge for foreign currency liabilities, particularly in case the borrower has no foreign currency revenue. Many banks have taken into account to their cost that they have solely substituted credit risk for the risks of exchange rate.

Another reason of the instability of financial system stems from maturity mismatches. Countries with original sin problem face series of currency and maturity mismatches in their balance sheets. Typically, developing countries cannot borrow abroad in local and foreign currency at long maturities. Therefore, banks in these countries have high levels of short-term deposits, while they give credit at long maturities. Banks usually hedge risk resulting from maturity mismatches by using swaps and other derivative instruments. However, dollarized countries, where banks face mismatch risks in more than one currency; such hedging options may not be readily available or may be too expensive for the bank to utilize. As a result, banks in these economies might carry an inherent risk of maturity mismatches between foreign currency denominated assets and liabilities that is difficult to resolve (Ozsoz and Rengifo, 2016: 41).

Some authors have highlighted the importance of foreign currency debt on financial fragility. The work of Bacchetta (2000) mentions that one country with a large proportion of foreign currency debt can be face with currency crises concerning currency devaluations and large recessions. Most developing countries are particularly sensitive to their exchange rate and are reluctant to see currency depreciation. One problem is clearly the threat of important inflation when devaluations are large. However, this problem can

occur in developed countries. The reason for a higher sensitivity to an exchange rate depreciation appears to be the presence foreign currency denominated short-term borrowing: domestic profit will be sharply squeezed by a depreciation when banks and firms borrow in foreign currency. This effect may offset the increased competitiveness of a depreciation for firms, thus, leads to default risks.

Table 2 An increase in default risk as a result of a foreign currency loan

	Initial conditions	10 percent depreciation	20 percent depreciation
Loan in USD	100	100	100
Exchange rate (lira/USD)	1	1.1	1.2
Monthly interest rate	5 percent	5 percent	5 percent
Loan duration (months)	4	4	4
Monthly payment in USD[5]	USD 28.20	USD 28.20	USD 28.20
Monthly payment in USD	Turkish liras	Turkish Lira 31.02	Turkish Liras 33.84

Source: Ozsoz and Rengifo, 2016

To better understand this, Ozsoz and Rengifo (2016) give an example. They assume that a given firm earns 1,000 Turkish Lira, that the exchange rate is 1 lira per dollar and that the firm has a 4-month, 100 dollar loan with a 5% compounded monthly interest rate. A sudden and persistent depreciation of 10% increases the local currency value of the firm's dollar denominated loan (it increases its loan cost from 5% to 9.23%). With this increase, each payment now represents 31% of the household's income (versus 28.2% before the devaluation). A 20% depreciation is equivalent to an interest rate increase from 5% to 13.32%, and repayments as a percentage of household income jump from 28.2% to 33.84%, this simple example also indicates the impact of volatility in exchange rates on loan payments.

3.3   Cost and Benefit of Official Dollarization

When evaluating costs and benefits associated to official dollarization, cost and benefit analysis of fixed exchange rate can be used. However, official dollarization displays more

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[5] Present value of an annuity: $A = R . \frac{(1-(1+r)^{-n})}{r}$). This formula gives the present value A of an ordinary annuity of R per payment period for n periods at the interest rate of r per period (Haeussler, 2010: 222)

permanent character compared to fixed exchange rate regime. Because changes in fixed exchange rate can be made by monetary authorities and fixed exchange rate harbors future risks, but official dollarization can completely remove risks derived from exchange rate.

Benefits of official dollarization:

As each country has its own currency, economic transactions that will be made with non-resident cause a transaction cost because an exchange between local and foreign currency is considered as a cost. However, transaction cost deriving from exchanging the foreign exchange rates with official dollarization will disappear. Since exchange rate fluctuations accompany risks, transaction costs of foreign trade will increase. As fixed exchange rate eliminates the volatilities that might occur in the exchange rate, it will affect international trade positively. As in the fixed exchange rate system, official dollarization will remove these risks, too and this will have a positive effect on the economy by decreasing the transaction costs of investment and foreign trade.

As official dollarization neutralizes monetary policy, it will increase the credibility of domestic currency by providing the prevention of inflationary policies that will be practiced and the prevention of printing the money in order to close the budget deficit.

Meanwhile, if a powerful country's money is chosen as official currency, then the credibility of monetary policy of chosen currency will be imported, thus inflation rates will converge to the foreign country's inflation rates and tend to decrease. A decrease of inflation and disappearance of volatilities that might occur in exchange rates provides the reduction of economic risk. It also will leads to a decrease of high-interest rates depending on the disappearance of economic uncertainties. These changes occurring in the economy will increase the rate of economic growth.

The most important disadvantages of official dollarization are that central bank loses its authority of using monetary and exchange rate policies. The country adopting official dollarization of another country whichever country's currency it accepted, then this country's monetary policy will play an active role in the adopting country's economy. The possibility of using monetary policy instruments such as money supply, interest rate, and exchange against real and exogenous shocks, which might occur in the country's economy, will disappear. For instance, in case of a recession that might occur policies such as increasing money supply, decreasing interest rate cannot be implemented or in an

inflationary environment, decreasing money supply and increasing interest rates as an instrument of contractionary monetary policy cannot be implemented. While implementation of a policy such as decrease of money supply or an increase in interest rates against officially chosen currency intensifies recession, the other country might cause inflation to raise more if it implements expansionary monetary policy in an inflationary environment.

Another cost due to adopting another country's currency will be the disappearance of authority of printing the money. The disappearance of printing the money will cause the government not to get seniorage incomes. As the government adopted another country's currency, the chosen currency's country will have the seniorage incomes. Seniorage incomes can be shared with an agreement between two different countries.

Another cost emerges as central bank loses its feature of lender of the last resort. One of the functions of central banks is to have the ability of transferring funds in case of liquidity squeeze in the financial system. The country will lose its characteristic of lender of last resort and issuing money after it accepts foreign exchange as its official currency.

3.4   De-Dollarization

Currency substitution view assumes that one of the main reasons for dollarization is high inflation rates. If inflation rate is high, its stables another currency instead of local currency and provides the actual purchasing power. According to this view, dollarization ratio may decrease in case a major reduction in inflation rate happens in one economy. However, even if a reduction in the level of inflation is achieved, the level of dollarization remains high or even rises. Residents continue to use foreign currencies in the financial system and in transactions because the use of foreign currencies has been already entrenched as a means of payments in the economy and persistent expectations of the devaluation of the local currency contribute to the persistence of dollarization. This is known as ''dollarization hysteresis'', ''ratched effect'' or ''dollarization trap'' in the literature.

Figure 11 demonstrates some examples called dollarization hysteresis. As observed, the degree of dollarization[6] in Peru, Paraguay, Bolivia, Uruguay etc. remains relatively high despite substantially the drop in the inflation rate after 1992. In Peru, the level of dollarization was about between 65 percent and 75 percent during the 1990s. It has dropped under 50 percent and remained about 45 percent from the mid-2000. This recent drop is because of inflation targeting policy as well as nominal and real exchange rate appreciate (6.7 percent and 3.2 percent)[7]. The same case can be observed other countries.
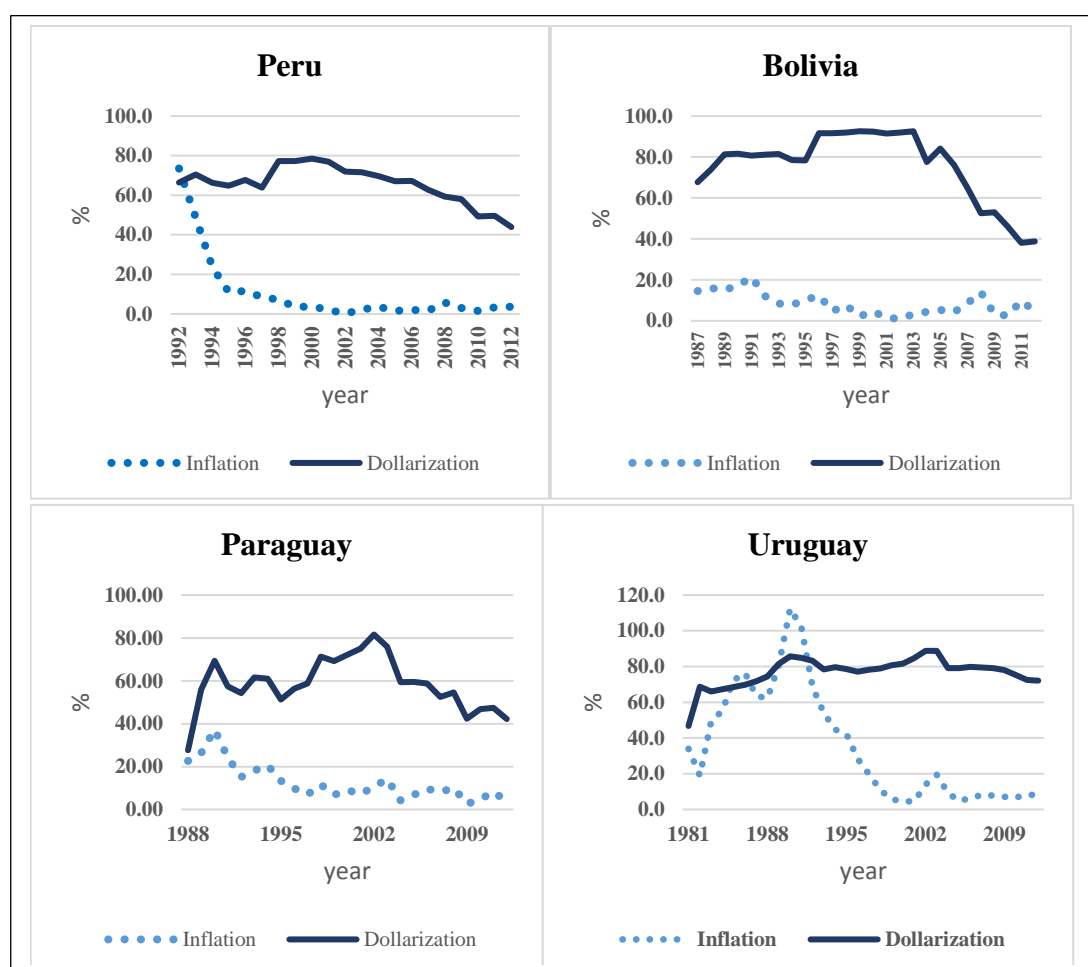
Figure 11 Dollarization Hysteresis in selected countries

Source: Authors computations based on data from IMF country report and Levy-Yeyati (2006)

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[6] The degree of dollarization is measured by the ratio foreign currency deposit in the banking system to total deposit

[7] See Winkelried and Castillo, 2010

One of the explanations for dollarization introduced by Ize and Levy-Yeyati (1998, 2003) is that the reason of dollarization might be explained by the volatility of exchange rate depreciation and inflation. A rise in the volatility of exchange rate depreciation reduces dollarization by limiting the hedging benefits of foreign currency assets. Therefore, dollarization could not be reduced by a stabilization policy when accompanied by an increasingly more stable real exchange rate. This ensures an alternative explanation for the persistence of dollarization. An inflation target as a single policy may not be sufficient. Therefore, two policies should be implement together.

De-dollarization strategies can be based on different strategies. It is necessary to first reduce the level of the inflation in order to decrease the degree of dollarization since chronic and high inflation is seen as the most important reason of dollarization. For this reason, one of the strategies is the adoption of inflation targeting. Inflation targeting policy can be seen to be a credible regime that delivers low and stable inflation, it also helps strengthen local currency as a store of value. However, to get rid of the persistence of dollarization altogether, pass through effect which is mainly the effect of depreciation of local currency on inflation should be moderate. Similarly, an inflation target policy may not stand wide exchange rate fluctuations because it is going to harm this policy. In dollarized countries, the pass-through effect is very high so depreciation of the local currency will quickly increase the rate of inflation. When the pass-through effect is high, the scope for raising the volatility of exchange rate while preserving the stability of price will be limited. Lower and stable inflation along with fixed exchange rate can fail to reverse dollarization. Therefore, dollarization may be decreased by increasing the flexibility of the exchange rate regime (Sarı, 2006: 12).

To achieve the aim of low dollarization, second strategy can be macro-prudential policies like capital requirements, higher provisions for foreign currency lending etc. can be expected to affect de-dollarization. It has been aimed at avoiding credit booms through these instruments. Generally, it would be expected that these policies discourage financial dollarization (Catao and Terrones, 2016: 11).

One country can impose restrictions on foreign currency deposits as another strategy. This way immediately reduces the degree of dollarization in the economy. However, restrictions on different foreign currencies can come at the cost of smaller domestic financial systems and it causes capital flight and an increase in offshore dollarization.

For low dollarization, it should have also developed capital markets in domestic currency or should be developed of indexed instruments like CPI-indexed dept. CPI index assets are presented as an alternative instrument to compete with foreign currency deposits (Yeyati, 2003: 24) Especially, in the lack of confidence in domestic currency-denominated assets, a credible indexation instrument could enhance investments in such assets. Developed capital market giving different kinds of alternative domestic currency denominated financial assets also contributes to reduce using foreign currency denominated instruments a flexible alternative investment opportunity to foreign currency deposits (Kokeyne, 2010: 10). According to De Nicolo et al., (2005), de-dollarization could be achieved by the application of more credible monetary policies, the formation of sound institutional frameworks, and the development of the financial sector. These should also include increasing central bank independence, fiscal discipline and transparent monetary policy. A credible indexation of local currency instruments is also important because most of Latin American countries have used such an indexation in the past. However, this policy to reduce the degree of dollarization has not been successful in most Latin American countries because of lack of fiscal discipline and credible monetary policy. Most successful economy in Latin America has been Chile owing to credibility index as well as the credibility in fiscal and monetary policy (Galindo and Leiderman, 2005: 21).

Galindo and Leiderman (2005) set three criteria to identify successful experiences of de-dollarization. Firstly, a country initially has over the 40 percent of dollarization. Secondly, it reduced the degree of dollarization to 20 percent or less and finally, the country should maintain 20 percent or less levels for at least 5 consecutive years. The authors show that only 3 countries among 90 countries (Poland, Israel and Chile) have successful experiences of de-dollarization. Figure 12 shows only different deposit dollarization levels of these countries. Chile does not fit this criteria given that the deposit dollarization is below initial degree but Chile fit this criteria when loan dollarization is considered.
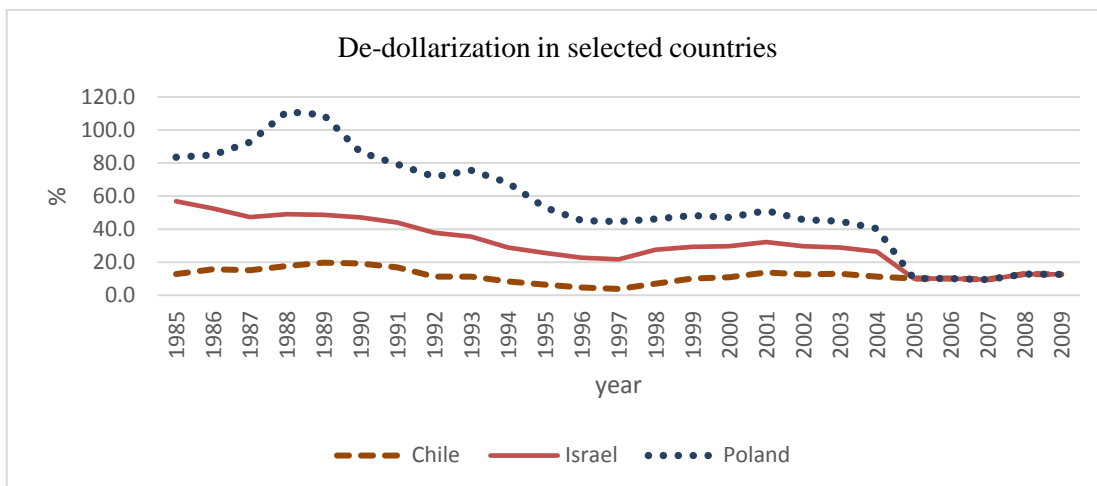
Figure 12 De-dollarization in selected countries

Source: Authors computations based on data from Moody's and Levy-Yeyati (2006)

The study of Reinhart et al. (2003) also defines de-dollarization as a case where dollarization declines by 20 percent immediately or over time and remains below this level until the last time. They find that only four countries among 85 countries have been able to successful de-dollarize their financial system successfully: Pakistan, Poland, Mexico, and Israel. Mexico and Pakistan were forced to be converted the foreign currency deposits into deposits in local currency (see figure 13). In Israel, the authorities introduced a one-year compulsory holding period for all deposits in foreign currency. This policy makes foreign currency deposits significantly less attractive than other indexed financial assets.
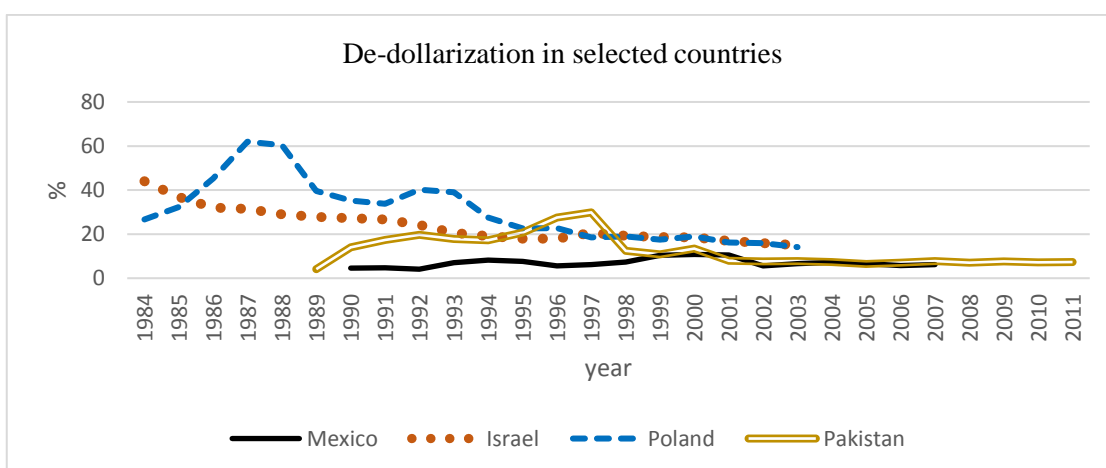
Figure 13 De-dollarization in selected countries

Source: Author's computations based on data from Moody's and Levy-Yeyati (2006)

4. MEASUREMENT OF DOLLARIZATION AND FINANCIAL DEVELOPMENT

4.1 Measurement of Dollarization

Unofficial dollarization has no unique definition, so there is no consensus in the theoretical and empirical studies about the measurement of dollarization. The different types of dollarization have been conducted in different ways. However, it may not be easy to quantify some kinds of dollarization owing to the lack of data.

One of the most commonly used measurements of dollarization in the empirical literature is the ratio of foreign currency deposits (FCD) in the banking system to broad money in one economy. Some authors who have investigated dollarization employed this measure; Clements and Schwartz (1993), Sahay and Vegh (1995), Agenor and Khan (1996), Akçay et al. (1997), Balino et al. (1999), Komarek and Melecky (2001), Reinhart et al. (2003), Yinusa (2008), Metin and Us (2009), Erasmus et al. (2009), Lay et al. (2010), Winkelried and Castillo (2010), Court et al. (2012).

Table 3 provides data on this measure used for dollarization. Balino et al. (1999) identify a highly dollarized economy when the level of dollarization exceeds 30 percent in the economy. According to this definition, Bosnia and Herzegovina, Bulgaria, Cambodia, Croatia, Georgia, Lebanon, Macedonia, and Turkey can be seen as a highly dollarized economy as depicted in the table 3. The higher dollarization levels in these countries could be as a result of economic (high inflation and depreciating exchange rate) and political instability. For example, Turkey experienced an economic crisis in 2001. The economic crisis of 2001 resulted in an increase in deposit dollarization ratio to the highest level (53.33 percent). However, some Latin American countries like Colombia, Brazil, Chile, and Mexico have lower level deposit dollarization since they have imposed the restriction on foreign currency. Deposit dollarization in Cambodia, Georgia, and Lebanon seems to have increased constantly from 1997 upward. This table also indicates that dollarization phenomenon is widespread across all developing countries.

Table 3 Deposit dollarization (Foreign Currency Deposit to Broad Money, Ratio (%)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Argentina	46.5	49.2	52.27	55.68	60.48	2.52	4.60	5.39	4.91	4.3	3.8
Armenia	34.2	40.6	48.53	49.26	46.82	36.6	42.9	41.7	36.6	29.5	18.8
Bosnia and Herzegovina	58.2	49.9	40.57	40.81	36.55	35.5	37.2	38.0	40.4	49.9	48.4
Bulgaria	40.2	38.5	34.48	31.51	33.30	35.1	32.5	35.4	33.2	33.1	33.6
Cambodia	62.5	54.2	60.95	68.22	69.76	69.2	69.2	61.3	72.3	74.5	80.9
Chile	0.04	0.06	0.09	0.10	0.07	0.07				0.07	0.06
Colombia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Croatia	61.7	66.3	65.75	64.62	67.73	62.0	58.9	58.0	55.7	47.9	47.3
Czech Republic	11.4	11.6	12.68	11.33	11.01	11.5	9.33	9.14	8.9	9.1	8.2
Georgia	23.3	42.8	52.68		67.28	73.6	63.2	64.7	70.5	81.8	60.2
Ghana	21.2	16.3	19.30	17.46	19.13	20.2	21.0	21.5	19.3	20.8	17.3
Indonesia	26.0	20.6	17.61	18.62	18.43	16.0	14.7	13.1			
Kazakhstan	19.4	28.5	36.23	43.24	49.95	35.5	33.3	24.3	18.9	23.2	20.5
Kenya	7.81	8.03	10.12	13.16	12.73	13.8	12.5	13.8	12.6	10.7	8.9
Kyrgyz Republic	14.9	27.1	28.33	29.49	25.46	23.4	24.2	20.0	25.5	25.1	20.0
Latvia	22.3	19.8	20.47	21.37	21.28	20.0	18.9	20.3	22.5	23.2	27.9
Lebanon	57.8	58.7	54.67	60.23	66.96	64.0	75.6	81.9	85.0	87.6	87.8
Lithuania	72.7	83.2	104.8	117.5	123.6	84.1	67.4	65.0	70.9	56.0	56.9
Macedonia	24.0	26.7	35.92	29.08	51.97	41.3	42.5	44.9	46.7	44.3	38.5
Mexico	0.04	0.05	0.06	0.05	0.04						
Romania	22.5	24.7	29.76	30.07	41.55	36.3	31.4	29.0	26.7	28.1	31.0
Russian Federation	17.5	30.2	29.20	26.78	24.32	25.2	18.9	17.6	16.3	11.4	9.60
Turkey	45.4	42.6	42.49	42.92	53.33	51.4	43.9	39.1	29.2	31.1	28.7
Uganda	13.2	12.9	22.00	23.51	19.99	20.5	24.1	24.4	21.5	21.9	23.4
Ukraine	13.0	20.9	24.58	22.72	18.36	18.5	20.6	24.1	23.5	26.8	22.6

Source: IMF country report, World Bank' WDI, and Levy-Yeyati (2006)

Another main measure of partial dollarization is the ratio of foreign currency deposit to total deposit in the banking system. This measurement considered by conventional source for dollarization can be found in the works of Mcnelis and Rojas-Suarez (1996), Barajas ans Morales (2003), Piontkovsky (2003), Rajan and Tokatlidis (2005), Arteta (2003; 2005), De Nicolo et al. (2005), Galindo (2005), Honig (2006), Rennhack and Nozaki (2006), Levy-Yeyati (2006), Honohan (2007), Weymouth (2007), Asel (2010), Neanidis and Savva (2009; 2013), Sahin and Sahin (2014), Catão and Terrones (2016). These two alternative measures of partially dollarization are called deposit dollarization, asset dollarization or onshore dollar deposits.

Kumah (2015) argues that the unofficial dollarization ratio should be measured using as total deposit because estimation of onshore dollar deposit using broad money do not sufficiently measure the preference of local residents for foreign currency. For instance, using broad money makes it difficult to find out whether the reported deposit dollarization ratio represents a preference for currency or deposit. This measure can also suffer from measurement error, owing to the inadequacy of data on foreign currency in circulation. However, measure of deposit dollarization using total deposit instead of broad money implies that economic agents take into consideration the relative preference for holding deposits in foreign currency versus domestic.

Financial dollarization can be used as another measurement method. This covers both credit and deposit dollarization. Credit dollarization is measured as the ratio of foreign currency credit (FCCs) to total credit issued by the domestic banking sector. However, there is no reliable data on credit dollarization constrained the measures of dollarization used in the empirical studies (Reinhart et al, 2014). Therefore, according to De Nicolo (2005), financial dollarization patterns can be loan dollarization (instead of credit dollarization) and deposit dollarization because they are similar owing to prudential regulations on exchange rate positions in the financial system. At this point, loan dollarization is the ratio foreign currency denominated loans to total loans.

Ozsoz and Rengifo (2016) mention three diffrent types of partial dollarization; liability dollarization (the ratio of foreign currency denominated liabilities to total liabilities); loan dollarization (the ratio of foreign currency denominated loans to total loans); deposit dollarization (foreign currency deposits as a ratio of broad money).

Table 4 and 5 represent the extent of liabilities and loan dollarization for a selected group of developing countries. Data on these types of dollarization is collected from International Financial Soundness Indicators. For some countries such as Bosnia and Herzegovina, Cambodia, Honduras, Paraguay, Uruguay, both loan dollarization and liabilities dollarization seem to not decline over time. De Nicolo (2005) explains that loan dollarization is associated with deposit dollarization. A 10 percent increase in foreign currency deposits causes an increasing 7.3 percent in foreign currency loans. Therefore, the reason of persistent dollarization could be openness, interest rate differentials, lack of confidence due to memories of high and persistent of inflation. Loan dollarization varies widely across sample countries, with a minimum of 4.19 percent in Colombia in 2009 and a maximum of 98.49 percent in Nicaragua in 2012.

Table 4 Loan Dollarization (Foreign currency denominated loan to total loan, ratio (%))

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Argentina	10.10	12.72	14.09	14.00	12.69	13.58	12.79	6.64	4.49	4.51	4.47
Bosnia and Herzegovina	68.66	70.99	74.09	73.35	73.89	70.05	66.86	67.16	68.76	67.95	67.09
Armenia, Republic of	61.59	51.19	39.33	38.22	65.22	56.76	61.05	64.01	61.91	66.03	65.17
Croatia		71.32	61.69	65.47	72.30	74.31	75.07	73.72	74.05	73.48	71.38
Bulgaria				57.19	58.66	61.30	63.74	64.04	61.17	56.98	50.02
Colombia	7.17	4.38	6.30	6.58	4.19	6.87	7.72	7.54	7.30	8.35	8.31
Georgia	76.12	73.82	68.59	72.63	76.82	73.92	68.72	67.43	62.07	60.27	64.23
Czech Republic			23.92	21.82	21.20	21.55	22.16	20.88	29.11		
Gambia			48.08	16.99	18.33	22.24	20.99	38.26	32.12	46.85	37.43
Ghana				25.31	23.94	27.05	30.01	28.02	31.71	29.90	29.22
Honduras		36.11	30.32	28.80	24.69	27.69	29.39	30.45	32.88	34.00	32.50
Indonesia	18.64	19.28	21.18	19.52	14.94	15.64	16.57	15.20	17.00	16.34	15.58
Israel	31.34	28.68	26.78	24.94	21.69	16.22	16.59	14.88	13.13	13.25	12.42
Kazakhstan				52.17	53.51	46.74	38.53	31.24	31.52	30.66	42.71
Kenya		12.67	14.23	16.40	14.19	18.95	20.01	22.71	23.41	25.39	27.02
Kyrgyz Republic						53.55	52.32	50.28	49.71	54.86	53.19
Latvia				89.49	92.12	92.66	90.12	88.25	88.49	23.29	27.70
Lebanon							78.45	77.41	76.53	75.80	74.64
Lithuania				64.59	73.69	74.00	72.37	71.55	68.65		
Macedonia		52.72	54.67	57.00	58.47	58.81	59.23	55.37	52.70	49.40	46.49
Nicaragua				97.83	97.82	98.14	98.42	98.49	96.56	98.20	97.27
Paraguay	42.51	39.81	40.26	40.24	37.40	39.01	41.87	40.75	45.43	47.76	50.01
Peru						46.47	45.29	43.85	40.75	38.22	30.09
Poland				34.96	32.23	32.46	34.43	30.54	28.48	28.01	27.76
Romania			50.89	57.77	59.86	63.04	63.39	62.49	60.93	56.38	49.33
Russian Federation				30.17	29.93	27.00	25.43	21.26	22.69	29.44	35.31
Turkey	25.23	24.78	23.05	26.97	24.93	25.80	27.94	25.03	27.09	27.82	30.80
Uganda	28.17	25.42	28.63	24.43	19.96	23.74	26.71	39.07	39.69	42.44	43.69
Ukraine	44.58	50.48	51.45	60.32	52.59	48.23	42.13	37.66	34.72	47.77	57.90
Uruguay				75.82	66.13	61.16	61.88	61.80	58.04	57.87	64.21

Source: IMF—Financial Soundness Indicators.

Table 5 Liability Dollarization (Foreign currency denominated liabilities to total liabilities, ratio (%))

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Argentina	16.63	16.74	17.08	18.85	20.17	19.34	15.61	10.02	10.41	9.85	14.70
Armenia	66.76	55.96	48.30	55.06	67.61	64.88	63.35	64.94	63.94	65.35	65.66
Bosnia and Herzegovina	64.43	62.78	65.05	69.51	69.17	66.97	66.16	65.24	63.77	62.68	60.29
Bulgaria				59.98	64.36	58.56	54.80	51.83	50.16	49.04	42.55
Cambodia						97.31	97.06	96.61	96.17	94.83	94.02
Colombia	6.86	5.20	9.63	9.40	7.06	9.84	11.47	10.48	11.92	13.52	13.88
Croatia		78.35	74.04	76.13	79.02	76.97	77.18	77.82	67.74	67.78	65.34
Dominican Republic				22.07	21.17	24.94	25.20	26.69	29.11	29.96	29.97
Gambia			24.44	21.27	17.95	25.48	29.47	40.69	54.71	61.83	55.02
Georgia	77.30	74.61	74.37	80.83	78.21	73.54	68.66	69.28	65.88	63.59	70.71
Ghana				28.54	31.45	26.58	27.37	27.40	31.40	32.28	30.03
Honduras		37.49	34.84	35.41	31.95	31.71	32.12	35.17	37.21	37.97	36.13
Indonesia	19.86	17.11	18.28	19.95	17.83	16.48	16.34	18.63	24.40	22.94	24.06
Israel	41.71	40.42	39.14	35.61	32.90	29.59	29.74	27.74	26.83	29.16	26.86
Kazakhstan				60.80	55.54	45.99	40.27	37.10	40.40	54.11	66.62
Kenya				24.19	21.83	17.29	21.71	21.10	23.16	23.25	25.62
Kyrgyz Republic						63.89	56.83	54.41	54.98	60.82	64.86
Latvia				80.70	89.89	87.93	72.41	84.62	71.76	37.55	40.36
Lebanon							66.22	65.07	65.55	64.76	63.99
Lithuania				63.32	61.61	56.97	53.10	50.42	48.18		
Macedonia		56.90	53.51	55.38	61.75	57.58	54.50	52.79	50.15	47.17	46.43
Nicaragua				71.96	60.17	54.44	56.27	67.36	69.76	69.81	73.73
Paraguay	49.74	45.45	41.39	46.00	41.91	44.77	44.95	43.93	45.74	49.30	54.64
Peru						51.83	50.01	47.13	49.60	48.44	49.24
Poland				20.49	19.89	21.13	23.22	21.17	20.19	19.82	19.32
Romania			45.93	43.74	42.79	37.26	36.82	37.47	35.88	34.86	33.78
Russian Federation				33.34	31.50	28.20	26.08	25.15	25.40	34.74	39.94
Turkey	41.43	43.09	38.68	40.01	36.67	35.45	41.63	41.23	47.47	48.32	52.11
Uganda	30.57	30.27	35.04	30.87	25.24	29.25	32.86	36.17	38.10	39.15	44.20
Ukraine	43.47	50.31	49.77	59.04	55.83	51.25	49.76	49.22	43.25	49.27	52.82
Uruguay				78.39	70.53	69.50	67.91	66.99	68.62	71.56	75.25

Source: IMF—Financial Soundness Indicators

Conceptually, partial dollarization is measured by the sum of foreign currency held by domestic residents in the form of cash (FCC), the sum of foreign currency deposit in the financial system, and the offshore deposit (OSD) held by economic agents at foreign banks. When we consider FCC in this measurement method, it is highly difficult to measure the amount of foreign currency in circulation within the domestic economy because no local institution is responsible for its issue (Kessy, 2011: 5). The amount of foreign currency in circulation in the economy can only be estimated. Some studies investigate how FCC is measured. For example, Feige (2003) obtains estimates of the amount of U.S. currency by cumulating the Currency and Monetary Instruments Reports (CMIR) recorded net outflows of U.S. dollars and by using informal interviews and surveys regarding the flow of U.S. currency between U.S. and other countries [US Treasury Department (2000)] conducted by Federal Reserve and Treasury officials in Latin America and Transition economies. According to the author, although informal interview estimates and the CMIR estimates for some countries are considerable different, both sources confirm the belief that per capita holdings of US currency are highest in Bulgaria, Latvia, Turkey, and Russia. Similarly, Kamin and Ericson (2003) estimate the amount of foreign currency in circulation in Argentina using CMIR and survey of Treasury Department.

Erasmus (2009) also estimates U.S. dollars in circulation in Liberia. He assumes that the money multiplier for the U.S. dollar component of broad money is equal to that for the Liberian dollar component.

Letting L denotes Liberian economy, F denotes foreign economy

$$M^L = C^L + D^L \tag{11}$$

$$M^F = C^F + D^F \tag{12}$$

M: money supply

C: currency in circulation

D: total deposit

$$B^L = C^L + RR^L + ER^L; \ B^L = C^L + TR^L \tag{13}$$

$$B^F = C^F + RR^F + ER^F; \ B^F = C^F + TR^F \tag{14}$$

B: monetary base

RR: the required reserves held by banks

ER: the excess reserves held by banks

TR: total reserves (RR + ER)

$$\text{Multiplier} = M/B \tag{15}$$

$$\text{Multiplier}^L = (C^L + D^L) / (C^L + TR^L) \tag{16}$$

$$\text{Multiplier}^F = (C^F + D^F) / (C^F + TR^F) \tag{17}$$

The money multiplier for foreign currency and foreign currency in circulation (C^F) are not known in the equation. The author assumes that the multipliers for Liberian dollar and foreign currency are identical. Thus;

$$\text{Multiplier}^L = \text{Multiplier}^F \tag{18}$$

$$\text{Multiplier}^L = (C^F + D^F) / (C^F + TR^F) \tag{19}$$

$$(\text{Multiplier}^L * C^F) + (\text{Multiplier}^L * TR^F) = C^F + D^F \tag{20}$$

$$(\text{Multiplier}^L * C^F) - C^F = D^F - (\text{Multiplier}^L * TR^F) \tag{21}$$

$$C^F = (D^F - \text{Multiplier}^L * TR^F) / (\text{Multiplier}^L - 1) \tag{22}$$

Erasmus (2009) estimates U.S. dollars in circulation in Liberia using this measure (equation 22) and finds that the amount of U.S. dollars in circulation has approximately tripled since 2003 to an estimated \$28 billion at the end of 2007—about nine times higher than Liberian dollars in circulation.

IADB (2005) explains the importance of the offshore deposits (OSD) held by the domestic residents at foreign banks for especially Latin American countries. When countries impose severe restrictions on onshore foreign currency deposits, offshore dollarization is an important source of determining the level of unofficial dollarization. Restricting dollarization might come at the cost of smaller domestic financial systems and raised offshoring. Figure 14 indicates the significance of offshore deposits. Each Latin

American country especially Brazil, Colombia, and Venezuela have a higher level of dollarization.

Metin-Ozcan and Us (2009) describe the measure of offshore dollarization. According to the authors, offshore dollarization can be the ratio of foreign credits used by the banking sector total credits borrowed by the banking sector.
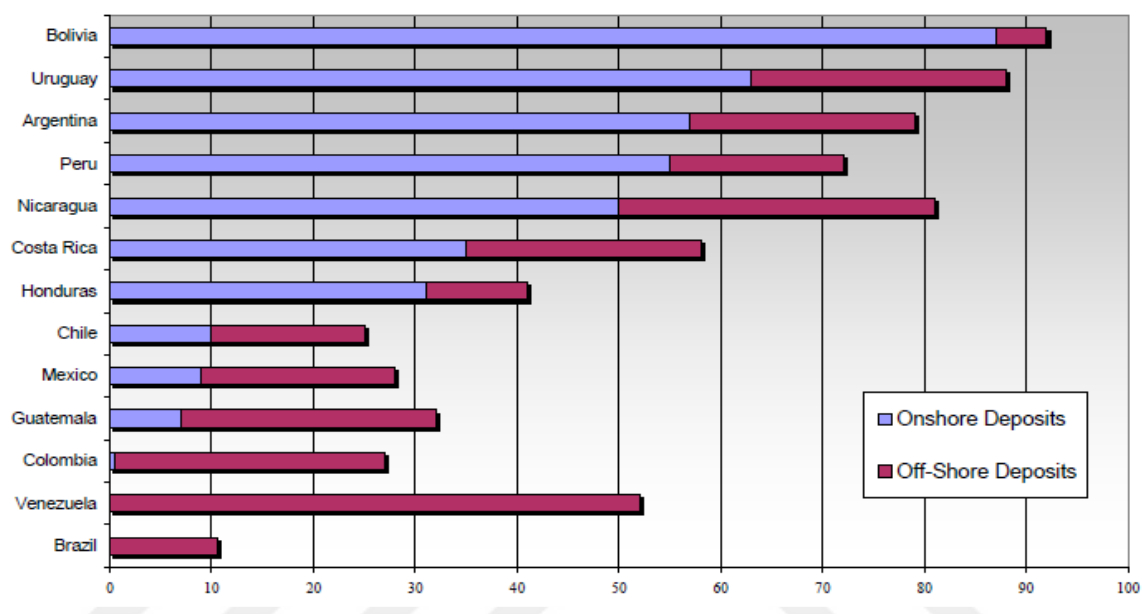
Figure 14 Onshore and Offshore Deposit Dollarization in Latin America, 2001

Source: Inter-American Development Bank Report (IADB, 2005)[8]

Arteta (2005) uses three different types of dollarization, namely credit dollarization, deposit dollarization and currency mismatches to analyze the impacts of exchange rate regimes on financial dollarization and currency mismatches in financial intermediation.

•   Credit Dollarization Ratio

a)   foreign currency credit to total credit to the private sector

b)   foreign currency credit to total assets

•   Deposit Dollarization Ratio

a)   foreign currency deposit to total deposit

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[8] Note: offshore deposits was computed external liabilities of BIS reporting banks vis-á-vis nonbank sectors in each Latín American country

b)   Foreign currency deposits to total liabilities

•   Deposit-credit Mismatches Ratio

a)   Difference between foreign currency deposits and foreign currency credit to total liabilities [(dollar deposits – dollar credit) * 100 / (total liabilities).

According to Reinhart et al. (2003), another way to measure unofficial dollarization is to construct a composite index, which combines both deposit dollarization and liability dollarization. The composite index is defined as total external debt as a share of income, the total of bank deposits in foreign currency to M2Y, and local government debt denominated in foreign currencies to total government debt for developing countries. They convert from each of three components to an index that could take a value from zero to ten. This index measures dollarization level for all developing countries in the samples on a scale that goes from zero to thirty.

The authors categorize the dollarized countries into four groups in terms of types of unofficial dollarization. Table 6 indicates the types of dollarization. Type I covers domestic public debt denominated foreign currency and external liability dollarization; Type II covers domestic public and private sector debt; Type III covers low public debt denominated foreign currency and high private foreign borrowing; Type IV covers countries where low domestic liability dollarization and the enlargement of the external liabilities are owed by the government.

Table 6 Varieties of Dollarization

	Private sector debt accounts for **ten percent or more** of total external debt.	Private sector debt accounts **for less than ten percent** of total external debt.
At least ten percent of broad money or of domestic public debt are denominated in or linked to a foreign currency	Type I	Type II
Less than ten percent of broad money **and** of domestic public debt are denominated in or linked to a foreign currency	Type III	Type IV

Source: Reinhart et al. (2003)

Table 7 shows the criteria used to convert the ratios obtained from data into indices of dollarization. Degree of dollarization in each country is assessed at four different dollarization value namely, very high degree of dollarization for the range of composite index: 14-30, high degree of dollarization for the range of composite index: 9-13; moderate level of dollarization for the range of composite index: 4-8; low level of dollarization for the range of composite index: 0-3.

Table 7 Indices of Dollarization

Recorded value of ratio	Assigned Index value
xi = 0	0
$0 < x \leq 0.1$	1
$0.1 < x \leq 0.2$	2
$0.2 < x \leq 0.3$	3
$0.3 < x \leq 0.4$	4
$0.4 < x \leq 0.5$	5
$0.5 < x \leq 0.6$	6
$0.6 < x \leq 0.7$	7
$0.7 < x \leq 0.8$	8
$0.8 < x \leq 0.9$	9
$x > 0.9$	10

Source: Reinhart et al. (2003)

Mwase and Kumah (2015) claim that one should measure dollarization in the real terms by abstracting exchange rate movements. Therefore, real deposit dollarization index is competed as a fixed base-year nominal exchange rate indicator, adjusted FCD_t / adjusted $FCD_t + LCD_t$) where adjusted FCD is derived as ($FCD_t/NER_t*NER_{t==2000}$); NER is the nominal exchange rate. According to the authors, exchange rate movement leads to volatility in the nominal dollarization ratio even with constant stock of foreign currency deposits. They explain this situation by giving an example ''*if there are 70 units of FCD and 30 units of LCD and the currency depreciates by 10 percent, the FCD goes up from 70 to 77 units in local currency terms. Since the LCD remain unchanged, there are now 107 units and the share of FCD in total is 77/107 = 72 percent, although nothing has happened to the amount of dollar foreign exchange holdings*''* (Mwase and Kumah, 2015: 5).

4.2   Measurement of Financial Development

For a variable to be measured, it is needed to be identified, and this can also be concerned with financial development. One should measure the degree of financial development to evaluate accurately the role of financial system in an economy as well as identify financial sector development for measuring it (Ağır, 2010: 89). For this reason, an overview of the primary measurements that arises the choice of proxies for the level of financial development in the theoretical and empirical literature will be mentioned after the development of the financial sector is defined.

Financial development can be defined as a process that marks the progresses in efficiency, quality, and quantity of the financial market as well as the number and variety of intermediary services. This process involves the interaction of institutions and many activities. The development of the financial system may not be captured by a single measure in the literature because countries have different institutional environments and financial structures according to their development stage (Abu-Bader and Abu-Qarn, 2005: 13). Consequently, someone can make use of various indicators of financial development to capture different aspects of financial sector in the process of economic development (Kar et al., 2011: 685).

To understand financial development, the functions of the financial system should also be considered. The financial system comprises of financial instruments which can be divided by various categories such as the instruments of investment (like shares, futures, and bond); the instruments of payment (like credit card, debit, check, currencies and that serve as media payments) and financial markets (foreign exchange markets, bond markets, derivatives, and stock markets); legal and accounting structures regulating markets, the financial instruments, and institutions; the central bank (Handa, 2009: 818).

The primary roles of the financial system can be categorized into five fundamental functions:

•   facilitating the trading, diversifying, hedging, and pooling of risks

•   allocating resources to finance promising projects and acquiring information for investment

•   monitoring exerting corporate control and managers

- mobilizing saving

- facilitating the exchange of goods and services (Levine, 1997).

The degree of financial development can ''*be measured by the number and variety of financial intermediaries, the size and sophistication of the markets for bonds and stocks and the efficiency of the rules regulations and practices governing the financial practices of firms in the economy*'' (Handa, 2009: 819). However, there is no exact indicator to measure these financial services and their development. Therefore, researchers have used different variables as an indicator of financial development in their empirical studies of finance and growth (Jung (1986), King and Levine (1993a, 1993b), Gregoria and Guidotti (1995), Xu (2000), Deidda and Fattouh (2002), Khan et al. (2003), Hsueh et al. (2013), Law and Singh (2014), among others).

According to Lynch (1996), financial development indicators can be divided into five categories: structural measures, quantity measures, product ranges, transactions cost, and financial prices.

4.2.1   Quantity Measures

Since the scope of financial development is not easily measurable, to capture the different aspects of financial development, various proxies should be developed (Kar et al., 2011: 691). In this sense, quantity indicators based on monetary aggregates, indicators of capital markets and credit aggregates have been chosen in the literature as proxies for the degree of financial sector development. These measurements are regarded as traditional measures of financial development in many empirical studies. The forms of financial development based on monetary aggregates consist of narrow money to nominal income (M1 divided by GDP) or a broader measure such as M2 to GDP, M2Y to GDP, or M3 to GDP. A number of empirical studies (Jung, 1986; King and Levine, 1993a,b; Berthelemy and Varoudakis, 1995; Gregorio and Guidotti, 1995; Demetriades and Hussein, 1996; Odedokun, 1996; Barnes, 2001; Shan et al., 2001; El-Yousif, 2002; Rousseau and Wachtel, 2002; Keho, 2010; Kim and Lin, 2010; Bittencourt, 2011; Oztürk and Karagöz, 2012) have used these indicators of financial development to analyze the correlation between financial intermediation and growth or financial development and

inflation. A higher degree of monetization, measured by M1 to the level of nominal GDP, indicates that financial system is underdeveloped, while a decreasing level of currency ratio shows that financial systems become more sophisticated. This indicator may not be a good proxy to measure financial development because it is more related to the ability of the financial system to provide transaction services than to the ability to channel funds from savers to borrowers (Khan and Senhadji, 2003: 91-92).

Another common proxy of financial development is the ratio of broad money stock (M2) to the level of GDP. This measurement is seen as a monetization variable which is designed to show the real size of the financial sector of a growing economy. An increase M2 to GDP implies that financial sector develops faster than the real sector (Jung, 1996: 336). The monetization variable is designed to indicate the real size of the financial sector of a growing economy in which money provides valuable payment and saving services. The narrow money stock (M1) providing payment services best reflects the former and the broad money (M2) the latter, pure savings balances. Narrow money balances increase in line with economic transactions, but broad money increase at a faster pace if financial development is occurring (Lynch, 1996: 7).

The third measure of financial development is M2Y, which includes M2 plus residents' foreign exchange deposits, to nominal income. It also has been used as the traditional measure of financial development because of widely availability. As such, an increase in the ratio broad money stock to GDP in developing countries may reflect an extensive use of currency rather than a rise in bank deposits, and this can be widespread at an early stage of economic development in which barter transactions are being replaced by market exchange (Demetriades and Hussein, 1996). For this reason, Demetriades and Hussein (1996) suggest subtracting currency in circulation from the broad money stock as a proxy for measurement of financial development. Gregorio and Guidotti (1995) propose a less liquid monetary aggregate (M3 to nominal GDP) as a measure for financial development. However, this measure still contains liquid assets (M1) and M2, so it may be affected by factors other than financial depth. As suggested by the authors, it can be solved this problem by subtracting Ml or M2.

As noted by King and Levine (1997), the expansion of financial services may help to foster economic growth by improving the efficiency of innovative activity, diversifying risks, increasing saving and improving borrowing options. The higher development of

financial system tends to provides more credit to the real sector. More recently, in the literature concerning the link between the process of economic and financial development, credit measure of financial development can be frequently used to the allocation of financial assets. Monetary aggregates cannot provide that. An alternative indicator that is used to evaluate the financial development is the credit ratio issued by banks which can be defined as the ratio credit provided by commercial banks and other deposit-taking banks to nominal income. This proxy is used by Gregorio and Guidotti, 1995; Pill and Pradhan, 1995; Demetriades and Hussein, 1996; Ndikumana, 2000; Levine et al., 2000; Boyd et al., 2001; Arestis et al., 2001; Djankow et al., 2005; Khan et al., 2006; Beck et al., 2007; Apergis et al., 2007; Hassan, 2011; Court et al., 2012; Arcand et al., 2015; Kar and Ozsahin, 2016. Domestic credit to private sector provided by financial system is more directly associated with economic growth and the efficiency and the quantity investment. Economies with higher levels of private credit to GDP have been shown to grow faster (King and Levine 1993a, 1993b; Levine et al., 2000).

Another alternatives indicator for financial development is concerning stock market developments. The indicators of stock markets developments can be based on proxy of financial systems such as stock market capitalization ratio. The ratio of market capitalization is used in empirical studies which measures the size of the stock market relative to the size of the economy (see Levine and Zervos, 1998; Rousseau and Wachtel, 2000; Arestis et al., 2001; Khan et al., 2003; Naceur and Ghazouani, 2005; Colombage, 2009, Naceur et al., 2014).

According to Arestis et al. (2001), significant features of a stock market is encouraging specialization as well as acquisition and dissemination of information, decreasing the cost of mobilizing savings, thereby facilitating investment and increasing long-run economic growth. Stock markets also make financial assets traded in them less risky since if savers would like to change their portfolios, they will allow savers to buy and sell cheaply and rapidly.

4.2.2 Structural Measures

''*Structural measures are designed to help analyze the structure of the financial system and determine the importance of its different elements''* (Lynch, 1996: 10). The ratio of broad money divided by narrow money (M2 divided by M1) can be utilized as the structural proxy for financial development. As such, an increase in M2 to M1 will

accompany the degree of financial development of an economy or a higher level of financial development may reflect an increase in saving deposits relative to transaction balances.

4.2.3 Financial Prices

The McKinnon-Shaw hypothesis suggests that more developed financial systems should be closely related to positive real interest rate reflecting peoples' positive rate of time preference and growth opportunities in the economy (Gregorio and Guidotti, 1995: 436). The positive interest rate also should adequately reflect economic expectations. One of the financial prices is the real interest rate. The positive interest rate is an important precondition for substantial financial development (Lynch, 1996: 12). When real interest rate is not held below its normal competitive level, it can be said that:

• The rates of positive deposit mobilize saving. Particularly, with positive rates, there are higher saving rates, and saving will be efficiently channeled by financial intermediaries rather than going into goods or dollars.

• Positive real active rates assure a higher quality of investment and therefore higher growth rates of output (Dornbusch, 1990: 36).

The negative real interest rate, the degree of inflation rate is larger than the rate of the nominal interest rate, leads to discouraging savings in the financial system, hence, the extent of financial repression. ''*while the main channel of transmission emphasized by the McKinnon-Shaw hypothesis is the effect of real interest rates on the volume of savings*'' (Gregorio and Guidotti, 1995: 436). Empirical side finds that there is no clear relationship between real interest rate and domestic saving, but positive link between domestic saving and positive real interest rate. However, Gregorio and Guidotti (1995) argue that real interest rates may be a poor indicator of the degree of financial intermediation and, more generally, of financial development. Because there is the discussion that turns to the question of the precise channel of transmission from real interest rate to economic growth. Dornbusch (1990) concludes that there is no correlation between saving rates and real interest rates, between investment rates and real interest rates, or between per capita growth rates and real interest rate.

4.2.4 Product Range

Another indicator of financial sector development is a variety of sophisticated financial products. Economies with developed financial system have a greater diversity of financial products. Domestic banks, foreign banks, and non-banks in the financial system provide a wide range of wholesale products. Financial instruments provide decreasing in the costs of transactions, facilitating specialization in production, enhancing credit and investment opportunities.

According to Lynch (1996), financial products can be divided into three categories:

1.   Business-financing products such as bank loans, commercial bills, commercial paper, corporate bonds

2.   Saving products with market determined returns (bank deposits, government paper)

3.   Risk management products (spot foreign exchange rate products, forward foreign exchange rate contracts, interest rate options, forward rate options, bank bill and bond futures contracts, equity (swaps, futures, and options)

Gelbard and Leite (1999) explain that the progress of financial sector development in a country may not be easily assessed by looking into monetary aggregates of financial development. According to the authors, it should be looked into a different measure of financial development. One of them is the index of financial products that indicates the availability of financial products to the public. To construct financial products index, answers to individual yes/no question (such as, are there interbank transactions in (a) foreign exchange, (b) loans, (c) bank certificates of deposit or acceptances, (d) commercial paper, or (e) government securities; do banks issue debit/credit cards; is there a stock exchange, etc.) is assigned dichotomous values of zero and 100. They concluded that most of Sub-Saharan countries have an underdeveloped financial system in this area. Because, according to this index, for all Sub-Saharan countries excluding South Africa have a very limited of financial products. The promotion of diversity in financial products is crucial to promote the financial system and to improve the competitiveness of the financial sector, consequently, economic growth.

4.2.5 Transaction Costs

The neoclassical economic theory supposes that the absence of transaction costs is due to efficient markets. However, there is no place where transaction cost is zero. Transaction cost can be defined as a cost like time, money incurred in carrying out the exchange of assets, good or services in a market. Lawyer payments, the time spent to find the best investor, etc. are included in transaction costs which cause main problems for investors and savers.

Minimum transaction cost is a precondition for well-functioning financial intermediaries. The financial system should provide lower transaction costs for optimal financial development and, thereby, economic growth. Greenwood and Smith (1997) indicate the links between exchange, specialization, and innovation. Financial markets play role in supporting specialization in economic activity. More specialization in economic activity requires more transactions. When transaction cost is low, it facilitates greater specialization and hence, promotes productivity. Because deepening of financial markets tends to reduce transaction costs through economies of scale. Lower transactions costs of financial contracts increase the return savers make on their investments in new and better and production technologies that strengthen economic growth.

Financial market transaction cost cannot be evaluated properly in individual countries and specifically cannot be compared with across countries because of the differences in variables ranging from financial sector design to population dispersion. Generally, transaction cost are estimated using bank interest rate spreads (lending rate minus deposit rate). However, they should take full account of interactions between bank operating costs and interest rate spreads, among other factors (Lynch, 1996: 20).

5. EMPIRICAL SURVEY ON FINANCIAL DEVELOPMENT AND DOLLARIZATION

5.1 Financial Development and Economic Growth

One important area of discussion among researchers is the link between financial development and economic growth. A large number of studies, both theoretical and empirical, have found a strong correlation between the level of development of financial markets and economic growth. However, there is no universal consensus about the nature of this link among economists who employ many different methodologies. In the literature, four views including supply leading and demand following hypothesis, bi-directional and inverse relationship have emerged concerning the link between financial development and economic growth.

One of the important views which explain the impact of financial development on economic growth is the supply leading hypothesis. This hypothesis states that financial development has a positive effect on economic growth. Supply leading view has two functions: to transfer resources from the traditional, less productive sectors to the modern sectors which are more productive and to promote and stimulate an entrepreneurial response in these modern sectors. Therefore, financial intermediation can accelerate economic growth by transferring resources from non-growth sectors to modern sectors which are dominated by international modern technology (Patric, 1966: 175-176).

According to this hypothesis, a more developed financial system in the economic growth process can contribute through two main channels. On one hand, it enhance the efficiency of capital accumulation and turn the marginal productivity of capital. On the other hand, financial intermediation contributes to raising the saving rate and thus the investment rate by increasing the size of savings and improving the efficiency of investment. Financial development leads to faster rates of economic growth (Yousif, 2002: 132). The former effect is first emphasized by Goldsmith (1969), who also finds some positive correlation between the level of development of the financial sector and the level of real per capita GNP. He emphasizes how the development of a financial superstructure leads to an increasing aggregate volume of saving and investment (Gregorio, 1995: 435). He credits

this correlation to the be positive impact that financial development has in promoting more efficient use of the capital stock.

Mckinnon (1973) and Shaw (1973) construct a convincing theoretical framework link between financial liberalization and economic growth and implicitly highlight that finance leads to economic growth (Kar et al., 2011: 686). Mckinnon and Shaw focus on the effects of government policy regarding financial development on saving and investment. They argue that financial repression arises precisely from government intervention in financial markets, usually in the form of interest rate control (like negative interest rate ceiling) high bank reserve requirements, or strict credit allocation directions (Lync, 1996: 6). These repressive financial policies have an adverse effect on financial development due to lower saving. Thus, they conclude that financial liberalization leads to a positive real interest rate. The higher interest rate stimulates greater financial saving and promotes efficient investment, hence, higher economic growth, while artificial interest rate which is negative interest ceiling cause decreasing saving and promote inefficient investment, hence, hinder economic growth.

High transaction cost and information asymmetry, technical tax, a symptom of poor physical, and the infrastructure of regulatory cause real return that may still experience significant dispersion in countries with initial liberalization. As financial sector develops, the range of price dispersion decreases. It is assumed that mechanisms' development like effective company and security industry regulation and law to remove information asymmetry, creation of new institutions like credit-rating agencies to produce higher quality information, use of technology to improve the processing and dissemination of information including price, adoption of efficient business practices and market organization in the financial sector and deregulation of financial system are necessary to facilitate further financial sector development (Lync, 1996: 6).

King and Levine (1993b) claims that higher level of financial development is positively associated with faster rates of economic growth. When countries have high levels of financial development, economic growth tends to be relatively fast over the next 10 to 30 years. Therefore, financial development is a good predictor of long-run growth rate over the subsequent 10 to 30 years, they revealed that an important link between financial development and long-run growth as suggested by Schumpeter 80 years ago.

The supply leading hypothesis has received considerable support from recent empirical studies. This view can be found in the work Fry (1978), King and Levine (1993a, 1993b), Jung(1986), Gregorio and Guidotti (1995), Demetriades and Hussein (1996), Neusser and Kugler (1998), Xu (2000), Arestis et al. (2001), Hermes and Lensink (2003), Khan et al. (2003), Christoulos and Tsionas (2004), Ghirmay (2004), Abu-Bader and Abu-Qarn (2008), Colombage (2009), Menyah et al. (2014).

The second view traces back to the work of Robinson (1952). He claims that financial development simply follows economic growth (King and Levine, 1993a: 717). This view which is called demand following mean that the demand for financial services depends on the growth of real output and the modernization and the commercialization of agriculture and other substance sectors. On this point, the real side of economy rapidly expands, the demands for various new financial services will increase, hence, financial intermediation (Patric, 1966: 174). Because firms will be less able to finance expansion from internally generated depreciation allowance and retained profits. Due to the same reasons, with a given aggregate growth rate, the greater the variance in the growth rates among different industries or sectors, the greater will be the need for financial intermediation to transfer saving to fast-growing industries from slow-growing industries or from individuals. The financial system may thereby support and sustain the leading sectors in the process of economic growth. In this case, an expansion of the financial system is induced as a result of high economic growth that demands more and better financial services (Kar and Pentecost, 2000: 5). In brief, while the direction of causality relationship in the supply-leading phenomena is from financial development to economic growth, the direction of causality in demand following phenomena is running from economic growth to financial development.

In the third view, causality between financial development and economic growth can run both ways; hence, financial development accelerates economic growth and economic growth lead to increasing financial development. The work of Patric (1966) was first to

examine a bi-directional relationship by developing the concepts of demand following phenomena and supply leading phenomena.

Berthélemy and Varoudakis (1995) indicated that causality between the level of development of the financial sector of the economy and economic growth runs both ways. They show that, financial sector's positive influence on capital efficiency, hence, on economic growth and the real sector's external effect on the financial sector via the volume of savings. Bi-directional mechanisms between the real and the financial sector of the economy is that:

-An increase in the volume of savings generated by the real sector gives rise to an increase in the size of the financial market and improves the efficiency of banks, increasing their labor productivity through learning-by-doing. Therefore, expansion of real sector leads to improvement the financial sector.

-As the size of the financial market increase, this results in a strengthening of banking competition and thus in low financial intermediation margin and a high level of the net interest rate paid to households. It follows a high growth rate, in the long-run, a strong incentive to save and again a large financial market. At the same time, financial market has an advantage in gathering information on investment projects and thus allocates the funds to high-return investments, so it has a positive effect on growth.

Demetriades and Hussein (1996) and Shan, et al. (2001) conducted causality test for 16 developing countries using time series technique for ten developing countries and 9 OECD countries and China, respectively. They found that half exhibited a two-way relationship between financial development and economic growth.

Al-Yousif (2002) examined the nature and direction of the relationship between financial development and economic growth using both time-series and panel data from 30 developing countries for the period 1970–1999. His findings revealed that financial development and economic growth are mutually causal and there is also some support for other views including the supply leading, demand following and the view that there is no relationship between two variables but these results are not as strong as the one for bi-directional.

Demetrieades and Hussein (1996) show the causality results are very much country specific. This highlights the dangers from lumping together in cross-section equations

countries with very different experiences in relation to financial development which may reflect different institutional characteristics, different policies and differences in their implementation and their success depends on the effectiveness of the institutions which implement them. Therefore, there can be no 'wholesale' acceptance of the view that 'finance development leads to growth' as there can be no 'wholesale' acceptance of the view that 'finance development follows economic growth'.

The fourth view is that the development of the financial sector may not be beneficial for economic growth. Singh (1997) and Singh and Weisse (1998) explain that financial development may not lead to economic growth for several reasons. Firstly, the high volatility of share prices and arbitrariness of the stock market pricing process in developing countries cause a high level of difficulty to economic agents in making efficient investment allocation. The share price volatility renders the prices inefficient as signals for resource allocation. Secondly, the interactions between the stock and foreign exchange markets in the wake of unfavorable internal and external economic shocks may exacerbate macroeconomic instability and thus decrease in economic growth. Thirdly, the dominance of stock markets is likely to undermine the existing group-banking systems in developing countries.

The work of Gregorio and Guidotti (1995) has indicated that the link between the degree of financial intermediation and economic growth in 12 Latin American countries can be negative because of unregulated financial liberalization and expectations of government bailouts. Yousif (2002) claims that most of the result in his empirical analysis shows that a positive correlation between financial development and economic growth but there are some cases where a negative correlation is found between these two variables. This finding seems puzzling at first glance. He says that two possible explanations for this negative correlation is that: firstly, it is the result of the business cycle rather than a repression of a long run relationship. Secondly, it is owing to the fact that financial intermediaries are operating in a weak regulatory environment combined with the expectation that governments will bail out failing banks. As a result, these financial institutions are inefficient in their allocation of resources. This inefficiency may cause a decreasing in the economic growth.

Some recent studies (Deidda and Fattouh (2002); Checchetti and Kharroubi (2012); Louis et al. (2012); Law and Singh (2014); Samargandi (2015)) on the link between

financial development and economic growth assume that this relationship between two variables can be non-linear. They explored whether financial development accelerates growth rate after financial development exceeds a certain threshold level. Their results showed that financial development has a detrimental effect on economic growth beyond a threshold level. There are several reasons why financial development may eventually display negative returns. One of these reasons is that rapid credit growth can increase macroeconomic volatility or lead to financial and banking crises which, in turn, may have a negative effect on growth (Louis Arcand et al. 2015: 16). Another reason is that a larger financial system leads to higher productivity growth. However, there comes a point where more banking and more credit are associated with lower growth. This indicates that big and fast-growing financial sectors may be very costly for the rest of the economy. This interpretation occurs because the financial sector competes for resources (physical capital (like buildings, computers), highly skilled workers): financial booms are not, in general, growth-enhancing (Cecchetti and Kharroubi, 2012: 14). The third alternative explanation is that large financial sectors are growth-promoting in the presence of a good institutional and regulatory framework, but could have adversely effect on growth in countries that lack an appropriate regulatory infrastructure and potential misallocation of resources, even in good times (Arcand et al., 2015: 16-23).

Table 8 shows overview of empirical findings on financial development and economic growth.

Table 8 Overview of Selected Empirical Findings on Financial Development (FD) and Economic Growth (EG)

Authors	Countries	Period	Indicators of financial development and other variables used	Methods and results
Maxwell J. Fry 1978	7 Asian countries	Burma(1962-69) India(1962-72) Korea(1962-72) Malaysia (1963-72) Philippines (1962-72) Singapore(1965-72) Taiwan(1962-72)	Dependent variable: domestic saving to GNP Independent variable: real per capita income expressed in 1970, growth rate in real GNP, the nominal deposit rate of interest, the nominal government bond or short term loan rate, expected rate of inflation, foreign saving to GNP	LSDV, 2SLSDV, OLSDV Interest rate has a positive effect on domestic saving and economic growth
Woo S. Jung 1986	56 countries (19developed 37developing countries)	Countries have at least 15 annual	Financial development indicators used: M1/GDP(or GNP) and M2/GDP (or GNP) Economic growth indicators: per capita GDP or GNP	Granger Causality analysis When M1/GDP as a measure of financial development is used, the causality direction for developing countries is from financial development to economic growth, while the causality direction for developed countries is from economic growth to financial development. When M2/GDP as a measure of financial development, causality direction does not appear to distinguish developed countries from developing countries
Robert G. King, Ross Levine 1993a	80 countries	1960-1989	Dependent variable: real per capita GDP Independent variable: FD (M2/GDP, deposit money bank domestic credit to total credit, ratio of claims on the nonfinancial private sector to GDP, ratio of claims on the nonfinancial private sector to total domestic credit), other variables (initial income, initial secondary school enrollment rate, ratio of government expenditures to GDP, inflation rate, openness)	Cross country regression The link between FD and EG is positive. The higher FD leads to the higher EG.

Robert G. King, Ross Levine 1993b	80 countries 5 countries (for case studies)	1960-1989	FD indicators(liquid liabilities (M3 or M2) to GDP, the ratio of deposit money bank domestic assets to deposit money bank domestic assets plus central bank domestic assets, credit issued to private enterprises divided by credit issued to central and local governments plus credit issued to public and private enterprises, credit issued to private enterprises divided by GDP), real GDP per capita Control variables (initial secondary school, initial income enrollment rate, government expenditure to GDP, inflation, and openness)	Cross country regression Results show that financial intermediaries can accelerate the rate of technological innovations and improve the efficiency of innovative activity by evaluating, managing, and funding the entrepreneurial activity ; they thereby accelerate EG
Jose De Gregorio, Pablo E. Guidotti 1995	1)98 countries 2) 12 Latin America C.	1)1960-1985 2) 1950-1985	Dependent variable: average GDP per capita growth Independent variables: domestic credit to the private sector to GDP, primary and secondary school enrollment ratios, GDP per capita in 1960, the average level of government spending over GDP, and political instability.	OLS estimation The impact of FD on EG is positive but different subsamples show that this effect in high-income is relatively small (they may have reached the stage of diminishing returns). Effect of FD on the volume of investment in low-income and middle-income countries is relatively small and, this effect on growth comes from the increased efficiency of investment. The link between the degree of financial intermediation and growth in Latin America countries can be negative because of unregulated financial liberalization and expectations of government bailouts
J.C. Berthblemy, A. Varoudakist 1995	91 countries	1960-1985	Real GDP per capita M2/GDP, secondary school enrolment rate(initial human capital), government expenditure to GDP, political stability (revolutions and coups), initial level of financial development (treshold variable) dummy (OPEC countries)	OLS estimation Bi-directional (the financial sector has positive effect on capital efficiency and the real sector's external effect on the financial sector via the volume of savings) Results show that educational attainment is an important factor with respect to EG but that financial factors such as interest rate liberalization could lead to high or low EG outcomes.

Panicos O. Demetriades, Khaled A. Hussein 1996	16 countries	At least 27 annual observation	Financial development indicators: M2/GDP, the ratio of bank claims on the private sector to nominal GDP economic growth indicator: real GDP per capita	Time series analysis, Engle-Granger cointegration tests, Johansen cointegration tests, They find very little support to supply leading hypothesis and evidence that EG causes FD in a few countries. However, most of the evidence seems to favor bi-directional causality
Klaus Neusser, Maurice Kugler 1998	13 OECD	1960-1994	Manufacturing GDP (Proxy for economic growth) Financial sector GDP (Value-added for financial intermediaries (sum of payments to all factors of production including wages and salaries, profits, interest expense, and depreciation), total factor productivity (the ratio of real value added to a geometric weighted average of the capital stock and total employment)	Time series technique, Granger-Lin long run causality test, panel cointegration test The causal link between FD and EG is weak for the smaller countries due to different degrees of capital mobility. Supply leading approach is found for USA, Japan and Germany.
Zhenhui Xu 2000	41 developing countries	1960-1993	Real GDP, real domestic investment Financial development indicators: Total deposit to the GDP	Impulse-reponsive Analysis and VAR Financial development affects positively economic growth via investment
P.L. Rousseau, P. Wachtel 2000	47 countries	1980-1995	Dependent v.: real per capita Independent v.: market capitalization to GDP, total value traded, per capita market capitalization, real per capita M3, per capita value traded, initial GDP per capita, initial secondary enrollment rate, political stability (number of revolutions and coups), M3/GDP,	Cross-sectional regression, panel VAR Cross-section regression show that liquid liabilities and value traded to GDP have a positive effect on growth Panel VAR estimation indicate that causality running from stock market indicators to EG

Philip Arestis, Panicos O., Demetriades, Kul B. Luintel 2001	5 countries	Germany(1973-1997), U.S.(1972-1998), Japan(1974-1998), U.K.(1968-1997), France (1974-1998)	Economic growth indicator: The log of real GDP Financial development indicator: market capitalization ratio, domestic bank credit to nominal GDP and volatility in stock market	Johansen test of cointegration, VECM Stock markets and banks in France, Germany and Japan seem to have made contributions to EG but the link between FD and EG in U.K. and the U.S.A is weak. General result shows that financial systems can be promote long-term growth than capital-market-based ones
Jordan Z. Shan, Alan G. Morris, Fiona Sun 2001	9 OECD countries and China	1960-1998 Mid-1980s-1998 (for subsamples)	Economic growth: Real per capita GDP Financial development: Bank credit to GDP, M1/GDP or M3/GDP Control variables(total factor productivity, openness, total capital expenditure to GDP, inflation, an index of stock market prices)	VAR model, time series approach There is a weak evidence for the hypothesis that FD lead to EG. Some countries have bidirectional causality.
Yousif Khalifa Al-Yousif 2002	30 countries	1970-1999	The growth rate of per capita GDP M1 to GDP M2 to GDP	Granger causality test, Johansen test of cointegration Panel data analysis and time series analysis There is a relationship between FD and EG. Causality is bidirectional. Time series analysis show that results are mixed because results include supply-leading, demand-leading, no link between FD and EG, a negative correlation between FD and EG.
Luca Deidda, Bassam Fattouh 2002	119 countries	1960-1989	Dependent variable is real per capita GDP growth Independent variable: Initial GDP per capita in 1960(treshold variable), ratio of liquid liabilities to GDP, secondary school enrollment rate in 1960, ratio of government consumption to GDP, the inflation rate, openness, number of revolutions, index of civil liberties.	OLS estimation, treshold estimation The growth effect of financial development is not significant in low-income countries, while in high-income countries this effect becomes positive.

Niels Hermes, Robert Lensink 2003	67 countries	1970-1995	Dependent variable: the per capita growth rate Independent variables: FDI to GDP, the private sector bank loans to GDP, the initial level of GDP per capita, the investment share in GDP, credit to GDP, the initial level of the secondary enrolment rate	Fixed effects model, random effects model In countries with very weak financial systems, FDI does not positively affect growth while an increase in FDI can enhance EG in less developing countries with sufficiently developed financial system
Mohsin S. Khan, Abdelhak S. Senhadji 2003	159 countries (both developed and developing countries)	1960-1999	The growth rate of real GDP The indicators of financial depth: a)domestic credit to the private sector to GDP, b) a plus stock market capitalization to GDP c) b plus the private and public bond market capitalization to GDP d) stock market capitalization ratio) control variables (investment to GDP, the growth rate of population, growth rate of terms of trade, the log of initial income(per capita GDP in 1987)	Cross section analysis, 2SLS, OLS, 5 year average panel, nonlinear form (both cross section and 5 year average samples) FD positively affects the rate of EG
Dimitris K. Christopoulos, Efthmios G. Tsionas 2004	10 developing countries	1970-2000	Economic growth: Quantity of output, Financial development: total bank deposits liabilities to GDP Other variables.: The share of gross fixed capital formation to GDP, inflation rate	Panel cointegration analysis, treshold cointegration test, dynamic panel data analysis, full modified OLS estimation, Johansen maximum likelihood cointegration (country by country) Panel cointegration analysis shows that there is no evidence of bi-directional causality but there is unidirectional causality from FD to EG. Time series evidence is also supportive to this result.
Teame Ghirmay 2004	13 Sub-Sahrahan African countries	At least 30 years	Economic growth indicators: real GDP Financial development indicators: credit to private sector by financial intermediaries	Granger causality approach and Johansen cointegration test FD causes EG in 8 countries. There is an evidence of bidirectional causality relationship in 6 countries

Nasri Harb, Mouawiya Al-Awad 2005	10 Middle Eastern countries	1969-2000	Financial development: private credit to GDP, real GDP, real government spending, real M1	Pedroni's Panel cointegration method, Granger causality, the variance decomposition, Johansen maximum likelihood cointegration (country by country), Granger causality Panel cointegration test shows that FD and EG may be linkages in the long run and causality runs from EG to FD in the short run. However time series evidence is not clear of the direction of causations
Nicholas Apergis, Ioannis Filippidis, Claire Economidou 2007	65 countries 50 Non-OECD and 15 OECD	1975-2000	Economic growth indicator: GDP per capita Financial development indicators: M3/GDP, credit by deposit money banks to the private sector to GDP, credits by deposit money banks and other financial institutions to the private sector to GDP Control v.: average years of schooling, investment to GDP and government spending to GDP, openness	Panel cointegration analysis, panel causality test (using the pooled mean group) There is a bidirectional causality between growth and all indicators of FD for all countries
Suleiman Abu-Bader, Aamer S. Abu-Qarn 2008	6 countries MENA	1960-2004	Economic growth: Real GDP per capita Financial development: M2Y/GDP, M2 minus currency to GDP, bank credit to the private sector to GDP, credit issued to nonfinancial private firms to total domestic credit Investment to GDP, government expenditure to GDP	Granger causality There is strong evidence for causality running from FD to EG in Mena countries excluding Israel
Sisira R.N. Colombage 2009	5 developed countries	1995-2007 (quarterly)	Economic growth indicator: Real GDP Financial development indicators: the equity market capitalization ratio, domestic credit to private sector to GDP, the ratio of bank claims on the private sector to GDP,	Johansen cointegration test for the long run equilibrium Granger causality test for the short run equilibrium. There is a uni-directional causality running from FD to EG in developed countries excluding Canadian result supports a causal link from EG to FD only in the short run.

Songul Kakilli Acaravci Ilhan Ozturk Ali Acaravci 2009	24 Sub-sahrahan African countries	1975-2005	Economic growth indicator: real GDP per capita Financial development indicators: domestic credit provided by the banking sector to GDP, domestic credit to private sector to GDP, M3/GDP	Panel cointegration and panel causality analysis using panel GMM There is a bidirectional causality between growth and one of indicators of FD (domestic credit provided by banking sector) for all Sub-Saharan African countries. Their results show that there is no long-run relationship between EG and FD
Muhsin Kar, Şaban Nazlıoğlu, Hüseyin Ağır 2011	15 Mena countries	1980-2007	Financial development indicators: M1/GDP, M2/GDP, quasi money(M2-M1) to GDP, deposit money bank liabilities to GDP, private sector credit to GDP, domestic credit to GDP Economic growth indicator: Real income	Bootstrap panel Granger causality analysis They find that the results seem to be country and FD indicators specific. For example, there is no evidence causality direction from FD to EG or from EG to FD in Algeria, but the results show that there is evidence on both demand following and supply leading hypothesis in other countries
M. Kabir Hassan, Benito Sanchezb, Jung-Suk Yuc 2011	168 countries (geographic regions and income group)	1980-2007	Dependent v.: Economic growth (GDP per capita growth) Independent v.: FD (domestic credit provided by banking sector to GDP, domestic credit to the private sector to GDP, M3/GDP), gross domestic savings to GDP, openness, general government expenditure to GDP	OLS, Granger causality test, VAR analysis The results show that there is a positive strong link between FD and EG for developing countries but contradictionary results for high-income countries. They find that there is two-way causality between FD and EG in all regions but there is one-way causality from EG to FD in Sub-Saharan and East Asia and Pacific in the short-run.
Stephen G Cecchetti, Enisse Kharroubi 2012	50 developed and developing countries	1980-2009 (5 year average)	Dependent v.: real GDP per worker growth Independent v.: financial development (private credit to GDP, private credit by banks to GDP, financial intermediation share in total employment) financial development squared, working population growth, openness, government consumption to GDP, inflation	Panel treshold model When FD exceeds 90% , FD becomes a drag on EG. A faster rate of EG of the FD may be detrimental to EG because of the fact that financial sector competes for resources with the rest of the economy

				Bootstrap panel Granger causality analysis
Shun-Jen Hsueh, Yu-Hau Hu, Chien-Heng Tu 2013	10 asian countries	1980-2007	Economic growth indicator: Real GDP Financial development indicators: the domestic assets of financial sector, M1/GDP, M2/GDP, M3/GDP	They find that the results seem to be country and FD indicator specific. For example, there is no evidence causality direction from FD to EG or from EG to FD in Philippines, India and Japan, but the results find that there is evidence on both demand following (in Malaysia for only M1) and supply leading hypothesis (Malaysia, Indonesia, Korea, Singapore, Thailand, Taiwan and China for all of 3 FD indicators)
Law and Singh 2014	87 developing and developed countries	1980-2010	Dependent v.: economic growth Independent v.: financial development (the threshold variable 88%) (private sector credit, liquid liabilities, domestic credit) Controls variables (openness, institutions, government expenditure, inflation rate, initial GDP per capita, human capital, population growth, investment)	Dynamic panel threshold method There is a threshold effect relationship between FD and EG. Finance exerts a positive effect on EG below the threshold, but the impact of FD on EG turns negative above threshold
Kojo Menyah, Saban Nazlioglu, Yemane Wolde-Rufae 2014	21 African countries	1965-2008	Economic growth indicator: real GDP per capita Financial development index (M2/GDP, M3/GDP, total domestic credit provided by the banking sector to GDP, domestic credit to the private sector to GDP) Openness	Bootstrap panel Granger causality analysis There is a uni-directional causality running from FD to EG in Benin, Sierra Leone and South Africa and from EG to FD in Nigeria
Jean-Louis Arcand, Enrico Berkes, Ugo Panizza 2015	69observation (for cross-section) 917 observation (for panel regression)	1960-1995 1960-2000 1960-2005 1960-2010	Dependent v.: real per capita GDP Independent v.: financial development(total credit to private sector to GDP, the level of credit to private sector GDP) financial development squared, years of education, government consumption to GDP, openness, inflation, dummy variable	Cross-country OLS regression, system GMM, Sasabuchi-Lind-Mehlum test (for inverse U-shaped relationship) The link between FD and EG is negative, once the ratio of private credit to GDP exceeds a threshold of about 100% for high-income countries.

Samargandia 2015	52 middle income countries	1980-2008	Dependent v.: real GDP Independent v.: financial development index, financial development square Control variable(initial real GDP, investment, population growth, openness, government expenditure to GDP, life expectancy, inflation	Panel ARDL model, dynamic panel threshold estimation Results show that FD and EG are negatively associated in the long-run. When FD exceeds threshold value of 0.915, it could cause an negative impact on EG
Muhsin Kar and Serife Özşahin 2016	17 emerging economies	2004-2009	Dependent variable: the entrepreneurship indicator (new business density) Independent variable: financial development indicators (private sector credit to GDP, market capitalization ratio), institutional quality indicators(corruption and political instability), per capita GDP, inflation	Random effects model Improvements in financial system enhance the entrepreneurial activity

5.2 Financial Development and Inflation

Why the recent interest in inflation and finance? Two empirical findings recognize that high and sustained rate of inflation has a detrimental impact on economic growth and there is a positive relationship between the development of the financial system and economic growth, these reasons forms the basis for the recent interest. These two strands of the empirical literature (the development of financial sector- economic growth and the rate of inflation- economic growth relationship) have lived separate lives but one obvious link is that inflation might be affecting economic growth through the financial sector (Naceur & Ghazouani, 2005: 2).

Boyd et al. (1996) explain that there has been a substantial theoretical literature on inflation and finance link, somewhat surprisingly; there has been the lack of evidence regarding the nature of the empirical relationship between inflation and financial market performance. Boyd et al. (1996) are among first to investigate the empirical effects of inflation on financial sector development.

Khan et al. (2006) explain that some theoretical mechanisms demonstrating how changes in the rate of inflation affect financial markets and through this channel, long-term economic growth. Financial sector arises to address endogenous frictions (such as adverse selection or moral hazard problems) that are present in the process of allocating credit and investment capital. The transmission mechanism from high and volatility inflation rate to financial markets works as follows: an increasing in the rate of inflation could lead to lower long-term real rates of return on assets, hence, cause more severe rationing of credit, reductions in financial sector development and economic growth. However, they emphasize theoretical model based on a non-linear relationship between inflation and financial market development. In these models, the impacts of the threshold level of inflation on financial development can arise. If the level of inflation is sufficiently low and real rates of return are sufficiently high, an increase in inflation rate causes economic agents to substitute away from cash and into investment in physical or human capital. Consequently, long-term economic growth or real activity can be stimulated. If the level of inflation is above a certain threshold, higher rate of inflation will interfere with the efficient allocation of investment capital and thus have negative consequences on economic growth.

Rousseau and Wachtel (2002) claim that inflation hampers financial sector development and results in financial repression. High inflation also discourages any long run financial contracting and financial intermediaries tend to maintain liquid portfolios. Thus, in countries with an inflationary environment, financial intermediaries are less eager to provide long-term financing for capital formation and growth; both lenders and borrowers are less willing to enter long-term nominal contracts.

Boyd et al. (1996; 2001), Haslag and Kao (1999), English (1999), Barnes (2001), Rousseau and Watchel (2002), Naceur and Ghazouani (2005), Khan et al. (2006), Kim and Lin (2010), Keho (2010), Bittencourt (2011) empirically examined the relationship between inflation and financial development.

Table 9 indicates some selected studies concerning empirical findings on financial development and inflation. These studies demonstrated in the table are as follows:

Boyd et al. (1996) try to assess the links between sustained inflation and financial sector performance. They indicated that moderate inflation has a negative impact on financial development by employing various measurements for financial sector performance. They used a measure of formal financial intermediary sector that includes a) the ratio of a country's currency (held outside of the banking system) plus demand deposits to its GDP, b) the ratio of liquid liabilities of the financial system to GDP, c) quasi-liquid liabilities (ratio of liquid liabilities of the financial system minus M1), d) the ratio of claims on the private sector held by the financial sector to GDP, e) the ratio of deposit money bank domestic assets to deposit money bank plus central bank domestic assets. They employ time-averaged data over the entire 1960-1989 period from a large number of countries including 119 countries and examine the cross-sectional relationship between inflation and financial development. Their result also established that this link might be nonlinear. The recognized threshold level of inflation is 15 percent per year. Similarly, Haslag and Koo (1999) find that inflation and financial sector development are negatively related. As inflation rises, financial sector will be less developed. They explore a cross-section of countries with time-averaged data for the entire 1960-1989 period

English (1999) provides cross-country evidence that an increase in inflation rate leads economic agents to substitute purchased transactions services for money, which expands the supply of financial services and stimulates financial development. When 62 countries

are divided into three groups (low income, medium income, and high-income countries), the coefficient on inflation rate is small and insignificant for low-income countries, large and significant for the high-income countries. Therefore, the effect of inflation on financial sector size can be nonlinear.

Barnes (2001) investigated the threshold relationship among inflation financial sector development and economic growth in the case of 49 countries for four different model specifications using the non-dynamic panel threshold model with the Hansen's (1999) methodology during the 6 periods from 1965 up to 1995. He found that the link between financial development and growth is significantly positive before the threshold level of inflation (14%), but the link between inflation and growth was significantly negative before threshold level of inflation. When an interaction variable between inflation and financial market development is added in the regression, the relationship between inflation and growth is significantly negative before threshold (14%), but this relationship becomes negative and insignificant after threshold.

Rousseau and Wachtel (2002) examined the link between inflation financial development and economic growth using a Rolling regression technique for 84 countries during the 7 period from 1960 up to 1995. Their result shows that inflation has a negative effect on financial development when the five-year average inflation rate is below a threshold of about 15 percent to 20 percent. Financial development has a positive impact on economic growth only once inflation is below a threshold 6.5 percent to 8 percent

Naceur and Ghazouani (2005) used time series and applied GMM methodology to examine the link between inflation and financial development for 11 MENA countries. The dataset covers the period 1979-1999. Their results indicated that inflation has a significant negative effect on financial development, but there is no evidence of thresholds levels. The results indicate that a marginal increase in inflation is harmless to stock market performance and banking sector development whatever the rate of inflation.

Khan et al. (2006) analyze a linear and nonlinear relationship between financial depth and inflation using unbalanced panel data for 168 countries. The results show that if the rate of inflation is above the threshold (almost 3 up to 6 percent), a further increase in inflation rate has a significant negative effect on the level of financial activity. When the rate of

inflation is under the threshold, a modest increase in inflation rate has a positive effect on financial development.

Keho (2010) examined financial development and inflation nexus using threshold models and cross-terms regression techniques for seven in West Africa. He attempts to build an overall index for financial development for each of the countries under study, so the method of principal components analysis is used in this work. Financial development index includes the ratio of money and quasi-money (M2) to GDP, the ratio of quasi-money to M2, the ratio of liquid liabilities to GDP, the bank liquid reserves to bank assets ratio and the ratio of credits to private sector to GDP. His results show that there is no strong evidence of nonlinearity between financial development and economic growth. Financial development does not have a significant effect on growth regardless of the level of inflation for West African countries.

Kim and Lin (2010) applied the Pooled Mean Group (PMG) estimator of Pesaran et al. (1999) to analyze the effect of inflation on financial development. Their dataset consists of a panel of 87 countries over the period 1960–2005. Their results showed evidence of a strong link between inflation and financial development, irrespective of alternative financial development measures (domestic private credit to GDP, M2/GDP, and deposit money banks' domestic assets to GDP). There is a negative long-run relationship between inflation and financial development, while there is a positive short-run relationship inflation and financial development. However, when the data are divided into different income or inflation groups, the results show that low income or low inflation groups have the negative long-term relationship and a positive short-term relationship between inflation and financial development. The link between inflation and financial development is nonlinear. Although the positive short-term effects of inflation on financial development seem to decrease with inflation, the negative long-term relationship between inflation and financial depth appears to be U-shaped in the rate of inflation.

Bittencourt (2011) also examined the role of inflation on financial development in Brazil using time series (the seemingly unrelated regressions estimator (SUR)) and panel data analysis (fixed effects and random effects). The dataset covers the period between 1985 and 2004 and ten economically major regions from North to South:Ceará, São Paulo, Rio Grande do Sul, Pernambuco, Pará, Bahia, Distrito Federal, Rio de Janeiro, Paraná and

Minas Gerais. The work based on both the panel data analysis and the time series analysis found that inflation deteriorates financial development. According to the author, weak macroeconomic performances have detrimental effects on developing economy for affecting high inequality, erratic growth, and a restrictive financial sector. Therefore, low and stable inflation, stronger economic institutions (independent central bank and a sound fiscal authority) are necessary for a deeper financial sector.

In a related single country study, which examines the link between financial development and inflation, Ozturk and Karagoz (2012) employed the Autoregressive Distributed Lag (ARDL) approach developed by Pesaran et al. (2001) to investigate the effect of inflation on financial development for Turkey for the entire period 1971-2009. They found that there is no long run (a significant long-run relationship) link between inflation and financial development, but when credit to GDP is used, there is a significant long-run relationship between inflation and financial development. Their results established that the link between inflation and financial development is negative in the short run and long run, in the case of Turkey. So more developed financial sector can be a significant contributor to the decrease in inflation.

Table 9 Overview of Selected Empirical Findings on Financial Development and Inflation

Authors	Countries	Period	Variables	Methods and results
John H. Boyd, Ross Levine, Bruce D. Smith 1996	119 countries	1960-1989	Dependent v.: financial development Independent v.: inflation, initial real per capita GDP, initial secondary school enrollment, the average black market exchange rate premium (as a indicator of price, trade and exchange rate distortions), political stability (the number of revolutions and coups), government expenditure to GDP	Threshold regression(using inflation dummy variable; 40%, 15%, 25%, inverse of inflation), linear regression, cross-section analysis The link between inflation and financial market performance is negative when inflation threshold occurs under 15% per year. Once the rate of inflation exceeds 15%, there is a discrete decline in the amount of banking activity
Joseph H. Haslag Jahyeong Koo 1999	119 countries	1960-1989	Dependent v.: Financial development Independent v.: Financial repression variables (inflation rate, reserve ratio), per GDP growth, per capita capital growth, investment to GDP, initial real per capita GDP, initial secondary school enrollment, government expenditure to GDP, openness, political stability	Cross-section analysis, linear regression and threshold regression (using inflation dummy variable 15%, 40%) There is a nonlinear relationship between finance and inflation. Countries with lowest inflation have more developed financial system than those close to the high inflation threshold, but a negative relationship between inflation and FD disappears with increases in the inflation rate above a threshold
William B. English 1999	62 countries	1975-1985	Dependent v.: financial sector development (finance, insurance, real estate, and business services) to GDP Independent v.: average annual inflation rate GDP per capita, Financial sector productivity(the financial share in GDP to the financial share in employment)	Cross-sectional data An increase in inflation rate leads economic agents to substitute purchased transactions services for money, which expands the supply of financial services and stimulates financial development

Michelle L. Barnes 2001	49 countries	1965-1995 (five year average)	Dependent v. :Domestic private credit to GDP, M2/GDP, real per capita GDP Independent v.: Inflation, real per capita gdp, political stability (the number of revolutions and coups) initial real GDP per capita, average years of secondary schooling, government expenditure to GDP, black market premium	Non-dynamic panel threshold model The link between FD and EG is significantly positive before the threshold level of inflation (14%), but the link between inflation and growth significantly negative before threshold level of inflation.
John H. Boyd, Ross Levine, Bruce D. Smith 2001	100 countries	1960-1995	Dependent v.: FD: total assets to deposit money banks to GDP, domestic credit to private sector to GDP, M2/GDP Independent v.: Initial (1960) real per capita GDP, initial secondary school enrollment, political risk and corruption, the average black market exchange rate premium (indicator of price, trade, and exchange rate distortions), central government expenditure to GDP	Cross-sectional analyses (threshold regression), dynamic-panel GMM When inflation rates lower than 15 percent, there is a strong negative correlation between inflation and FD. For economies with inflation rates exceeding 15 percent, there is a discrete drop in FD.
Peter L. Rousseau Paul Wachtel 2002	84 countries	1960-1995 (five-year averages)	Dependent v.: FD indicators (M3/GDP, (M3-M1)/GDP, total credit to GDP) Independent v.: inflation, initial real GDP, initial secondary school enrollment rate, initial secondary school enrollment, inflation and disinflation dummy variable	Rolling regression technique Inflation has a negative effect on FD when the five year average inflation rate is below a threshold of 15% to 20%. Results shows that FD has a positive effect on EG when inflation decrease below 6% or 8%
Samy Ben Naceur Samir Ghazouani 2005	11 Mena countries	1979-1999	Dependent v.: the stock market capitalization ratio, the domestic credit to private sector to GDP Independent v.: inflation, GDP per capita, government expenditure to GDP, secondary school enrolment	GMM regression without threshold, GMM regression with threshold Inflation has a significant negative effect on FD, but there is no evidence of threshold levels.

			Dependent v.: d1: domestic credit to private sector to GDP, d2: d1+ stock market capitalization to GDP, d3: d2+ private and public bond market capitalization to GDP	Non-linear least square
Mohsin S. Khan Abdel S. Senhadji Bruce D. Smith 2006	168 countries	1960-1999		For the rate of inflation above the threshold, a further increase in inflation rate have significant negative effect on the level of financial activity
			Independent v.: inflation(threshold), real GDP per capita, openness, share of public consumption to GDP, regional dummies	For the rate of inflation under the threshold (almost 3 up to 6 percent), a modest increase in inflation rate has a positive effect on FD
Yaya Keho 2010	7 West Africa countries	Benin 1980-2005 Burkina Faso 1968-2003 Cote d'ivoire 1966-2005 Mali 1980-2005 Niger 1966-1999 Senegal 1976-2005 Togo 1966-2005	Dependent v.: real GDP Independent v.: Inflation, FD index (M2/GDP, liquid liabilities to GDP, the bank liquid reserves to bank assets, credit to private sector to GDP) and control variables	Time series analysis (using threshold model) FD does not have significant effect on EG regardless of the level of inflation for all countries
Dong-Hyeon Kim Shu- Chin Lin 2010	87 countries	1960-2005	Dependent v.: FD indicators (domestic private credit to GDP, M2/GDP, deposit money banks' domestic assets to GDP) Independent v: rate of inflation, initial real per capita GDP, government expenditure to GDP, openness	Pooled Mean Group estimator There is a negative long-run relationship between inflation and FD, while there is a positive short-run relationship inflation and FD.
Manoel Bittencourt 2011	Brazil	1985-2004	Dependent v.: financial development (M2/GDP, M3/GDP, domestic private credit to GDP, personal credit to GDP) Independent v.: inflation, government expenditure to GDP, the financial domestic product, lag FD ratio	Time series(the seemingly unrelated regressions estimator (SUR)) and panel data analysis (fe and re) Inflation deteriorates financial development.

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Nurettin Ozturk, Kadir Karagoz 2012	Turkey	1971-2009	Dependent v.: FD indicators (M2/GDP, domestic private credit to GDP) Dependent v.: Inflation rate, real per capita GDP	ARDL bounds testing approach and Error Correction Model (ECM) The link between inflation and FD is negative in the short run and long run. So more developed financial sector is an important contributor to the decrease in inflation

5.3 Determinants of Dollarization

This section reviews the empirical literature on the determinants and consequences of partial dollarization and the link between financial fragility and dollarization for developing countries and transition economies.

Some of the empirical studies have examined certain factors including exchange rate depreciation and the rate of inflation. The work of Ortiz (1983) on Mexico shows that the expected rate of depreciation is a significant variable explaining dollarization. El-Erian (1987) tries to examine the determinants of currency substitution in Egypt and the Yemen Arab Republic over the period 1980-86. It was concluded that foreign currency portfolio preferences reflected in the expectations of exchange rate is affected by political and institutional environment, as well as intensification of inflationary pressures.

Ize and Levy-Yeyati (2003) focused on a different aspect of the reasons of dollarization. They highlight the importance of the volatility of inflation and the real exchange rate on credit and deposit dollarization. They apply the cross-country regression using the period 1990-1995 for 46 countries. At the same time, they analyze the dynamic behavior of dollarization using panel data for a sub-sample of highly dollarized Latin American countries (Argentina, Bolivia, Mexico, Peru and Uruguay). Empirical results show that financial dollarization is likely to persist whenever the expected volatility of the inflation rate remains high in relation to the real exchange rate, even after price stabilization has been achieved.

De Nicolo et al. (2005) also summarize the determinants of deposit dollarization conducting cross-section estimation for different dependent variables like the 2001 level of deposit dollarization; the average level for available years during the sample period 1990-2001 etc. They found that the credibility of macroeconomic policy and the quality of institutions affect the level of deposit dollarization.

Barajas and Morales (2003), Arteta (2005) and Honig (2009) focus on the impacts of exchange rate policy on dollarization. Arteta (2005) indicates that floating exchange rate regimes are positively associated with deposit and credit dollarization using Pooled OLS regression for 92 countries over the period 1990-2000. In contrast, Honig (2009) has shown that exchange rate regime is not important determinants of dollarization but improving institutional quality lead to a decreasing in the level of dollarization He has

used OLS, random effects, and fixed effects regression for 66 countries over the period 1988-2000.

Honohan (2007) tries to explain determinants of dollarization using Feasible GLS estimation. Date set covers the period from 1993 to 2004 and 121 countries. The result shows that depreciation and interest rate positively affects dollarization in the short run. Basso et al. (2007) find that the tradeoff between inflation and real exchange rate variability (MVP), interest rate differentials. Increases in the presence of foreign banks in the local financial sector, are found to be significant factors explaining financial dollarization. Their dataset consisted of a panel of 24 transition economies over the period 2000-2006.

Neanidis and Savva (2009) try to explain short-run determinants of financial dollarization in the 11 transition economies using OLS, fixed effects, random effects, FGLS, 2SLS. They found that deposit dollarization is affected by exchange rate, money base interest rate differentials. MVP does not affect short-run deposit dollarization. Loan dollarization is not driven depreciation and monetary base, while it is driven by banks matching of domestic loan and deposits and currency matching of assets and liabilities, institutional quality, interest rate differentials.

Table 10 The Selected Empirical Literature on Determinants of Partial Dollarization

Authors	Countries	Period	Variables	Methods and results
Mohamed A. El-Erian 1987	Egypt and Yemen Arab Republic	1980-1986 (quarterly)	Dependent v.: Relative holdings of foreign currency deposits Exchange rate expectations, interest rate differentials, political disruptions, stock adjustment	OLS estimation Dollarization is affected by exchange rate devaluations
Johannes Mueller 1994	Lebanon	Model1 1982-1993(monthly) Model2 1982-1993 (quarterly)	Dependent v.: foreign currency deposits to total deposits, sum of domestic and foreign currency deposits Expected depreciation, interest rate differential, lagged dependent variable, ratchet effect(the highest previously achieved CS ratio)	OLS estimation Interest rate differential does not play a major. Foreign currency deposits has a primary role as a hedge against potential depreciation
Paul D. Mcnelis and Lilina Rojas-Suarez 1996	A comparison of Bolivia and Peru	Bolivia 1978-1994 Peru 1978-1994 Peru 1990-1994	Dependent v.: dollar deposit to short-term deposits in domestic banks) First difference dollarization, depreciation, risk and dummy variable for December, Instrumental variable (3 lags of depreciation, 3 lags of first of dollarization ratio)	2SLS Even if exchange rate has remained fixed, depreciation risk can be important factor for persistence of dollarization
Alain Ize and Eduardo Levy-Yeyati 2003	46 countries	1990-1995	Dependent v.: Actual dollarization (total foreign currency deposits over total domestic and cross-border deposits) Independent v.: Inflation rate, MVP, NFA(foreign assets of commercial bank- foreign liabilities of commercial bank + cross border deposit minus cross border loans divided by foreign currency domestic deposits + local currency domestic deposits + cross border deposits + total claims of deposit money banks + cross-border loans) correlation between inf. and exchange rate, variance of inf. and exchange rate	Cross-country regressions Results suggest that MVP dollarization provides a significant benchmark to estimation of financial dollarization.

Adolfo Barajas and R. Armando Morales 2003	14 Latin America and Caribbean countries	1995-2001 (monthly, quarterly and annual)	Dependent v.: Loan dollarization(foreign currency loan to total loan), foreign currency loan minus foreign currency deposit to GDP, total foreign loan to GDP Foreign currency deposit (for loan dollarization analysis), Spread differential, central bank intervention index, private sector credit to GDP (financial development), deposit insurance coverage, exports to GDP, borrowing from overseas banks	OLS estimation, Fixed effects estimation While foreign Exchange intervention spread differential play an important role explaining liability dollarization, financial development and openness are generally associated with an increase of liability dollarization.
Ruslan Piontkovsky 2003	9 transition economies	1Q1991-4Q2001	Dependent v.: Dollarization ratio (foreign currency deposits to total deposits) Difference of real returns on foreign and domestic bonds, inflation volatility, financial market development (national currency loan to deposit rate spread, monetization of GDP, external trade turnover, external trade of goods balance and current account balance)	Fixed effects GLS estimation (unbalanced panel data) Relative returns on assets and inflation volatility affect level of dollarization in transition economies. But when relative returns on domestic assets increases and there is an increase in inflation volatility, level of dollarization does not reduce
Alina Luca 2003	22 transition economies	1990-2001	Dependent v.: Credit dollarization (foreign currency loan to total loans or foreign currency loan to total bank assets) Deposit dollarization, banks 'net foreign assets, interest rate spread, banks' profit, banks' risk-taking behavior(banks' total risk asset to total assets), deposit insurance, banks' concentration, firms' external borrowing, trade, imports of intermediate goods, exports, index of total commodities, index of industrial inputs, change in the oil price, average firm size, firms' profit margin, firms' leverage ratio, dummy variable, financial development, GDP per capita etc.	Pooled OLS, Fixed effects estimator, First differencing estimation, 2SLS Results indicate that the main driving force of credit dollarization is bank currency matching and real dollarization has little influence on financial dollarization

Patrick Honohan 2007	121 countries	1993-2004	Dependent v.: Change in Deposit Dollarization Percentage Share (foreign currency-denominated deposits in total deposits) Exchange rate, Money base, lagged dollarization, deposit interest rate, cumulative inflation, time	Feasible GLS estimation Depreciation rate and interest rate spread positively affect level of dollarization in the short run
Robert Rennhack and Masahiro Nozaki 2006	62 countries	1990-2001	Dependent v.: Financial dollarization(foreign currency deposit to total deposit) Independent v.: MVP, inflation, restriction on foreign currency, government balance, institutional quality (voice and accountability, regulatory quality, rule of law, control of corruption)	Cross-section model, two-step system GMM MVP and inflation play an important role, while legal restrictions institutional quality appear to be effective in decreasing deposit dollarization.
Mohsen Bahramani-Oskooe and Muge Karcal 2006	Turkey	1M1987-6M2004	Dependent v.: Monetary aggregate in real return (M1 or M2) Real income, domestic interest rate, inflation rate, nominal exchange rate[1]	Cointegration Analysis Depreciation of Turkish lira reduce the demand for M1. CS is in favor of foreign currency
Arteta (2005)	92 countries	1990-2000	Dependent v.: deposit or credit dollarization Independent v.: Intermediate regime, floating exchange rate regime, control variable (interest rate, openness, depreciation etc.)	Pooled OLS regression Floating exchange rate affects both deposit dollarization and loan dollarization
Raghuram G. Rajan and Ioannis Tokatlidis 2005	91 countries	1965-2002	Dependent v.: 1990-2001 average of foreign currency deposit to total deposit Sensitivity of inflation tax to growth, square of sensitivity, inflation tax, standard deviation of inflation tax, log Gdp per capita, legal restriction on dollarization	Cross-section analysis Weak institutions have greater sensitivity of inflation to growth. Therefore, they may prefer foreign currency rather than local currency

Stephen Weymouth 2007	134 Countries	1990-2004	Dependent v.: foreign currency deposit to total deposit) Checks on Executive, political Constraints, log GDP/Capita, trade, log inflation, dollar restriction	OLS estimation, Instrumental variable regression The empirical analysis of this paper shows that dollarization provides a hedge against policy instability
Adam honig	92 countries for deposit dol. 41 countries for credit dol.	1988-2001	Dependent v.: Exchange rate regime Independent v.: Dollarization ratio(dollar credit to total credit, dollar deposit to total liabilities, dollar mismatch to total liabilities, weighted dollarization, external dollar mismatch to total liabilities), openness. Log Real GDP, growth rate real GDP, government quality, government quality squared	OLS estimation Liability dollarization contributes to fear of floating
Adam Honig 2009	66 countries	1988-2000	Dependent v.: Dollarization ratio(dollar credit to total credit, dollar deposit to total liabilities, total dollarization to total credit + liabilities, weighted dollarization) Managed floating, floating, government quality, trade/GDP, foreign currency allowed, inflation, depreciation, MVP, high past inflation	OLS, Random effects, fixed effects Exchange regime is not important determinant of dollarization and improving institutional of quality can lead to a decreasing in the level of dollarization.
Henrique S. Basso, Oscar Calvo-Gonzalez, Marius Jurgilas 2007	24 countries	2000-2006 (monthly)	Dependent v.: Loan dollarization or deposit dollarization Independent v.: Foreign currency denominated funds, the interest differentials (loans and deposits), the interest rate margins (local currency and foreign currency). openness, exchange rate regimes, and FD, MVP	MVP, interest rate differentials, raising presence of foreign banks in the local financial sector, is found to be an important factor explaining financial dollarization. Rise in access to foreign funds causes higher credit dollarization, while it reduces deposit dollarization

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Kıvılcım Metin Ozcan and Vuslat Us 2009	Turkey	6M1996-6M2006	Asset dollarization(log of foreign currency to M2Y), liability dollarization (log of foreign currency loan to total loans), offshore dollarization(log of borrowings of banks from abroad to banks' total borrowing (excluding central bank credit))	Granger causality, Johansen Cointegration,Error-Correction Model In the pre-crisis period asset dollarization has led to a rise in liability dollarization, while in the post-crisis period witnessed externally driven dollarization albeit at a decreasing rate
Kyriakos C. Neanidis and Christos S. Savva 2009	11 transition economies	2M1993:12M2006	Dependent v.: Model 1:The change in deposit dollarization(foreign currency deposit to total deposit), Model2: the change in loan dollarization(foreign currency loan to total loan) Independent v.: Model1:Exchange rate, money base, error correction term related to the size of desired dollarization, and control variables(interest rate differentials, MVP change in inflation rate, asymmetry, intervention) Model2: model1, the change in deposit dollarization, the change in banks' net foreign assets, high dollarization dummy, international financial integration	OLS, Fixed effects, random effects, FGLS, 2SLS Deposit dollarization is affected by exchange rate, money base and error correction. Mvp does not affect short-run deposit dollarization. Loan dollarization is not driven depreciation and monetary base, while it is driven by banks matching of domestic loan and deposits and currency matching of asset and liability.
Mercedes García-Escribano 2010	Peru	2001-2009 (monthly)	Dependent v.: Model 1: total credit and deposit dollarization, exogenous v.(Inflation, dummy variable for depreciation and appreciation, nominal exchange rate, first difference of EMBI Peru), Prudential variables (difference reserve requirement share , dummy variable for 2006),soles capital market variables (bonds in soles (percentage of the stock of private sector bonds denominated in local currency), other dummy variables) Dependent v.: Model 2: commercial credit dollarization, consumer credit dol, mortgages dol., demand deposit dol., saving deposit dol., time deposit dol., prudential variables, soles capital market variables.	Granger causality test, VAR model Credit and deposit dollarization can be greater exchange rate variability, maintaining macroeconomic stability and institutional credibility thanks to stringent prudential regulations, lending and funding in foreign currency discourage

| Kyriakos C. Neanidis, Christos S. Savva 2013 | 10 EU member | The data span changes for each country. At least 15 years (monthly data) | Endogenous v.: Deposit and loan dollarization, inflation rate, depreciation rate, MVP dollar share, interest rate differential, net foreign assets

Exogenous v.: financial development, international financial integration, openness, intervention, corruption, growth, etc. | Time series, dynamic FAVAR model, impulse response functions

An exogenous shock to inflation, depreciation and MVP contributes positively to deposit dollarization, while an interest rate differential shock contributes negatively to deposit dollarization.
Institutional improvements lead to lower financial dollarization |

5.4 Consequences of Dollarization

Theoretical studies have focused on the effects of exchange rate movements on dollarization. Recently, however, review of some literature have come to a conclusion that dollarization affects exchange rate stability in terms of exchange rate movements. Akçay et al. (1997), a related single country evidence that for Turkey over the period 1987(1)-1996(3), concluded that the higher the level of dollarization causes the higher volatility of the exchange rate. Similarly, applying Granger causality test for Nigeria for the period 1986(1)-2003(4), Yinusa (2008) found that there is bi-directional relationship between exchange rate movements and dollarization. However, causality from dollarization to exchange rate movements appears stronger. Another time series analysis for Cambodia over the period 1998(6)-2008(1) is applied by Lay et al. (2012). The authors find that dollarization leads to exchange rate instability.

Edwards (2001), applying Random Effects and FGLS for 11 dollarized economies and emerging and advanced countries over the period 1970-1998, investigate the link between dollarization and economic performance. He claims that dollarized economies have lower GDP growth than non-dollarized countries but the rate of inflation under dollarized economies is lower than non-dollarized economies. There is no difference in the fiscal record for two groups.

Levy-Yeyati (2006) contributes to explain the impact of dollarization on inflation, financial fragility, and economic performance. The authors found evidence that countries with high dollarization ratio tend to display higher inflation rates, higher propensity to suffer banking crises and slower and more volatile of economic growth, without important gains in terms of domestic financial depth.

Carranza et al. (2011) analyze the relationship between investment and large exchange rate depreciations in dollarized economies applying two-stage least square (2SLS) dynamic unbalanced panel method for 73 countries over the period 1970-2007. The analysis indicates that large depreciation has a negative effect on investment. According to the authors, this negative effect is related to openness and to liability dollarization or currency mismatch.

Kutan et al. (2012) investigated the profitability of 36 dollarized banking systems with a data set covering the period 1996-2002. They claim that deposit dollarization negatively and consistently affects bank performance and bank profitability. The impacts of institutional quality (Government Efficiency, Political Stability, Regulatory Quality, Rule of Law, Voice, and Corruption) may be more important. Therefore, policy makers may be interested in the negative impacts of dollarization on bank profits by improving their institutions' quality.

Table 11 The Selected Empirical Literature on The Consequences of Dollarization

Authors	Countries	Period	Variables	Methods and results
Guillermo Ortiz 1983	Mexico	1Q1960-4Q1979	Dependent v.: Real monetary aggregate1: local currency + local demand deposit; Real monetary aggregate2: local currency + local demand deposits + dollar demand deposits Independent v.: Current real income, interest rate payable, the three-month Eurodollar deposit rate, expected rate of inflation; dummies included to correct for seasonal variations	Currency substitution has posed problem for monetary policy. The negative effects on economic activity can be minimized with appropriate exchange rate insurance mechanisms on the credit side.
0. Cevdet Akçay, C. Emre Alper and Meral Karasulu 1997	Turkey	1M1987-3M1996	Dependent v.: Exchange rate depreciation Independent v.: Dollarization ratio (foreign Exchange deposit to domestic money)	EGARCH-M Higher level of dollarization lead to the volatility of the exchange rate
Sebastian Edwards 2001	11 dollarized countries (one group) Emerging and advanced countries (second group)	1970-1998	Dependent v.: Gdp per capita Independent v.: Inflation, fiscal deficit, current account, investment, trade, dollarized dummy(not reported in the regression)	Random effects, FGLS Dollarized economies have lower GDP growth rate than non-dollarized countries but inflation rate under dollarized economies is lower.
Reinhart et al., 2003	89 countries	1996-2001	Dependent v.: Inflation Lagged inflation, RER, Exchange rate change, interactive coefficients high, moderate and low dollarization, openness, time trend	Pooled estimation Dollarization cause large currency mismatches

Eduardo Levy-Yeyati 2006	The number of observation change diffrent replication (from 2987 to 1076)	-	Dependent v.: Log difference consumer price Independent v.: Log dif. broad money, log dif. real GDP, the change in nominal interest rate, regional dummies, year dummies, openness, government consumption, exchange rate regime, deposit dollarization ratio, deposit dollarization interaction with money growth	Fixed effects estimation, OLS estimation
Eduardo Levy-Yeyati 2006	124 countries	-	Dependent v.: Difference average growth Independent v.: Average dollarization ratio, initial per capita GDP, secondary school enrollment (initial human capital), average investment to GDP, population growth, regional dummies	OLS, cross-section analysis. Dollarization may lead to slower and more volatility growth rate, without any visible gain in terms of FD and dollarization is associated with volatility, even after controlling for terms of trade and the volatility of nominal exchange rates.
Myriam Quispe-Agnoli and Elena Whisler 2006	Ecuador and Salvador	1995-2004	Dependent v.: Profitability, loan quality, and loan growth Independent v.: Dollarization dummy variable, economic growth rate, inflation rate, interest rate, GDP per capita, openness, private sector credit to GDP, bank deposit to GDP, bank assets' share in the banking system, loan to asset, equity to asset, deposit to loans plus deposits, country and year dummy	Even though adoption of full dollarization lead to eliminate of the government's ability to generate seigniorage, results show that de jure dollarization has played an important role in improving bank liquidity and asset quality
Luis Carranza, Jose E. Galdon-Sanchez and Javier Gomez-Biscarri 2009	124 countries	1Q1996-4Q2004	Dependent v.: Inflation Independent v.: lagged nominal depreciation, the degree of dollarization, dummy variable for nominal depreciation level, control variables (openness, real GDP growth, investment growth, exchange rate regime dummies), instrument variables(3 lags of the depreciation rate, dollarization and control variables)	2SLS estimation Higher dollarization exhibit higher inflation pass-through. Results show that large depreciations tend to generate a negative effect on the pass-through coefficient due to the higher dollarization ratio

Sok Heng Lay, Makoto Kakinaka and Koji Kotani 2010	Cambodia	6M1998-1M2008	Dependent v.: Log difference of nominal exchange rate Independent v.: Autoregressive terms of nominal exchange rate and difference of dollarization index(foreign currency deposit to M2), real interest rate differential, foreign exchange reserve to M2	Granger Causality test, GARCH, EGARCH Dollarization causes exchange rate instability so dollarization could not be suitable for Cambodia due to the depreciation of local currency. The best policy for Cambodia is de-dollarization
Luis Carranza, Jose E. Galdon-Sanchez and Javier Gomez-Biscarri 2011	73 countries (1600 observation)	1970-2007	Dependent v.: Real aggregate investment Independent v.: The growth rate in real exchange rate(depreciation), dummy for real Exchange rate level, control variables (openness, dollarization, interacted dollarization and Exchange rate dummy, dummies for exchange rate regime), instrument variable (3 lags of the depreciation and all control variables)	2SLS-dynamic panel estimation Large depreciation has a negative effect on investment and this negative effect is related to openness and to liability dollarization or currency mismatch.
Ali M. Kutan, Emre Ozsoz, Erick W. Rengifo 2012	36 countries	1996-2006	Dependent v.: banks' earnings-before-taxes to their total assets Independent v.: deposit dollarization, inflation economic growth, institutional quality, loan loss provisions/loans, equity/total assets etc.	OLS, GMM Dollarization depresses bank performance and lowers bank profitability

5.5   The Effects of Dollarization on Financial Fragility

Some studies Domaç et al. (2003), Reinhart et al. (2003), Arteta (2003), De-Nicolo et al. (2005), Levy-Yeyati (2006), Honig (2006), Mvase and Kumah (2015) try to examine the relationship between dollarization and financial fragility and to investigate whether dollarization contributes to balance sheet problems owing to volatility of exchange rate. Arteta (2003) finds that deposit dollarization leads to less contractionary banking crises, while credit dollarization may deepen crises.

Domaç et al. (2003) try to investigate the relationship between banking crises and exchange rate regimes. They use logit analysis to estimate the probability of a banking crisis, and OLS estimation to analyze the linkage among them for 95 developed and developing countries covering the period 1980-1997, report that adopting a fixed exchange rate reduces the probability of a banking crisis. Nevertheless, when the crisis occurs, the cost related to it appears to be larger in economies with fixed exchange rate. They also show that high liability dollarization, lack of credibility and high pass-through from the exchange rate swings to inflation are a positively correlated banking crisis. Arteta (2003), using panels of 92 countries for deposit dollarization and 40 countries for credit dollarization between the early 1990s and 2000, provided substantial contributions to the dollarization and financial fragility literature by indicating that deposit dollarization induces less contractionary banking crises, while credit dollarization may deepen crises. Nicolo et al. (2005) claim that highly dollarized economies could be more exposed to recurrent financial instability (solvency and liquidity risks). The fundamental risks result from currency mismatches affecting banks' balance sheet in the event of large depreciation. Another empirical analysis is conducted by Levy-Yeyati (2006). He stated that dollarization leads to financial fragility through the balance sheet channel and offshore dollarization played a role in recent financial crises and helps explain the deleterious effects of exchange rate adjustments.

In contrary, Honig (2006), using probit model with data for the entire 1988-2000 period in 85 countries, find that there is a weak link between dollarization and possibility of banking crisis in the domestic banking system. Finally, Mwase and Kumah (2015), employing System GMM estimator and fixed effects estimator with data from 2006-2009 in 45 low-income countries, find that real dollarization is related to the crisis, and the role of initial macroeconomic conditions, quality of institutions.

Table 12 The Link Between Partial Dollarization and Crisis

Authors	Countries	Period	Variables	Methods and results
Domaç et al. 2003	88 countries	1980-1997	Dependent v.: Crisis Independent v.: Foreign liabilities to foreign assets, cash held by banks to bank assets, private credit to GDP, M2 to reserves, the real growth of GDP, real GDP per capita, the rate of inflation real interest rate, net capital flows to income, capital outflows to GDP, capital inflows to GDP, exchange rate regime dummy, trade	logit analysis (for probability of a banking crisis) , OLS estimation High liability dollarization can cause crises
Reinhart et al., 2003	89 countries	1996-2001	Dependent v.: Inflation Lagged inflation, RER, Exchange rate change, interactive coefficients(high, moderate and low dollarization, openness, time trend	Pooled estimation Dollarization cause large currency mismatches
Carlos Arteta 2003	92 countries for deposit dol. 40 countries for credit dol.	the early 1990s to 1999 and 2000	Dependent v.: Crisis Independent v.: Deposit and credit dollarization, foreign currency allowed, FC loans allowed, FDI relative to GDP, short-term debt to total debt, international reserves, the current account balance to GDP, RER overvaluation, investment growth, debt service to GDP, domestic credit growth, the rate of GDP growth, quasi-money to reserves, the US interest rate	OLS estimation Deposit dollarization leads to less contractionary banking crises, while credit dollarization may deepen crises
Nicolo et al. 2005	100 countries	1995-2000 for Z index 2001	Denepdent v.: 1-) Z index, Nonperforming loans to total loans Independent v.: average dollarization, volatility of inflation, volatility of RER, correlation (inflation, rer), Instruments (restriction, institutional quality indicator)	1-) OLS (-), 2SLS(-) 2-) OLS(+) 2SLS(+)

Eduardo Levy-Yeyati 2006	sample size change from 535 observations to 1429	-	Dependent v.: Crisis The change in the nominal Exchange rate, deposit dollarization dummy, inflation rate, changes in the terms of trade, real interest rate, the real GDP growth rate, and M2 to reserves, private credit to GDP, liquid (cash) to total assets, and capital flows to GDP, foreign liabilities to foreign assets, interaction between foreign liabilities	OLS estimation Financial dollarization lead to financial fragility through the balance sheet channel.
Adam Honig 2006	85 countries	1988-2000	Dependent v.: Crisis Independent v.: Dollar deposit to total deposit, dollar deposit to total liabilities, weighted bank dollarization, external mismatch, Exchange regime, reserves to M1, external debt to GNP, domestic credit to GDP, real interest rate, capital flows to GDP, cash to bank assets, northern interest rate, current account to GDP, government surplus to GDP, inflation, growth domestic credit, growth real GDP per capita	There is weak link between dollarization and probability of banking crisis in the domestic banking system.
Mvase and Kumah 2015	45 Countries	2006-2009	Dependent v.: Real deposit dollarization index Expected real return, Exchange rate, uncertainty, set of controls(including exchange regime, prudential requirements, crisis dummy, quality of institutions)	System GMM estimator Fixed effects estimator (+)

5.6   Critical Review on Financial Development and Dollarization

De-Nicolo et al. (2005) explain that ''*no study has so far attempted to assess directly the impacts of dollarization on financial deepening*'' (De-Nicolo et al, 2005: 1704). Therefore, they were first to investigate the empirical effects of dollarization on financial development.

The authors, using a sample of 100 industrialized and emerging economies over the 1990-2001 period, investigated the impacts of dollarization which is measured as the ratio of foreign currency deposit to total deposit on the financial development M2 to GDP. Other explanatory variables used are an interaction term between dollarization and inflation, the logarithm of inflation, per capita GDP. They concluded that more dollarization is associated with deeper financial systems for only countries with high inflation.

When an interaction term between inflation and dollarization is added to the regression, dollarization has a positive effect on financial development since it leads to decrease in the adverse effects of inflation on financial development. They show that dollarization stimulates financial development when the rate of inflation is above the threshold (almost 20 up to 30 percent).

In order to find these results, OLS estimator and instrumental variable method were used. According to De-Nicolo et al., an empirical analysis of the impacts of dollarization on the development of financial sector requires attention to endogeneity problems because most of the factors influential for financial development are also among the determinants of deposit dollarization. The coexistence of financial development and dollarization could be reflections of the same regulatory, macroeconomic or institutional factors rather than having a causal relationship (De-Nicolo et al, 2005: 1705). In order to solve this problem, they used two-stage least squares (2SLS) regression analysis including instruments like minimum variance portfolio (MVP), institutional quality (political stability, regulatory quality, voice, corruption etc.) and other instruments like the logarithm of inflation, the logarithm of GDP per capita and restriction on the holdings of foreign currency deposits.

Similarly, Court et al. (2012) try to analyze the link between dollarization and financial development. The authors further extend the study by De Nicolo (2005) using different econometric models Ordinary Least Square (OLS) and 2SLS, different equations;

First equation includes financial development indicators (domestic credit to nominal GDP) as dependent variable, the ratio of dollarization (foreign currency deposit to broad money), creditor right index, real per capita GDP, private credit bureau dummy variables, inflation dummy variable and interaction term between inflation dummy and dollarization as explanatory variables.

Second equation is a benchmark model the one proposed and developed by De Nicolo et al. (2005) including financial development indicator (domestic credit to nominal GDP) as a dependent variable, the ratio of dollarization (foreign currency deposit to M2Y), the logarithm of the inflation, real per capita GDP and interaction term between inflation and dollarization as explanatory variables, creditor rights index, private bureau availability dummy variable, minimum variance portfolio coefficient (MVP), restrictions on the holdings of foreign currency deposits as instrumental variables.

Empirical estimation covers the period 1990-2002 and 56 developing countries with the degree of dollarization and different levels of inflation. However, a full data set only covers the period 1996-2002 and 44 developing countries when they use foreign currency deposit to M2Y as their dollarization measure.

The authors' results indicate that dollarization has a consistent and significant negative effect on financial development for countries with moderate inflation. Interaction term is found to have a significant and positive coefficient so deposit dollarization may have a positive effect on financial development by reducing the negative effects of inflation.

Asel (2010) studies different concepts of financial dollarization in the framework of simple statistical correlation owing to a short time span in three economics of Central Asia (Kazakhstan, the Kyrgyz Republic and Tajikistan), where dollarization of bank deposits and loans has remained high over the years. The following explanations of dollarization are suggested: The currency substitution view can be captured by the past values of inflation; MVP view; the financial development explanation is captured by interest rate spreads where relative interest rates on deposits and loans in foreign and domestic currency are used; the institutional view that may be captured by the initial GDP per capita, a variable that measures the degree of legal restrictions on dollarization, and several other institutional variables that can influence dollarization and lastly, the drivers

of loan dollarization can be the growing international trade, interest rate spreads and deposit dollarization ratio.

The author, using the same methodology, investigates whether there is a relationship between dollarization and financial system development and stability. He finds a negative correlation between financial development and dollarization: the higher the deposit dollarization the lower monetization of a given economy. The author says that 'Central Asian economies have thin financial markets where the only way to make savings is to keep banking deposits denominated in foreign currencies. Indeed, in Tajikistan, monetization of the economy was only 16.5 per cent in 2005 while 75 per cent of deposits in 2006 were denominated in foreign currency (Asel, 2010: 28).

Figure 15 represents relationship between deposit dollarization and financial development measured by the ratio of broad money to GDP. As it can be seen from the table, there is a negative relationship between dollarization and financial deepening. Countries with developed financial have a lower dollarization ratio, while economies with weak financial system have a higher degree of dollarization.
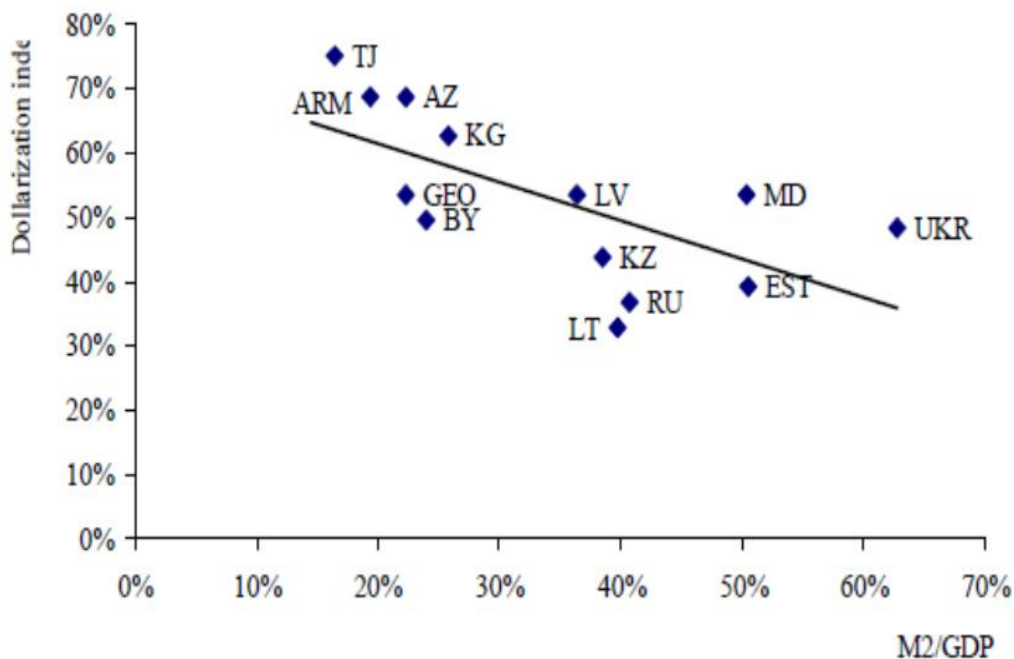
Figure 15 Financial development and deposit dollarization

Source: IMF World Economic Outlook, central banks, CEIC, Asel 2010: 28

Marcelin and Mathur (2016) theoretically try to survey significant features of financial dollarization and its implications for the macro economy and the process of financial development. According to the authors, dollarization decelerates the process of financial development. Such a hindrance may be disruptive to financing to investment and growth.

6. THE ECONOMETRIC ANALYSIS OF DOLLARIZATION ON FINANCIAL DEVELOPMENT

6.1 Methodology

Since it is not enough to work only with time series or cross-sectional for some researchers, the econometrics of data panel has been an increasingly popular form of longitudinal data analysis in recent years. Panel data or longitudinal data consists of repeated observations belonging to countries, firms, household or individuals on the same unit observed for multiple time periods. A dataset which consists of number N of countries, individuals or firms, and several time period T which may vary years, quarters, months, weeks etc. a total of N x T observations is refer red to as a panel data set.

Several major advantages of using panel data over conventional cross-sectional or time series data sets relating to this study as listed by (Baltagi, 2014) are:

• Panel data shows that countries are heterogeneous. Panel data estimation techniques allows controlling unobserved individual heterogeneity for variables

• The use of panel data enables to obtain more reliable parameter in estimation. Because the number of observations increases due to the fact that both time series and cross-sectional data are included.

• Panels give less the problems of multicollinearity among the variables as compared to cross-sectional and time series data.

• Panel data provides the higher degrees of freedom allowing for more consistent predictions with more informative data

• Unlike cross-sections, panel data are better able to study the dynamics of adjustment like spells of unemployment, job turnover or income mobility.

Although the panel data regression models have some advantages, it poses several estimation challenges. Some of the major disadvantages of panel data over conventional cross-section or time series are the difficulty of data collection for countries or firms

which are observed for different time periods. Panel data analysis contains both cross-section data and time series, problems that cross-section (e.g. heteroscedasticity problem) and time dimension (e.g., autocorrelation problem) need to solve. Another disadvantage is cross-section dependence. If panel data analysis does not address cross-country dependence, results may lead to misleading inference.

Panel data models may be classified into two categories namely, balanced panels, and unbalanced panels. If the panel has the different number of time observations for every variable and every individual it is usually called an unbalanced panel. Generally, researchers work with unbalanced panel because of unavailability data for the different cross-section. However, it is known as the balanced panel where we have the same number of time observations for every of the individual (Asteriou and Hall, 2007: 344). In our work, there will be no missing observation data. Thus, the data will have "balanced panel" property.

The basic single equation model in panel data regression express as:

$$Y_{it} = \alpha_i + \beta\, X_{it} + u_{it} \tag{23}$$

In this formula, while the subscript t represents time dimension (t =1,…., T), the subscript i shows individual dimension which are cross-sectional units (i = 1,…., N). Y_{it} is the dependent variable, X_{it} is explanatory variable (independent variable), α_i is intercept, β is the slope coefficients u_{it} is the vector of standard error terms.

In general, the ordinary least squares (OLS), the fixed-effects model (FEM), or the random-effects model (REM) can be used for simple linear panel data regression. REM is an appropriate specification when N individuals are taken randomly from the whole of a large sample while FEM is an appropriate model if it is taken from the whole of a specific sample such as all of OECD countries (Baltagi, 2014: 20).

In OLS model, all observations are pooled without any dummy variables reflecting the specific effects of each country, and classical OLS regression equation mentioned below shows the effects of independent variables over the dependent variable (Uslu, 2013: 52).

$$Y_{it} = \alpha_{it} + \beta_i X_{it} + e_{it} \tag{24}$$

Y_{it}: dependent variable

α : constant term

β : slope coefficient

X_{it} : set of explanatory variables

e_{it} : independent and normally distributed error term for i_{th} variable for time

FEM allows for different constants for each group but does not allow different slope coefficients. It is also called the least-squares dummy variables (LSDV) estimator due to allowing for different constant for each group, it includes a dummy variable for each group. Below is the general model for these three kinds of fixed effects and the differences in the constant term of the model according to cross section/time as expressed in terms of dummy variables to be included in the model, namely, FEM with cross section specific dummy (one way fixed-effects model) (1); FEM with time dummy (2); two-way fixed effects model - least square dummy variable (3)

General model:

$$Y_{it} = \alpha_i + \beta_1 X_{1it} + \ldots + \beta_k X_{kit} + u_{it} \qquad \textbf{(25)}$$

$$Y_{it} = \alpha_1 + \alpha_{2d1} + \alpha_{3d2} + \ldots + \alpha_N d_N + \beta_2 X_{2it} + \beta_3 X_{3it} + \ldots + \beta_k X_{kit} + e_{it} \qquad \textbf{(26)}$$

$$Y_{it} = \delta_1 + \delta_2 Year_2 + \delta_3 Year_3 + \ldots + \delta_t Year_t + \beta_2 X_{2it} + \beta_3 X_{3it} + \ldots + \beta_k X_{kit} + e_{it} \qquad \textbf{(27)}$$

$$Y_{it} = \alpha_1 + \alpha_{2}d_1 + \alpha_{3}d_2 + \ldots + \alpha_N d_N + \delta_1 + \delta_2 Year_2 + \delta_3 Year_3 + \ldots + \delta_t Year_t + \beta_2 X_{2it} + \beta3 X_{3it} + \ldots + \beta k X_{kit} + e_{it} \qquad \textbf{(28)}$$

An alternative method of estimating a model is the random-effects model. It is supposed the individual-specific effects (intercept) like u_{it}, as random variables (Hsiao, 2014: 39). In REM, thus, the variability of the constant for each section comes from the fact that:

$$a_i = \alpha_i + v_i; \qquad \textbf{(29)}$$

where v_i; is a zero mean standard random variable [9]

The random effects model therefore takes the following form:

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[9] Asteriou and Hall, 2007: 348

$$Y_{it} = (\alpha_{it} + v_i) + \beta_{1it}X_{1it} + \beta_{2it}X_{2it} + \ldots + \beta k_{it}X_{kit} + \mu_i \qquad \textbf{(30)}$$

$$Y_{it} = \alpha_{it} + \beta_{1it}X_{1it} + \beta_{2it}X_{2it} + \ldots + \beta k_{it}Xk_{it} + (v_{it} + \mu_i) \qquad \textbf{(31)}$$

Equation 31 is called one-way random effects model when it takes into account only the differences with respect to cross sections (Uslu, 2013: 55).

$$Y_{it} = \alpha_{it} + \beta_{1it}X_{1it} + \beta_{2it}X_{2it} + \ldots + \beta k_{it}X_{kit} + (v_{it} + \lambda_t + \mu_i) \qquad \textbf{(32)}$$

Equation 32 is called two-way REM. the μ_i representing the cross section effect, λ_t, used for the estimation of differences within time is included an error component term in the model. v_{it} and λ_t are unobserved. Here v_{it} is not correlated with μ_i and λ_t, but total error term may be correlated with independent variables (Uslu, 2013: 55). The random effects model can be estimated by GLS. The GLS estimator is obtained by applying the least-squares method to the transformed model (Hsiao, 2014: 44).

6.2   Data and Sources

This study followed a similar methodology used by Court et al. (2012). A panel data estimation method is used to test the effects of partial dollarization, the strength of legal rights, depth of credit information index, institutional factors and macroeconomic conditions like inflation on financial development.

Period is determined by the availability of consistent data. For all countries, consistent data on the depth of credit information index and strength legal right index begin in 2004. The endpoint of the dataset is determined to be 2012 because data on dollarization for all countries ends in 2012. Therefore, the period of coverage in the empirical estimation will be annual data from 2004 to 2012. Data will be available for 60 economies[10].

Data used for dollarization is obtained from country reports of the IMF, Moody's Statistical Handbook, Central Bank Bulletins. The data for depth of credit information index, strength legal right index are obtained from World Bank's Doing Business Report. Governance indicators data (Government efficiency, Regulatory Quality, Voice, Political Stability, Rule of Law and Corruption) are retrieved from World Bank's Worldwide

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[10] A list of developing economies that used in the empirical analyses has been given in Appendix A .

Governance Indicators. The data on inflation rate and real per capita GDP are obtained from the World Bank's World Development Indicators (WDI).

6.3 Empirical Model

The development of the financial sector could be explained by a set of institutional and regulatory variables. An empirical form of this model will be estimated as follows[11]:

$$\text{FD}_{jt} = \beta_0 + \beta_1 \text{DDOLL}_{jt} + \beta_2 INSQ_{jt} + \beta_3 \text{GDPPC}_{jt} + \beta_4 D_{jt} + \beta_5 \text{CII}_{jt} + \beta_6 \text{SLR}_{jt} + \beta_7$$

$$\text{DDOLL}_{jt}\text{*}D_{jt} + u_{jt} \tag{33}$$

$$u_{jt} = \mu_j + \lambda_t + \nu_{jt} \tag{34}$$

where j denotes the each emerging market economies (j=1, 2, 3,4,…, 60) and t is the time period (t=2004-2012). In the equation, μ_t is the unobservable individual effects, λ_t is unobservable time effects and ν_{jt} denotes the error term. The variables used in the equation are as follows:

FD_{jt} represents dependent variable based on financial development bank. Even if financial services are provided by banks and stock markets, we have to exclude stock market indicators, like market capitalization ratio because of the unavailability data for some emerging economies. Therefore, it is utilized the private sector credit defined as bank credit to private sector as a share of nominal income. According to most of the authors (see King and Levine 1993; Gregorio, Guidotti 1995; Arcand et al. 2015), this indicator is suitable for measuring financial development because it enables the utilization of funds and their allocation to more efficient and productive investments. For this reason, this measure is selected as a financial indicator.

$DDOLL_{jt}$ is the ratio of foreign currency deposits in the banking system to total deposit in country j in year t. The authors who study dollarization consider deposit dollarization as an important measure while accepting its shortcoming because of the fact that it fails to include foreign currency cash and offshore deposit. In general, they use this measure

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[11] The panel regressions in this study are estimated using Stata 14 program. Gauss 10, Stata 14, and EViews 9 are used for other tests.

because foreign currency deposit to total deposit is more accessible than other measures of dollarization and there is no reliable data to measure foreign currency in circulation. Levy Yeyati (2006) assumes that this ratio could be used as a sensible proxy for domestic loan dollarization because they are similar owing to prudential regulations on exchange rate positions in the financial system. Economies with developed financial systems have a lower degree of dollarization, on the contrary, economies with smaller banking systems tend to have a higher degree dollarization. Thus, dollarization is expected to be inversely related to financial development.

$INSQ_{jt}$ is an equally-weighted average of the six institutional indicators (government efficiency, regulatory quality, voice, political stability, rule of law and corruption). This index is measured in units ranging from -2.5 to 2.5, with lower values corresponding to worse governance outcomes. A high-quality institutional environment reflects credibility of economic policies and effectiveness of policy making institutions. Low credibility leads to lower confidence toward local financial systems and local currencies (Asel, 2010: 21). Institutional improvement can promote the development of the financial sector, thereby, in our empirical analysis, it is expected that the impacts of the institutional quality index on financial development to be positive.

$GDPPC_{jt}$ is the logarithm of real per capita income. As discussed in the earlier chapter, according to demand following view, economic growth leads to financial development. An economic growth increase, the demand for financial services increases and thus more financial institutions, financial instruments and services appear in the financial system. Therefore, it is expected the coefficient of per capita GDP indicators as an economic growth indicator to be positive.

D_{jt} is a dummy variable which is equal to one if the rate of inflation in country i in year t exceeds 20 percent, otherwise 0. The authors who study the effects of inflation on financial development find that if the rate of inflation is above the threshold, a further increase in inflation rate has significant negative effect on the level of financial activity. The work of De Nicolo et al. (2005) and Court et al (2012) indicate that the threshold level of yearly inflation beyond which it has an adverse effect on financial development. It is expected that the coefficient of inflation dummy indicator to be negative because inflation causes lower long-term real rates of return on assets, thus, yield more severe rationing of credit, reductions in financial sector development.

CII_{jt} is depth of credit information index that reflects the scope, accessibility, and quality of credit information through public or private credit registries in the country. It takes on a value between 0 and 6, with lower values demonstrating the accessibility of less credit information to facilitate lending decisions. ''*When lenders know more about borrowers, their credit history, or other lenders to the firm, they are not as concerned about the lemons problem of financing nonviable projects and therefore extend more credit*'' (Djankov et al, 2007: 300). Therefore, credit information index is associated with higher ratios of private credit to GDP[12]. This study expects the coefficient on this index to be positive.

SLR_{jt} is the strength of legal rights index which aggregates the scores and varies on a value between zero (poor strength of legal rights) and ten (strong strength of legal rights). This index measures the extent to which the rights of lenders and borrowers are protected by bankruptcy and collateral laws. The protection of legal rights guarantees an environment in which creditors and debtors want to pursue financial contracts. Legal rights protection stimulates both lenders and borrowers to enter into financial contracts and to abide by their clauses and thus stronger legal rights can contribute to credit market development (Galindo and Micco, 2004: 30)[13]. It is expected that this index has a positive impact on financial development.

$DDOLL_{jt}*D_{jt}$ is an interaction dummy variable in our model. It indicates the effects of dollarization on financial development in economies with inflation (over twenty percent). We expect the coefficient on this variable to be positive.

6.4 Descriptive Statistics by Group Panels

The descriptive statistics is given before estimation of regression with panel data analysis. Table 13 shows the result of descriptive statistics of both dependent and independent variables namely mean, median, maximum, minimum, standard deviation, observations. Based on Table 13, the mean of deposit dollarization ratio in each year is 0.36. The minimum observed level for this variable in the sample is zero and the maximum

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[12] See, Djankov et al., 2007; Dehasa, 2007; Zoli, 2007
[13] See, Galindo and Micco, 2004; Djankov et al., 2007; Zoli, 2007; Dehasa, 2007; Court et al, 2012

observed level is 0.98. While maximum value belongs to Cambodia (2007), minimum value belongs to Colombia (2004-2012). For financial development indicator, the average for each year is 0.355350. The sample contains countries with credit to GDP coefficients ranging from 0.032750 to 1.064440. Chile has the highest institutional quality while Guinea has the lowest one in our sample between 2004 and 2012.

Table 13 Descriptive Statistics

	Mean	Median	Maximum	Minimum	Std. Dev	Observ.
FD	0.36	0.31	1.06	0.03	0.21	540
INSQ	-0.31	-0.37	1.24	-1.62	0.56	540
SLR	5.08	5	10	0	2.23	540
GDPPC	5,930.63	3,490.04	60,917.87	388.56	8208.07	540
CII	3.49	4	6	0	2.07	540
DDOLL	0.35	0.35	0.98	0	0.22	540
INF	8.06	6.77	59.22	-1.07	6.59	540

6.5   Empirical Results

Panel unit root tests are classified in two generations including first and second generation panel unit root test. The reason for this classification is to know whether unit root tests allow for potential correlation across residuals of panel units. Therefore, the first issue has to be addressed to control for cross-sectional dependence across the member of the panel. The first generation panel unit root test is not based mainly on the cross-sectional dependence assumption. However, under cross-sectional dependence, a shock in a country is likely to affect all individual units differently. The second issue is to consider whether the data can be pooled across countries and whether panel estimates account for country-specific heterogeneity (Menyah et al., 2014: 389). These issues are important steps in selecting the appropriate unit root testing method.

6.5.1 Homogeneity Test

First generation unit root test can be divided into two groups. Some of them only allow for heterogeneity. For example, Levin, Lin Chu test restrict to be homogenous across all units of the panel while the Im, Pesaran and Shin test allow heterogeneity on the coefficient of the lag dependent variable (Asteriou and Hall, 2007).

With respect to testing for slope homogeneity, Pesaran and Yamagata (2008) proposed the so-called delta ($\tilde{\Delta}$) test for testing slope homogeneity. If N is large and T is small ($N > T$), this test is applicable. Hypotheses of test:

$$H_0: \beta_i = \beta \text{ for all i (slopes are homogeneity)}$$

$$H_1: \beta_i \neq \beta_j \text{ (slopes are not homogeneity)}$$

Statistic as follows:

$$\tilde{\Delta} = \sqrt{N}\left(\frac{N^{-1}\tilde{S} - k}{\sqrt{2k}}\right) \tag{35}$$

The small sample properties of the $\tilde{\Delta}$ test can be improved under normally distributed errors by using the following bias adjusted version:

$$\tilde{\Delta}\,adj = \sqrt{N}\left(\frac{N^{-1}\tilde{S} - E(\widetilde{Z_{it}})}{\sqrt{Var(\tilde{Z}_{it})}}\right) \tag{36}$$

Test statistics which can be obtained, shows asymptotic standard normal distribution. When test results obtained probability value less than 0.05, null hypothesis is rejected at a significance level of 5% and conclusion is that slope coefficients are not homogeneity.

Table 14 Slope Homogeneity Tests in Pesaran and Yamagata (2008)

	Stat	**Prob.**
Delta tilde	7.771[***]	0.000
Delta tilde adj.	10.989[***]	0.000

*** Denotes statistical significance at 1%.

Table 14 indicates that the null hypothesis of slope homogeneity is rejected. Therefore, we conclude that there is heterogeneity across the countries under this study.

6.5.2 Cross-section Dependence Test

In order to test the existence of unit root test in panel data analysis, we test whether or not there is cross-sectional dependence. If there is no cross-section dependence, Levin, Lin and Chu, Maddala and Wu, Im, Pesaran and Shin, Breitung, Hadri, and Choi panel unit root tests classified as first generation panel unit root tests can be performed.

To test for cross-sectional dependency, one of tests is the Lagrange multiplier (LM) test developed by Breusch and Pagan (1980). If dimension of time is large than cross-section dimension ($T > N$), LM test can be applicable. If N and T are large ($T = N$), CD_{lm1} developed by Peseran (2004) is valid. However, when N is large and T is small, CD_{lm1} test is subject to substantial size distortions (Menyah, 2014: 390). To solve this problem, Pesaran (2004) developed CD_{lm2} test, which is a more general cross-sectional dependency test. If dimension of time is less than cross-section dimension ($T < N$), CD_{lm2} test can be applicable. For this reason, Pesaran (2004) CD_{lm2} test has been used in this study since there are 60 countries (N = 60), and 9 years (T = 9) in our panel data

Hypotheses of test:

H_0: There is no cross-section dependency.

H_1: There is cross-section dependency

The results of cross-section dependency tests reported in Table 15 demonstrate that null hypothesis is rejected at one percent significance level. There is cross-section dependency; hence, a shock because in a country can affect other countries through globalization. Because of the presence of cross-section dependence, second-generation unit root test should be used.

Table 15 The results for Cross-section Dependence Tests

CDlm	LM (Bresusch,Pagan)		CD$_{lm2}$ Pesaran		CD$_{lm1}$ Pesaran	
	Stat	**prob**	**stat**	**prob**	**Stat**	**prob**
FD	4396.783***	0.000	44.149***	0.000	1.076	0.141
DDOLL	5136.542***	0.000	58.558***	0.000	-1.337*	0.091
INSQ	4719.940***	0.000	49.581***	0.000	-0.222	0.412
GDPP	6464.546***	0.000	78.903***	0.000	0.161	0.436

***, * Denotes statistical significance at 1%, 10%, respectively.

6.5.3 Second Generation Unit Root Test (CADF test)

Frequently used second-generation panel unit root test is the cross-sectional Augmented Dickey-Fuller (CADF) test developed by Pesaran (2007). The author suggests a simpler way of getting rid of cross-sectional dependence than estimating the factor loading. He deals with ADF regression included the cross-section averages of the first differences in the unit root test as a factor structure (Baltagi, 2014: 289). This simple CADF regression is:

$$\Delta y_{it} = a_i + p_i y_{i,t-1} + d_0 \bar{y}_{t-1} + d_1 \bar{y}_t + \varepsilon_{it} \qquad \textbf{(37)}$$

Hypotheses of test:

$$H_0 : \rho_i = 0 \text{ , for all i}$$

$$H_1 : \rho_i < 0$$

When null hypothesis cannot be rejected, the series is nonstationary. After running this CADF regression for each unit i in the panel, the test for the panel as a whole is obtained by averaging the statistics on the lagged value (called CADF); CIPS statistic:

$$CIPS = 1/N \sum_{i=1}^{N} CADF_i \qquad \textbf{(38)}$$

Table 16 Second Generation Unit Root Test : CADF Test

	Cips stat	**Pesaran Critical value**
FD	-5.58***	
DDOLL	-13.313***	-2.76 (-2.66) 1%
INSQ	-4.505***	-2.40 (-2.35) 5%
		-2.22 (-2.20) 10%
GDPP	-8.964***	

*** denote statistical significance 1%

According to the findings presented in Table 16 all variables are stationary[14]. Calculated CADF statistics are smaller than the critical value of -2.76, -2.40, -2.22, respectively the 1%, 5% , 10% from Pesaran critical value table, thus, null hypothesis is rejected. All of the series do not have unit roots and variables are stationary at level.

6.5.4   Panel Regression Analysis

6.5.4.1   Breusch Pagan and Honda Tests

In the panel data analysis, one should determine whether data are fixed or random to test the significance of individual and time effect. In our empirical analysis, data is randomly selected because of unavailability of data in some developing countries. Therefore, we assume that random effects model is an appropriate model. In order to decide whether one way or two way REM can be used Lagrange Multiplier (LM) Test developed by

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[14] We exclude CII and SLR in the CADF regression. Because these variable for almost countries take almost same value from 2004 to 2012. It is assumed that they are stationary since they take 0 value due to cross-section averages of the first differences.

Breusch Pagan (1980) is applied. This is a test based on the residuals from pooled OLS for random effect model.

Hypotheses of test for individual random effect ;

$$H_0: \sigma_\mu^2 = 0 \text{ (no individual random effect)}$$

$$H_1: \sigma_\mu^2 \neq 0$$

LM test has χ^2 distribution under the null.

$$LM_{group} = \frac{NT}{2(T-1)} \left[\frac{\sum_{i=1}^{N}\left(\sum_{t=1}^{T}\widehat{u_{it}}\right)^2}{\sum_{i=1}^{N}\sum_{t=1}^{T}\widehat{u_{it}}} - 1 \right]^2 \sim \chi^2 \qquad (39)$$

Hypotheses of test for time random effect ;

$$H_0: \sigma_\lambda^2 = 0 \text{ (no time random effect)}$$

$$H_1: \sigma_\lambda^2 \neq 0$$

LM test has χ^2 distribution under the null.

$$LM_{time} = \frac{NT}{2(T-1)} \left[\frac{\sum_{t=1}^{T}\left(\sum_{i=1}^{N}\widehat{u_{it}}\right)^2}{\sum_{i=1}^{N}\sum_{t=1}^{T}\widehat{u_{it}}} - 1 \right]^2 \sim \chi^2 \qquad (40)$$

Hypotheses of test for two-way (both individual and time) effect

$$H_0: \sigma_\mu^2 = \sigma_\lambda^2 = 0 \text{ (no time and individual random effect)}$$

$$H_1: \sigma_\lambda^2 \neq 0 \text{ and/or } \sigma_\mu^2 \neq 0$$

$$LM = LM_{group} + LM_{time} \sim \chi^2 \qquad (41)$$

One problem with Breusch Pagan test is that alternative hypothesis two way once the variance components are not negative; this means that alternative hypothesis should be one way. Honda (1985) derived modified LM statistics under the one-way alternative hypothesis:

Hypotheses of test for Honda individual random effect ;

$$H_0: \ \sigma_\mu^2 = 0 \text{ (no individual random effect)}$$

$$H_1: \ \sigma_\mu^2 > 0$$

$$\text{Honda}_{\text{group}} = \sqrt{\frac{NT}{2(T-1)}} \left[\frac{\sum_{i=1}^{N}\left(\sum_{t=1}^{T}\widehat{u_{it}}\right)^2}{\sum_{i=1}^{N}\sum_{t=1}^{T}\widehat{u_{it}}} - 1 \right] \sim N(0,1) \qquad \textbf{(42)}$$

Hypotheses of test for Honda time random effect ;

$$H_0: \ \sigma_\lambda^2 = 0 \text{ (no time random effect)}$$

$$H_1: \ \sigma_\lambda^2 > 0$$

$$\text{Honda}_{\text{time}} = \sqrt{\frac{NT}{2(T-1)}} \left[\frac{\sum_{t=1}^{T}\left(\sum_{i=1}^{N}\widehat{u_{it}}\right)^2}{\sum_{i=1}^{N}\sum_{t=1}^{T}\widehat{u_{it}}} - 1 \right] \sim N(0,1) \qquad \textbf{(43)}$$

Hypotheses of test for Honda time and individual effect ;

$$H_0: \sigma_\mu^2 = \sigma_\lambda^2 = 0 \text{ (no time and individual random effect)}$$

$$H_1: \ \sigma_\lambda^2 > 0 \text{ and/or } \sigma_\mu^2 > 0$$

$$\text{Honda} = (\text{Honda}_{\text{time}} + \text{Honda}_{\text{individual}}) / \sqrt{2} \sim N(0,1) \qquad \textbf{(44)}$$

Table 17 Breusch-Pagan and Honda Test

	Cross-section One side	Period One-side	Both
Breusch-Pagan	1440.805*** (0.0000)	0.845910 (0.3577)	1441.651*** (0.0000)
Honda	37.95793*** (0.0000)	0.919734 (0.1789)	27.49066*** (0.0000)

*** denote statistical significance 1%

The results of Honda and Breusch Pagan tests are given in the Table 17. On one hand, the LM and Honda statistics indicate that both random individual and time effects are significant. Individual random effects are significant according to The LM_{group} and $Honda_{group}$. On the other hand, The LM_{group} and $Honda_{group}$ demonstrate that time effects are not significant. According to these results, one-way cross-section for Hausman test should be used.

6.5.4.2 Hausman Test

A critical assumption of the random effects model is that unobservable effects and the explanatory variables are uncorrelated (($E(u_{it} / X_{it}) = 0$). When the disturbances contain individual invariant effects (the μ_i) which are unobserved and is correlated with the X_{it} ($E(u_{it} / X_{it}) = 0$), the REM can not be estimated consistently by Feasible Generalized Least Squares (FGLS) (Baltagi, 2014: 76). If it is specified as a linear function of X, then the GLS estimator becomes the within estimator. Thus, testing the validity of this assumption becomes important (Erlat, 2016: 23). Hausman (1978) suggests comparing FGLS and within estimators. Hausman statistics can be computed as follows:

$$H = (\hat{\beta}_{within} - \tilde{\beta}_{GLS})'[Cov(\hat{\beta}_{within}) - Cov(\tilde{\beta}_{GLS})]^{-1} (\hat{\beta}_{within} - \tilde{\beta}_{GLS}) \tag{45}$$

It will be asymptotically $\chi2_{K-1}$ under null hypothesis.

Erlat (2016) emphasizes that the outcome of the Hausman test does not lead to a choice between the FEM and REM. The model to which the test is being applied is the REM; the effects, μ_i, are random and what is being tested is whether they are correlated with the explanatory variables or not. When unobservable effects and explanatory variable are correlated, the FEM is used; but this does not mean that the effects have now become fixed. It means that the FGLS estimator is no longer consistent but the within estimator is. When the unobservable effects and explanatory variable are uncorrelated, then GLS is used. If there is a question of choice, it is not between models but between estimators for the same model, namely, the random effects model.

Random effects model has 3 well-known components variance estimators including Swamy-Arora, Wansbeek-Kapteyn and Wallace-Hussein. Traditionally, the default option of well-known software for estimating variance components of random effects model is Swamy-Arora that propose running two regression (within and between) to estimate variance components from respective mean square errors. Wallace Hussein use OLS residuals and Wansbeek-Kapteyn use within estimator residuals (Mohammadi, 2012: 88). Since our model includes dummy variables which cannot be estimated Swamy-Arora[15] and Wansbeek-Kapteyn, because they use within estimator which drops the dummy variable hence the appropriate estimator to use is Wallace-Hussein.

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[15] Swamy-Arora uses within and between estimator

Table 18 Hausman Test Results

Cross-section Random Effects Test Comparisons:				
Variable	**Fixed (b)**	**Random (B)**	**(b-B)** **Difference**	**Prob**
DDOLL	0.132470	0.019223	0.113247	0.0001
INSQ	0.025637	0.034465	-0.008828	0.6196
SLR	0.006136	0.007664	-0.001528	0.0426
GDPPC	0.463264	0.279387	0.183877	0.0023
DDOLL*D	-0.070861	-0.063801	-0.00706	0.0123
CII	0.014674	0.016622	-0.001948	0.0528
D	0.033786	0.032736	0.00105	0.7122
Test Summary	**Chi-Sq. Statistic**		**Chi-Sq. d.f.**	**Prob.**
Cross-section random	0.000000		7	1.0000

Hausman test results can be seen from table 18. The common belief is that the Hausman test cannot reject the FGLS estimator if probability is bigger than 0.05[16]. However, the Hausman statistic cannot be obtained since $[\text{Cov}(\hat{\beta}_{\text{within}}) - \text{Cov}(\tilde{\beta}_{\text{GLS}})]$ should be positive definite (within standard error (b) should be bigger than GLS standard error (B)). Results show that the standard errors such as interaction dummy variable, institutional quality, strength legal rights index, credit information index for these estimates are larger than the corresponding standard error for the within estimates. As it can be seen from the table above, difference between fixed effect and random effect for these variable are negative. Therefore, it is concluded that FGLS would be inconsistent hence REM is not appropriate

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[16] Our probability value is bigger than 0.05

but within estimator can be used. However, within estimator which is used for fixed effect model has some problems. The main problem with within estimator is that it does not allow the use of dummy variables and the time invariant variables. Note that for the simple regression[17]

$$y_{it} = \alpha + \beta x_{it} + \mu_i + v_{it} \tag{46}$$

Averaging over time gives

$$\bar{y}_i = \alpha + \beta \bar{x}_i + \mu_i + \bar{v}_i \tag{47}$$

and therefore, upon subtracting (46) from (47), we get

$$y_{it} - \bar{y}_i = \beta (x_{it} - \bar{x}_i) + (v_{it} - \bar{v}_i) \tag{48}$$

Note that both α and μ_i have been differentiated out. This causes a drop in the dummy variable, which is important for our panel regression, therefore, we cannot use within estimator. Fixed effect model can also use least-squares dummy variable (LSDV) estimator, because in order to allow for different constants, it includes a dummy variable for each group. The use of independent dummy variable causes dummy variable trap since dummy variables are used in the fixed effect model. In econometric science, model prediction cannot be made because of dummy variable trap. As there exists dummy variable in the model, i.e., inflation and interaction term which includes inflation dummy and dollarization, FEM cannot directly be estimated. Therefore, we have to use pooled OLS in order to determine the effects of all variables on financial development.

6.6   Panel Data Pooled Estimation

In this part, the effects of partial dollarization on financial development is investigated using balanced panel data set. Pooled OLS, fixed effects (FE) and random effects (RE) are used in static panel data models. Here random effects (RE) are excluded since the Hausman (1981) statistic cannot be obtained because within estimator standard error for some explanatory variable is smaller than FGLS estimator standard error. Fixed effects

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[17] See Baltagi, 2014: 15

model are excluded because of dummy variable trap and within estimator causing drop in dummy variable. Therefore, the regression parameters are estimated using pooled OLS. After identifying the probable models, group-wise heteroscedasticity, autocorrelation and cross-sectional dependence should be tested[18]. Silva and Tenreyro (2006) explained that in the presence of heteroscedasticity, OLS estimation based on this transformation will be inconsistent.

If we assume that cross-sectional dependence is caused by the presence of common factors, which are unobserved (and the effect of these components is thus felt through the disturbance term) but uncorrelated with the included regressors, standard estimator is consistent, although not efficient, and the estimated standard errors are biased. For this reason, we have to examine these possible problems to determine whether they exist in our regression.

6.6.1 Multicollinearity

In order to detect possible problems in the data, we check assumption of multicollinearity for any possible multicollinearity between explanatory variables. One of the classical linear regression model (CLRM) is that there are no exact linear relationships among two or more independent variables. The existence of perfect multicollinearity causes the fact means that the method of OLS cannot provide estimates for the population parameters (Asteriou & Hall, 2007: 86) the variance of the coefficients increase and therefore increase in the standard errors of the OLS estimators; statistical reliability reduces and causes biased estimates. Small changes in the data produce large change in the estimation.

First, in order to check for multicollinearity among the independent variables, we use the correlation matrix to determine whether there is any possible multicollinearity. If the pair-wise correlation coefficient between two repressors exceed 0.80, then multicollinearity presents a potential serious statistical problem (Gujarati, 2004: 359). Table 19 presents the correlation matrix. From the table, it can be seen that all possible correlation terms between independent variable are below 0.80. The highest correlation (0.64) exits between GDP per capita and institutional quality, while the lowest correlation coefficient

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[18] In the previous part, it was found cross-section dependence problem.

exists between   dollarization ratio and real GDP per capita. Therefore, there will not be any serious evidence of multicollinearity.

Table 19 Correlation Matrix

	FD	GOV	SLR	US	DOL	CII
FD	1					
GOV	0.511137	1				
SLR	0.088590	0.223874	1			
US	0.596028	0.649814	0.028249	1		
DOL	-0.256400	-0.118189	0.069391	-0.092002	1	
CII	0.392582	0.361138	-0.017334	0.499230	-0.028287	1

6.6.2   Heteroscedasticity

It is assumed that regression disturbances are homoscedastic with same variance across time and individuals. This may be a restrictive assumption for panel data where the cross-sectional units could be of varying size and thus could exhibit different variation. In cognizance of above assumptions when heteroscedasticity is present, it will still result in consistent estimates of the regression coefficients, however, these estimates will not be efficient (Baltagi, 2014: 91).

To test for the presence of heteroscedasticity, one can use Breusch-Pagan (1979) / Cook-Weisberg (1973) test after determining classical regression model (Yerdelen Tatoğlu, 2016: 211).

Table 20 The Result for Heteroscedasticity

chi2(1)	29.33
Prob > chi2	0.0000
Ho: Constant variance	

The results are presented in Table 20. The probability value is 0.000 which is smaller than 0.05. Therefore, the null hypothesis that there is no heteroscedasticity is reject. It can be suggested that heteroscedasticity is a problem for the model.

6.6.3 Autocorrelation

One of the assumptions of the CRLM states that the covariance's and correlations between different disturbances are all zero (cov (u_t, u_s)=0 for all $t \neq s$). The error term u_t and u_s are independently distributed which is called serial independence. If this assumption is violated, OLS estimators will be inefficient and thus no longer BLUE but OLS estimator of the $\hat{\beta}_s$ are still unbiased and consistent because of the fact that they do not depend on this assumption. The estimated variances of the regression coefficients will be biased and inconsistent so hypothesis testing is no longer valid (Asteriou and Hall, 2007: 134-136).

To test autocorrelation, the test developed by Wooldridge (2002) is used. The null hypothesis is that there is no first order autocorrelation. The null hypothesis is rejected at one percent significance level. Hence, there is an autocorrelation problem in the model.

Table 21 The Result for Autocorrelation Test

F stat	Prob
198.423***	0.0000
Ho: no first-order autocorrelation	

*** denote statistical significance 1%

6.6.4 Estimation Pooled Results

Panel regression suffers from the presence of heteroscedasticity, autocorrelation and cross sectional dependency (error terms of cross sections are dependent). The methods to correct the standard errors address these problems. One of them is Newey-West standard

error, which are robust to heteroscedasticity and autocorrelation between error terms. However, this method is suitable for large numbers of time periods in panel data regression. Another method proposed by Parks (1967) and Kmenta (1986) is a feasible generalized least-squares (FGLS). Unfortunately, this method is inappropriate for use with medium and large scale panels for at least two reasons. Firstly, this method is infeasible if time dimension is smaller than cross-sectional dimension. Secondly, this tends to produce unacceptably small standard error estimates (Hoechle, 2007: 284)

Apart from these standard errors, some can use Beck and Katz standard error relying on OLS coefficient, which is computed to be robust to cross-sectional dependence, heteroscedasticity, and serial correlation between error terms. However, this method is very poor when the time dimension of the dataset is smaller than the panel dimension of the dataset.

The standard errors proposed by Driscoll & Kraay (1998) can also be employed to counter the problem of cross-sectional dependence, heteroscedasticity, and autocorrelation. This method can be used for fixed effect estimation and pooled estimation. For fixed effect estimation, the corresponding transform is the within transformation, and for pooled estimation the transform applied is the OLS transform (Hoechle, 2007: 287)

In this study, the effects of dollarization is empirically tested on financial development through panel analysis technique after detecting autocorrelation, heteroskedacity and cross-section dependence problem. These effects is estimated by using a panel data pooled OLS technique with Driscoll and Kray (1998) corrected standard errors in the model.

Table 22 Estimation Results for the Pooled Model

		Number of observation	540
		Number of groups	60
		F (7 , 59)	33704.61
		Prob > F	0.000
		R^2	0.4341

FD Dependent varible	Coef.	Driscoll/Kray Std. Err	t	P>ItI
DDOLL	-.2090532***	.0089367	-23.39	0.000
GDPPC	.1952547***	.0285564	6.84	0.000
INSQ	.0607444***	.0069922	8.69	0.000
SLR	.005109***	.0019459	2.63	0.011
CII	.0130349**	.0031897	4.09	0.000
D	-.0844345***	.0188419	-4.48	0.000
DDOLL*D	.1261778***	.0453243	2.78	0.007
_cons	-.3079991***	.0842905	-3.65	0.001

** and *** denote statistical significance at 5 and 1%, respectively.

Table 22 presents the pooled OLS technique with Driscoll and Kray corrected standard errors in the model results from the estimation of the effects of deposit dollarization on financial development where the dependent variable is domestic credit to GDP. All explanatory variables on financial development have a significant coefficient. GDP per capita, interaction dummy variable for developing countries, credit information index, strength legal right index, and institutional quality positively affect financial

development, while inflation and dollarization have negative impacts on financial development. We have found the results as we expected.

When we look at the results of all explanatory variables separately in the panel regression, the result demonstrates that deposit dollarization, DDOLL, is not only found to be high statically significant among explanatory variables, but also to have the greatest impact on the financial development. This outcome is one of the key findings of this study. The coefficient of dollarization variable suggests that holding the other factors constant, one-unit increase in deposit dollarization reduces the private sector credit to nominal income ratio by approximately 0.20 unit in the developing economies studied. This suggests that countries with high degree of deposit dollarization may have the shallowness of the financial system.

On one hand, dollarization has a negative effect on financial development. On the other hand, GDP per capita employed as a proxy for economic growth in the economy has a positive effect on financial development. As it is seen in the table above, this positive effect has statistically significant coefficient at 1 % level of confidence. Holding the other factors constant, developing countries with 1% higher GDP per capita, GDPPC, will face almost higher 0.19 unit effect on financial development.

Turning to other control variables, we can see that institutional quality, INSQ, has a positive effect on financial development. INSQ is statistically significant at 1% level of confidence. Holding the others factors constant, the result shows that one unit increase in the composite index of institutional quality leads to an increase in domestic credit to GDP ratio by an average of 0.06 unit.

Strength legal right index, SLR, as another explanatory variable is positively signed and significant at 5% level of confidence. Holding the others factors constant, a one-unit increase in SLR, would increase the domestic credit to nominal income by almost 0.005 unit. It can be also seen to have the lowest positive impact on the financial development.

Similarly, credit information index, CII, in the regression is positively signed and significant at 1% level of confidence. Therefore, it has a positive effect on financial development. If credit information index were one unit greater, financial development would increase by approximately 0.01 unit.

In contrast to these explanatory variables having positive effect, inflation dummy is significantly and negatively related with credit to GDP at 1% level. The high inflation, as expected, leads to the shallower the financial system.

Finally, it is added the interaction term of dummy for inflation and dollarization in the regression. Our purpose is to understand whether the effect of deposit dollarization in countries with high inflation on financial market development. The interaction term has positive impact on credit to income and it is significant at 1% level of confidence. This result indicates that dollarization has a positive effect on financial development in inflationary environment.

CONCLUSION

The concept of currency substitution or dollarization can be defined as the use of another countries' currency as a part of its own local currency. This has existed in developing countries for a period of more than two decades. Economic agents under macro-economic instability gives partly up using domestic currency and they tend to search for available hedging alternatives owing to higher cost of holding local currency. Therefore, dollarization generally arises under environments of the high and volatile inflation.

The issue of dollarization can have different forms such as partial dollarization and full dollarization. Some countries give up the use of local currency altogether and accept foreign currency as legal tender for full dollarization, while residents use both local currency and foreign currency together in the economy in partial dollarization.

Existing literature deals with the causes and the consequences of dollarization phenomenon. This study examines consequences of dollarization on financial development because of little research on the nexus between dollarization and financial development. Therefore, we have empirically analyzed the effect of dollarization on financial development.

The first finding of this study indicates that an increase in dollarization leads to a decrease in the private sector credit to income. This finding also supports the studies done by both De Nicolo (2005) and Court et al. (2012). These authors found that dollarization has a negative effect on financial development. In the different regressions conducted by De Nicolo (2005), it was also found that the coefficient of the deposit dollarization ranges from -0.280 to -0.296. Similarly, Court et al. (2012) found that the coefficient of the deposit dollarization ranges from -0.412 to -0.936. The authors explain that this negative effect on financial development is due to fear of floating. In this vein, deposit dollarization

in the banking system slows financial deepening by limiting local credit. These restrictions can be attributed to the currency mismatch and loan default risks that banking systems face in dollarized environments. Therefore, dollarization exerts a negative impact on bank profitability and simultaneously contributes to the shallowness of the financial system[19].

The second finding of our model is that high inflation has a negative and significant coefficient on financial development. Our result supports empirical and theoretical models concerning the link between inflation and financial development investigated by macroeconomists[20]. The transmission mechanism from high inflation to financial market can be explained as follows: in economies with high and chronic inflation, residents expect a reduction in returns on savings, and they tend to reduce their savings. Then, banks lend less and allocate capital less effectively because of the higher interest rates that follow high inflation rate. Therefore, the stock market becomes scarce in such economies.

The third finding shows that the aggregated measure of institutional quality, INSQ, is found to be positively related to financial development. Similar finding can be found in the studies conducted by Dehasa et al. (2007), De Nicolo et al. (2005), Court et al. (2012). According to Bittencourt (2011), weak economic institutions have detrimental impacts of developing economy for affecting high inequality, erratic growth, and a restrictive financial sector. Therefore, low and stable inflation, stronger economic institutions (independent central bank and a sound fiscal authority) are necessary for a deeper financial sector.

The fourth finding of our model is that the impact of an interaction term between partial dollarization and inflation on financial development is positive. This result reaffirms previous studies[21] that dollarization has a positive effect on financial development but only in countries with high inflation. However, the authors who investigated the relationship between dollarization and financial development found different coefficient. De Nicolo et al. (2005) have found out that the coefficients range from 0.14 to 0.36 while

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[19] See Ozsoz and Rengifo, 2016

[20] See Moore (1986), Boyd et al.(1996, 2001), Haslag and Kao (1999), English (1999), Barnes (2001), Rousseau and Watchel (2002), De Nicolo (2005), Naceur and Ghazouani (2005), Khan et al. (2006), Kim and Lin (2010), Keho (2010), Bittencourt (2011), Court et al. (2012)

[21] See De Nicolo et al. (2005), Court et al. (2005)

Court et al. (2012) found that the coefficient of interaction term ranges from 0.26 to 0.48 showing that dollarization exerts larger effect on financial development. Both studies explain that this positive effect on financial development is due to the fact that local residents willingly substitute foreign strong currencies for the domestic currency because strong currency like the US dollar protects the residents against inflation. As Feige (2003) explains, dollarization helps prevent capital flight from economies with high inflation; it contributes to keep savings in the domestic country, and thus may positively contribute to financial development.

The fifth finding of this study, real GDP per capita employed as a proxy for economic growth in the economy has a positive effect on financial development. This finding is in line with theoretical expectations because when the real side of economy expands, the demands for different new financial services will increase, hence, financial intermediation.

As expected, credit information index and strength legal right index have a positive and significant impact on financial development. These variables explain the importance of legal rights protection as well as information about borrowers and their credit history on the development of financial systems.

This study has focused on the role of deposit dollarization and its effects on financial development in emerging economies. The results of dollarization are emphasized more than other explanatory factors in these countries with high and low inflation. Even though we find that dollarization has a positive effect on financial development, the empirical studies show that economies with high inflation and high dollarization face significant challenges and exchange rate risks. These factors contribute to currency mismatch and default risk, and thereby financial crises. Therefore, different policies should be implemented to achieve low dollarization and inflation.

The important limitation of this thesis is lack of available data concerning credit information index, strength legal right index and some of the dollarization data. Because the problem of dollarization belongs to developing countries due to economic and political instability, the aim of this study is to collect data for all developing countries. After collecting the data of all developing countries, we then investigate and compare the effects of dollarization by dividing into sub-groups. However, this could not be conducted

because of short time period and lack of data. Future research can be conducted to determine whether the magnitude of effects of dollarization on both financial development and financial fragility by comparing different sub-groups.

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APPENDICES

Appendix A A List Of Countries (Regional)

Table 23 A List of Countries (Regional)

Transition Economies In Europe and the Former Soviet Union		
CIS	**CEE**	**Transition Economies In Asia**
Armenia	Albania	Cambodia
Azerbaijan	Bulgaria	Vietnam
Belarus	Croatia	
Georgia	Hungary	**Baltics**
Kazakhstan	Romania	Latvia
Kyrgyz Republic	FYR Macedonia	Lithuania
Moldova		
Russia		
Ukraine		
Middle East, North Africa Afghanistan and Pakistan (Mena)		
Egypt	Morocco	
Jordan	Tunisia	
Kuwait	United Arab Emirates	
Lebanon	Yemen	
Sub-Saharan Africa		
Angola	Nigeria	Kenya
Botswana	Rwanda	Madagascar
Ghana	Sierra Leone	Tanzania
Guinea	South Africa	Zambia
Latin America and the Caribbean		
Bolivia	Chile	Jamaica
Costa Rica	Guatemala	Dominican Republic
Uruguay	Haiti	Colombia
Honduras	Peru	Venezuela
Nicaragua	Paraguay	
Emerging and Developing Asia		
Bangladesh	Mongolia	Philippines
India	Sri Lanka	
Indonesia	Thailand	
Emerging and Developing Europe		
Bosnia and Herzegovina	Turkey	

Appendix B A List of Countries (The Whole Sample)

Table 24 A list of countries (the whole sample)

Number	Country	Number	Country	Number	Country
1	Albania	21	Haiti	41	Paraguay
2	Angola	22	Honduras	42	Peru
3	Armenia	23	Hungary	43	Philippines
4	Azerbaijan	24	India	44	Romania
5	Bangladesh	25	Indonesia	45	Russian Federation
6	Belarus	26	Jamaica	46	Rwanda
7	Bolivia	27	Jordan	47	Sierra Leone
8	Bosnia and Herzegovina	28	Kazakhstan	48	South Africa
9	Botswana	29	Kuwait	49	Sri Lanka
10	Bulgaria	30	Kyrgyz republic	50	Tanzania
11	Cambodia	31	Latvia	51	Tunisia
12	Chile	32	Lebanon	52	Turkey
13	Costa Rica	33	Lithuania	53	Ukraine
14	Croatia	34	Macedonia	54	United Arab Emirates
15	Dominican Republic	35	Madagascar	55	Uruguay
16	Egypt	36	Moldova	56	Venezuela
17	Georgia	37	Mongolia	57	Yemen
18	Ghana	38	morocco	58	Zambia
19	Guatemala	39	Nicaragua	59	Colombia
20	Guinea	40	Nigeria	60	Thailand

FD
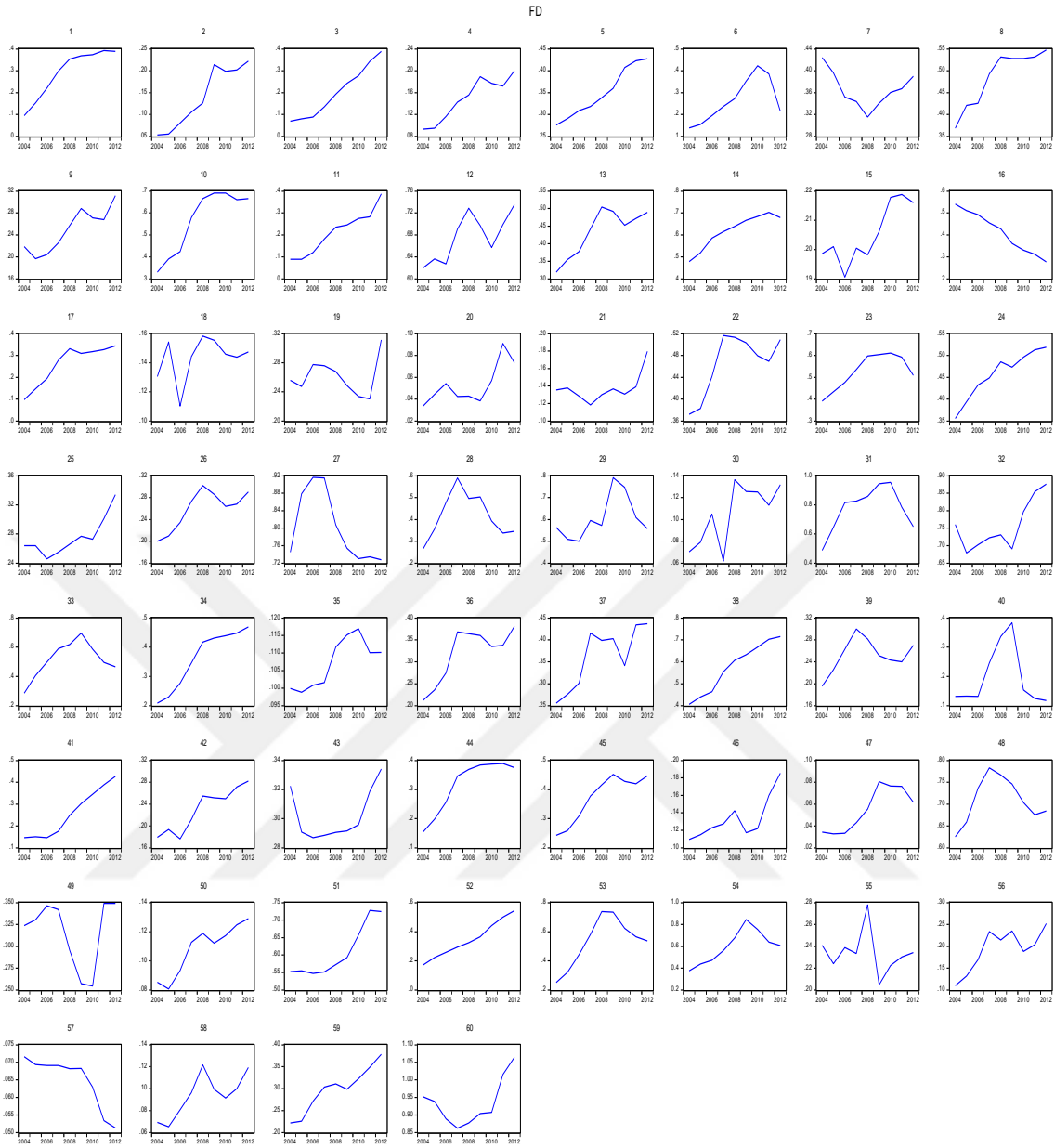
Figure 16: Financial Development in 60 Countries Used in the Sample

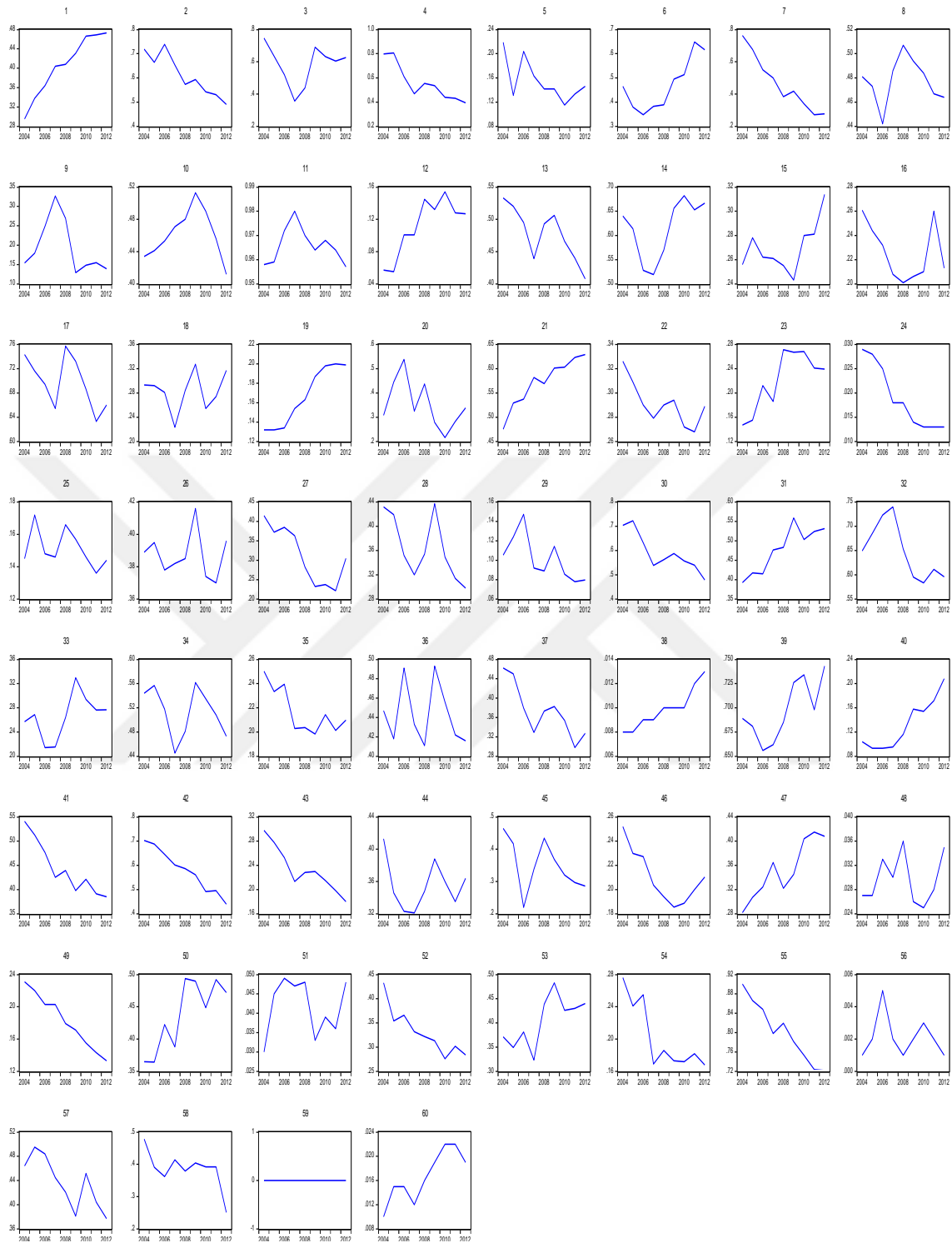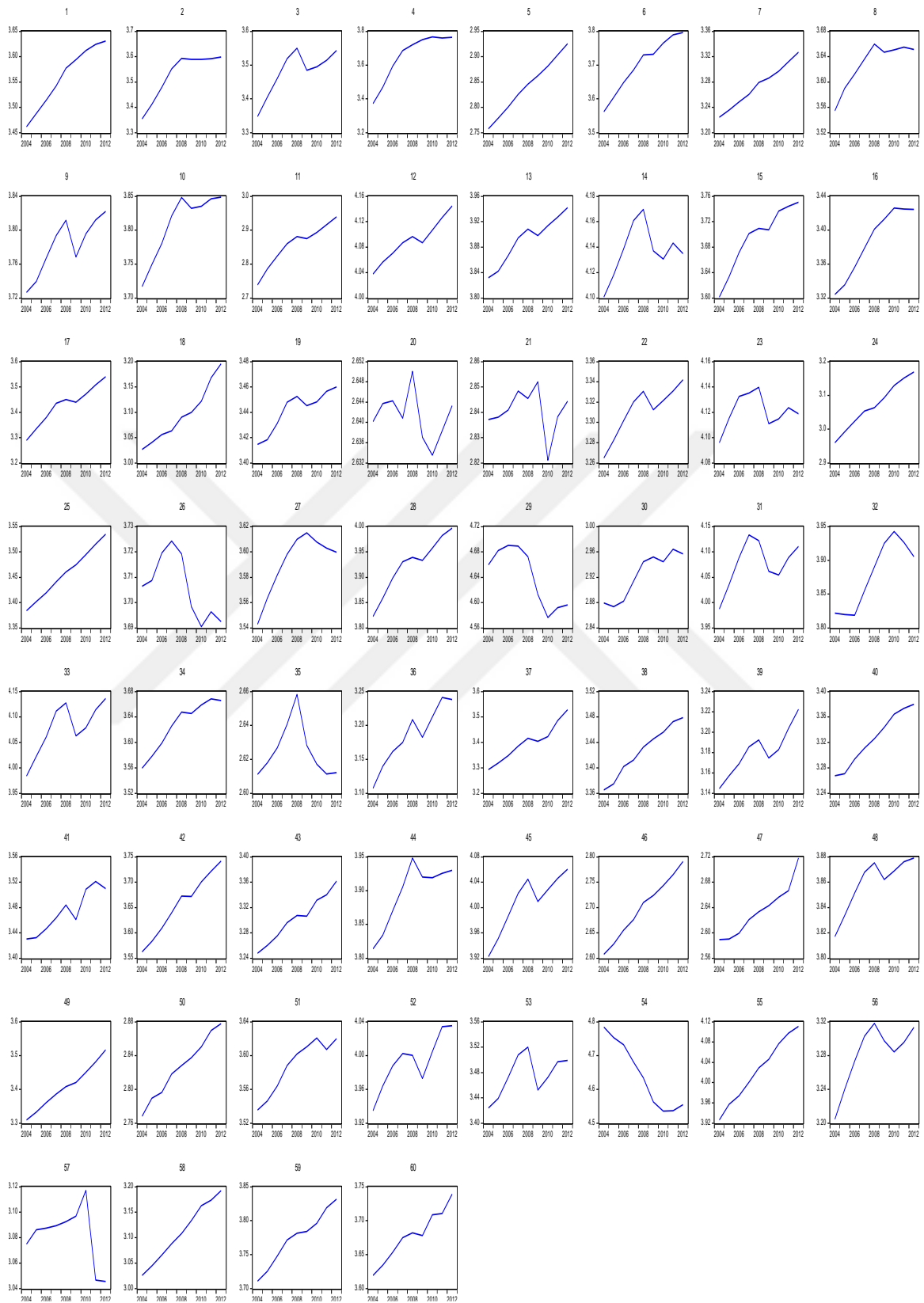**Figure 17** Deposit Dollarization in 60 Countries Used in the Sample

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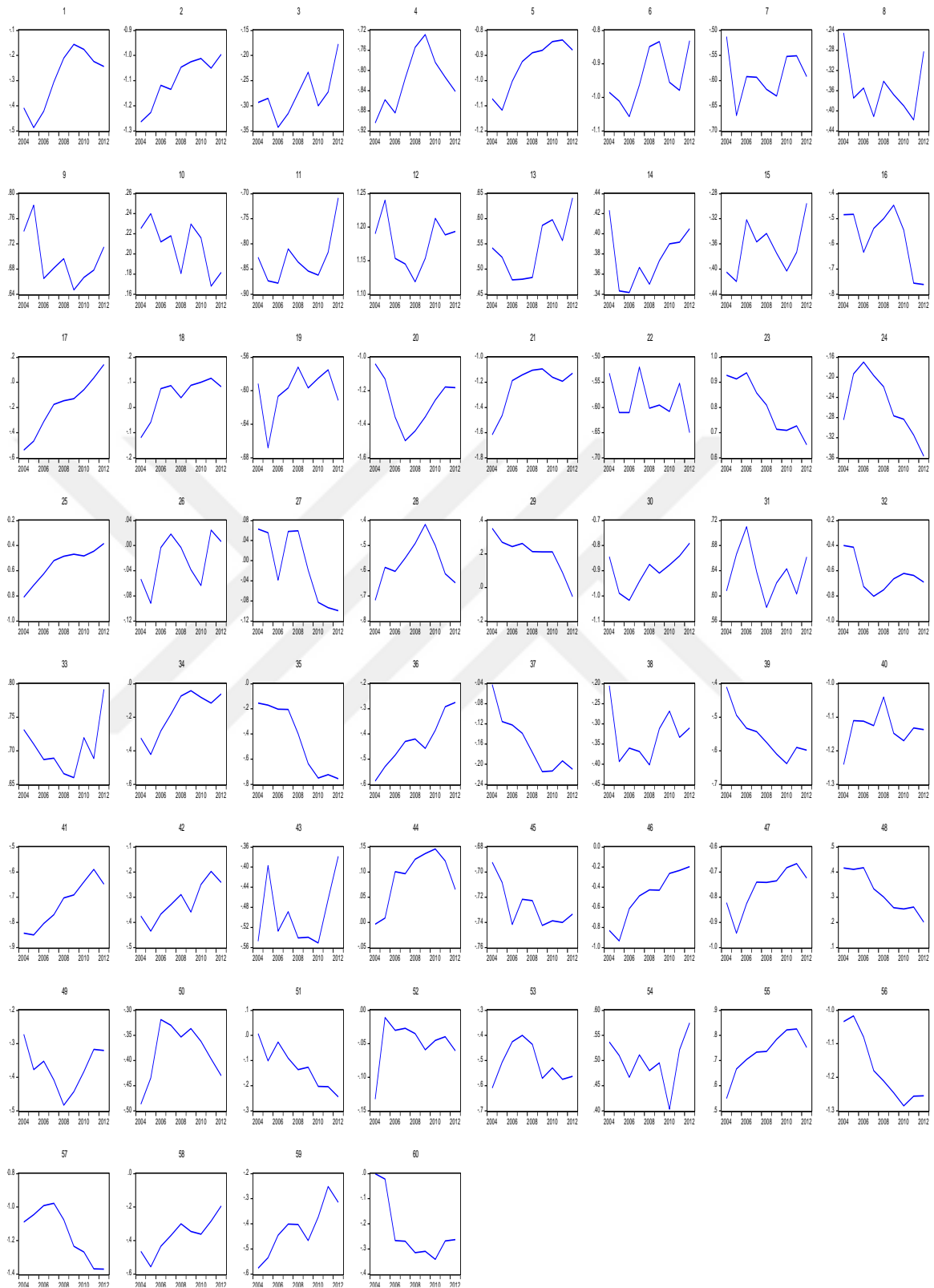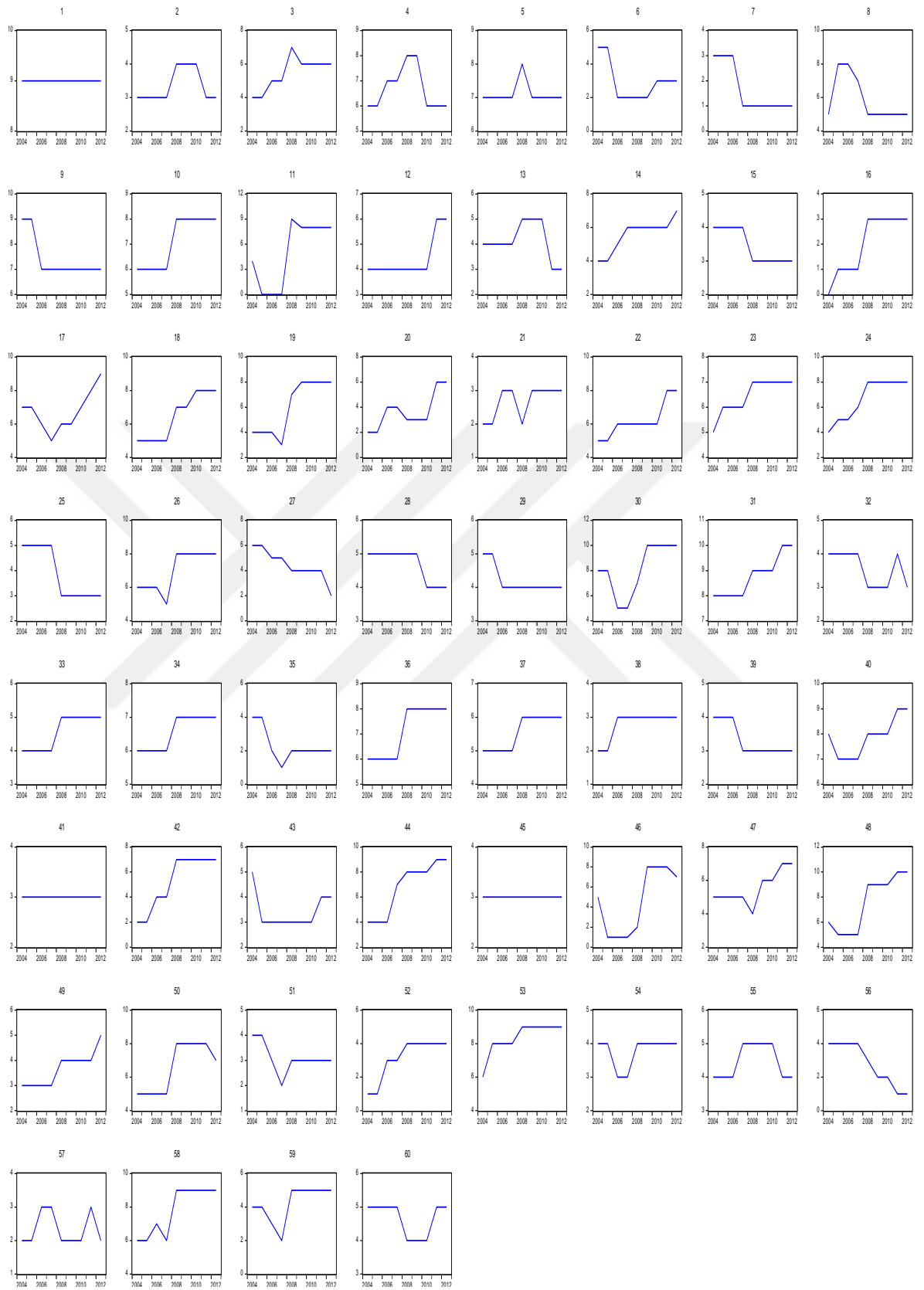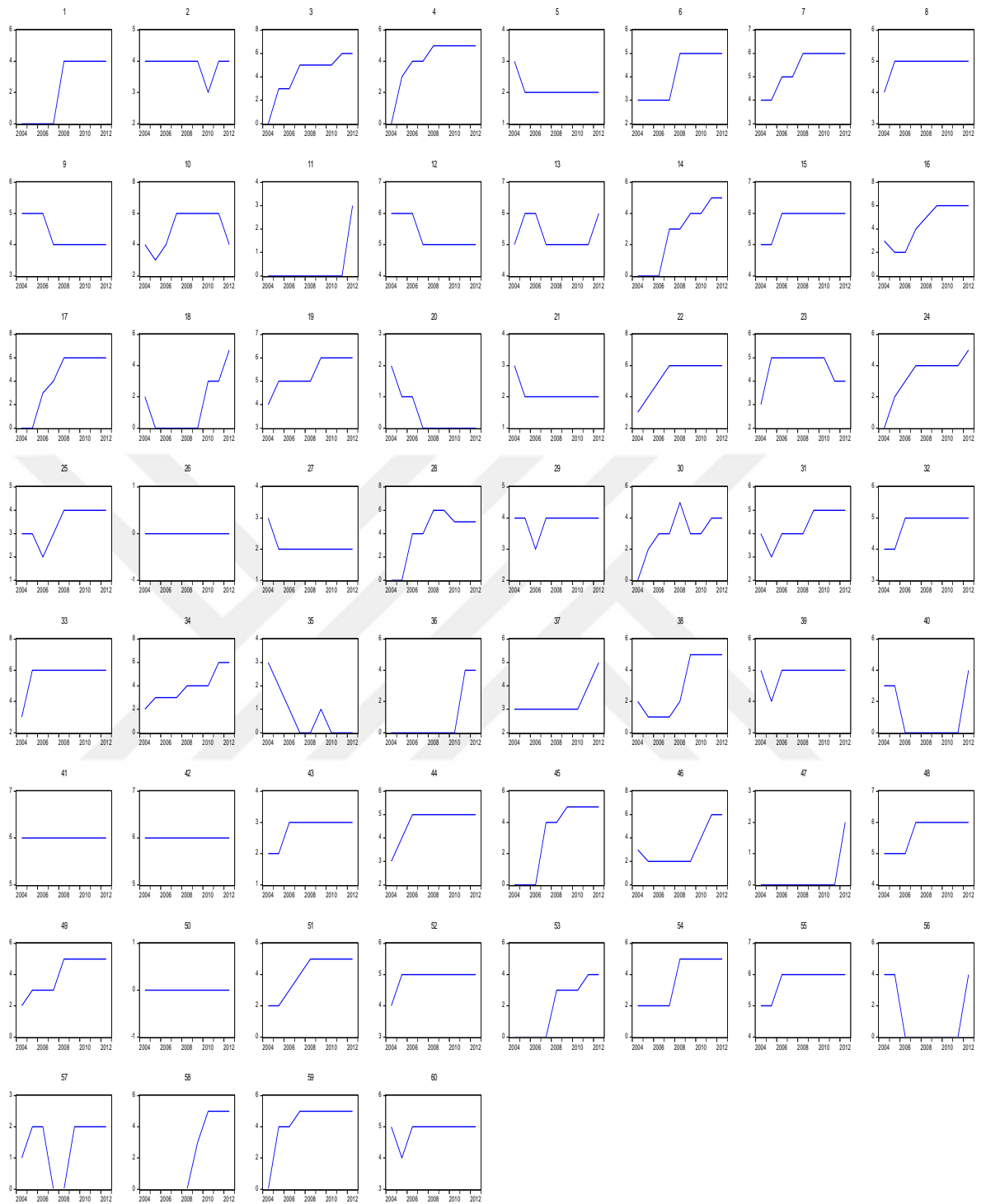**Figure 18** GDP per capita in 60 Countries Used in the Sample

Figure 19 Governance Indicator in 60 Countries Used in the Sample

Figure 20 Strength Legal Right Index in 60 Countries Used in the Sample

Figure 21 Credit Information Index in 60 Countries Used in the Sample

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Appendix C Tez Fotokopisi İzin Formu

TEZ FOTOKOPİSİ İZİN FORMU

ENSTİTÜ

Sosyal Bilimler Enstitüsü

YAZARIN

Soyadı: ŞAHİNLER

Adı: Ayşe Nur

Bölümü: İktisat

TEZİN ADI: An Empirical Analysis of Dollarization on Financial Development in the Developing Economies

TEZİN TÜRÜ: Yüksek Lisans

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir. ☐

2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir. ☐

3. Tezimden bir (1) yıl süreyle fotokopi alınamaz. ☐

TEZİN KÜTÜPHANEYE TESLİM TARİHİ: