

CURRENCY DEPRECIATION AND INCOME INEQUALITY
IN A DOLLARIZED ECONOMY: THE CASE OF TURKEY

by
HASAN ALTUĞ ÖZASLAN

A DISSERTATION SUBMITTED TO THE GRADUATE INSTITUTE OF SOCIAL SCIENCES
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR
OF PHILOSOPHY IN ECONOMICS

YEDİTEPE UNIVERSITY

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JUNE, 2022

PLAGIARISM

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Date: 21/06/2022

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ÖZET

Para biriminin değer kaybetmesinin mi dolarizasyona neden olduğu yoksa dolarizasyonun mu para biriminin değer kaybına neden olduğu konusunda literatürdeki tartışmalar devam etmektedir. Türkiye gibi yüksek oranda dolarize olmuş bir ülkede, yerel para biriminin değer kaybetmesi gelir eşitsizliğini artırabilir. Bu makale, Türk Lirasının değer kaybı ile dolarizasyon arasındaki ilişkiyi ampirik olarak inceleyerek ve ardından Türk Lirası'ndaki değer kaybı ve dolarizasyonun 2001 ve 2020 yılları arasında Türkiye'nin GINI katsayısı üzerindeki etkilerini inceleyerek bu iki konuyu tartışmaktadır. GARCH analizi nominal döviz kuru hareketinin, hipotezimizle tutarlı olarak, dolarizasyonun Granger nedeni olduğunu gösterdi. Daha sonra bu çalışmada, Türkiye'de uzun dönemli ilişki saptaması için Gecikmesi Dağıtılmış Otoregresif Sınır Testi (ARDL) yaklaşımı kullanılırken, nominal döviz kurundaki değer kaybı ve dolarizasyon oranı ile GINI katsayısı arasındaki kısa dönem ilişki için ise Vektör Hata Düzeltme Modeli (VECM) uygulanmıştır. Türk Lirası'ndaki nominal değer kaybının kısa vadede Türkiye'de gelir eşitsizliğini kötüleştirdiğini ve dolarizasyondaki artışın hem kısa hem de uzun vadede gelir eşitsizliğini artırdığını tespit ettik. Bu çalışmada ayrıca Türkiye'de işsizlikteki artışın gelir eşitsizliğini azalttığı, kişi başına ekonomik büyümedeki artışın gelir eşitsizliğini artırdığı ve enflasyondaki artışın gelir eşitsizliğini azalttığı tespit edilmiştir.

Anahtar Kelimeler: Dolarizasyon, Döviz Kuru, Değer Kaybı, Gelir Eşitsizliği, Türkiye

JEL Sınıflandırması: C12, C22, C51, E31, F31, F62, O11, O15.

ABSTRACT

There has been an on-going debate whether currency depreciation causes dollarization or vice versa. And in a highly dollarized country, like Turkey, depreciation of the domestic currency may increase income inequality. This paper discusses these two related issues by empirically examining the relationship between the depreciation of Turkish Lira and dollarization and then examining the impacts of the depreciation of Turkish Lira and dollarization on GINI coefficient of Turkey between 2001 and 2020. The GARCH analysis suggested that nominal exchange rate movement is the Granger cause of dollarization which is consistent with our hypothesis. And then this paper applied the Auto Regressive Distributed Lag (ARDL) bounds testing approach for the long run relationship and applied Vector Error Correction Model (VECM) for the short run relationship between nominal exchange rate depreciation and GINI coefficient in Turkey. We find that nominal depreciation of Turkish Lira worsens income inequality in Turkey in the short-term and an increase in dollarization aggravates income inequality both in the short and the long term. This study also found that an increase in unemployment decreases income inequality, an increase in economic growth per capita increases income inequality and an increase in inflation decreases income inequality in Turkey.

Keywords: Dollarization, Exchange Rate, Depreciation, Income Inequality, Turkey

JEL Classification: C12, C22, C51, E31, F31, F62, O11, O15.

DEDICATION



TO MY FAMILY

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LIST OF ABBREVIATIONS

AD	Aggregate Demand
ADF	Augmented Dickey-Fuller Test
AIC	Akaike Information Criterion
AR	Autoregressive Process
ARDL	Autoregressive Distributed Lag
ARMA	Autoregressive Moving Average Model
AS	Aggregate Supply
BAT	Border Adjustment Tax
BOP	Balance of Payments
BRSA	Banking Regulation and Supervision Agency
BW	Bretton Woods
CBRT	Central Bank of Turkey
CPI	Consumer Price Index
CUSUM	Cumulative Sum of Recursive Residuals
CUSUMsq	Cumulative Sum of Squared Recursive Residuals
DI	Dollarization Index
DSC	Stock of Money Base
ECB	European Central Bank
ECM	Error Correction Model
EGARCH	Exponential Garch
EKC	Environmental Kuznets's Curve
EU	European Union
EUR	Euro
FDI	Foreign Direct Investment
FED	Federal Reserve
FKC	Financial Kuznets' Curve
GARCH	Generalized Autoregressive Conditional Heteroskedastic
GDP	Gross Domestic Product

GDPPC	GDP per Capita
GNI	Gross National Income
GNP	Gross National Product
HDI	Human Development Index
IMF	International Monetary Fund
IS	Investment and Savings
JPY	Japanese Yen
LATAM	Latin America
LDC	Less Developed Countries
LM	Liquidity and Money
MA	Moving Average
MVP	Minimum Variance Theory
NPL	Non-performing Loan
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
OMO	Open Market Operations
PED	Price Elasticity of Demand
PP	Phillips-Perron Test
R	Stock of Foreign Exchange Reserves
REER	Real Effective Exchange Rate
RER	Real Exchange Rate
SIC	Schwarz Information Criterion
TIBA	Turkish Industry and Business Association
TURKSTAT	Turkish Statistical Institute
UNDP	United Nations Development Program
USA	United States of America
USD	United States Dollar
VECM	Vector Error Correction Model
YOY	Year on Year
ZZ	Demand for Goods

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1. INTRODUCTION

Depreciation of the domestic currency or devaluation is a common tool to rectify the current account deficit problems and accelerate economic growth. However, the effects of depreciation via dollarization on income inequality have not attracted much attention in academic literature neither in Turkey nor abroad. The relationship between exchange rate and income inequality is crucial in an era when trade is in the center of growth strategies in a globalized world in which currency wars and trade wars are the most popular topics. Hence, policymakers should interpret the relationship between exchange rate and income inequality better. In the last few years, the general view in Turkey is that poor are getting poorer and rich are getting richer. However, between 2010 and 2021, the average spread between the minimum wage increases and Year over Year (YoY) inflation change was 6.58 percent, indicating that the minimum wage has on average increased by 6.58 percent, more than the previous year's yearly inflation rate. The average real Gross Domestic Product (GDP) growth of Turkey was 5.98 percent (Turkish Statistical Institute, TurkStat, 2021) and the average Gross National Income (GNI) was -0.39 percent between the 2010-2020 period in current United States Dollar (USD) (World Bank, 2020). According to the World Bank data, the GINI Index of Turkey was 38.8 in 2010 and it increased to 41.9 in 2019 indicating a higher level of income inequality. The P80/P20 ratio which defines the ratio of total income received by the 20 percent of the population with the highest income to that received by the 20 percent of the population with the lowest income has declined from 9.60 in 2006 to 7.80 in 2018 (TurkStat, 2018) and the GINI coefficient slightly declined from 0.440 in 2002 to 0.408 in 2018.

The Turkish Lira (TL) continuously depreciated from the level of 1.80 to 18.39 between 2013 and 2021 against the USD. In the same period, the dollarization ratio (Foreign Exchange (FX) Deposits/Total Deposits) of the Turkish residents increased from 34 percent to its highest level, 56 percent and precious metals' savings increased by 480 percent to 122 billion TL from 21 billion TL. The purpose of de facto dollarization or currency substitution and precious metals' savings is hedging against financial and political risks. However, despite the increase in the saving ratio from 14.4 in 2000 to 26.5 in 2020 (Census and Economic Information Center, CEIC) in the last two decades, the income inequality coefficients have not improved.

The exchange rates and effects of depreciation are the main concerns for low-income residents since most of them receive their earnings in domestic currency (TL). The main focus of this study: (i) is the relationship between dollarization and exchange rate movements and (ii) their effects on income inequality in Turkey.

According to the literature Giovannini and Turtelboom (1995) mention that dollarization mitigates price stability. On the contrary several studies indicate that dollarization is the crucial cause of currency depreciation and hence, exchange rate instability McKinnon (1982), Akçay, Alper, and Karasulu (1997), Berg and Borensztein (2000), and Yinusa (2008). Theoretical models of exchange rate show that exchange rate instability increases according to the degree of dollarization (especially currency substitution which will be revealed in detail in this study). Furthermore, this study tests whether dollarization is a crucial cause of exchange rate instability (domestic currency depreciation) or not by applying Generalized Autoregressive Conditional Heteroskedastic (GARCH) analysis model based on Lay, Kakinaka, and Kotani (2010).

The aim of this study is to research the impacts of the depreciation of the TL and dollarization on income inequality. This study hypothesizes that they both have negative impacts on the living standards of the Turkish citizens, triggering income inequality. In depth, qualitative research is required to gain a fuller understanding of the effects of the depreciation of the TL and the effects of dollarization on income inequality. Qualitative methods will be used to examine, firstly the relationship between dollarization and the depreciation of Turkish Lira, and secondly the impact of the depreciation of TL on income inequality and the impact of the dollarization on income inequality in Turkey.

2. LITERATURE REVIEW

Inequalities in income and wealth distribution may be a significant threat to the future of capitalism and democracy (Piketty, 2014). The inequality of income distribution in Turkey is a debatable concept since the 1980s with the trade account liberalization. According to Sezen and Eteman (2017), “the distribution of income in Turkey is in a convex pyramid structure; in other words, it is distributed very unequally.”

Yüncüler (2011) studied the pass-through of external factors into price indicators in Turkey and found that external factors such as import price shocks were influential on consumer prices; however, the degree of pass-through is lower in the inflation targeting period compared to the previous period which is before 2002. Kara and Öğünç (2008) studied the inflation targeting and exchange rate pass-through in Turkey, and they found that the exchange rate pass-through was not only lower but also slower after adjusting inflation targeting in the floating exchange regime era of Turkey. They added that two factors affected the decline of the exchange rate pass-through from imported inflation to domestic inflation: (i) the decrease in the indexation of prices to exchange rates and (ii) inflation targeting regime. Their findings are also supported by Yüncüler’s (2011) study, and despite the 128.89 percent cumulative depreciation rate, the cumulative inflation rate and the cumulative minimum wage increase have been lower.

After being a free market, foreign currencies were bought and sold freely in Turkey both by the households and the corporations. Foreign currencies (especially the USD) have always been attractive assets for the Turkish citizens. In 1985, FX deposits to total deposits ratio was 13 percent and it increased to 51 percent in 2019 (Banking Regulation and Supervision Agency, BRSA, 1985).

2.1. Income Inequality

Most of the studies which have contributed to the literature on income distribution are based on the impact of economic growth. A considerable amount of research shows that as per capita income rises income inequality worsens and then improves, as shown by the inverted-U curve also known as the Kuznets’ Curve that was introduced to the literature by Simon Kuznets (1955). Ahluwalia (1974) and Fields (1981) showed that although the relationship between economic growth and income inequality was negatively correlated, it was not robust. Clarke (1995)

indicated that income inequality is negatively correlated with growth in the long run. Easterly (2007) used cross-country data and found that income inequality is a momentous boundary to prosperity.

Muller (1988) studied the relationship between democracy, economic development, and income inequality and found that there is a strong negative correlation between regime stability and income inequality. Longtime democratic institutions may lower income inequality gradually, independent of economic development level.

Lam (1997) studied the relationship between demographic variables and income inequality and found that age, fertility, household composition, marriage, migration, and mortality have various effects on income inequality. For example, a change in the age structure in a country may change the measure of income inequality even if there may not be a change in mean income or age-specific income inequality. The study indicated that married couples tend to have low-income inequality ratios because of the contribution of wife's earnings in household income.

Corden (1997) suggested how tariffs conduce toward transfer of revenue from citizens to government and hereby redistribution. The problem with redistribution made by the government is whether it is fair and homogeneous or not. Both in the developed and developing countries, the conglomerates and people who are in the power domain of the ruling party exploit the government resources. The incentives and dispensations are generally for this distinguished vanity fair. So, this type of distribution is widening the gap between the rich and poor and negatively influencing income inequality.

“On the other hand, if protectionism is designed to avoid the sharp sectoral differences that often result from trade - between the ‘winners’ and ‘losers’ - then income inequality might be reduced if a country erects barriers to trade. Theoretical papers have come to this conclusion, often in terms of productivity and skill differentials” (Bahmani-Oskooee et al., 2008).

Pissarides (1997) explained that openness results in technology to increase the returns to skilled labor in less developing countries and widens the gap between skilled and unskilled labor.

Since skilled labor is at least middle-income earner and unskilled labor is low-income earner, income inequality expands differentially among the pyramid and consequently poor remain poor. Diwan and Walton (1997) stated by citing factors like migration, capital mobility, and technology that openness leads to an increase in inequality unless effective measures are put in place. Openness may reduce inequality by increasing income, it may also exacerbate the problem as well. The studies on openness in the literature have employed different measures such as Dollar (1992) used price levels, Edwards (1992) utilized nine different measures such as capital, three types of labor, four types of land and oil, Pritchett (1996) employed four different measures which are non-tariff barriers, import penetration ratios, price distortions and different rankings of countries because of uncorrelated different measures. Andriamananjara and Nash (1997) used exports of consumer goods and concluded that openness encourages less income inequality. However, Williamson (1997) and Savvides (1998) explained that economic integration has widened income inequality. Factors like the sociology, education level, and the production of value-added products etc. affect the variability in income inequality among the countries and cities.

Campano and Salvatore (1988) re-examined Kuznets' inverted-U hypothesis by expanding Ahluwalia's (1976) study of 60 countries to 95 countries (68 developing, 21 developed, and 6 socialist) during the development process of each of them. They found strong support for Kuznets' inverted-U hypothesis except for the bottom 20 percentile of the population. The study suggested that it should be investigated why the bottom 20 percentile of the population was ignored during the analysis of the development process. However, in the same decade Papanek and Kyn (1986) analyzed the effects of development, growth rate, and economic strategy on income inequality for 83 countries. The study showed that there was no relationship between income inequality and the rate of economic growth or government intervention. The study has not captured Kuznets' inverted-U hypothesis and it indicated that "more rapid growth contributes to the more rapid alleviation of poverty." (ibid., 1986, p.64)

Reuveny and Li (2003) studied the effects of both economic openness and democracy on income inequality statistically by applying time series analysis for the first time in literature. The study covered 69 countries between 1960 and 1996. The study explains that: (i) higher level of democracy and trade openness decrease income inequality, (ii) FDI increases income inequality, and (iii) foreign financial capital inflows do not have any significant effect on income inequality.

Meschi and Vivarelli (2008) studied the impact of trade on income inequality for a sample of 65 developing countries. The study concluded that trading, importing, and exporting with high income countries increase income inequality. The study also noted that developing high technology and trading value added goods and services produced by this technology create technological differentials and such differentials and skill biased use of them are considerable factors in shaping the distributive effects of trade.

The relationship between education and income inequality was analyzed by Muller (2002), De Gregorio and Lee (2002) and Rodriguez-Pose and Tselios (2009) in the literature. All these studies find that lack of high-level education increases income inequality. Muller (2002) focused on whether the differences in the educational levels influence the relationship between mortality and income inequality in the United States of America (USA). The study indicated that the lack of high school education creates low level of social and physical conditions which support the relationship between mortality and income inequality. De Gregorio and Lee (2002) focused on the broad range of countries between 1960 and 1990 to examine whether education is a main determinant of income inequality or not. The study suggested that educational factors are highly correlated with income distribution and proved the Kuznets' inverted-U hypothesis between the income level and income inequality. The study also stated that the social expenditure of governments tends to make distribution of income more equal. Rodriguez-Pose and Tselios (2009) studied the effects of the changes in human capital on income inequality for 102 regions of the European Union (EU) between the 1995 and 2000 period. They found a strong positive relationship between educational inequality and income inequality.

Clarke, Xu, and Zou (2006) examined the relationship between financial development and income inequality for 83 countries for the period between the 1960 and 1995 period and stated that when financial development increases, income inequality decreases, and this result is consistent with the previous studies in the literature such as Galor and Zeira (1993) and Banerjee and Newman (1993). The study also rejected the hypothesis that financial development only benefits the rich in a country.

Jomo (2001) and Kayizzi-Mugerwa (2001) separately examined the impact of globalization on poverty and income inequality in developing countries in Southeast Asia and

Africa. The studies show that globalization is not the major cause of income inequality and poverty, but it has some contribution to the poor performance of developing countries. On the contrary, Bergh and Nilsson (2010) studied the effects of liberalization and globalization on income inequality by examining the relationship between income inequality and Konjunkturforschungsstelle of ETH Zürich's KOF Globalization and Economic Freedom Index in 80 countries between 1970 and 2005. The study reflects that trade freedom is highly related to income inequality as well as social globalization and deregulation. Another conclusion found by the study is that although economic freedom increases income inequality in rich countries; monetary and legal reforms and political globalization not. The study suggests that building a well-functioning legal system is important to promote growth and lower the income inequality ratio.

Agnello, Mallick, and Sousa (2012) assessed the impact of financial reforms on income inequality of 62 countries between the 1973 and 2005 period. The study proved the Kuznets' inverted-U curve and found that financial reforms decrease income inequality. Another considerable finding of the study is that the reduction of the gap between the rich and poor, becomes smaller as the government size gets bigger, and hence the inequality in income distribution worsens with trade.

Brei, Ferri, and Gambacorta (2018) examined the relationship between financial structure and income inequality of 97 countries during the period between 1989 and 2012. Contrary to Agnello, Mallick and Sousa (2012), the study indicated that financial development decreased income inequality up to a point. However, beyond that point if finance is expanded by market-based financing, income inequality increases; but if finance is expanded by the banking sector, then income inequality does not increase. The study also captured the Kuznets' inverted-U curve in line with Agnello, Mallick, and Sousa (2012).

Nau (2013) studied the relationship between income earned from the investment portfolios of the economic elites' and income inequality. The study claims that economic elites are now less reliant on the returns of labor and more reliant to investment portfolio income when compared to previous periods, thereby influencing income inequality negatively. Lin and Tomaskovic-Devey (2013) also examined the relationship between financialization and income inequality in the United States (U.S.) between the 1970-2008 period. The study argued that in the long run if financial income dependence increases, labor's share of income decreases. The study also evaluates that

financialization of the U.S. economy ends with redistribution of wealth to a privileged limited class of citizens. Besides income from the investment portfolios and finance, salaries of the financial sector are subjects analyzed to explore income inequality. Denk (2015), analyzed the relationship between financial sector pay and income inequality in the European region. The study identified that financial sector workers are among the top 1 percent income earners because of high salaries and bonuses relative to similar profile workers in other sectors.

Stossberg, Bartolini, and Blöchliger (2016) investigated the relationship between fiscal decentralization and income inequality in 20 Organization for Economic Co-Operation and Development (OECD) countries during the 1996-2011 period. The study asserts that there is a weak correlation between fiscal decentralization and income inequality, and it also shows that middle income class benefits more with fiscal decentralization.

Bengtsson and Waldenström (2018) studied the relationship between income inequality and capital share in national income and offered that there is a strong positive correlation between income inequality and capital share. Their study concludes that capital-labor split is an important determinant of income inequality since exogenous shocks determine personal and functional income distribution via asset allocation.

Tsai (1995) examined the relationship between Foreign Direct Investment (FDI) and income inequality and addressed that there is a strong correlation between both variables. The study also indicates that FDI gives rise to more income inequality in less-developed countries (LDC). Agnello, Mallick and Sousa (2012) examined the effect of banking crisis on income inequality and stated that income gaps rise before banking crises and then fall sharply after the crisis occur.

Alvarez-Cuadrado and Vilalta (2018) studied the relationship between saving and income inequality in the USA. They indicate that while aggregate saving rate decreases with income inequality savings rates decrease with reference income when economic agents mostly care about their consumption.

Bulir (2001) studied the impact of inflation on income inequality. The study found that low inflation level (considered as below five percent a year) and controlled inflation improve income

distribution. The stabilization of general prices has a nonlinear positive impact. The author stated that price stability offers a free lunch which means that disinflation does not have any medium-term or long-term costs on income inequality; there are only benefits of it.

The United Nations Development Program (UNDP) published a special report about Turkey in 2016 which studied the income and social inequalities in Turkey focusing on the GINI coefficient, S80/S20 disposable income quintile, and poverty rates. As mentioned in this study before, P80/20 ratio is the ratio of the household income at the 80th percentile to the household income at the 20th percentile and, S80/S20 ratio is the ratio of total income received by the 20% of the population with the highest income (the top quintile) to that received by the 20% of the population with the lowest income. Although Turkey ranked 18th among other countries in terms of the Gross Domestic Product (GDP), she ranked 72nd according to the Human Development Index (HDI) of the UNDP. Turkey's human development progress has not converged to her economic growth (ibid, 2016). In the latest report of UNDP in 2020, Turkey ranked 54th according to the Human Development Index (HDI) of the UNDP.

Turkish Industry and Business Association (TIBA) Report published by Selim, Günçavdı, and Bayar (2016) analyzed the regional income inequalities in Turkey and showed that the two regions, the Mediterranean and the Central Eastern Anatolia, had higher GINI coefficients than the other regions and the Mediterranean region had the highest GINI coefficients throughout the 2006 and 2011 period. The report underlined that the income inequalities between the regions are striking because the property rental income and the interest income are the main sources of the income inequality in Turkey. Especially in the Eastern Black Sea and the Eastern Marmara regions, property rents had a significant impact on the rising income inequalities after 2009 and interest incomes had a substantial impact on the income inequalities in the South-Eastern Anatolia region in 2009.

Dağdemir et al. (2018) studied the impact of migration on poverty and income distribution in a rural region of Turkey and suggested that migration lessens the poverty and income distribution of the middle-income Turkish households. Tamkoç and Torul (2019) investigated the cross-sectional facts in Turkey for wage, income, and consumption inequality and compared her with nine countries. Their study indicated that the wage, income, and consumption inequality trend is

downward sloped between 2002 and 2016 due to the rapid minimum wage increase and the decline in informal employment. Turkey's economic inequalities resemble the Russian Federation most, among the nine countries that are included for comparison. Pakistan is another meaningful analogous to Turkey in terms of income inequality and dollarization.

Kos and Güven (2007) studied the link between government education expenditures and income inequality in Turkey on province basis. The study explained that although increasing the government expenditures on education decreased the level of income inequality, the results suggest that relatively poor provinces significantly benefit more than relatively rich provinces. The study also noted that lowering inflation and maintaining price stability alongside with an increase in government education expenditures help decreasing income inequality (ibid). Duman (2008) analyzed that the lowest income quintile in Turkey has the lowest level of education and the government spending on education in Turkey is relatively lower than the Organization for Economic Co-Operation and Development (OECD) countries on average.

With the adoption of the neo-liberal economic model in Turkey during the 1980s, income inequality rose significantly due to the negative trend of real wages, tax policies, and high interest rates. Elveren (2010) analyzed the wage inequality in the Turkish manufacturing sector for the period 1980 and 2001. The study suggests that although the inequality in the private sector increased in Turkey between 1980 and 2001, the inequality in the public sector stayed almost stable. This conclusion is revealed since metropolitan areas dominate the allocation of sub-manufacturing sectors and specialization and industrial concentration increased regionally.

Yeldan (2004) examined the impact of financial liberalization and the rise of financial rents on income inequality in Turkey. The study indicated that as financial capital gained supremacy over industry, wage incomes of the working class, especially the poor, worsened. Dynamics of real wages against labor productivity increased income inequality in the long term. Destek, Sinha, and Sarkodie (2020) examined the nexus between financial development and income inequality in Turkey in detail by creating four financial development indices: (i) overall financial development index, (ii) banking sector development index, (iii) stock market development index, and (iv) bond market development index. The study showed that the rise in real income and government expenditure tends to decrease income inequality and even though inflation has a

positive impact on income inequality in the short-term, its impact on income inequality in the long-term is negative. Considering financial development, the study confirmed that the overall financial development index and banking sector development index have proven the Kuznets' inverted U-curve hypothesis of income inequality. The study also confirmed that income inequality and stock market development index have a monotonically decreasing relationship. Çetin, Demir, and Saygın (2021) analyzed the link between financial development, technological innovation, and income inequality for the period between 1987 and 2018 and indicated that Financial Kuznets' Curve (FKC) is valid for Turkey in the long-term. The study reveals that while technological innovation affects income inequality positively; economic growth is negatively correlated with income inequality. The study also suggests the improvement of the financial system and elimination of the negative effects of technological innovation on income distribution.

Örnek and Elveren (2010) examined the relationship between trade openness and income inequality in Turkey between the 1980-2001 period. They presented that there is a strong causality between trade openness and income inequality. Öz (2017) studied the effect of foreign trade on income inequality between the 1980-2014 period and stated that imports, exports, foreign trade deficits, and foreign trade ratio are not correlated with the GINI coefficient values; but foreign trade volume is significantly correlated with them. The study was separated into two periods: (i) the first period covered the years before the 2001 economic crisis and (ii) the second period covered the years after the 2001 economic crisis. While the study confirmed Kuznets' inverted-U curve hypothesis for the first period it rejected the hypothesis for the second period due to the increase of government income especially between 2001 and 2007.

Yıldırım and Öcal (2006) studied the economic convergence and income inequality in Turkey which has been a debated issue for a long time with limited empirical evidence. The study used the Theil coefficient and indicated that regional income inequality is a small portion of the overall income inequality. According to the study, 67 provinces are grouped into four regions (Marmara, Ege-Akdeniz-West Anatolia, East and South-East Anatolia, and Karadeniz-Mid Central Anatolia) in Turkey that have smaller income disparity within the region rather than between regions and hence, as a result these four regions are accepted to be homogenous in nature. The study also reveals that although income inequality decreased nationally, regional income disparities are still observed.

Elveren (2012) analyzed the impact of military spending on income inequality in Turkey for the 1963 and 2007 period. The study shows that there is a strong relationship between military spending and income inequality in Turkey indicating that income distribution worsens when military spending increases.

Uzar and Eyüboğlu (2019) examined the impact of income distribution on the carbon dioxide (CO₂) emissions in Turkey during the period between 1984 and 2014. The study reflects that the Environmental Kuznets' Curve (EKC) is valid for Turkey and income inequality has a positive and significant relationship with CO₂ emissions. It is revealed that because of rapid economic growth and hence industrialization energy consumption determines the CO₂ emissions in both the short and long terms. The authors noted that, the urbanization rate has a significant impact on CO₂ emissions and trade openness have a negative effect on CO₂ emissions. The study advised that decreasing the income inequality is also a fight against the CO₂ emissions problem and this new strategy may result as a win-win situation for Turkey.

2.2. Dollarization and Devaluation/Currency Depreciation

As McKinnon (1982), Akçay, Alper, and Karasulu (1997), Berg and Borensztein (2000), and Yinusa (2008) indicated dollarization is the crucial cause of currency depreciation and hence, exchange rate instability. This study defines dollarization in detail in Chapter 3 and as stated before the term dollarization will be used in general instead of currency substitution.

Calvo and Rodriguez (1977) showed that in the existence of currency substitution, if there is an expansion of money supply this leads to an immediate real depreciation of domestic currency in the short run. Georgiou (1991) stated that under a floating exchange rate regime, the rate of change of the exchange rate will be higher in the long term, because of the existence of foreign currency deposits in the banking system.

Dollarization is an ongoing problem in Latin America since the Bretton Woods (BW) Agreement, the countries that have more than 30 percent Foreign Currency Deposits/Total Deposits or Foreign Currency Deposits/M2Y ratios in the study are from Latin America. Hence, most of the

studies about dollarization are based on Latin American countries. One of them is Clements and Schwartz (1993) who studied dollarization in Bolivia and indicated that economic agents prefer to hold foreign currency because of domestic currency depreciation and interest rate differentials. Engel (1989) stated that in the existence of dollarization, the response of real exchange rate is unclear because it depends on the total earnings on the foreign assets. Ramirez-Rojas (1985) and Clements and Schwartz (1993) underlined that if dollarization ratio is influenced by devaluation expectations, whenever the expected rate of currency depreciation is higher than the total earnings on the foreign assets, economic agents prefer foreign currency instead of domestic currency and therefore, domestic currency depreciates.

McKinnon (1982, 1993, 1996) presented that dollarization is a pivotal cause of both exchange rate instability and depreciation of domestic currency. Akçay, Alper, and Karasulu (1997) showed that exchange rate volatility increases in accordance with the degree of currency substitution hence because of higher volatility domestic currency depreciates in the short run. Several studies, such as Willett and Banaian (1996), Berg and Borensztein (2000), and Yinusa (2008) also have come to the same conclusion of dollarization being the pivotal cause of currency depreciation.

Kem (2002) stated that there is a long-run relationship between the expected rate of depreciation and dollarization between the 1993-2001 period in Cambodia. Lay, Kakinaka, and Kotani (2010) also studied the relationship between dollarization and exchange rate movements in Cambodia and agreed with McKinnon's (1982, 1993, and 1996) findings that dollarization is the pivotal cause of currency depreciation and exchange rate instability. This study employs Lay, Kakinaka, and Kotani's (2010) model to analyze the relationship between dollarization and exchange rate movements in Turkey.

2.3. Devaluation/Currency Depreciation and Income Inequality

According to the literature, there may either be a positive or negative relationship between exchange rate and income inequality depending on the macroeconomic structures, growth model, economic, and political policies of a country. Even on a country, state or city basis, the relationship may vary, as in the study of Bahmani-Oskooee and Motavallizadeh-Ardakani (2017b) who

analyzed 51 states of the U.S. and found different results. Because of the low interest rates in the U.S., the gold reserves drained, financial account surplus decreased, Vietnam War expenditures rose, and input prices increased thereby leading to oil crisis.

The first study that emphasizes devaluation/depreciation, inflation, wages, and income distribution is Alexander's (1952) which argued that devaluation/depreciation results in inflation and income may be transferred from workers to capital holders if wage increase does not adjust to the increase in inflation. Alexander (1952) indicated that the rise in wages lag behind the rise in prices. Hence, employers maximize profits and gain more at the expense of employees because employees have high marginal propensity to absorb, and employers have low marginal propensity to absorb. Krugman and Taylor (1978) supported Alexander (1952) by stating "if money wages lag the price increase and if the marginal propensity to save from profits is higher than from wages, ex ante national savings goes up. The magnitude of the resulting contraction depends on the difference between savings propensities of the two classes".

Lindert (1986) argued that devaluation/depreciation has different effects on different income level groups because of inflationary effects in the short term. Theoretically, an increase in national income should reduce income inequality in the long run, as employees would be able to find higher paying jobs. Kuznets (1955) stated that since only the wealthy are able to save, an increase in the income of the rich in the long run widens the gap between the rich and poor. As a result, new economic models implemented by the developed countries in 21st century affects income inequality negatively. Conceição and Galbraith (2001) expressed that an increase in income tends to result directly in lower inequality in developing countries but the policies that are applied to raise income matter.

Bahmani-Oskooee (1997) studied the effects of exchange rate changes on income distribution. A cross sectional model with data from 24 countries showed that devaluations have negative effects on income distribution, and they create inflation. Therefore, redistribution of income occurs and triggers the increase in inequality. In the era of currency and trade wars, developed countries are shifting from being consumption-based economies to export-oriented economies to create trade surplus. In order to be successful, these countries depreciate their currencies by lowering their interest rates to zero, even negative values, by printing money and

buying bonds in the name of quantitative easing. At the end, these countries generate higher growth than the previous decade's growth and increase their national income levels. The transfer of income from workers to capital holders is "based on the assumption that there could be long lags of wages behind prices, at least in the short-run" (ibid, 1997).

The depreciation of the domestic currency raises the value of foreign assets which are held by high-income residents. By assuming that these residents make up the minority part of the community, income inequality will rise due to the wealth increase of the minority part of the community. Arango and Nadiri (1981) stated that foreign asset owners may feel wealthier because of depreciation and then, their demand for domestic currency may increase. According to the Aggregate Demand (AD) and Aggregate Supply (AS) model, depreciation affects net exports positively on the AD side; however, because of the pass-through effect, inflation rises leading to an increase in the cost of imported goods and a decline in the AS. Krugman and Taylor (1978) stated that a decline in AS could more than offset the increase in AD thereby diminishing domestic output.

Bahmani-Oskooee and Hajilee (2010) studied the effects of currency depreciation on wages by dividing the working class into skilled and unskilled labor and found that currency depreciation affects the increase in the wage rate between the skilled and the unskilled workers in favor of skilled workers. Their findings are based on the assumption of high marginal propensity for unskilled workers and low marginal propensity for highly skilled workers which is in line with Alexander's (1952) and Krugman and Taylor's (1978) studies. Also, devaluation/depreciation have effects on other macro variables like imports, exports, trade balance, production, and demand for money etc. However, the effect on income distribution is not only an economic problem, but also a sociological problem in the long term which then becomes a vicious circle from economics to sociology and vice versa. Due to devaluation/depreciation when rich get richer, and poor get poorer, educational opportunities of the second generation vary depending on the income of the families. If the children of the poor are not well educated, their chances to be successful and generate middle or high income are less than the children of the rich. The income distribution becomes worse for the second generation and the gap between the rich and poor widens more than the one observed in the first generation. Diaz-Alejandro (1965) argued in his study on Argentina, a country notorious for hard devaluations during the twentieth century, that depreciation of the domestic currency has negative effects on the real wages and employment of the poor.

Shahbaz, Islam, and Butt (2011) studied devaluation and income inequality in Pakistan during the 1973-2006 period and observed that nominal devaluation aggravated income inequality. The study tested Kuznets' hypothesis (1955) like Bahmani-Oskooee (1997), while Shahbaz, Islam, and Butt (2011) used the GDP per capita, devaluation rate, FDI, trade openness, inflation, and unemployment rate as independent variables and the GINI Coefficient as dependent variable; Bahmani-Oskooee (1997) used real income per capita, devaluation rate, growth rate of real Gross National Product (GNP), and population growth as the independent variables and P80/P20 ratio as the dependent variable in formulating the Kuznets' hypothesis. The former (2011) found evidence that FDI, growth, and trade openness worsened income distribution in Pakistan. According to the model, a 1 percent increase in nominal devaluation affects income inequality negatively by 0.06 percent, on average all else being equal. Their results support Kuznets' inverted U relationship and confirm Bahmani-Oskooee's (1997) findings for 24 countries. Pakistan may not be a competitor of Turkey, however in terms of their macroeconomic structures both countries are similar. Both Turkey and Pakistan are countries that have solid chronic problems such as: net imports of energy, exposure to high inflation, unemployment, and balance of payment deficits. Also, both countries do not have proper commercial policies in tune with their growth policies.

Shahbaz and Rahman (2012) investigated the impact of nominal devaluation on income distribution in Bangladesh both for the short-run and long-run. Their study expresses that economic growth and nominal devaluation have positive effects on income distribution and there is non-linearity between the variables of Kuznets' hypothesis in Bangladesh. However, financial development and trade openness have negative effects on income distribution. Also, the negative effect of trade openness on income distribution is linked to the Leontief Paradox (1953) which suggests that a country with a higher labor capital per worker has a lower capital/labor ratio in exports relative to its imports.

Delatte and Lopez-Villavicencio (2012) discussed the effects of devaluation/depreciation on income distribution through inflationary effects of depreciation since prices react to exchange rate changes in an asymmetric manner. The study stated that the measure of income distribution also reacted to exchange rate changes in an asymmetric manner.

Bahmani-Oskooee and Motavallizadeh-Ardakani (2017b) stated that changes in the value of the USD could have asymmetric effects on income distribution. The study found that the exchange rate has short-run effects on income inequality in the 29 states of the U.S.; however, they could not find any significant long-run effects on income equality in their linear model. But, by using a non-linear model, for the 49 states of the U.S., they found meaningful and significant long-run effects of exchange rate changes on income equality, except for Nevada. The study claimed that “such long-run asymmetric effects and asymmetry cointegration must be attributed to non-linear adjustment of the real effective value of the dollar” (ibid, 2017). As a result, they mentioned that wages adjust to inflation differently and asymmetrically in each state and this adjustment of wage directly contributes to the different asymmetric effects on income inequality.

Carloni (2018) investigated how the nominal foreign currency depreciation against the USD affects the U.S. wealth and suggested that the foreign currency depreciation against the USD would negatively affect the wealth of the U.S. residents and indicated the need of Border Adjustment Tax (BAT). Min, Shin, and McDonald (2015) studied the relationship between income inequality and real exchange rate (RER) on 56 countries, except Turkey, and indicated a “robust empirical evidence for a negative association between income inequality and the real exchange rate”. Their study showed that income inequality is positively correlated with the price of non-tradables and because of a decline in the price of non-tradables, RER will depreciate; hence income distribution will be improved. Rodrik (2008) analyzed seven developing countries (China, India, South Korea, Taiwan, Uganda, Tanzania, and Mexico) and stated that rapid growth periods are associated with the undervaluation of the domestic currency because of the increase in relative profitability of tradables which trigger a change in the direction of growth.

Mariolis, Rodousakis, and Katsinos (2019) studied the effects of wage and currency devaluations on international price competitiveness and income distribution for Greece and Italy and their study detected that “both effective wage and currency devaluations imply significant effects on income distribution in the long-run, while the wage rate is more sensitive than the profit rate to currency devaluation”. Hence, this proves that currency devaluation has a significant effect on income distribution, and it involves a range of alternative distributive regimes.

After the BW, many economists believed that the floating exchange rate system would be better since the RER misalignments would be corrected automatically with the adjustment of domestic prices, stabilization of the RER, and balance of payments (BoP) equilibrium. According to the neoclassical law of one price the relative prices will remain unchanged and for a free open economy, free floating exchange rate regime is suitable. Turkey devaluated the TL on September 7th, 1946, August 4th, 1958, and August 10th, 1970, respectively. Other adjustments such as the one on January 24th, 1980, were made in the Turkish economy between 1970 and 1980. After the application of the free-market economy the TL depreciated sharply on April 5th, 1994, February 21st, 2001, September 29th, 2008, and August 9th, 2018.

Turkey liberalized its economy in 1984 and changed the law of the Protection of the Value of Turkish Currency by allowing the Turkish workers, who are living abroad, to open Foreign Exchange Deposit Accounts in Turkey and hence, dollarization started. The beginning of dollarization in Turkey has been similar to the Latin American (LATAM) countries which had experienced high inflation between the 1980-2000 period. With high domestic inflation and low or zero real rate conjuncture residents prefer to substitute domestic currency-based saving accounts to foreign currency-based saving accounts. Specifically, the currency depreciation and dollarization, and their impact on income inequality have not been studied in Turkey. For example, Öz (2019) investigated the relationship between the GINI coefficient and the P80/P20 income inequality ratio. Daşkaya and Sağbaş (2019) concentrated on consumption inequality among households rather than wealth or income inequality.

Sarel (1997) studied the macroeconomic factors that affect income inequality in 52 countries, including Turkey. The study constructed a large cross-country database including income distribution, macroeconomic, and demographic variables. The study highlighted that higher growth rate, higher income level, higher investment rate, real depreciation, and improvement in terms of trade have significant negative effects on income inequality. Therefore, the effect of real depreciation on income inequality is a more significant and important effect in low-income countries. Akçay, Alper, and Karasulu (1997) studied the effects of currency substitution on exchange rate instability in Turkey and concluded that exchange rate instability increases with the degree of currency substitution. Their study hypothesizes that the path to income inequality starts

from currency substitution under the dollarization process which triggers instability-mainly depreciation- of the TL and ends with higher income inequality in Turkey.

Litwin (1998) and Spilimbero, Londono, and Szekely (1999) stated that LATAM countries and Turkey which were generally exposed to high devaluation/depreciation since the 1950s tended to have high GINI coefficients. LATAM and Turkey are clear examples of high-income inequality because of historical devaluations/depreciations. Garcia (1999) investigated the theoretical relationship between exchange rate and income inequality using a Salter-Swan type general equilibrium model with heterogenous agents and found that the relationship may either be positive or negative. According to Aghion et al. (1999,) the relationship between real exchange rate and income inequality shows that a better income distribution is beneficial for growth. Agenor (2004) showed that the exchange rate depreciation (higher currency value) increases the welfare of the poor.

3. CURRENCY DEPRECIATION AND INCOME INEQUALITY IN A DOLLARIZED ECONOMY

This part of the study is about defining and examining dollarization, currency depreciation and income inequality with a wide range of literature review.

3.1. Dollarization

Dollarization is a crucial and chronic problem for developing countries. In this part this study will define dollarization from a wide range of literature review.

3.1.1. The Theory of Dollarization

“Dollarization” or with the formal term “Currency Substitution” has started with the fall of pegged currency system in 1970s after the BW. At the beginning of 1980s, the term dollarization was added to the literature with the first academic studies on the subject focusing especially on LATAM countries. “Dollarization, in a broad sense, is increasingly a defining characteristic of many emerging market economies” (Reinhart, Rogoff, and Savastano, 2003). Uribe’s study (1997) was the first academic study which used the term dollarization instead of currency substitution. Calvo and Vegh (1992) stated that in high inflation countries, dollarization is a form of financial adaption where country residents use foreign currency as a means of payment, the term is also used to indicate that a foreign currency serves as a unit of account or a store of value. Feige (2003) defined the store of value as “Asset Substitution” and stated that dollarization is the combination of both “Currency Substitution” and “Asset Substitution”. This study will use the term of dollarization instead specifying the name of each type of dollarization.

3.1.2. Definition of Dollarization

Defining dollarization is difficult depending on the economic era that it occurred and whether the dollarization is asset based or liability based in that country. However, the generally accepted and the first definition of dollarization is, if residents hold some part of their asset portfolio in foreign currency, that economy of dollarization is called a dollarized economy. This study is based on the above-mentioned definition of dollarization although this measure does not

include cash foreign currency amount and offshore deposits. Calvo and Vegh (1992) expanded the first definition as, if residents of a country prefer to use foreign currency instead of local currency and also if the foreign currency takes over the storing value function of the local currency, dollarization occurs. The second definition of dollarization is, if a country that has not issued its own national currency or prefers to use a foreign currency instead of its own, then country has a dollarized economy. This definition was actualized after the 1997 Asian Financial Crises. The third definition of dollarization is, if the private and public sectors of a country has borrowing in foreign currency; hence, exposing it vulnerable to external shocks, that country is also called a dollarized economy. Considering the balance sheet of a country, in terms of its assets and liabilities, if both sides of the balance sheet are weighted in foreign currency than this country is fully dollarized, as it is in the case of Turkey, which is the main focus of this study.

Friedman and Verbetsky (2001), stated that the currency substitution is the last step of dollarization progress. The dollarization progress starts with the behavioral change of the residents who prefer foreign currency as their saving account value and continue to exchange local currency to foreign currency as a storing value.

As stated in Bahmani-Oskooee and Domaç (2003), dollarization reflects efforts of residents and firms in a country to protect the value of their wealth under deteriorating financial conditions which are caused by instable macroeconomic policies, political and some external factors. The traditional measure of dollarization in the literature is the ratio of foreign currency deposits to total deposits in the banks of a country.

During the last four decades, rapid increase of dollarization has been a significant feature of globalization especially in emerging and transition economies. Foreign currency, which is mostly USD, has been used for payment and storage of the wealth, instead of local currency. Some countries abandoned the usage of foreign currency by law and some countries allowed it and even switched to dual currency regime. Nicolo, Honohan, and Ize (2003), found that a sound macroeconomic policy application and the institutional structure are the key determinants of cross-country variations of dollarization. They also found that dollarization promotes a deeper domestic financial system, however, in inflationary economies, dollarization has an adverse effect on financial depth and increases the risk in the banking system.

3.1.3. Types of Dollarization

Giovannini and Turtelboom (1992), state that the definition of currency substitution in the literature is not clear since the definition varies from a narrow to a broad view of the role of money. Their study points to the use of the term “substitution” which is rather uncommon in economics. Further, they refer to the meanings of substitution, as “1: to put in place of another: exchange; 2: replace.” The authors claim that the “substitution” does not refer to the characteristic of currencies and hence, they prefer to use “substitutability”. Their study defines the determinants of “Currency Substitutability” by referring to the three functions of money which are: “Unit of Account”, “Provider of Transactions Services” and “Provider of Store of Value Services”. According to their study this replacement of the term makes sense because there are no reasons to believe that a “Substitutability” implies “Substitution” or vice versa.

Calvo (1999), defines the types of dollarization as “Partial Dollarization” and “Complete Dollarization”. If foreign currency takes over one of the three main functions of domestic currency than it is called “Partial Dollarization”, for example in LATAM countries and Turkey. If foreign currency is used in official payments and salary payments instead of the domestic currency, then this situation is called “Complete Dollarization”, for example in Panama.

Dollarization process varies from the developed countries to developing countries. In the developed countries, foreign currency is used in portfolio diversification and foreign trade transactions. However, in developing countries, residents prefer foreign currency to hedge their wealth against high inflation as a saving instrument. Ramirez-Rojas (1985) added depth to definition by defining the “Currency Substitution” in developed countries as “symmetric” and the “Currency Substitution” in developing countries as “asymmetric”. In developed countries both residents and non-residents demand both foreign currency and domestic currency mutually and this is defined as “Symmetric Currency Substitution”. However, in developing countries, the demand of foreign currency is unilateral, and it is defined as “Asymmetric Currency Substitution”. Residents demand both domestic currency and foreign currency but non-residents do not have a counter demand.

Meyer (2000), classified dollarization into three varieties as “Unofficial Dollarization”, “Semiofficial Dollarization” and “Official Dollarization”. According to the study, “Unofficial Dollarization” is “Currency Substitution”, “Semiofficial Dollarization” is the acceptance of USD as official and efficient currency besides with the domestic currency and “Official Dollarization” is the acceptance of USD as the official currency in a foreign country. Ize and Yeyati (2003), used the term of “Financial Dollarization” to define “Asset Dollarization” and “Liability Dollarization”.

Reinhart, Rogoff, and Savastano (2003) determined the variety of dollarization on the basis of two criteria: first criteria is the degree of domestic dollarization, and the second criteria is the amount of foreign borrowing of the private sector. The degree of domestic dollarization is measured by the ratio of foreign currency deposits to broad money supply and foreign currency denominated debt to total government debt using threshold of 10 percent as below and above. The amount of foreign borrowing of the private sector is measured by the ratio of private sector debt to total external debt using threshold of 10 percent below and above. By using 10 percent threshold for both criteria, 4 types of dollarization are classified.

Table 1: Types 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 domestic public debt are denominated in or linked to a foreign currency	Type I	Type II
Less than ten percent of broad money and domestic public debt are denominated in or linked to a foreign currency	Type III	Type IV
Source: Reinhart, Rogoff and Savastano, 2003		

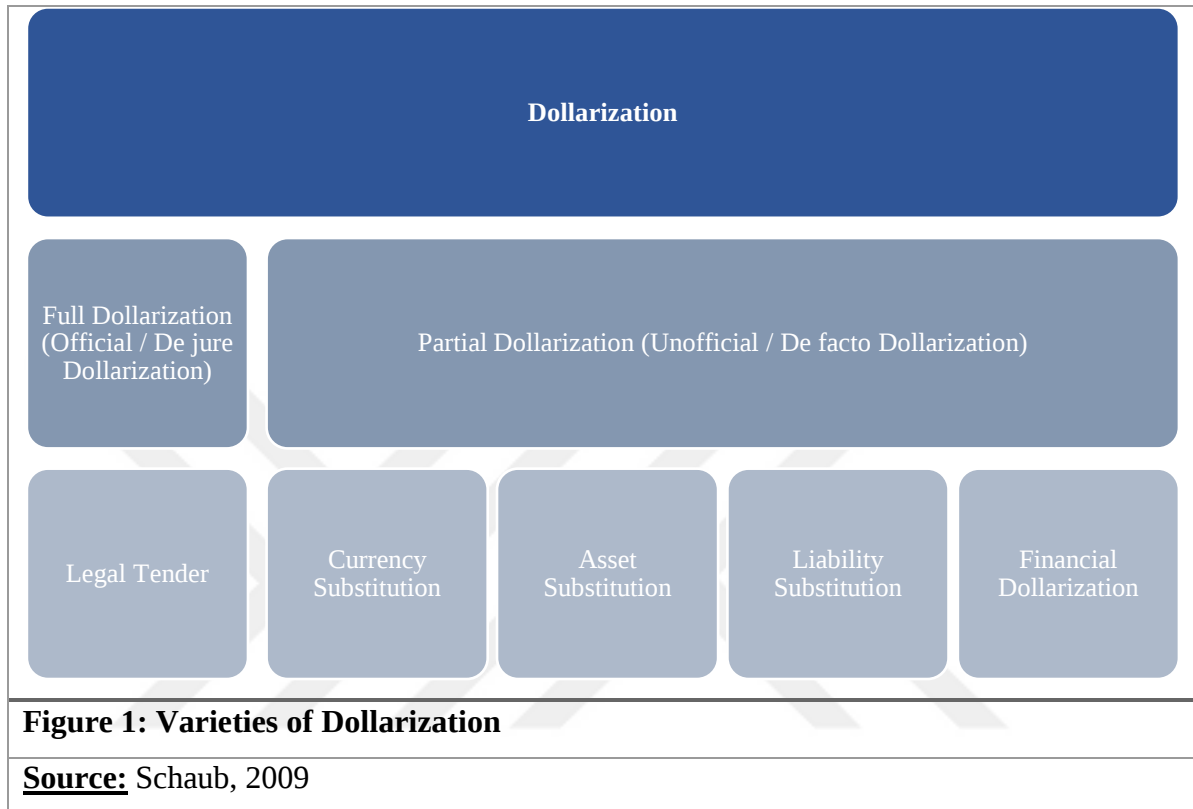
Four types of dollarization are classified with two criteria in Table 1. According to Table 1, Type I is defined as the countries with both domestic and external liability dollarization, Type II is defined as domestic liability dollarization with less private sector foreign denominated debt, Type III is defined as external liability dollarization with high private sector foreign denominated debt

and Type IV defined as low domestic dollarization with high external liabilities of government. By using this classification, Reinhart, Rogoff and Savastano (2003) stated that this approach has 3 main advantages and 3 disadvantages against standard empirical studies on partial dollarization. The first advantage is the full coverage of both foreign currency denominated assets of the private sector and liabilities of the economy in a country. The second advantage is that domestic dollarization is taken into account by adding foreign currency denominated debt which was generally ignored in previous studies. The third advantage reflects the 4 types of data mentioned in the above table which are easily applicable to all quantitative studies that measure dollarization. The first disadvantage is the lack of cash holdings and deposits of households on the asset side and the lack of foreign currency denominated borrowing of local private sector on the liability side. The second disadvantage is the external debt to GNP ratio which does not reflect the effect of dollarization according to the balance sheet of sectors. The third disadvantage is this classification which ignores the macroeconomic instabilities that causes the dollarization.

Schuler (1999) stated that dollarization has three main varieties as: Official Dollarization, Semiofficial Dollarization, and Unofficial Dollarization. Official Dollarization occurs in a country where foreign currency is accepted as full legal tender. In this case, domestic currency may also exist as in Panama or there could be no domestic currency like in Andorra. In a country where domestic currency is used for paying wages, taxes, and all daily expenses; however, foreign currency is legal tender and foreign currency exposure is more than domestic currency exposure in bank deposits, Semiofficial Dollarization occurs like Bahamas and Liberia. In a country where households hold their wealth mostly in foreign assets even though foreign currency is not legal tender, Unofficial Dollarization occurs like most of Latin America countries, Russia, and Turkey.

Meyer (2000) also used same varieties of dollarization as Schuler (1999) and classified as Official Dollarization, Semiofficial Dollarization, and Unofficial Dollarization. Meyer also used Unofficial Dollarization term to express “currency substitution”. Calvo (1999), used the term dollarization to emphasize Full Dollarization which is the substitution of domestic currency with foreign currency in legal payments in a country. The paper used the term Partial Dollarization for the status which is out of scope of Full Dollarization.

By combining all definitions and views of dollarization, this study combines the views on literature, and we will define two main types of dollarization. First one is Full Dollarization i.e. Official Dollarization (De-jure Dollarization), and the second one is Partial Dollarization i.e. Unofficial Dollarization (De facto Dollarization).



3.1.3.1. Full Dollarization

A country which adopts a foreign currency for all money functions as a legal tender to replace its own domestic currency is called a fully dollarized country. Full Dollarization is also called Official Dollarization. According to Quispe-Agnoli, and Whisler (2006), the adopted foreign currency takes over all the functions of the domestic currency as store of value, medium of exchange and unit of account. The developing market financial crisis in the 1990s, Mexico 1994-1995, Asia 1997, Russia 1998, Brazil and Ecuador 1999, Argentina 2001-2002, and Turkey 2000-2001, started discussions over the exchange rate systems. For example, Ecuador adopted the U.S. Dollar as legal tender in 2000 and El Salvador adopted full dollarization policy to improve its economic reform process in 2001. Panama which is the most popular fully dollarized country has been dollarized since 1904.

A few developing countries substituted their domestic currency with a foreign currency during the 20th century. The causes of currency substitution differ in their purposes from one country to another as in the example of Ecuador and El Salvador.

According to Meyer (2000), in a country where official dollarization is adopted, no domestic currency is used. Official dollarization also brings a “fixed exchange rate system”, sometimes called a “pegged exchange rate”, generally pegged to the U.S. Dollar. This fixed exchange rate system is irreversible, and this irreversibility creates a credible economic system with low country risk premium, low inflation, and thereby low interest rates which encourage foreign direct investments. And this policy helps to avoid balance of payments (BoP) crisis in a fully dollarized country. The highest cost of official dollarization is losing the ability of generating seigniorage which is financing fiscal deficit by the revenue of issuing domestic currency.

Except the countries that have adopted fixed exchange regime, the floating exchange regime is the commonly adapted exchange rate policy globally. The value of the domestic currency is determined by demand and supply in the market under a floating exchange regime. In the case of fixed exchange regimes, the value of the domestic currency is pegged to a foreign currency that is announced publicly day by day. The change in the value of the currency under fixed exchange regimes is generally managed by a currency board which is accepted as the “soft fixed exchange rate” regimes. The “hard exchange rate” regime is Official Dollarization (Full Dollarization) that requires the use of foreign currency instead of domestic currency, which is generally the U.S. Dollar.

Table 2 - List of Officially Dollarized or Dual Currency Countries 2002

Countries	Population	GDP	Legal Currency	Local Coins	Since
Kiribati	82,000	0.1	Sterling Pound replaced by the Australian Dollar		2001
Liberia	3,300,000	0.5	Dual Currency: U.S. 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: U.S. 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	Swiss Franc		1921
Tuvalu	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	1865 (Franc) 2002 (Euro)
East Timor	857,000	0.2	U.S. Dollar		
Palau	19,000	0.2	U.S. Dollar		
San Marino	26,000	0.1	Italian Lira replaced by the Euro	X	1897 (Lira) 2002 (Euro)
Nauru	11,000	0.1	Australian Dollar		1914
Vatican City	1,000	0.0	Italian Lira replaced by the Euro	X	1929 (Lira) 2002 (Euro)

Source: Minda, 2005

Edwards and Magendzo (2003) studied and compared the economic performance between independent and fully dollarized Panama and partially dollarized Puerto Rico. Their study concluded that in fully dollarized economies inflation and expectations about inflation are lower than partially dollarized economies. Also, GDP per Capita (GDPPC) is higher in fully dollarized economies than partially dollarized economies.

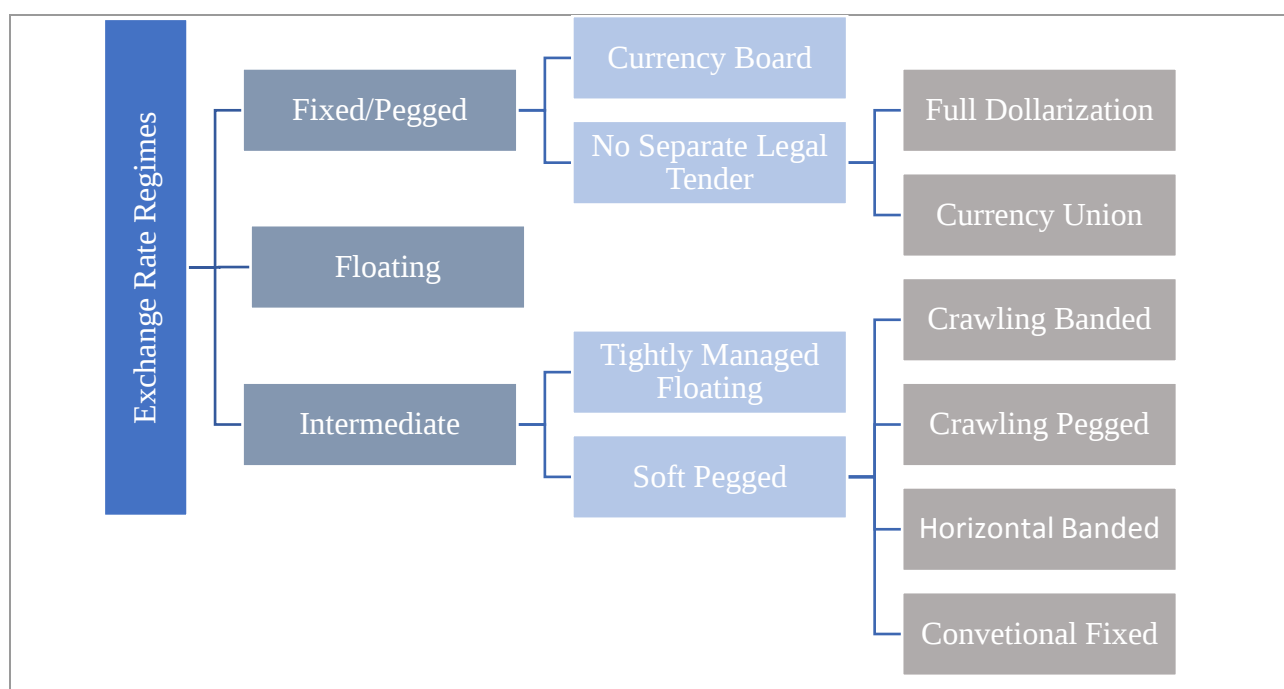


Figure 2 - Types of Exchange Rate Regimes
Source: Yörükoğlu, 2006

Full Dollarization is a part of “exchange rate regime”. Exchange rate regimes can be classified to Floating Exchange Rate, Intermediate Exchange Rate, and Fixed/Hard Pegged Exchange Rate regimes. As may be seen in Figure 2, exchange rate regimes may be sub-divided into different categories depending on the expectations of a country’s macroeconomic policy. Under the Floating Exchange Rate regime, domestic currency value is determined by the supply and demand in the market. Under Fixed/Pegged Exchange Rate regime, domestic currency is pegged or in other words tied to a foreign currency at officially announced value which generally does not vary, from day to day but may be adjusted throughout a period. Full Dollarization is the extreme point of Fixed or Hard Pegged Exchange Rate regimes; in other words, Full Dollarization is a part of Fixed Exchange Rate regime which requires the use of foreign currency, generally the U.S. Dollar, instead of domestic currency. Intermediate Exchange Rate regimes include “soft pegged regimes” (conventional Fixed Pegged Exchange Rate, Horizontal Banded Exchange Rate, Crawling Banded Exchange Rate and Crawling Pegged Exchange Rate) as well as tightly managed Floating Exchange Rates which are between Fixed Exchange Rates and Floating Exchange Rates. This type of exchange rate regime is adjustable Fixed Exchange Rate regime. The Central Bank of a country may intervene in the foreign exchange market either from the sell side or the buy side to affect the value of the currency depending on its target.

Although full dollarization is accepted as part of a Fixed Exchange Rate regime, it shows permanent characteristic results because the value of the domestic currency may be changed by the monetary authorities under Fixed Exchange Rate regimes. Fixed Exchange Rate has some future risks, but Full Dollarization eliminates the risks that are derived from exchange rate. So, when a country decides to adopt a foreign currency as a legal tender, there are two implementations of this policy which are Unilateral Dollarization and Bilateral Dollarization.

If a country adopts a foreign currency without consulting or making an agreement with the issuer of the foreign currency’s country, it is called Unilateral Dollarization. Under this system, the dollarized country has no obligation to the issuer country of the foreign currency so any country may implement this type of dollarization anytime they wish without any negotiation or agreement

with the issuer country. Panama, Virgin Islands, Marshall Islands and Puerto Rico are main examples of unilateral dollarized countries. However, according to Curuchet (2001) the implementation of dollarization without agreement has some disadvantages like sharing the seigniorage revenue and the possibility of acting as a last resort lender.

If a country adopts a foreign currency by making an agreement with the issuer country to specify conditions like sharing the seigniorage revenue and access to the discount window of the central bank, it is called Bilateral Dollarization. Under Bilateral Dollarization, countries can change their law, macroeconomic policies, establishing Central Bank and adopting a new currency easier compared to Unilateral Dollarization. By signing an agreement with the issuer country, the issuer supplies coins, and bills of the currency to the dollarized country. Ecuador and Timor-Leste are main examples of bilateral dollarized countries.

3.1.3.2. Partial Dollarization

If a foreign currency takes over one of the three main functions of a domestic currency in a country, unit of account, provider of transactions services, and provider of store value, this is called Partial Dollarization. Argentina, Bolivia, Peru, and Turkey are the main examples of partially dollarized countries.

Partial Dollarization is a general concept which includes Currency Substitution, Asset Substitution, Liability Dollarization and Financial Dollarization. Partial Dollarization is not an instantaneous situation; it occurs through time. Partial Dollarization should be understood as a whole since the extent of substitution and dollarization in a country cannot be measured precisely if an informal economy exists. According to Feige (2003) informal economy is one of the main causes of partial dollarization.

To summarize, Partial Dollarization is a common concept used to refer to all types of dollarization that occur in different ways or are seen in different degrees of a similar dollarization situation in the economies of developing countries where Full Dollarization does not exist. In the literature, there are different varieties of Partial Dollarization such as Currency Substitution, Asset

Substitution, Liability Dollarization, and Financial Dollarization. Turkey is one of the partially dollarized countries which is subject to all kinds of varieties mentioned.

3.1.3.2.1. Currency Substitution

With the collapse of the BW system, the value of the currencies started to float in the financial markets by 1973. Since then, there are numerous studies about Currency Substitution in the literature. Feige (2003) evaluated dollarization by stating that the process consists of Currency Substitution and Asset Substitution. According to Feige and Dean (2002) when a foreign currency bears the function of being a payment instrument which is one of the basic functions of a national currency, it is defined as Currency Substitution. And when a foreign currency bears the function of storing the value of a national currency, then it is defined as Asset Substitution.

Quispe-Agnoli (2002) mentioned the difference between Currency Substitution and Asset Substitution in his study. The study defines Currency Substitution as the use of foreign currency serving as a medium of exchange and unit of account and Asset Substitution as the use of a foreign currency serving as a store value to diversify asset allocation. El-Erian (1988) defined Currency Substitution as a situation where foreign currency replaced, either totally or partially, domestic currency in performing all roles of the money. Yeyati (2003) defines Currency Substitution and Asset Substitution as Quispe-Agnoli (2002) by stating that Currency Substitution is using foreign currency as a unit of account and payment instrument and Asset Substitution is using foreign currency as store value.

Fischer (2006) states that, Asset and Liability Dollarization is understood with the term dollarization, mainly due to economic instability and prolonged inflation. Besides, in a dollarized economy, domestic currency is used for small number of payments and foreign currency is used for big number of payments.

The demand for foreign currency may vary depending on different requirements of households and corporates in a country. According to Krueger and Ha (1995) there are five major motives of foreign currency demand which are: (i) international trade/transactions, (ii) medium of saving, (iii) speculation against domestic exchange rate, (iv) use in domestic trade/transactions and (v) store of value. The motives of holding and using foreign currency differs in advanced economies and developing economies. In advanced economies, the major motives of holding foreign currency are to diversify portfolio allocation and to reduce the financial and transaction costs of international trade. However, in developing economies, the major motive of holding foreign currency is to hedge against macroeconomic and political instability. According to Bernholz (1989) Currency Substitution is generally the ultimate consequence of higher-than-expected inflation. Higher-than-expected inflation diverts domestic agents to favor foreign currency which leads to dollarization and eventually to Currency Substitution.

In a country where dollarization occurs, macroeconomic parameters such as money supply, exchange rate, inflation, and interest rate are affected. These negativities that arise in the dollarized economy may trigger the loss of domestic currency's main three functions and therefore, foreign currency substitutes domestic currency to fulfill the main three functions of money. This case is called Currency Substitution. There are distinct definitions for replacing the main functions of money. Generally, studies define dollarization by referring to the use of foreign currency as a unit of account and store of value. Also, studies define Currency Substitution by referring to the use of foreign currency as a medium of exchange. Hence, Currency Substitution is related to the cost of doing trade/transactions under high inflation where foreign currency generates higher purchasing power than domestic currency.

McKinnon (1982) classified Currency Substitution into two categories as Direct Currency Substitution and Indirect Currency Substitution. In a country where two or more currencies compete as a means of payment, direct Currency Substitution occurs. In a country where domestic agents shift from currencies to non-monetary financial assets which are denominated in different currencies to influence the demand for transaction balance, Indirect Currency Substitution occurs. Domestic agents prefer to substitute more liquid assets to fewer liquid assets like substituting domestic currency to domestic bonds. Under Fixed Exchange Rate regime domestic currency depreciates when an exogenous shock occurs in the economy and the domestic interest rate raises to

sustain the uncovered interest parity because holding domestic asset is more beneficial than holding domestic currency and this preference creates a situation called “arbitrage” where the exchange rate is generally lower than the domestic interest rate. Due to high foreign currency demand the country faces a capital outflow, and hence, Indirect Currency Substitution occurs.

Most of the views on Currency Substitution include local and foreign interest-bearing assets. However, Calvo and Rodriguez (1977) and Cuddington (1989) stated that the studies should focus on Currency Substitution by paying attention to the demand and transaction of domestic and foreign currencies; because, the domestic agents are rational, and holding both domestic currency and foreign currency facilitates economic transactions. As a result, these studies distinguish capital mobility and diversification of international portfolio from the general view on Currency Substitution.

Figure 3 shows the difference between McKinnon’s (1982), Calvo and Rodriguez’s (1977), and Cuddington’s (1989) approaches. According to the first approach, the movements from I to II and II to I are Direct Currency Substitution formations and the movements from II to IV and IV to II are Indirect Currency Substitution formations. According to Calvo and Rodriguez and the last approach of Cuddington there can only be movements from I to II and from I to IV which are called Direct Currency Substitution formations and the movements from III to IV are Capital Mobility formations.

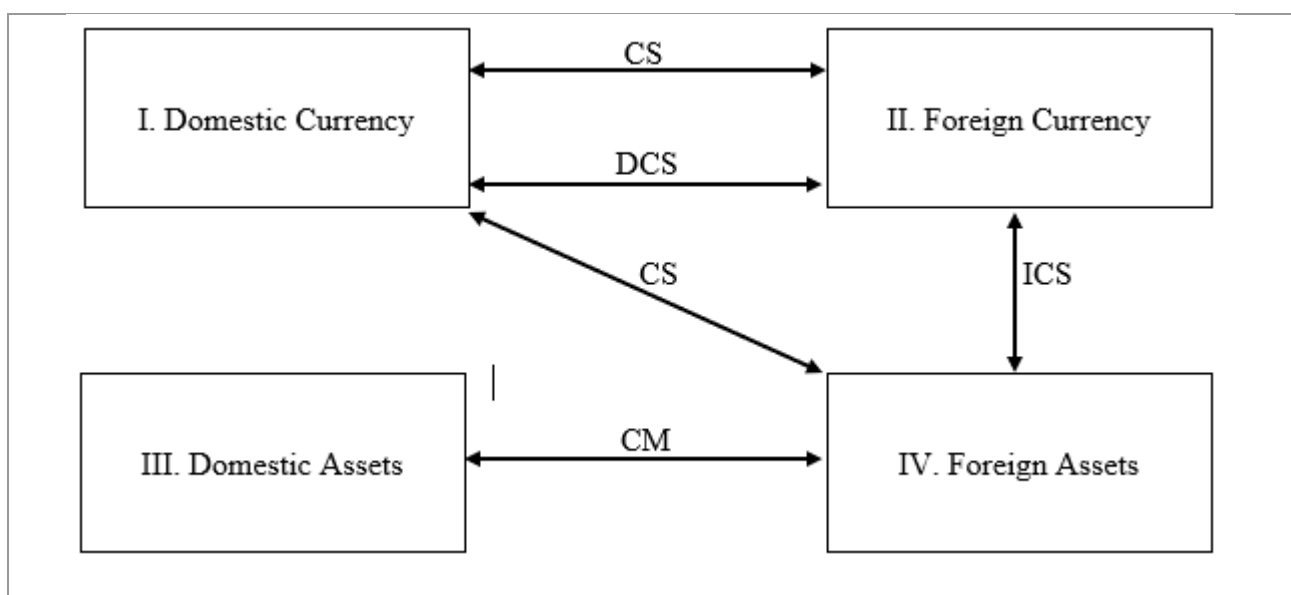


Figure 3 - Direct and Indirect Currency Substitution

Source: Arce-Catacora, 1997

where:

CS: Currency Substitution

DCS: Direct Currency Substitution

CM: Indirect Currency Substitution

ICS: Capital Mobility

One of the questions to the define type of currency substitution depends on whether stems from the supply-side or the demand-side. If currency substitution occurs from supply-side, it is because of the implemented exchange rate policy in a country. If a country implements fixed exchange rate regime, the domestic currency would be a perfect substitute for foreign currency on the supply-side of the market because the domestic currency would be easily convertible into foreign currency via the Central Bank. This supply-side currency substitution is called Official Dollarization. On the contrary the demand-side currency substitution is driven by market forces. Without any intervention from the Central Bank, domestic agents may convert their wealth from domestic currency to foreign currency. This demand-side currency substitution is called Unofficial Dollarization.

Currency substitution definitions may also be summarized with broad and narrow explanations. The narrow explanation refers to the appetite of domestic agencies to choose foreign currency instead of domestic currency. The broad explanation indicates the appetite of domestic agencies to choose foreign currency denominated assets instead of domestic currency denominated assets.

According to Giovannini and Turtelboom (1992) the concept of currency substitution can be explained under two sub-concepts which are “substitution” and “substitutability”. Their study states that whether it is partial or full, currency substitution is the replacement of domestic currency with foreign currency. Especially in most developing countries who are keen on endogenous macroeconomic shocks, a reliable and reputational foreign currency can be used as a unit of account and/or store of value and/or medium of exchange. Under this condition, currency substitution

becomes the last step of dollarization in such a country. On the other hand, currency substitutability is the process of the replacement of domestic currency with foreign currency; however, domestic currency does not completely replace foreign currency. As a result, both domestic and foreign currencies may be substitutable, in other words economics agents can choose to hold one currency rather than the other, but these currencies are not substituted.

Ramirez-Rojas (1985) divided currency substitution into two sub-categories as “symmetrical” and “asymmetrical”. Symmetrical currency substitution is defined as a situation where both local and foreign residents may hold domestic currency and foreign currency concurrently. Also, in the study, asymmetrical currency substitution is defined as a situation where local residents demand foreign currency which is not accompanied by the demand of the foreign residents. This currency substitution is referred to as asymmetrical currency substitution. Under ineffective or unstable monetary and fiscal conditions, currency substitution occurred in countries like Latin America or Turkey in the last 50 years. Although the U.S. Dollar is substituted with domestic currency in these countries, the domestic currencies of these countries are not demanded in the US. Symmetrical currency substitution is experienced in developed countries.

3.1.3.2.2. Asset Substitution

When economic agents prefer to invest into foreign currency denominated assets for savings purpose in order to protect against inflation risk, asset substitution occurs. Feige (2003) states that asset substitution is the situation where economic agents desire to hold foreign currency and foreign denominated assets instead of domestic currency. Under asset substitution, economic agents earn from foreign assets, hedge against domestic inflation, and diversify their portfolio. Also, under asset substitution, economic agents hold their foreign currencies either as cash or in deposit accounts at banks to store their value. Yeyati (2003) defined asset substitution as using foreign currency as a store of value. According to Yinusa (2009) the holding of foreign currencies as a store of value purpose may also be called as “deposit dollarization”. In the literature, the “term deposit dollarization” is used to express “asset substitution”.

Morón (1997) by referencing Cuddington’s study in 1982 defines the situation of economic agents holding non-monetary foreign assets as asset substitution and economic agents holding

foreign currency for exchange purposes as currency substitution. In the same study, the author stated that asset substitution depends on interest rate differentials between currencies and currency substitution depends on inflation differentials between currencies (ibid., 1997).

3.1.3.2.3. Liability Dollarization

Domestic or foreign borrowing of economic agents, corporations and governments in foreign currency is called “debt or liability dollarization”. According to this definition, “liability dollarization” concept is used for the units of economy that have liabilities denominated in foreign currency. For example, foreign currency deposits and loans in foreign currency that are taken by banks are the liabilities of the banking industry. According to Aklan and Nargeleçekenler (2009) “liability dollarization” means that all economic units in a country, including the public sector and the banking sector, have large foreign currency denominated liabilities. In the literature, “liability dollarization” is under debate separately than “financial dollarization” because both “liability dollarization” and financial “dollarization levels” are high in developing countries.

The high level of “liability dollarization” relative to the assets in economic units, creates financial risks in balance sheets. The exchange rate instabilities are major threats in 21st century under highly liability dollarized countries like Turkey. If domestic currency depreciates in real terms, the foreign currency liabilities increase and GDP growth shrinks like i.e., Mexico, East Asia, Latin America, Russia, and Turkey during the 1990s.

According to Yavuz (2009) banks may cause “liability dollarization” by obtaining cheap and long-term loans outside the country and lending them inside the country and by swapping to either domestic currency or short-term funds in foreign currency. Fund suppliers and banks offer funds indexed to foreign currency or denominated in foreign currency in order to obstruct suffering losses in case of the depreciation of the domestic currency. Governments may also be a part of liability dollarization due to the lack or insufficient domestic borrowing opportunities domestically, lack of borrowing opportunities from abroad in domestic currency, cheap and long-term borrowing opportunities from abroad which increase “liability dollarization”.

Under “liability dollarization”, the foreign currency denominated liability may be bind to foreign economic units outside the country as well as to domestic economic units inside the country. In both cases, obliged parties are exposed to currency risk. Exchange rate risk can be defined as a situation in which the economic agents, banking industry, and government do not have sufficient foreign currency financial assets against their foreign currency liabilities. When the reserves of the Central Bank are insufficient against foreign currency liabilities, this causes the depreciation of the domestic currency; hence, as a result the repayment of debt becomes difficult. In countries with BoP deficit, borrowing in foreign currency carries currency risk. Exchange rate risk is called “Fear of Floating” in the literature. According to Calvo and Reinhart (2002) countries which claim that they allow their exchange rates to float mostly do not and as a result an epidemic case of Fear of Floating occurs. According to Eichengreen and Hausmann (1999), the insolvency risk that arises because of exchange rate risk is called “Original Sin” that refers to a situation in which a country cannot borrow from abroad in its own currency. Only the member countries of the OECD can borrow from abroad in their own currencies. The non-OECD countries are always under exchange rate risk.

Starting with the financial liberalization process in Turkey during the 1980s, the local banks started borrowing in foreign currency easily though liabilities of the banking industry started to switch from domestic currency to foreign currency. Then, in the 1990s, the increase in public debt and hence borrowing, the endeavor of the keeping exchange rate stable and supporting the market led local banks to borrow from abroad in foreign currency and stay on a short foreign exchange position. So, with the need of heavy public borrowing, governments conducted local banks to swap their foreign currency borrowing into the TL and then invest on Turkish government bills and bonds. As a result of this investment model, the banking sector was always short in their foreign currency position, meaning that the foreign currency assets were not sufficient in covering for the foreign currency liabilities. Due to the low exchange rate risk in fixed exchange systems, generally, banks are able to take risks to open short positions by investing their foreign funds in swapping to domestic currency and then investing in profitable treasury bills. However, under the floating exchange rate system this investment model is too risky and as a result Turkey experienced 3 economic crises in 1994, 2000, and 2001 respectively. Although resources created by borrowing in foreign currency require lending in foreign currency, it is more profitable to lend in domestic currency, which then increases “liability dollarization”.

3.1.3.2.4. Financial Dollarization

“Financial dollarization” term expresses the foreign currency assets and liabilities of economic units in a country. The definition of “financial dollarization” stems from the fact that the USD is the most common currency in the world. “Asset substitution” and “liability dollarization” concepts were previously studied under separate headings in the economics literature at first, later, both began to be studied under the term of “financial dollarization”. Arteta (2003) stated that dollarization should include assets and liabilities due to the usage foreign currency and the author defined “financial dollarization” as an extensive presence of the USD deposits and credits on the balance sheets of the governments, banks, and corporations. Yeyati (2003) defines “financial dollarization” as keeping both assets and liabilities in foreign currency. The study also remarks that not only deposits and loans, non-bank commercial papers and government debts should also be included to the concept of financial dollarization. To summarize;

$$\text{Financial Dollarization} = \text{Asset Dollarization} + \text{Liability Dollarization}$$

$$\text{Bank Dollarization} = \text{Deposit Dollarization} + \text{Loan Dollarization}$$

Reinhart, Rogoff, and Savastano (2003) stated that “asset and liability dollarization” focuses on left and right sides of the balance sheets of the economic units. In the literature until the 1990s, studies generally focused on “asset dollarization”; however, since last 30 years the literature focused on “liability dollarization”.

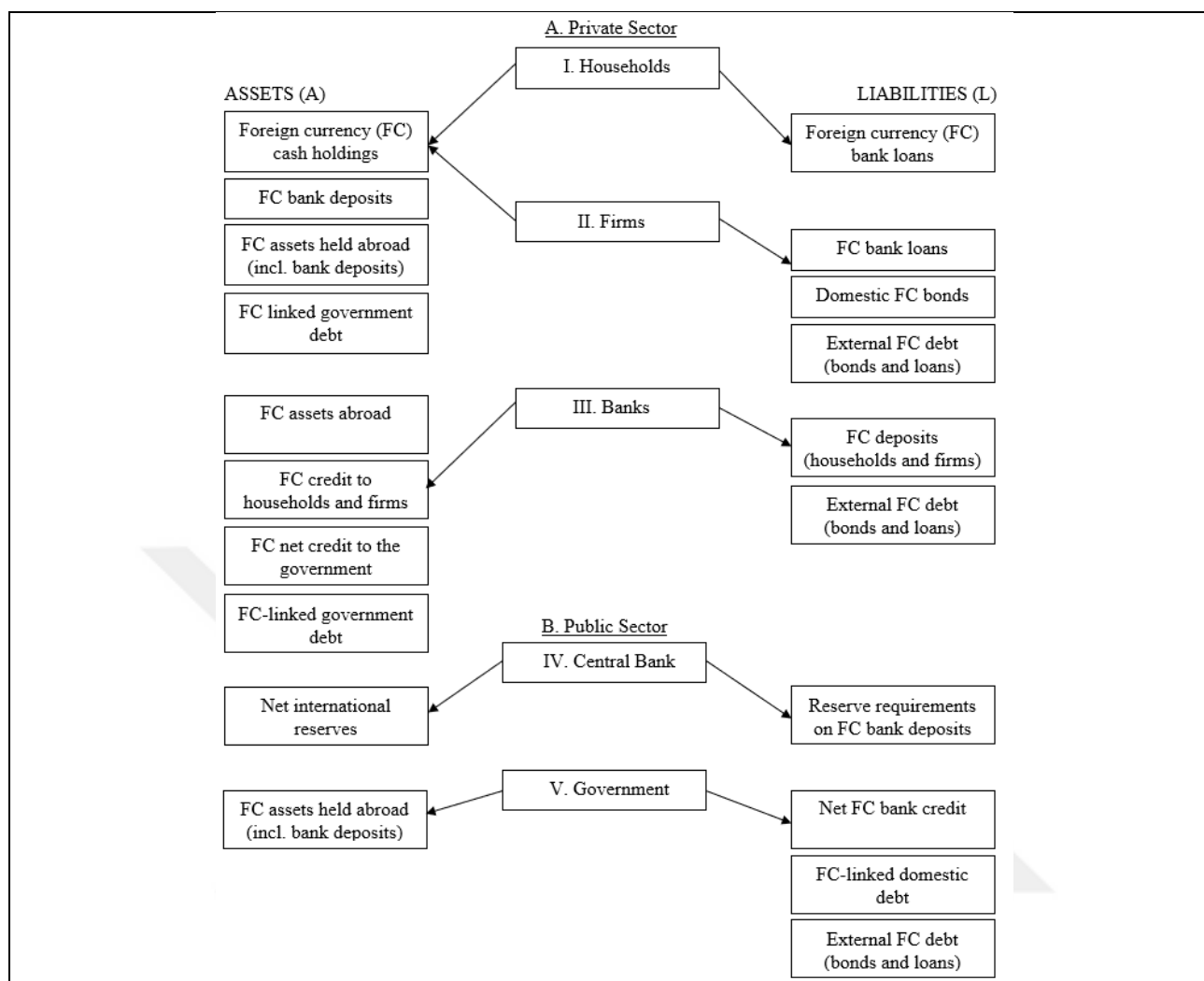


Figure 4 - Foreign Currency Balance Sheet of a Partially Dollarized Economy

Source: Reinhart, Rogoff and Savastano (2003)

“Financial dollarization” may be of “external nature” or “domestic nature” which depend on the claim of local and/or foreign residents against the government. Ize and Yeyati (2003) specified a difference between “domestic and external dollarization”. According to their study, “domestic dollarization” covers foreign currency deposits and loans of local residents, and “external dollarization” covers foreign currency debt bonded between domestic and external residents.

Rennhack and Nozaki (2006) argue that “financial dollarization” occurs after serious economic crises under high inflation. Dollarization may be permanent after the crisis, even when the economic conditions get better, and inflation is under control. Besides, the study argues that “financial dollarization” may prevent capital flight and help the economy by keeping the savings of economic agents within the domestic financial system. The study also specifies that in dollarized

economies, lending foreign currency to non-bearing foreign currency denominated income or relatively less bearing foreign currency denominated income causes “currency mismatch” in the balance sheets of economic units, and this situation may lead to the deepening of economic crises.

3.1.4. Prevalence of Dollarization

This study accepts the ratio of foreign currency deposits to M2Y Broad Money Supply in a country as the measure of dollarization. Although foreign currency deposits to total deposits measure which has some defects like not including cash foreign currency amount and offshore deposits is more common, this study preferred foreign currency deposits to M2Y.

Reliable data lacks for most countries, Table 3 shows the dollarization level on a regional basis and Table 4 shows the dollarization level in emerging and transition countries and highly developed Scandinavian countries.

Table 3 - Dollarization Levels of Regions and Economic Groups between 1996 – 2001							
Regions	Number of Countries	1996	1997	1998	1999	2000	2001
South America	8	45.8	46.1	49.4	53.2	54	55.9
Transition Economies	26	37.3	38.9	43.5	44.3	46.9	47.7
Middle East	7	36.5	37.2	37.7	37.5	38.2	41.9
Africa	14	27.9	27.3	27.8	28.9	32.7	33.2
Asia	13	24.9	28	26.8	28.8	28.7	28.2
Central America and Mexico	7	20.6	20.8	22	22.1	22.5	24.7
Caribbean	10	6.3	7.6	6.8	6.7	6.1	6.2
Developed Countries	14	7.4	7.5	7.5	6.7	7	6.6
Source: IFS, EDSS, Central Banks' statistical publications, IMF Working Paper 03/146, 2003.							

As clearly seen in Table 3, high dollarization ratios are recorded in South America, Transition Economies, and the Middle East. The level of dollarization generated an upward trend with the spread of dollarization in terms of YoY basis in South America, Transition Economies, the Middle East, and Africa which are accepted as non-developed and developing economies. Nicolo, Honohan, and Ize (2003) estimated the trend of dollarization from the data of Table 3 by a pooled cross-section time series regression and calculated that the yearly increase is about 0.9 percent. The equation is stated as:

$$y_{i,t} = \alpha_i + \beta y_{i,t-1} + \gamma t$$

Where y is dollarization and t is the year. The estimated coefficient β is 0.63 with a t-statistic of almost 24; the estimated time trend coefficient γ is 0.32 with a t-statistic of almost 4. As the result of the calculation is 0.9 percent, the deviations from the trend line are 63 percent of the deviation per a year. The exchange rate fluctuations in a country affects the calculation of the dollarization ratio. Hence, revised equation of Nicolo, Honohan, and Ize (2003) becomes:

$$y_{i,t} = \alpha_i + \beta y_{i,t-1} + \gamma t + \delta(e_{it} - e_{it-1})$$

where e is the log exchange rate; the estimated coefficient β is 0.68 with a t-statistic of almost 26 and estimated time trend coefficient γ is 0.34 with a t-statistic of over 4. This estimation implies that the trend of dollarization increased by 1.1% YoY basis and deviations from the trend line are closed at 68% of the deviation per year.

Table 4 – Dollarization Level of Emerging, Transition, and Scandinavian Countries between 1992 – 2001

Country	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Argentina	47.1	52.2	55.6	57.1	57.5	56.2	58.4	61.8	64.7	73.6
Azerbaijan	na.	na.	na.	49.1	50.2	57.2	62.8	66.9	78	81
Bolivia	81.2	81.4	78.5	78.3	91.6	91.7	91.9	92.6	92.4	91.5
Bulgaria	29.1	23	35.8	29.5	53.3	53.4	53.2	52.6	54.3	57.2
Costa Rica	32.4	30.4	31.1	40.9	35.7	38.3	41.8	41.1	41.1	43.8
Denmark	2.8	3	3.3	3.3	3.6	3.2	3.2	4.1	4.4	4.7
Ecuador	20	16.9	15.6	19.2	22.3	23.6	36.9	53.7	53.7	53.7
Egypt	37	32	32	31.6	27.2	22.6	22.1	22	23.3	25
Estonia	28.9	6.8	16.4	16.1	14.5	19.8	20	18.5	23.9	20.8
Finland	na.	na.	na.	na.	4.2	4.1	3.4	2.3	2.1	3
Georgia	na.	na.	66.7	40.1	46.4	58.4	68.7	79	77.9	81.5
Greece	na.	na.	22.7	24.1	22.6	29.5	35.2	30.9	29.8	19.6
Hong Kong	58.8	55.2	53.5	49.5	45	44	44	45.5	47.1	45
Hungary	18.4	23.5	24.7	30.5	27	24.6	23.9	22	21.8	20.5
Indonesia	18.2	19.7	20.1	19.7	19.4	28.3	22.2	19.4	20.8	20.1
Korea	1.1	0.7	0.5	0.5	0.9	3.3	4.7	2.6	3.4	3.5
Malaysia	na.	na.	na.	na.	0.9	1.8	2.3	2.5	3.3	3.7
Mexico	na.	na.	na.	na.	na.	5.6	6.2	7.3	10.4	10.8

New Zealand	3.5	4.2	2.8	2.8	4.5	3.2	4.7	2.7	3.4	3.1
Nicaragua	46	60.2	59.6	67.8	62.3	64.5	68.1	67.8	70.4	71
Norway	na.	na.	na.	na.	4.1	4	3.6	3.4	3.5	na.
Paraguay	na.	43.4	40.4	37.9	46.6	51.8	59.7	62.5	62.2	66.9
Peru	66.4	70.4	66.3	64.8	67.7	63.8	63.8	65.7	68.3	66
Poland	33.8	40.2	39	27.6	22.6	22.7	18.6	18.9	17.5	18.9
Romania	18.4	36.2	27.2	26.9	27.7	33.3	37.1	43.1	46.8	49
Russia	na.	40.8	39.8	28.5	27.5	25	44	41.1	37.4	34.3
Saudi Arabia	24	26.3	25.1	23.4	20.4	19.8	21.3	20.2	18.7	17.9
Slovenia	49	49.3	41	42.1	39.5	33.7	30.2	31.1	34.5	36.1
South Africa	0.3	0.5	0.5	0.7	1.5	2.3	3.5	3.5	4.2	6.2
Sweden	na.	na.	1.8	1	0.9	1.6	1.3	1.8	2.1	1.1
Switzerland	na.	na.	na.	na.	na.	na.	0.2	0.1	0.6	0.1
Turkey	37.3	42.1	50.1	49.9	47.5	48.8	45.1	47.2	46.6	58.2
Ukraine	10.6	25	42.2	36.8	30.4	25.8	39.1	43.7	38.4	32.4
United Arab Emirates	29.3	23.7	23.4	20.9	21.5	21.2	21.6	23.3	24.2	25.4
Uruguay	na.	78.4	79.6	78.6	77.2	78.2	79	80.8	81.6	84.6
Vietnam	44.9	42	41.8	34.6	32.1	34.1	36.6	40.5	41.2	43.4
Yemen	10.2	9.3	6.4	51.8	41.4	46.3	51.3	52.6	51.1	52.7
Source: Nicolo, Honohan, and Ize 2003										

According to Table 4, emerging and transition countries experience high level of dollarization between 1992 and 2001. Argentina and Turkey experienced high increased of dollarization level due to exchange rate shocks.

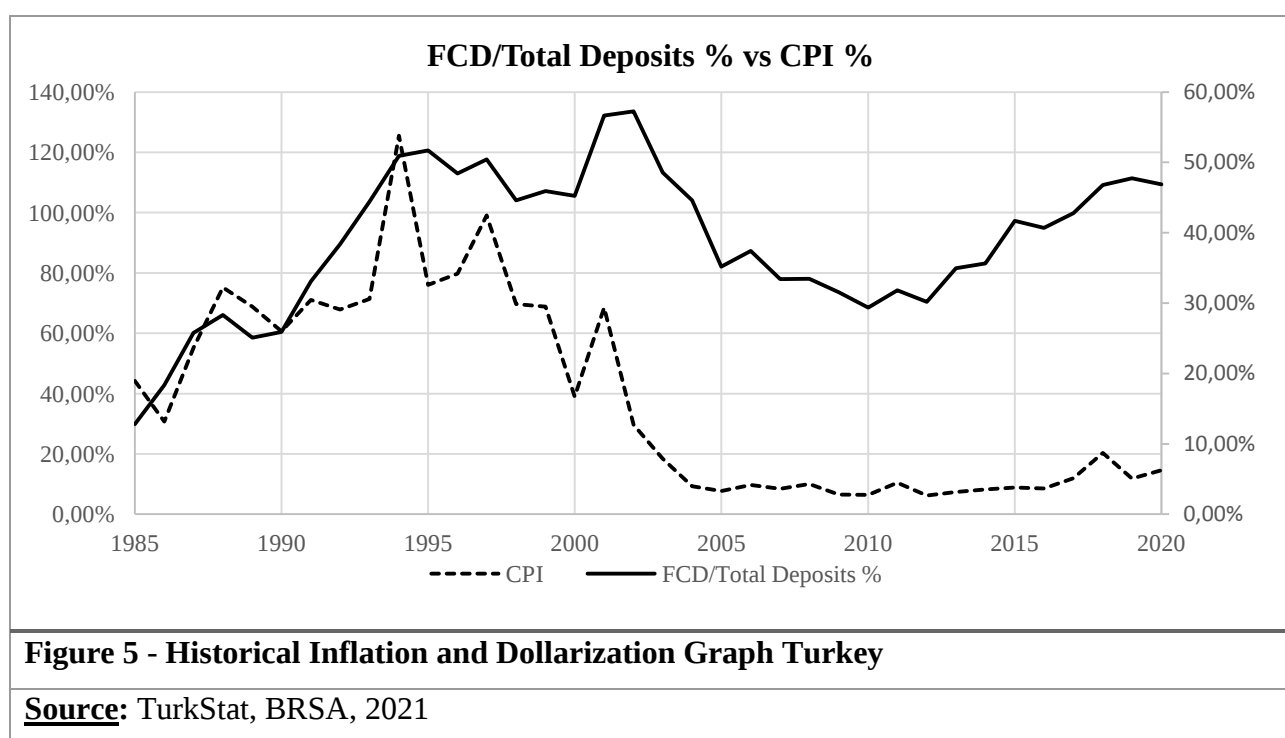
3.1.5. Causes of Dollarization

The phenomenon of dollarization emerged clearly in underdeveloped and emerging countries because of the deterioration of the macroeconomic balance and market structure, loss or lack of trust and confidence in economic policies, and regulatory failures in these countries especially after 1990s.

The major factors that trigger dollarization are; (i) high and volatile inflation, (ii) high and fragile public debt, (iii) interest rate differential, (iv) exchange rate, (v) policy credibility of economic institutions, (vi) insufficient financial development, and (vii) “original sin”.

High and volatile inflation and depreciation of domestic currency triggers the dollarization process due to the decrease in the real value of saving accounts denominated in domestic currency

and the purchasing power of economic agents. As long as the inflation increases on a trend, the demand for foreign currency increases correlated with the inflation levels so, currency substitution occurs as the first step of dollarization because of the need for a reliable store of value of money. As high or chronic inflation reduces the value of assets denominated in domestic currency, it causes the economic agents to behave reactively and therefore an escape from the national currency occurs. Calvo and Vegh (1992) indicated the strong relationship between inflation and dollarization and stated that although the domestic currency loses its store of value function, besides keeping its medium of exchange and unit of account functions are stable. Bahmani-Oskooee and Domac (2003) showed that high level of dollarization could affect the inflationary dynamics by; (i) aggravating inflation for a given fiscal deficit, (ii) increasing the volatility of inflation for a given budget deficit and (iii) boosting both the volatility of exchange rate and sensitivity to credibility under high currency substitution. The study found that the increase in the level of dollarization has a major effect on the evolution of inflation. The exchange rate responds positively to dollarization shocks and inflation targeting policy is a proved solution to decline the pass-through from the exchange rate to prices due to the high elasticity of substitution.



Thomas (1985) stated that the level of dollarization depends on the relative income of the investment portfolios. The study also reveals the change in the inflation rate and RER are the causes of dollarization. Ize and Yeyati (1998) studied portfolio modeling in which currency choice is made by hedging decisions depending on minimum variance theory (MVP) and found that there is a tight relationship between “real dollarization” and “financial dollarization”. MVP depends on relative volatilities of the inflation rate and real exchange rate, circumstances of stable volatility of the real exchange rate and high volatility of inflation rate. MVP increases dollarization because domestic residents prefer foreign currency instead of local currency.

High and fragile public debt is effective in the formation of dollarization. The high level of deficits in the public budget disrupts the macroeconomic balance in a country which encourages dollarization. Foreign borrowing amount increases in a country where savings ratio is low and insufficient to fund the need of public borrowing. Also, the use of domestic savings as a resource by the public instead of private enterprises in return of high interest rates disrupts the functioning of the economic structure and thereby, increases inflation and dollarization. According to Serdengeçti (2005) the increase in the amount of foreign currency denominated debt obtained from abroad also increases dollarization.

Interest rate differential is effective in the formation of dollarization. According to Agenor and Khan (1996) by the usage of foreign currency as a medium of exchange, currency ratio demand function is linked with marginal rate of substitution between domestic currency and foreign currency contrary to the ratio of the opportunity cost of them. In a high inflation environment, the interest rates paid to foreign currency deposits in the country are also high, as the high-risk premium paid against the effect of inflation is also reflected in the level of interest rates. High interest rates attract carry traders with short term foreign capital flow into the country. However, while foreign capital inflow is generally absorbed by the demand of domestic residents, the foreign capital outflow of the carry traders is combined with the stable demand of the domestic residents which creates high volatility on the exchange rate. According to Basso, Calvo-Gonzalez, and Jurgilas (2007) a wide interest rate differential between domestic and foreign assets reduces the “deposit dollarization” and vice versa. As a result, there occurs an existence of a trade-off between “deposit dollarization” and interest rate which tends to increase “loan dollarization”. Ramirez-Rojas

(1985) stated that the negative real interest rate aggravates “deposit dollarization”, and currency substitution is the difference between the foreign and domestic interest rates.

Exchange rate is another factor which is effective in the formation of dollarization. Depending on the exchange rate system in a country, high inflation leads to two kinds of consequences. Under a fixed exchange rate system, the expectation of devaluation increases. Under a floating exchange rate system, domestic currency depreciates. It is argued that factors such as high and volatile inflation as well as expected volatility in the real exchange rates (RER) and fixed exchange rate systems drive dollarization.

The loss of policy credibility and institutional factors is effective in the formation of dollarization. According to Savastano (1996) institutional framework of a country has a strong relationship on the nascency of dollarization. Qualified and reputational institutions are considered as a proxy for credible monetary policy, i.e., Federal Reserve (FED) and European Central Bank (ECB). Even in developing countries, qualified and reputational institutions are strong barriers against dollarization. Especially, Central Banks and all the other economic institutions are believed to be totally free from politics and government policies, indicating credibility. According to Raheem and Asongu (2016) the irresponsible behavior of government to create short term growth through money printing and budget and current account deficits’ expansions lead to high inflation and dollarization.

As observed between 1980 and 2020 in the developing markets, political intervention on Central Banks’ policy decisions has always led to dollarization, depreciation of domestic currency, and high inflation. The political purpose to increase short term growth rate by expanding deficits and printing money creates loss of confidence in the domestic currency and exerts inflationary pressure and dollarization. According to Honig (2009) irresponsible fiscal policy to monetize fiscal debt creates high inflation and dollarization.

The high amount of government guarantee or deposit insurance on foreign currency deposits that directs economic units to foreign currency deposits as well as the low transaction costs on foreign currency transactions, are among the factors that encourage dollarization. The supply and availability of foreign currency depending on local institutional constraints determines foreign currency demand. Sahay and Vegh (1995) stated that legal restrictions on foreign currency

transactions and deposits, like Tobin Tax, lower the dollarization process and level. However, with the lack of public confidence, the implementation of restrictions increases the dollarization process at the beginning, since the economic agents fear that the value of financial assets may decline in line with the low credibility of economic institutions.

Financial development of a country is effective in the formation of dollarization. In an underdeveloped financial market, economic agents cannot find the suitable and desired tools to hedge against inflation. Developed financial systems offer high variety of structured and sophisticated financial products to economic agents to hedge against risks so that the value of financial assets may be protected and there would be no demand of foreign currency as a store of value. As a result, in developing countries foreign currencies are seen as a hedging tool due to the lack of sophisticated and various financial products. According to Guidotti and Rodriguez (1992) even under low inflation expectations, financial liberalization generates high dollarization levels because the marginal cost of foreign currency transactions is reduced by financial liberalization.

“Original sin problem” is effective in the formation of dollarization. Eichengreen and Hausmann (1999) created the term “original sin” to define the situation which the domestic currency cannot be used to borrow from abroad or not to be able to borrow in the long term even domestically. Generally, developing countries are not able to borrow in local currency from abroad. These countries can borrow in USD, Euro (EUR), and Japanese Yen (JPY). Burger and Warnock (2007) stated that countries living under the original sin problem generally have a great need of foreign capital; however, they are not able to attract foreign investors to their domestic currency denominated bills and bonds. This situation compels developing countries to finance their debt with short term capital and foreign currency denominated debt. Calvo, Izquierdo, and Mejia (2004), underlined the difference between the domestic component of dollarization and external factors of dollarization by stating the inadequacy in borrowing in domestic currency locally. As a result, high and volatile inflation conjuncture ends up with “domestic asset dollarization” but “foreign liability dollarization” occurs due to the “original sin problem”.

3.1.6. Effects of Dollarization

Dollarization affects the demand for money and therefore the monetary policy, as well as the finance, public, and real sectors that make up the economy. Dollarization increases the fragility of the economy with its negative effects on the financial, public, and real sectors. Dollarization increases the “liquidity risk” as well as the “solvency risk” if economic agents in the financial sector have liabilities in foreign currency. When the domestic currency depreciates at a high rate, foreign currency borrowers may not be able to repay their debts because the amount of foreign debt in terms of domestic currency increases dramatically. Also, due to the lack of liquidity financial institutions may experience problems if foreign currency denominated deposits are not sufficient to cover the withdrawal requests. This situation may cause a hard economic crisis in a country. Financial institutions can hedge their balance sheets by increasing their foreign currency denominated assets and giving loans in foreign currency. However, with a hard depreciation on the domestic currency rate these financial institutions would be face with a severe collection problem of these loans. So, the effects of dollarization can be wide in an economy depending on the type of dollarization. To understand the effects of dollarization, one may focus on titles such as: financial fragility, financial development, and monetary policy.

Financial fragility is the vulnerability of the financial system in a country. Allen and Gale (2004) defined financial fragility as small shocks which have disproportionately large effects on a financial system. Arteta (2003) stated that “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.” The question is, does dollarization influence the financial crisis? According to the studies in the literature, borrowing in foreign currency and the currency mismatch especially in developing countries cause financial crises via dollarization. Mwase and Kumah (2015) stated that, countries with high deposit and credit dollarization has always been faced with liquidity and solvency risk.

When domestic currency depreciates hardly, the balance sheets of financial institutions are exposed to currency mismatch which creates instability on the financial system. The banking sector accepts foreign currency deposits, and gives foreign currency loans; however, this two-sided transaction does not create a natural hedge against the currency risk. The banking sector only exchanges currency risk with loan default risk. In an unhedged situation like this, non-performing

loans (NPLs) of the banking sector increases which may cause a banking crisis. According to Honig (2006) credit dollarization has an important role in developing countries as much as deposit dollarization, where severe banking crises experienced.

According to Honohan and Shi (2001) when domestic currency depreciates sharply in a country, “deposit dollarization” and therefore an increase in “liability dollarization” occur. In this case, the foreign currency deposit amount of the banking sector’s balance sheet may not be able to match the foreign currency loan amount on banking sector’s balance sheet. Under this situation, the banking sector has two options: the first option is that the banks can invest foreign currency deposits outside the country and the second option is that banks can give foreign currency loans. The first option is limited because of domestic regulation and the credit limits between financial institutions. The second option can be risky, because the borrower may face solvency risk or insufficient foreign currency revenue. Therefore, the banking sector substitutes credit risk for exchange rate risk in general. In developing countries with the “original sin problem”, currency and maturity mismatch is a common risk in the financial institutions’ balance sheet. The weighted average foreign currency deposit maturity is generally much lower than the weighted average foreign currency loan maturity so that financial institutions hedge these risks by derivative instruments like swaps. The mismatch between foreign currency assets and foreign currency liabilities is a common problem and therefore it is expensive to hedge in these countries.

According to Bacchetta (2000) countries with large foreign currency denominated debt are keen on hard economic recessions through devaluations. Under a hard devaluation/depreciation of domestic currency, the country imports inflation from abroad because of exchange rate pass-through. If the country has high sensitivity to exchange rate movements cause by the high amount of short-term foreign currency debt, the banking sector and corporate profits will be affected negatively which can lead to default risk.

3.1.7. Measurement of Dollarization

Since dollarization is known as the propensity of economic agents to foreign currency and foreign currency assets which may have two main objectives: First, to protect the economic value of savings; the second is to take advantage of the opportunities created by the volatility in

macroeconomic status. As combined in the Types of Dollarization chapter of this study, dollarization is classified into two main categories, “official dollarization”, and “unofficial dollarization”. Unfortunately, “unofficial dollarization” does not have a unique definition. Therefore, there is no consensus about the measurement of dollarization in both theoretical and empirical studies in the literature. The effects of dollarization may be observed in the balance sheets of economic units in two forms: the first form is “asset dollarization” which includes foreign currency and foreign currency denominated assets in the balance sheets of economic units, the second form is “liability dollarization” which includes foreign currency and foreign currency denominated liabilities in the balance sheets of economic units. The concept of financial dollarization includes both “asset and liability dollarization”. It is necessary to consider both “asset and liability dollarization” values to obtain the best indicator in measuring the degree of dollarization in a country. The index that takes both types of dollarization into account is “financial dollarization index” and the “composite index of dollarization” and to create this index formulas below are to be used.

$$\text{Asset Dollarization Ratio} = (\text{FC Portfolio Amount}) / (\text{DC} + \text{FC Portfolio Amount}) \quad (3.3.)$$

$$\text{Liability Dollarization Ratio: } [(\text{FC Loans}) / (\text{Total Loans})] + [(\text{FC and FC Linked Domestic Debt}) / (\text{Total Debt})] + [\text{Total External Debt/GNP}] \quad (3.4.)$$

where FC is Foreign Currency and DC is Domestic Currency. $[(\text{FC Loans}) / (\text{Total Loans})]$ is the financial liabilities of the non-banking sector. $[(\text{FC and FC Linked Domestic Debt}) / (\text{Total Debt})]$ is the foreign currency denominated public debt. $[\text{Total External Debt/GDP}]$ is the external liabilities of the banking sector, non-banking sector and public.

Reinhart, Rogoff, and Savastano (2003) stated that “composite index of dollarization” can be used to measure “financial dollarization”. To measure financial dollarization in a country, variables of Foreign Currency Deposits/M2Y, Total External Debt/GNP, and Domestic Government Debt in FC/Total Government Debt can be taken into account. According to Yilmaz (2005) the average composite index of dollarization was 10 which is classified as high in Turkey between 1989-2004, depending on the table of Reinhart et al. (2003). The “indices of dollarization” and the ranges for the “composite index” that were used to group the countries according to their degree of dollarization.

Table 5 - Indices of Dollarization

Recorded Value of Ratio 1/	Assigned Index Value
$x_i = 0$	0
$0 < x_i \leq 0.1$	1
$0.1 < x_i \leq 0.2$	2
$0.2 < x_i \leq 0.3$	3
$0.3 < x_i \leq 0.4$	4
$0.4 < x_i \leq 0.5$	5
$0.5 < x_i \leq 0.6$	6
$0.6 < x_i \leq 0.7$	7
$0.7 < x_i \leq 0.8$	8
$0.8 < x_i \leq 0.9$	9
$x_i > 0.9$	10

i=1,2,3 represent the three ratios used to construct the composite

Source: Reinhart, Rogoff and Savastano 2003

Table 6 - Degrees of Dollarization

Degree	Composite Index Value
Low	0-3
Moderate	4-8
High	9-13
Very High	14-30

Source: Reinhart, Rogoff and Savastano 2003

According to Arteta (2003) “loan dollarization” is measured by the ratio of private sector loans in foreign currency to total private sector loans. Alternatively, the ratio of private sector foreign currency loans to total bank assets is used to measure the level of loan dollarization. The formula of loan dollarization is:

$$\text{Loan Dollarization} = (\text{Private Sector Loans in FC}) / (\text{Total Private Sector Loans}) \quad (3.5.)$$

According to Arteta (2003) “deposit dollarization” is measured by the ratio of foreign currency deposits held by economic agents to total deposits in domestic banks. The alternative ratio

that can be used is the ratio of foreign currency deposits to total assets and the ratio of foreign currency deposits to total loans.

$$\text{Deposit Dollarization} = (\text{Foreign Currency Deposits}) / (\text{Total Deposits}) \quad (3.6.)$$

It is not possible to measure dollarization precisely in dollarized economies. Dollarization ratios are used as variables in econometric calculations. The first common measurement of dollarization is the ratio of foreign currency deposits to total deposits in the banking system. Studies like, McNelis and Rojas-Suarez (1996), Barajas and Morales (2003), Piontkovsky (2003), Rajan and Tokatlidis (2005), Arteta (2003 and 2005), Nicolo, Honohan, and Ize (2005), Galindo and Leiderman (2005), Honig (2006), Rennhack and Nozaki (2006), Yeyati (2006), Honohan (2007), Weymouth (2007), Asel (2010), Neanidis and Savva (2009 and 2013), Şahin and Şahin (2014), and Catao and Terrones (2016) employed this measure.

The second the most common measurement of dollarization is the ratio of foreign currency deposits in the banking system to broad money amount in the country. Studies like, Ortiz (1983a and 1983b), Canto (1985), Marquez (1987), Clements and Schwartz (1993), Sahay and Vegh (1995), Agenor and Khan (1996), Akçay, Alper and Karasulu (1997), Ize and Yeyati (1998), Balino, Bennett, and Borensztein (1999), Komarek and Melecky (2001), Kem (2002), Bahmani-Oskooee and Domac (2003), Reinhart, Rogoff, and Savastano (2003), Yinusa (2009), Özcan and Us (2009), Erasmus, Leichter, and Menkulasi (2009), Lay, Kakinaka, and Kotani (2010), Winkelreid and Castillo (2010) and Court, Özsöz and Rengifo (2012) employed this measure.

Considering the measurement of dollarization by foreign currency deposits to total deposits ratio, Balino, Bennett, and Borensztein (1999) stated that countries with a level higher than 30 can be called as highly dollarized countries. Turkey experienced a severe economic crisis in 2001 when the deposit dollarization ratio was 53.33 percent. Latin America (LATAM) countries like Brazil, Chile, Colombia, and Mexico use restrictions to prevent high deposit dollarization and these restrictions have been successful so far. Table 7 provides data of deposit dollarization by measure of foreign currency deposit to broad money in some emerging market economies.

Table 7 - Deposit Dollarization as Percentage of FC Deposit to Broad Money

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Argentina	52.27	55.68	60.48	2.52	4.60	5.39	4.91	4.30	3.80
Armenia	48.23	49.26	46.82	36.60	42.90	41.70	36.60	29.50	18.80
Bosnia and Herzegovina	40.57	40.81	36.55	35.50	37.20	38.00	40.40	49.90	48.40
Bulgaria	34.48	31.51	33.30	35.10	32.50	35.40	33.20	33.10	33.60
Cambodia	60.95	68.22	69.76	69.20	69.20	61.30	72.30	74.50	80.90
Chile	0.09	0.10	0.70	0.70	n.a.	n.a.	n.a.	0.70	0.60
Colombia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Croatia	65.75	64.62	67.73	62.00	58.90	58.00	55.70	47.90	47.30
Czech Rep.	12.68	11.33	11.01	11.50	9.33	9.14	8.90	9.10	8.20
Georgia	52.68	na	67.28	73.60	63.20	64.70	70.50	81.80	60.20
Ghana	19.30	17.46	19.13	20.20	21.00	21.50	19.30	20.80	17.30
Indonesia	17.61	18.62	18.43	16.00	14.70	13.10	0.00	0.00	0.00
Kazakhstan	36.23	43.24	49.95	35.50	33.30	24.30	18.90	23.20	20.50
Kenya	10.12	13.16	12.73	13.80	12.50	13.80	12.60	10.70	8.90
Kyrgyz Rep.	28.33	29.49	25.46	23.40	24.20	20.00	25.50	25.10	20.00
Latvia	20.47	21.37	21.28	20.00	18.90	20.30	22.50	23.20	27.90
Lebanon	54.67	60.23	66.96	64.00	75.60	81.90	85.00	87.60	87.80
Lithuania	104.80	117.50	126.60	84.10	67.40	65.00	70.90	56.00	56.90
Macedonia	35.92	29.08	51.97	41.30	42.50	44.90	46.70	44.30	38.50
Mexico	0.06	0.05	0.04	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Romania	29.76	30.07	41.55	36.30	31.40	29.00	26.70	28.10	31.00
Russia Fed.	29.20	26.78	24.32	25.20	18.90	17.60	16.30	11.40	9.60
Turkey	42.49	42.92	53.33	51.40	43.90	39.10	29.20	31.10	28.70
Uganda	22.00	23.51	19.99	20.50	24.10	24.40	21.50	21.90	23.40
Ukraine	24.58	22.72	18.36	18.50	20.60	24.10	23.50	26.80	22.60
Source: Yeyati (2006)									

Mwase and Kumah (2015), mentioned that “unofficial dollarization” should be measured by using foreign currency deposit to total deposit ratio because estimating the onshore foreign currency deposit amount with broad money amount does not adequately measure the preference of local residents’ foreign currency. Measuring with broad money creates uncertainty about whether the deposit dollarization ratio shows the preference of local residents’ for currency or deposit and also measuring with broad money may also suffer from measurement error because of the inadequacy of data about the circulation of foreign currency. On the other side, measuring with total deposits admits that the economic agents’ relative preference for holding foreign currency deposits versus domestic currency deposits.

Other measurements of dollarization are used outside of these two widespread measurements. Below is the commonly used solo or combined measurements of econometric studies.

- Foreign Currency Deposits/M2
- Foreign Currency Deposits/Domestic Currency Deposits
- Total FC Debt/GDP
- Foreign Currency Denominated or Linked Government Debt/Total Government Debt
- Amount of the foreign currency assets held by the economics agents to the total assets in an economy
- Foreign Currency in Circulation/Total Money in Circulation

Although the ratios listed above are the generally accepted measurements of dollarization in the literature, it is not easy to obtain some of the data required to measure dollarization precisely and even if some data are obtained, they cannot be trusted. In general, there is no data available on the foreign currency in circulation in an economy and therefore the degree of dollarization cannot be measured precisely. Therefore, in dollarized economies “asset dollarization”, “liability dollarization” or the term “financial dollarization” which takes both of them into account are used in the measurement of dollarization.

3.1.8. Theories of Dollarization

There are two important theories in explaining dollarization. The first one is the “portfolio diversification theory” which suggests that economic agents keep foreign currency in their portfolios in order not to be affected by the damages of high and chronic inflation. The second one is “utility maximization theory” which is based on the view that economic agents aim to maximize their benefits and the main factor that determines the dollarization process is the idea of gaining from the depreciation of the domestic currency. The common point of both theories is that economic agents convert low-value domestic currency into high-value foreign currency due to high inflation.

Theories of dollarization were initially formed on the demand for money theories, then, the monetarist model and portfolio balance models were created to explain the dollarization. Some empirical studies that have also considered foreign currency and foreign currency assets in addition to the domestic currency. On the other hand, some studies created macro models to explain dollarization instead of demand for money models. Also, some studies considered Gresham's Law due to some similarities between dollarization and Gresham's Law, Boyer (1973), Bernholz (1989), Guidotti, Pablo and Carlos Rodriguez (1992).

3.1.8.1. Gresham's Law

The ability of a national currency to fulfill its functions in an economy is related to its value. The popular approach depending on the difference of the values of currencies' is named as the Gresham's Law. The name is given with reference to King Henry VIII.'s Minister of Treasury Thomas Gresham. Briefly, Gresham's Law indicates that, "bad money drives out good". Good money refers to money that has difference between its nominal value and its commodity value. Conversely, bad refers to money that has high difference between its nominal value and its commodity value. In order to talk about Gresham's Law in a country, there should be no restriction on foreign currencies and currency convertibility should be allowed. Gresham's Law can be observed both in open and closed economies.

Gresham's Law and dollarization comparison based on the functions of money:

- **Medium of Exchange:** In countries where the Gresham's Law exists, bad money is used as a medium of exchange. In dollarized countries, economic agents prefer to collect their account receivables on high valued currencies; hence, foreign currency is generally used as a medium of exchange.
- **Unit of Account:** In general, unit of accounts are based on most common and preferable currencies; hence, high valued currencies which are called as good money are used as a unit of account.
- **Store of Value:** Both under the Gresham's Law and dollarization, high valued currencies which are called as good money are preferred as a store of value and for saving.

While under the Gresham's Law, "bad money drives out good"; in dollarized countries, good money drives out bad. Both in Gresham's Law and dollarization, high valued currency is demanded as store of value and unit of account. But this does not mean that the Gresham's Law is the same with or opposite of dollarization. As a result, Gresham's Law is not a theory of dollarization and cannot be used to define or explain dollarization.

3.1.8.2. Demand for Money Models of Dollarization

These models argue that dollarization occurs when economic units demand foreign currency besides the domestic currency, to use the functions of money for maximizing utility. According to the demand for money theories, domestic and foreign currencies in circulation substitute the functions of each other as a medium of exchange and store of value. If economic units prefer to stabilize utility, then dollarization occurs via exchange rate changes. "Cash in Advance Model" and "Transaction Costs Model" are the most common models which cannot define dollarization precisely.

According to the "Cash in Advance Model" approach in an open economy the substitutability of domestic currency and foreign currency as the function of medium of exchange are taken into consideration. Based on three main functions of money motivation of transaction, the motivation of prudence, and the motivation of speculation are also taken into account. According to Giovannini and Turtelboom (1992) the basic assumption is that utility maximization of economic units occurs under budget constraint and cash in advance (expenditure) constraint. In their study, two expenditure restrictions are considered for two closed economies which are budget (revenue) and substitution of currencies is not allowed and the authors found that the dollarization level varies depending on different nominal exchange rates.

"Transaction Costs Model" approach is based on the store of value functions of domestic currency and foreign currency. In this approach, the economic units store cash in their accounts/portfolios to demand domestic and foreign goods and they do not make any extra payment for these goods. When these economic units hold financial assets rather than money in their portfolios, in order to pay for the demanded goods by selling assets to generate money, these transactions have costs. As a result, cash is considered more liquid compared to financial assets.

According to Giovannini and Turtelboom (1992) economic units decide their portfolio allocation depending on the expected returns of money and financial assets and they found that because of transaction costs of financial assets, money is demanded as a function of store of value. If the expected return of domestic currency is low or not enough in real terms, foreign currency demand increases.

3.1.8.3. Portfolio Balance Model of Dollarization

Dollarization is determined by the relative rates of returns of domestic currency denominated assets and foreign currency denominated assets according to “Under-Portfolio Selection Model”. So, this model is only valid for the free capital market economies, and money is considered as a medium of exchange and speculation tool. The four sub-classifications under “Portfolio Balance Model of Dollarization” are classified as: Monetarist, Restricted, Dynamic and Unrestricted.

According to the “Monetarist Money Demand Theory”, the money supply is the primary factor in determining the inflation level in an economy, Yinusa (2008) suggests that money demand depends on the return rate of money, return rate of alternative financial assets, total income, or total wealth, and inspected inflation. Vegh (2001) states that under income-expenditure constraint and all other conditions *ceteris paribus*, if money supply increases, then inflation level increases; hence, domestic currency depreciates against foreign currencies. As a result, economic units substitute domestic currency with foreign currency though currency substitution or dollarization occurs.

Miles (1978) indicates that according to the “Restricted Portfolio Balance Model” economic units allocate their financial assets in their portfolios in two steps: In step one, they allocate them between money and bonds and in step two depending on relative value and relative return they allocate between domestic and foreign currencies. The study concludes that both the degree of dollarization and money demand vary according to the change in domestic and foreign interest rates.

“Dynamic Optimization Model” is described as dynamic because it considers time in the analysis. Obstfeld and Rogoff (1996 and 2001) solved the optimal money demand problem of the

representative economic units as a dynamic optimization problem. The study found that devaluation causes currency substitution. Economic units substitute domestic currency with foreign currency for intertemporal utility maximization when domestic currency devaluates, thereby leading to dollarization or currency substitution.

In the “Unrestricted Portfolio Balance Model”, economic units try to maximize their financial gains. Cuddington (1982) states that economic units create portfolios by allocating their financial wealth between domestic and foreign currencies and bonds in a single step. The study shows that in a functional relationship, foreign asset demand decreases with the domestic interest rate, increases with the foreign asset interest rate and the expected depreciation rate of the national currency. There is also an uncertainty between the changes in national income versus total foreign asset demand.

3.1.9. Dollarization in Turkey

It took nearly ten years for Turkey to make the TL convertible. At first, on January 24, 1980, the fixed exchange rate regime and the multiple exchange rate regime were abandoned, and a daily exchange rate started to be announced by the Central Bank of Turkey (CBRT) as a new regime. Eventually, the price of TL against foreign currencies started to change on a daily basis. Between 1983 and 1989, further regulations were adopted, prohibitions on imports were canceled, financial system was liberalized, and the control on capital movements were eased first and then canceled. In 1990, capital movements were fully liberalized and canceled, and the Turkish residents were allowed to borrow from the international markets. In April 1990, the International Monetary Fund (IMF) evaluated Turkey’s application and announced that Turkey had accepted the obligations under Article 8 (General Obligations of Members) of the Agreement made with the IMF and the TL became a convertible currency.

Stock market and interest prohibitions were canceled in 1980, import substitution ended in 1981, capital market was established in 1982, foreign currency transactions were allowed in 1984, Banking Law was announced in 1985, Interbank was established in 1986, Open Market Operations (OMO) started in 1987, effective foreign currency market was established in 1988, and gold market was established in 1989 until the liberalization process in 1990.

Chronic inflation, economic crisis, political instabilities, undeveloped financial markets, and insufficient legal structure directed economic units towards foreign currency to hedge against inflation and devaluation risk. This avoidance triggered and accelerated the dollarization process in emerging markets and Turkey. Since 1985, the dollarization process accelerated, and it is still expanding in Turkey. According to Özen (2018) the Foreign Currency Deposit to M2Y was 13 in 1985, 23 in 1990, 48 in 1995, and 55 in 2001.

Table 8 - Top Ten Dollarization Ratios of Countries in 1995

Rank	Country	FX Deposits/Total Deposits (%)
1	Bolivia	82.3
2	Uruguay	76.1
3	Peru	64
4	Croatia	57.4
5	Cambodia	56.4
6	Nicaragua	54.5
7	Azerbaijan	50.3
8	Turkey	46.1
9	Argentina	43.9
10	Lao P.D.R.	35.6
Source: Meyer, 2000.		

Turkey ranked the eight in terms of the highest dollarization ratios among the countries of the world in 1995. According to the CBRT statistics of November 2019, dollarization that is defined as the share of the foreign currency denominated deposits to all deposits is 50.1 percent. The ratio peaked up to 56 percent at the beginning of year 2020 according to the Banking Regulation and Supervision Agency (BRSA) and remains as one of the highest ratios in the world besides the unregistered foreign currency and gold savings of the Turkish households, which are not considered in these calculations.

According to Meyer (2000) dollarization ratios prevailed between 30 to 60 percent prevailed in most of the emerging economies of Eastern Europe and the former Soviet Union in the 1990s. Panama and Liberia are known as the only fully dollarized countries in the world. From the

perspective of the U.S., about two-thirds of all USD is held outside the U.S. It is important to distinguish dollarization into 2 groups as: “de facto dollarization” and “policy dollarization”. Turkey is in the group of “de facto dollarization” countries since the 1990s and the intention of the Turkish residents to buy USD against TL is to hedge against inflation, political risks, and default risk.

Since the TL has continuously depreciated as of 2013, the dollarization ratio increased from 34 percent to 50.1 percent in Turkey. According to BRSA (2018) data for the same period, the Turkish residents increased their precious metal savings from 21 billion TL to 122 billion TL. The comparison between the increase in dollarization and precious metals’ savings shows that the precious metals have been more attractive for the Turkish citizens in hedging, since 2013. It is assumed that the Turkish citizens have 200 billion USD worth of unregistered precious metals as saving and hedging (Finance Minister of Turkey, 2018).

It is accepted that the high and chronic inflation and the dollarization process started in the 1970s in Turkey. The oil crisis began in October 1973 when the Organization of Arab Petroleum Exporting Countries proclaimed an oil embargo. In 1980, "The Stability Package" allowed economic units to open foreign currency deposit accounts in Turkey. This move can be accepted as the start of dollarization in Turkey. Hence foreign currency deposits have started to be a part of M2Y in Turkey. "Foreign Currency Convertible Deposit" and "Foreign Exchange Deposit Account with Credit Letter" applications were announced in 1984 to help meet the foreign exchange demand arising from the Oil Crisis. With all these applications, foreign currency-denominated asset and liability sizes of the banking sector started to increase gradually.

In Table 9, foreign currency deposits, M2Y money supply and the ratio of FCD/M2Y between 1985 and 2001 is given according to Özen (2018). The reason why 1985 has been chosen as the starting year in Table 9 is because in 1984 the Turkish government allowed foreign currency transactions. According to the author the level of dollarization increased sharply during the financial crisis of 1994, 1995 and 2001.

Table 9 - Dollarization Levels: Foreign Currency Deposits to M2Y Money Supply in Turkey between 1985-2001			
Year	FCD (Billions TL)	M2Y Money Supply (Billions TL)	FCD/M2Y %

1985	1,183	9,328	12.68%
1986	2,436	14,609	16.67%
1987	5,356	23,004	23.28%
1988	9,512	36,707	25.91%
1989	14,135	61,274	23.07%
1990	21,793	93,363	23.34%
1991	50,936	168,504	30.23%
1992	103,234	293,970	35.12%
1993	190,617	473,059	40.29%
1994	565,005	1,195,353	47.27%
1995	1,157,966	2,414,597	47.96%
1996	2,627,629	5,373,709	48.90%
1997	5,493,852	10,664,059	51.52%
1998	8,789,452	20,212,650	43.48%
1999	18,420,635	40,153,556	45.88%
2000	25,341,684	56,046,300	45.22%
2001	58,732,348	104,132,803	56.40%

Source: Özen (2018)

According to Yeldan (2001), financial liberalization in Turkey had three major results:

- (i) Financial instruments and securities developed as a requirement of the financial liberalization process, and they were generally used to finance the public sector.
- (ii) Dollarization problem started.
- (iii) Short-term capital movements caused instability in financial markets and overtime in the real economy.

According to CBRT (2002) all inflationary variables affect each other and inflation during the inflation process. Ineffective and failed economic policies caused inflation to become chronic. Regardless of its source and type, inflation is perceived negatively by economic units, and hence the dollarization process is triggered to protect their savings. In this process, inflation affects dollarization and dollarization also influences inflation so that both interact with each other. Thus, with the motive of protecting savings under the inflationary environment, economic units divert their savings to non-productive areas such as foreign currency and real estate. This is called “asset substitution”, “currency substitution” or “dollarization”. The relationship between inflation and dollarization have always been an unbreakable spiral in Turkey.

Table 10 - Historical Inflation and Dollarization Graph Turkey 1985-2020

Year	FCD/Total Deposits %	CPI	Year	FCD/Total Deposits %	CPI
1985	12.80%	44.20%	2003	48.56%	18.40%
1986	18.34%	30.70%	2004	44.59%	9.30%
1987	25.78%	55.10%	2005	35.17%	7.72%
1988	28.31%	75.20%	2006	37.43%	9.65%
1989	25.07%	68.80%	2007	33.42%	8.39%
1990	25.92%	60.60%	2008	33.45%	10.06%
1991	33.08%	71.10%	2009	31.54%	6.53%
1992	38.38%	67.90%	2010	29.36%	6.40%
1993	44.41%	71.40%	2011	31.81%	10.45%
1994	50.93%	125.50%	2012	30.20%	6.16%
1995	51.72%	76.00%	2013	34.98%	7.40%
1996	48.41%	79.80%	2014	35.63%	8.17%
1997	50.42%	99.10%	2015	41.69%	8.81%
1998	44.61%	69.70%	2016	40.67%	8.53%
1999	45.92%	68.80%	2017	42.80%	11.92%
2000	45.25%	39.00%	2018	46.80%	20.30%
2001	56.66%	68.50%	2019	47.74%	11.84%
2002	57.23%	29.70%	2020	46.87%	14.60%

Source: TurkStat, BRSA 2021

With transition to financial liberalization, Turkey had huge capital inflows beyond expectations like many other emerging markets. However, without macroeconomic stability and structural reforms, Turkey has been vulnerable against economic shocks. As a result, according to Yılmaz (2005), financial liberalization triggered 1994 and 2011 economic crises. According to Serdengeçti (2005) without structural reforms, dovish monetary policy implementation and non-independent Central Bank caused high and chronic inflation and increased public debt. Therefore, economic units preferred foreign currency rather than domestic currency to hedge their savings. The level of dollarization gradually increased due to the instability in the economy, volatility of inflation, failure to achieve stability in the exchange rate, and the increasing alternative cost of holding the domestic currency. The 1990s, which passed under the influence of such an economic structure, were the years when the crises were frequent, and dollarization accelerated in the Turkish economy. In 2001, the dollarization level of Turkey rose to all time high, %57,6 and was the highest among all emerging market economies. In the aftermath of the 2001 crisis, exchange rates were allowed to free float, “Transition to the Strong Economy Program” was implemented and financial

stability was achieved. The CBRT had become autonomous and independent, and inflation decreased, therefore the TL appreciated.

After 2001, FCD amount continued to increase; however, the dollarization level decreased. This can be explained by the incredible rise of M2 money supply, and we can also come to the conclusion that the rising money supply was preferred to be saved in domestic currency rather than foreign currency.

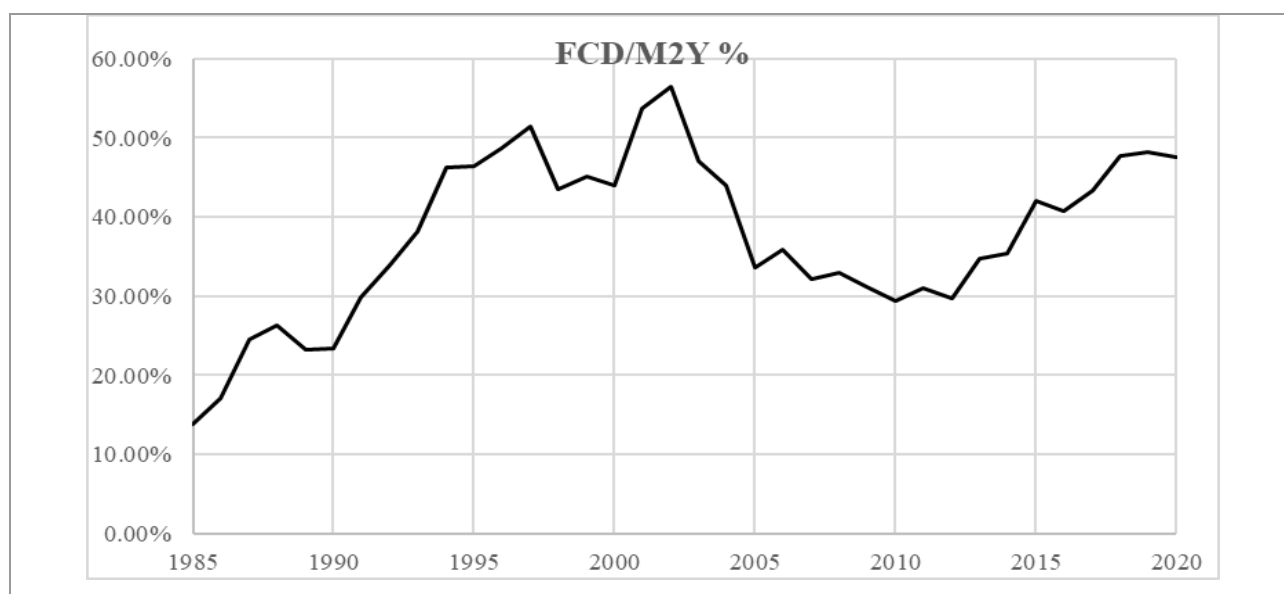


Figure 6 - FCD to M2Y 1985-2020

Source: BRSA, World Bank, 2021

The history of dollarization in Turkey may be divided into three eras: (i) the first one is between 1985-2001, (ii) the second one is between 2002-2010 and the third one is 2011-till date. The first era is the beginning of dollarization in Turkey which had the all-time high levels and also three huge economic crises in 1994, 1999, and 2001. The second one is the era when Turkey had macroeconomic stability, implemented inflation targeting regime, implemented free floating exchange rate regime, and redenominated the value of the TL by erasing six zeros from it. The third era is the reliving of macroeconomic instabilities, political instabilities, and questioning of the autonomy and independence of the CBRT and therefore the re-acceleration of dollarization.

Covid-19 pandemic started in December 2019 in China and spread to Turkey in March 2020. With the start of the pandemic, TL depreciated against USD by 114.26 percent between

March 2020 and December 2021. In the same period dollarization ratio increased from 51.71 percent to 65.71 percent.

3.2. Devaluation and Currency Depreciation

In this part this study will define the devaluation and the currency depreciation.

3.2.1. Definition of Devaluation

Devaluation is simply defined as lowering the value of a country's currency relative to a foreign currency by a monetary authority within a fixed exchange rate system. The opposite of devaluation is called revaluation. The devaluation term can only be used in economics under the fixed exchange system. If the exchange rate system is floating in a country and if the value of the domestic currency gets lower by market forces, then it is called currency depreciation.

In the early history, coins struck from precious metals such as gold, silver and copper were used as currencies issued and certified in weight and purity by an authority. When the country is short of precious metals and/or in need of money, the authority decreases the weight and/or purity or announces that the new issued coins are equal to the previously issued coins in value; this situation was called devaluation. In the near history, when paper currencies started to be in circulation which are redeemable for precious metals if the government is short on these metals, then the currency's redemption value is decreased by the government; this situation is called devaluation. (Feige, Sasic, Faulend, and Sonje, 2002)

This study will use the term currency depreciation rather than devaluation since it is based on the time period that Turkey had adopted the floating exchange rate system.

3.2.2. Causes of Devaluation and Currency Depreciation

In July 1994, international leaders met at the BW Conference to set up a new global economic environment and they created the fixed exchange rate system. The U.S. was the leader of the conference and the prime mover of the new system, and the value of the USD was fixed in terms of gold - \$35 per ounce. After the BW, the U.S. held down the enlargement of the USD reserves of

the other Central Banks' in order to lower the pressure on the conversion of the USD into gold. Then in the 1960s, the U.S. experienced high levels of inflation because currencies were not allowed to float to reflect the changing macroeconomic conditions between the U.S. and other nations and hence the fixed exchange rate system came under pressure. In 1973, the U.S. canceled the peg to gold standard. Right after that many other nations switched from the fixed exchange rate system to the floating exchange rate system. The hassle with the fixed exchange rates system was that sustaining a fixed exchange rate required sufficient foreign exchange reserves, especially the USD, for a country. Under a floating exchange rate regime, the "Impossible Trinity" concept may be considered as valid. The "Impossible Trinity" is concept developed by Mundell (1960) and Fleming (1962) which indicates that a Central Bank can only pursue two of the three policies, a fixed exchange rate, free capital movement, and an independent monetary policy, simultaneously. As a result, the foreign exchange reserves are still important, but the general usage area of them is hedging against the total foreign currency debt of the country, not keeping the exchange rate stable.

According to Cooper (1971) "under the present rules of international monetary system, laid down in the Articles of Agreement of the International Monetary Fund, devaluation is encouraged whenever a country's international payments position is in fundamental disequilibrium, whether that disequilibrium is brought about by factors outside the country or by indigenous developments." Between 1947 and 1970, over 200 devaluations occurred, and the U.S., Japan and Switzerland are the only developed countries that did not devalue their currencies throughout their history.

Under the floating exchange rate regime, a currency cannot be devalued; it can only appreciate or depreciate as stated in this study before. A currency may depreciate because of the negative trade balance or currency account deficit, low interest rates or low real interest rate, high inflation, unsustainable and/or unreliable monetary and fiscal policies, and political instabilities. To summarize, a currency may depreciate because of a loss of confidence of the investors.

3.2.3. Effects of Devaluation and Currency Depreciation

A fixed exchange rate regime does not mean that exchange rate will always stay at the same level. A change in the level of the exchange rate by a monetary authority under fixed exchange rate regime has significant effects in a country. According to Krugman and Taylor (1978) considering a Keynesian model, devaluation may reduce national output if, imports exceed exports initially, there are differences in consumption propensities from profits and wages and, government revenues are increased by devaluation when there are significant export taxes. Under the monetarist models, reduction in real balances and nominal money supply may occur.

The main effects of devaluation may be summarized as: (i) exports are relatively cheaper, (ii) imports are more expensive for domestic consumers, (iii) inflation rises in the short term, (iv) higher growth is observed and (v) demand for exports increases. (Sandler, 1971)

A devalued exchange rate makes the goods and services that are exported more competitive and cheaper for foreign buyers; because of competitive and cheap price, the demand for such goods and services increases. Also, domestic assets like properties and equities get cheaper and become more attractive for investors. A devalued exchange rate makes imports, generally oil, food, and raw materials, more expensive and thereby decreasing the demand for these imported goods. A devaluation may cause higher economic growth because part of the Aggregate Demand (AD) consists of net exports ($X-M$) therefore, high export volume and low import volume may shift the AD curve rightward, assuming it is relatively elastic. The rightward shift of the AD curve causes higher real GDP (under recession circumstances) and inflation (under boom circumstances). Inflation rises because the price of imported products gets more expensive, AD shifts rightwards causing “demand pull inflation”. Exports become relatively cheaper in the short term; however, the cost of production of the exported goods also increase in the long term. Current account balance improves because exports increase, and imports decrease. In other words, either the BoP deficit decreases, or BoP surplus occurs, a devaluation makes the country less attractive for foreign workers if they get paid in domestic currency. A devaluation may also cause a decline in real wages if the inflation is higher than wage increases. (Sandler, 1971)

The market equilibrium conditions of a small economy under fixed exchange rate regime show:

$$Y = (a + \delta + \Phi BT + DSB) / (s + m) - \mu / (s + m) r + m^* / (s + m) Y^* - \sigma / (s + m) Q \quad (3.6.)$$

$$r^* = - (1/\theta) (M/P + \Phi M) - \tau + (\varepsilon/\theta) Y \quad (3.7.)$$

where,

Y and Y*	: Domestic and foreign output and income and employment.
ΦBT	: Exogenous shocks to the balance of trade.
DSB	: Debt service balance.
Q	: Real exchange rate which is defined as the relative price of domestic output in terms of rest-of-world output.
r^*	: Domestic real interest rate which is determined by the global market conditions.
S	: Domestic marginal propensity to save.
m and m*	: Domestic and foreign marginal propensities to import.
M	: Nominal money stock.
P	: Domestic price level.
ΦM	: Exogenous shift factor in the demand for real money balances.
T	: Expected rate of domestic inflation.

A devaluation under conditions of less than full employment decreases Q in Equation (3.6.) therefore makes the domestic goods cheaper in the global market. Also, the current account balance improves, Aggregate Demand increases thereby shifting Investment-Savings (IS) curve to the right. The equilibrium is determined by the intersection of the IS curve and the Demand for Domestic Goods (ZZ) curve. The rightward shift of the IS curve and a decline in Q leads to an increase in employment and output. As output increases in Equation (3.7.) at the given interest rate level, the quantity of money demanded increases leading to the sale of assets abroad by domestic residents and an increase in the official reserve holdings as the authorities purchase foreign currency to keep the exchange rate level from appreciating back to its previous level, shown in Figure 7. The Liquidity-Money (LM) curve shifts to pass through the new IS-ZZ intersection at the full employment level of output (Floyd, 2009).

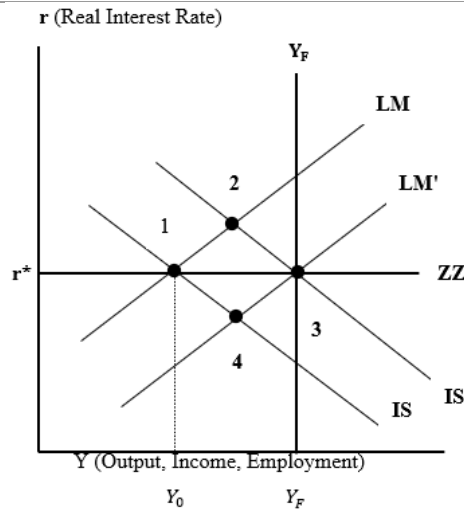


Figure 7 - The Effect of Devaluation in a Small Economy Under Fixed Exchange Rate Regime

Source: Floyd, 2009

Under a fixed exchange rate regime and assumption that full employment has not been achieved, devaluation causes the value of the domestic currency to depreciate, inducing an expansion in the domestic balance of trade and shifting the IS curve to the right. The output increase causes both the quantity of money demand and sale of domestic assets to foreign investors to increase. The money supply increases with the purchase of foreign exchange reserves by the authorities' from the market to stabilize the fixed exchange rate. Due to the price flexibility and full employment, the price levels tend to increase and prevent the rightward shift of the IS curve. The authorities buy foreign exchange reserves to stabilize the fixed exchange rate which increases the money supply by the same amount of increase in the prices.

The same result may also be achieved under the floating exchange rate regime, by increasing the money supply again to shift the LM curve to the right, to LM' curve. The excess supply of money will lead to the purchase of foreign assets, devaluing both nominal and real exchange rates and shifting IS to the right by the same amount of the shift in LM. Rewriting the Equation (3.7.) clarifies the adjustments on the money supply and foreign exchange reserves better:

$$M = P [\Phi M - \theta (r^* + \tau) + \varepsilon Y] \quad (3.8.)$$

Putting M from Equation (3.7.) to Equation (3.8.) we get:

$$H = mm H = mm (R + DSC) \quad (3.9.)$$

where,

H: Stock of base/High-powered money

mm: Money multiplier

R: Stock of foreign exchange reserves

DSC: Domestic source component of the stock of base money

and then Equation (3.8) becomes:

$$R = (P / mm) [\Phi M - \theta (r^* + \tau) + \varepsilon Y] - DSC \quad (3.10.)$$

The devaluation-induced rise in income leads to an increase in the demand for base money and as a result stock of official foreign exchange reserves increase.

A devaluation under less-than-full-employment conditions causes an increase in output and employment and a one-time increase in the stock of official foreign exchange reserves. This increase in official foreign exchange reserves would be avoided if the Central Bank would increase the domestic source component of the stock of base money (DSC) appropriately by purchasing bonds from the market.

Devaluation is necessary if the country has BoP problems caused by unsustainable deficit (Engel, 1989). A BoP deficit is a continuous outflow of foreign exchange reserves of the country which is indicated by a negative rate of change of stock of foreign exchange reserves (R) through time. The DSC should increase at a faster rate than the terms in Equation (3.10.) in order to create such a deficit. Devaluation will increase the stock of reserves but not necessarily increase the rate of growth or reduce the rate of decline through time in that reserve stock. Therefore, a devaluation may not fix a BoP deficit. This BoP deficit may easily be fixed by reducing the rate at which the DSC is growing through time rather than devaluing the exchange rate. One-time decrease in the DSC without devaluing the exchange rate may also be obtained by a one-time increase in the stock of reserves. As a result, devaluation may not improve the BoP and the main purpose would be

expanding output and employment under a recession. However, if all the countries maintain their fixed exchange rates this can be a strict “beggar-thy-neighbor” policy (Floyd, 2009) and (Tille, 2000). A beggar-thy-neighbor policy is an economic policy in which a country attempts to remedy its economic problems by tending to worsen the economic problems of other countries.

By ignoring fiscal policies, devaluation or revaluation is the only for a country to change its price level in a fixed exchange rate regime under full-employment conditions. Devaluation shifts the IS curve to the right, the price level rises to shift it back to the intersection point with the ZZ curve at full employment level and aggregate output (Y_F) . To maintain the position of the LM curve at the same intersection point, the Central Bank must increase the money supply either by an open market purchase of domestic bonds or an accumulation of foreign exchange reserves. Revaluation will lower the domestic price level vice versa. The manipulation of the money supply is not possible when the exchange rate does not change because the authorities provide to domestic residents with their desired money holdings to prevent the exchange rate from moving off its parity. As a result of devaluation, the price level change can be obtained by increasing the money supply and letting the exchange rate float. The change in the money supply will be associated with the movement in the exchange rate depending on whether the money supply adjustment is exogenous and the exchange rate adjustment is endogenous or the exchange rate adjustment is exogenous and the money supply adjustment is endogenous. The IS and LM curve shifts are identical in both cases. (Floyd, 2009)

In analyzing devaluation, much of the analysis mislead the exact nature of initial disequilibrium and these analysis focus on being in equilibrium. If a country has high cost of money to balance its international payments at a level of domestic economic activity, it must finance a continuously increasing deficit with its official reserves, which is unsustainable. Therefore, domestic demand is not pressing against productive capacity to an extent that is regarded as inflationary, despite the conditions that domestic expenditure does exceed domestic output which is a necessity to maintain full employment. Reducing Aggregate Demand (AG) to cure the imbalance of payments would cause an undesired unemployment because of the rigidity of factor income on wages in money terms. In a recession, pressure on costs and prices would restore a new equilibrium level which may cause a reduction in BoP at full employment level; however, this process is painful. The other alternative is the devaluation of the currency which is lowering the costs and

prices measured in terms of foreign currency. According to Cooper (1971) there are three different approaches to analyze the effects of devaluation to balance payment deficits. These are: “elasticities approach”, “absorption approach”, and “monetary approach”.

The “elasticities approach” is focusing on the substitution among commodities of consumption and commodities of production which are induced by the relative price changes caused by the devaluation. The “elasticities approach” gives rise to the Marshall-Lerner condition, which indicates that a currency devaluation may only improve BoP if the sum of demand elasticity of imports and exports is greater than 1 (Bahmani-Oskooee and Ratha, 2004) and (Cooper, 1971).

The “absorption approach” is focusing on the overall economy rather than focusing on individual sectors. The main idea of the approach is that the improvement in the balance on goods and services must increase the gap between total output and total domestic expenditure (Cooper, 1971).

The “monetary approach” is focusing on the demand for money balances and the main idea is that a devaluation and a decrease in the money supply affects all economic agents which are holding domestic assets equally. The most important implication of this approach is when monetary authorities expand domestic credit right after devaluation to cover the new money demand. In such a situation the effects of devaluation on international payments will be undermined (Cooper, 1971).

All these three approaches are not competitive, they are complementary representing different ways of looking at the effects of devaluation. The “elasticities approach” is “Marshallian”, partial-equilibrium analysis, and is relevant when foreign trade is smaller relative to the total economy or when there is ample unemployment. The “absorption approach” is “Keynesian”, focusing on total output and expenditure and drawing attention to the effects of exchange rate changes on overall income and expenditure where elasticities approach fails to do so. The “monetary approach” is a counterpart of the monetary school of thought by Chicago-London School of Economics and the roots go back to David Hume which is focusing on stock adjustments in the real value of money balances. The “elasticities approach” represents short run, the “absorption approach” represents medium run, and the “monetary approach” represents long run (Cooper, 1971).

Hanson (1983) challenged the view that devaluation stimulates economic activity. The study used a model which includes Cooper (1971) and Krugman and Taylor (1978) and stated that “substitution substantially lessens the possibility of contractionary devaluation.”. Since the Keynesian analysis of devaluation depends on the assumptions that wages are indexed in nominal terms or are determined by the labor market supply depending on real wages, the output and the BoP become inversely related. The study also pointed out that the effects of devaluation should be analyzed in the long run and also added that BoP crises generally result in unsustainable levels of AG and hence, decrease the net asset position unsustainably.

3.2.3.1. J-Curve Effect

The “J-Curve effect” indicates that when a depreciation or devaluation occurs in the exchange rate of a country, the demand is inelastic, in the short-run the current account balance deteriorates and in the long-run demand becomes more price elastic and the current account balance begins to improve.

The “J-Curve” is related to the “Marshall-Lerner condition”, which indicates that if $(PED_x + PED_m > 1)$ then a devaluation will improve the current account, where PED is price elasticity of demand. The “J-Curve” is also the bridge between microeconomics’-elasticity, and macroeconomics’-current account. The current account on the BoP is measured by the net value $(X - M)$ of exports and imports of goods, services, and investment incomes.

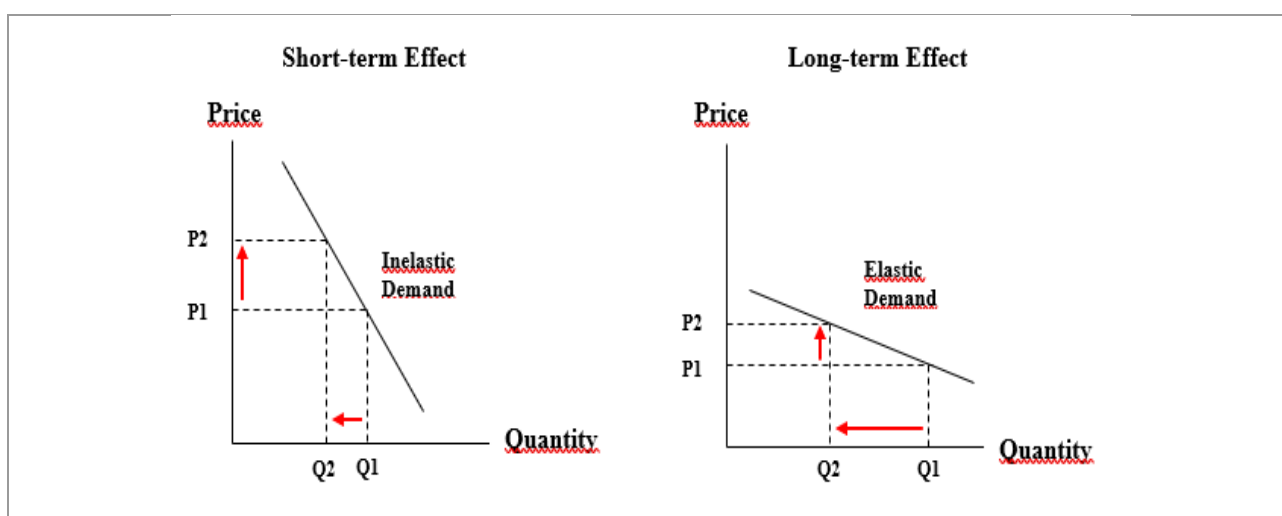
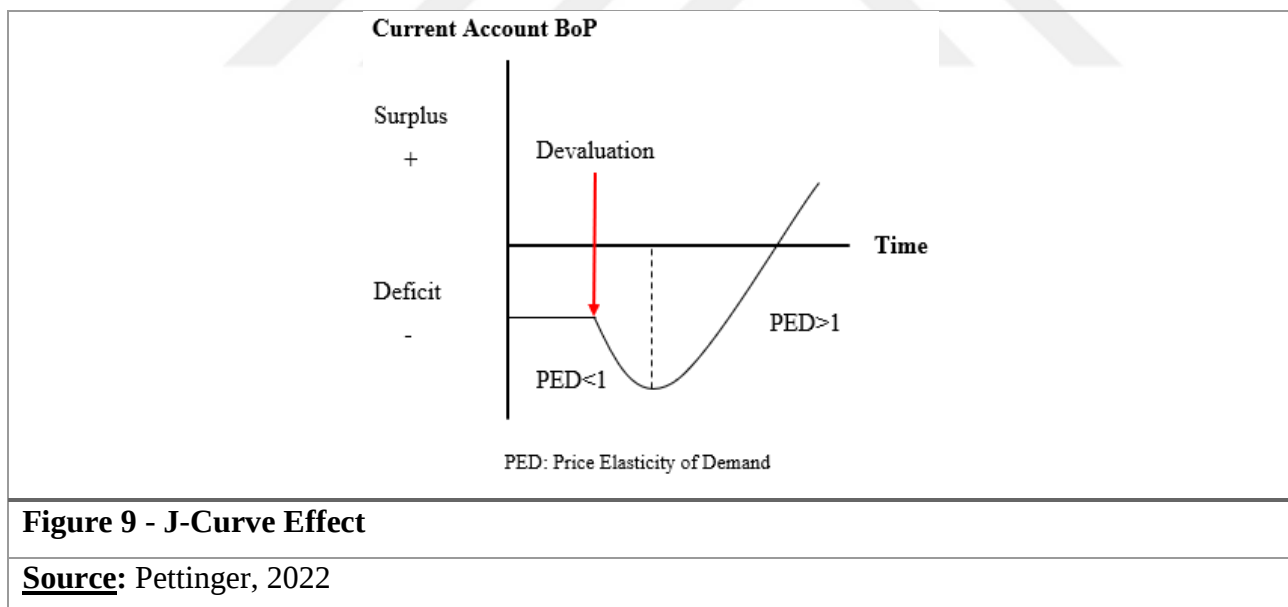


Figure 8 - Short-term and Long-term Effects of Currency Depreciation**Source:** Hofstrand, 2020

Short-term Effects: A decrease in export prices will only cause a smaller percentage increase in quantity demanded. An increase in import prices will only cause a smaller percentage decrease in demand for imports. As a result, the value of imports rises because the spending is more on imports. Consequently, if the demand is inelastic under currency depreciation conditions, current account balance worsens. (Petrovic and Matic, 2010)

Long-term Effects: Demand for imports and exports will become more elastic in the long-term. As a result, a decrease in export prices will cause a bigger percentage rise in quantity demanded so that the increase in the value of exports will be higher. When the demand is elastic, the value of exports increase, and hence current account balance improves. Further, if demand for imports is elastic; then, the percentage fall in demand for imports will be bigger. As a result, the total spending on imports decrease. (Petrovic and Matic, 2010)



According to the J-Curve, “when devaluation occurs, in the short-term the Price Elasticity of Demand (PED) is lower and hence, devaluation worsens the current account balance. In the short-term price is inelastic because companies and consumers have contracts for the goods that they buy, and it takes time for them to find alternatives. Also, the higher import prices will be an

incentive for domestic companies to increase which also takes time. However, in the long-term PED is higher than 1 and hence, devaluation improves the current account balance. If the demand for exported goods in global markets continue to increase, current account balance continues to improve in the future. (Pettinger, 2022)

There are also some other factors which affect the current account balance apart from the exchange rate conditions. In general, these are:

- Current account balance is dependent on economic growth and consumer spending in domestic country.
- Current account balance is also dependent on economic growth and consumer spending in foreign countries who are buyers of exported products from the domestic country.
- Current account balance is also dependent on the rate of inflation because if domestic currency depreciates, domestic country can import inflation from foreign countries, and this can decrease the competitiveness of exports.
- Companies may use hedging tools and insurances against unexpected exchange rate movements.

This leads to the “Marshall-Lerner” condition which states that a currency devaluation may only improve the BoP if the sum of demand elasticity of imports and exports is greater than 1.

3.2.3.2. Marshall-Lerner Condition

The “Marshall-Lerner” condition states that absolute sum of the country’s import and export demand elasticities should be greater than 1 for BoP to improve under conditions of devaluation. For example, if a country has negative and zero BoP when the domestic currency depreciates and right after that the BoP starts to improve. Then, the price of the imports of the country increases and the price of the exports of the country decreases due to the change in relative prices and the “Marshall-Lerner” condition indicates that the indirect effect on the quantity of trade will be more than the direct effect of the country which pays higher price for imports and receive lower price for exports. The “Marshall-Lerner” condition does not hold in the short-term, but it holds in the medium-term.

Reinhart (1995) states that if trade flows are sensitive to relative prices, devaluation, and currency depreciation will reduce trade imbalances. Bahmani-Oskooee (1998) studied long-run

trade elasticities and implied that the sum of demand elasticity of imports and exports is greater than 1 thus, underlined the explanation of the J-Curve. Brooks (1999) tested the “Marshall-Lerner” condition for the U.S. and its six trade partners and found that the U.S. fulfills the “Marshall-Lerner” condition on bilateral trade with all G7 countries, except Canada. Fang, Lai, and Miller (2006) analyzed the promotion of exports by exchange rate changes in Asia and found that the real depreciation of the exchange rate improves exports for most of the Asian countries; however, the impact of the depreciation of exchange rate on export growth is smaller.

3.3. Income Inequality

In this part this study will define the income inequality.

3.3.1. The Definition of Income Inequality

Adam Smith stated in 1776 that “No society can surely be flourishing and happy, of which by far the greater part of the members are poor and miserable.”

To define income inequality first one should clearly define what income is. According to Keeley (2015) income is generally accepted as pre-tax salary; however, disposable income, which is the available money that an individual may spend on housing, food, clothes, etc. is a more accurate indicator for the analysis of income. Basically, disposable income is the difference between incoming flow of money and outgoing flow of money of an individual. The incoming flows are considered as salaries/wages, financial/investment earnings, rents, government benefits, social transfers etc. The outgoing flows are considered as taxes, social security etc. The OECD defines income on its website as, “household disposable income in a particular year. It consists of earnings, self-employment and capital income, and public cash transfers. Income taxes and social security contributions paid by households are deducted. The income of the household is attributed to each of its members, with an adjustment to reflect differences in needs for households of different sizes.”

The basic definition of income inequality is that income inequality refers to the uneven “distribution of income” throughout individuals, groups, population, social classes, or countries (Britannica, 2016). Then income inequality in a country reflects the disproportionate distribution of total income among the domestic citizens in that country. The important phrase is distribution of

income in this definition. This phrase is a statistical concept, in reality no one or no group is distributing income. Classical economists like Smith, Malthus, and Ricardo focused on “factor income distribution” which is the distribution of income between land, labor, and capital which are the primary factors of production. Modern economists focus on “distribution of income” between individuals. According to Todaro and Smith (2012), there are two principal measures of income for both analytical and quantitative purpose which are the personal or size distribution of income and the functional or distributive factor share distribution of income. “The size distribution of income is the share of total income accruing to the poorest specific percentage or the richest specific percentage of a population-without regard to the sources of that income. The functional distribution of income is the distribution of income to factors of production without regard to the ownership of the factors.”

3.3.2. Causes of Income Inequality

In the literature there is a trade-off between income inequality and economic growth which means that a country should settle for a large income inequality in order to achieve a high degree of economic growth. Stiglitz (1969), Galor and Zeira (1993), Perotti (1993), and Alesina and Rodrik (1994) claimed this trade-off as it is given in the literature theoretically. On the contrary, Persson and Tabellini (1994) and Meckl and Zink (2004) argue that income inequality arises because of uneven distribution of skills. Also, Loury (1981) claimed that income inequality arises from uneven distribution of ability and inheritance.

According to Aydoğan (2010), “globalization” is one of the most important factors behind income inequality. Global economies became more integrated through technology, information, trade, and investment. Technology destroyed old jobs and created new jobs as a result high-skilled workers became more valuable versus low-skilled workers. This transformation also shifted the balance between labor and capital and therefore large a proportion of income has been delivered to the capital owners.

According to Aydoğan (2022), changes in the societies, like tendency of people getting married with similar wealth, social and educational background are also other major factors behind

income inequality. The rise in part-time working and the decrease in union memberships also have negative effects on income inequality, thereby worsening the income distribution.

Government's role in collecting and delivering taxes also has an effect on income inequality if the distribution of collected taxes benefits high-income level citizens more than the middle-income citizens or low-income citizens. The applied regulations also cause and worsen income inequality (Alesina and Rodrik, 1994; Persson and Tabellini, 1994; Perotti, 1993).

"Inheritance" is also a major factor that affects income inequality because as George Orwell (1945) said in his phenomenal book *Animal Farm*, "All animals are equal, but some are more equal than others". Inheritance of riches and wealth gives some people a lead start in life, and they generally keep up the lead (Loury, 1981).

The difference in "natural qualities", like intelligence, physique, and capacity for work is another factor behind income inequality. Some people are born naturally gifted, and therefore they are able to surpass others in the race of life. "Family influence" like inheritance is an important factor behind income inequality. A job that the people of same level of education apply for may be reserved for a person who might be preferred because of the family influence of her/him. Also, "luck and opportunity" affect the income inequality between individuals (Khachaturyan and Peterson, 2016).

According to Leung (2015) wage, education, technological growth, gender, and personal factors are the main causes of income inequality. Dabla-Norris et al. (2015) studied the causes and consequences of income inequality globally. The study stated that economic growth, technological change, trade globalization, financial globalization, financial deepening, changes in labor market institutions, redistributive policies of governments, and education are factors that drive higher income inequality.

3.3.3. Consequences of Income Inequality

The widening income inequality is one of the biggest challenges of the 21st century. To some degree, income inequality is not a problem because it provides incentives for individuals to

compete, save and invest to move further in their life. For example, investing in education leads to receive more labor earnings in the future which may boost human capital accumulation and economic growth. According to Lazear and Rosen (1981) income inequality provides incentives for innovation and entrepreneurship which affect economic growth positively. However, high degree of income inequality has large “social costs”. A high degree of income inequality is also high degree of “poverty” and higher poverty causes an increase in crime rates and poor public health. According to Thorbecke and Charumilind (2002) uneven income distribution also creates “political instability” which discourages capital accumulation, threat to property rights, and increase on the risk of state repudiated contracts. The study also added that widening inequality may increase the rate of rent-seeking and predatory market behaviors which burden economic growth.

After a phase of economic growth, decreasing availability of investment on human capital may suppress growth rate in countries with high income inequality. In such cases, individuals have less ample funds to invest in education; hence, physical capital becomes scarce. As a result, meeting the demand of human capital becomes difficult and economic growth slows. On the financial market side, non-performing loans tend to increase accordingly and the risk exposure on the lenders side also increase by the increasing possibility of borrower’s default. The increasing risk in the banking sector and the financial market makes foreign investors hesitate to bring short-term investment flows to the country. These investors may decrease their investment exposure, so that volatility in the market increases and defaults arise.

According to Stolzenberg, Eitle, and D’Alessio (2006) higher crime rates are correlated with “high income” inequalities. The study proposes three different explanations about this correlation. First, “low-income level” members of the society suffer from “resentment and hostility” which results in a higher bias for criminal behavior. Second, if the methods of legal resources obtainment are restricted, the incentive to committing crimes increases. When considering the risk of punishment for crime, the illegal methods of obtaining resources may provide better returns considering the risk/reward ratio of the crime. Third, a widening gap between high-income individuals and low-income individuals decrease the law enforcement spending in low-income areas in the country which tends to increase the crime rate.

Income inequality tends to obstruct the access to quality health care and healthy food for low-income individuals. This may be the result of a poor health conditioned society in general and hence, may create a less effective work force, higher health care costs, higher disease, fertility, and mortality rates. Also, a poor health conditioned economy means a country with slower economic growth in the long term which may result in lower tax resources for the country and hence higher tax rates or inferior public services. (Weatherby, Nam, and Isaac, 1983)

The uneven distribution of income to a small, privileged group in a country causes political power to become skewed in favor of this privileged group. So that, the low-income earning individual may not be able to influence the elected officials. However, the small, privileged, and elite group will be able to manipulate the government in its own favor, even under democratic regimes. This loop continues until it is broken with riots, regime changes, economic crisis etc. (Scheve and Stasavage, 2017).

According to Thorbecke and Charumilind (2002) high level of income equality tends to raise the level of education in a country. The study points out that a one-point increase in the Gini coefficient means a 40 percent increase in college education. In a country with high income inequality, average level of education is negatively correlated with the number of educational elites. Government support for public education programs also decreases in such countries. As a result, income inequality decreases the average level of education of a country.

3.3.4. Measurement of Income Inequality

In the literature two types of measures which are used for measuring income distribution in terms of both analytical and quantitative purposes: (i) personal/size distribution of income and (ii) functional/distributive factor share distribution of income.

Size distribution of income is the distribution of income according to the size classes of individuals' without considering the sources of that income. This measurement type is the most used one which only considers that how much each class earns. Size distribution of income arranges all individuals by ascending personal incomes and then dividing the population into distinct groups or sizes. The most common method is to divide the population into quintiles or deciles. A quintile is

the 20 percent proportion of the group population and decile is the 10 percent proportion of the group population Todaro and Smith (2012).

From a typical size distribution of income table which is divided into quintiles, a common measure of income inequality which is called “Kuznets’ ratio” (Kuznets, 1955) can be derived by dividing the top 20 percent ratio incomes to bottom 40 percent ratio incomes. Kuznets’ ratio is used to measure the degree of inequality between the high-income groups and the low-income groups in a country.

The “Lorenz Curve” which is a graph displaying the variance of the size distribution of income from the line of equality, is another common method to analyze the personal income distribution in a country. The “Lorenz Curve” was developed by Max Otto Lorenz in 1905. It graphs percentiles of population against cumulative income or wealth of individuals at or below that percentile. It is a mathematical estimation which is based on fitting a continuous curve to the incomplete and discontinuous observation data of income or wealth. The Lorenz curve starts at (0,0) and ends at (1,1). It is not defined if the mean of the probability is infinite or zero, it can never rise above the line of perfect equality.

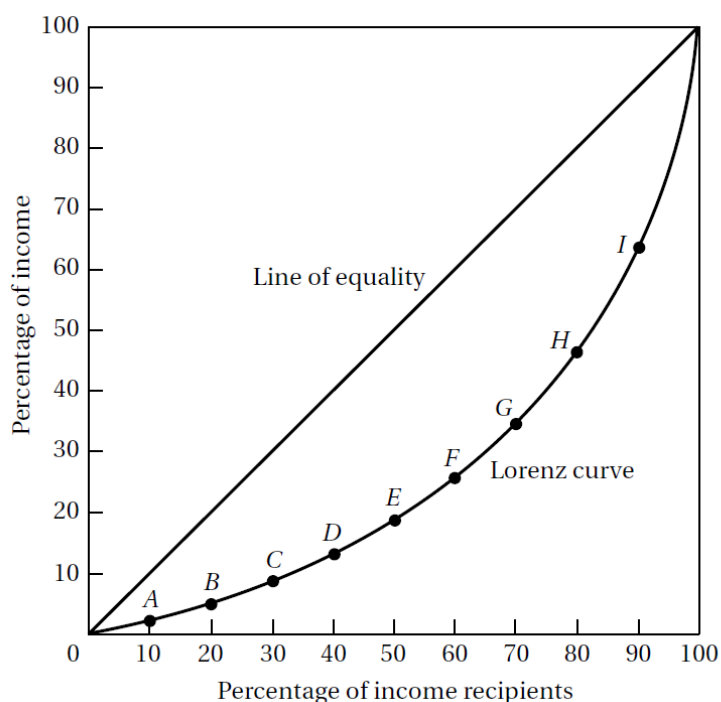


Figure 10 - Lorenz Curve

Source: Todaro and Smith, 2012

In Figure 10, on every point of the diagonal, the percentage of income received is exactly equal to the percentage of income recipients. The diagonal line is called the “perfect equality line” in the size distribution of income. The more the Lorenz line curves further away from the line of equality, the level of inequality is higher.

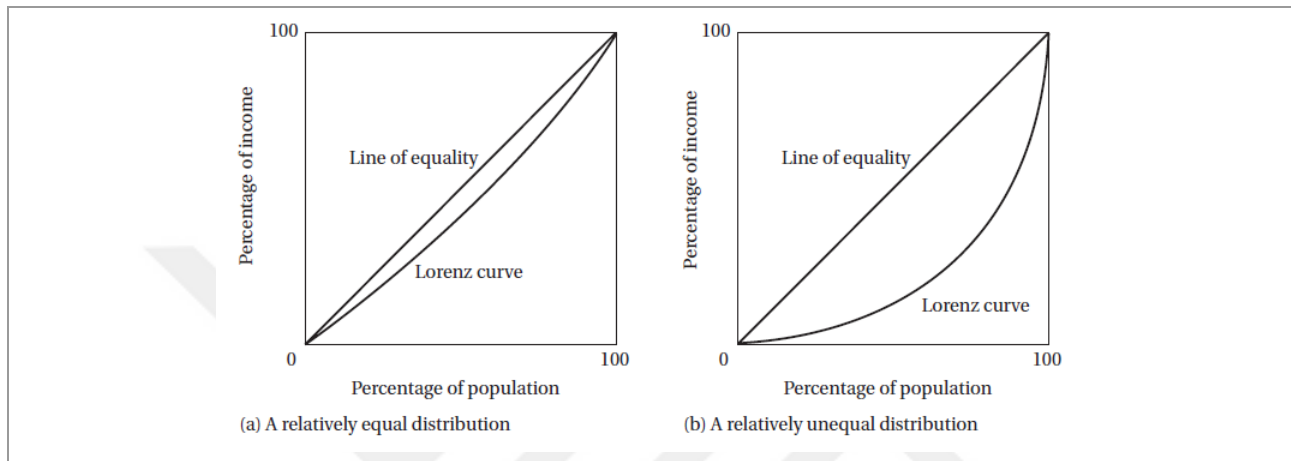


Figure 11 - Relatively Equal and Relatively Unequal Lorenz Curve Examples

Source: Todaro and Smith, 2012

In Figure 11, two example distributions are shown, first one (a) is a relatively equal distribution and second one (b) is a relatively unequal distribution (Todaro and Smith, 2012). The ratio of the area between the line of perfect equality and the observed Lorenz curve to the area between the line of perfect equality and the line of perfect inequality is called the “Gini Coefficient” which was introduced to the literature by Corrado Gini in 1912.

The “Gini Coefficient” ranges between 0 and 1 and the higher the value of the coefficient which is close to 1 indicates worse inequality in income distribution and the lower the value of the coefficient which is close to 0 means a fairer income distribution.

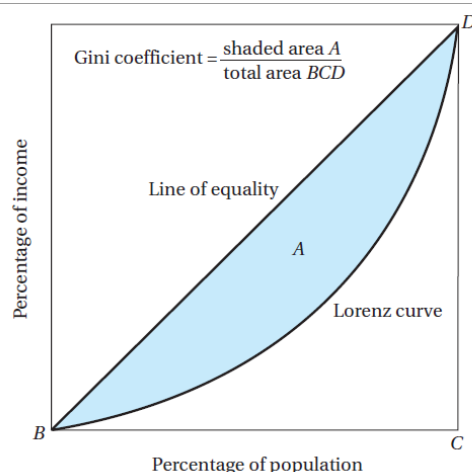


Figure 12 - The Gini Coefficient Estimation

Source: Todaro and Smith, 2012

According to the World Bank (2020), the global Gini Coefficient ranges between 0.60 and 0.70 in the 21st century. The Gini Coefficient between 0.50 and 0.70 generally reflects highly unequal income distribution and the Gini Coefficient between 0.20 and 0.35 generally shows relatively equal distributions.

Table 11 - Historical World Gini Coefficient between 1820-2013

Year	World Gini Coefficients
1820	0.43
1850	0.53
1870	0.56
1913	0.61
1929	0.62
1950	0.64
1960	0.64
1980	0.66
2002	0.71
2005	0.68
2008	0.70
2013	0.65

Source: World Bank Poverty and Prosperity Report, 2016

Anand and Segal (2008) studied global income inequality and found that there is insufficient evidence to determine the change of direction in global income inequality in the last

three decades because there is uncertainty on the diversity of estimates and sources including gaps and errors in the datasets.

According to Yitzhaki (1998), Sung (2010) and Blomquist (1981) there are some key issues in the interpretation of the Gini coefficient, namely:

- The same Gini Coefficient value may result from different distribution curves.
- The demographic structure of the country should be considered while interpreting.

The second distribution of income is the “functional distribution of income” which is defined as the distribution of income which does not consider the ownership of the factors that are regarded to the distribution of income. It is the share of the total income of factors of production. The theory does not consider individuals as separate entities, it inquires the percentage of income labor receives totally and compares it with the percentages of total income distributed as rent, interest gained and profit. Giovannini (2008) clarified the difference between personal income distribution and functional income distribution as, “The functional income distribution makes the distinction between the shares of types of income used for different spending purposes, while the personal distribution of income is a measure of inequality of a specific type of income. The former is an indicator of how much of labor income there is to share, while the latter indicates how equally labor income is distributed among individuals.” Galbraith (1998) stated that shifting from the functional income distribution to the personal income distribution does not make any sense. However, the perspective has changed from a macro one to a micro one, i.e., technology, skills, education, age, sex, etc.

Historically, the functional income distribution theory is found in the work of Ricardo (1817) at first stating that “To determine the laws which regulate this distribution [between rent, profit, and wages], is the principal problem in political economy.” Although Ricardo divided the produce of the earth by rent, profit, and wages according to the decrease in the marginal productivity, he did not apply the decreasing marginal productivity to labor and capital. According to the neo-classical theory, the income of any factor production depends on the price that is paid for the factor and the amount that is purchased. Hence, factor pricing and income distribution are interrelated. In a country, if more employees are employed when the wage rate is rising, the share of

labor in national income will rise, and eventually the employees will be able to afford goods that they were not able to afford previously.

3.3.4.1. Kuznets' Inverted-U Hypothesis

In his epochal study, “Economic Growth and Income Inequality”, Kuznets (1955) focused on whether economic growth increases or decreases the inequality in the distribution of income and what factors determine the trends and level on income inequality. Kuznets discovered the inverted U-shaped relationship between economic growth and income inequality. So, Kuznets' Inverted-U Hypothesis expresses that economic growth worsens income inequality at first and then improves it at a later stage of economic development. Kuznets also used the ratio of the richest 20 percent of the population to that of the poorest 40 percent of the population as a measure of inequality and this is called Kuznets' ratio.

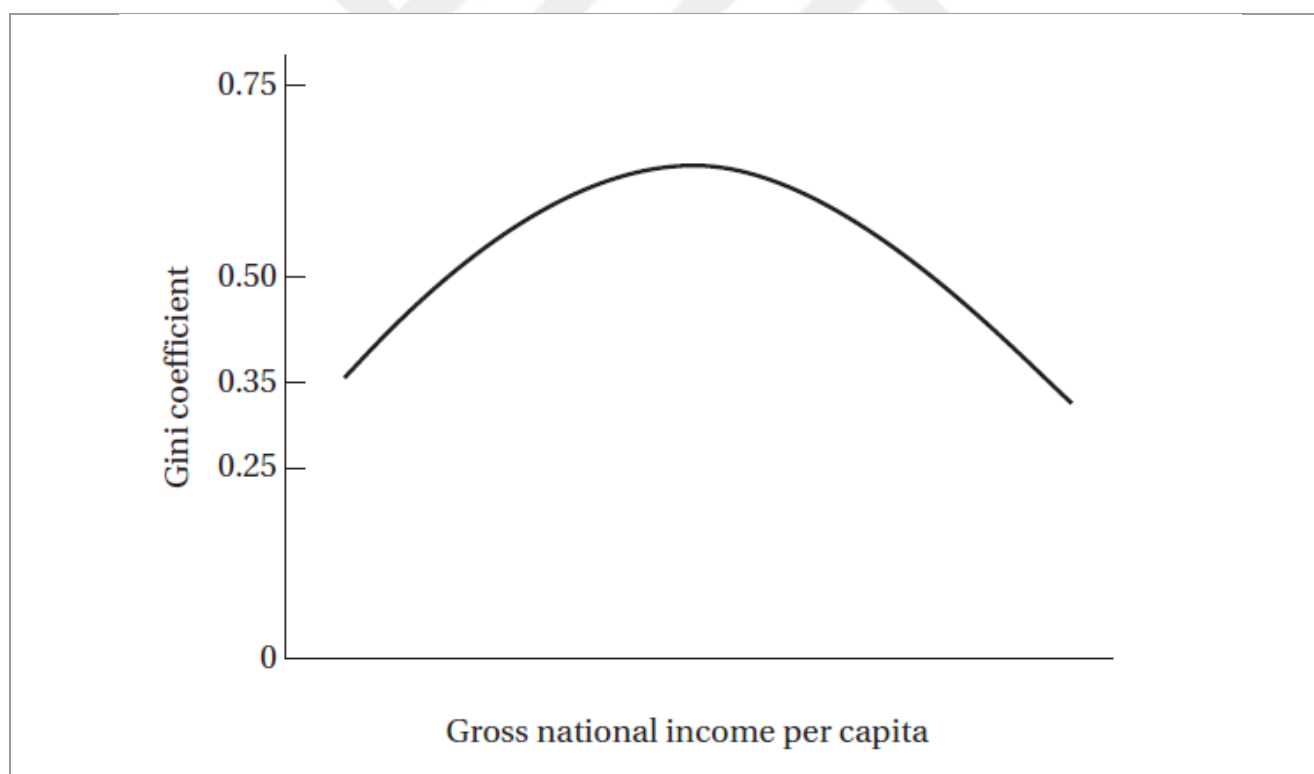


Figure 13 - Kuznets Inverted-U Curve

Source: Todaro and Smith, 2012

In another study of Kuznets (1963) “Quantitative Aspects of the Economic Growth of Nations, Distribution of Income by Size”, the author found more support for the inverted-U hypothesis, involving wide inter-sectoral difference in per capita incomes in Less Developed Countries (LDC) because of the income per worker disparities between the agricultural and non-agricultural sectors. The income in the agricultural sector is distributed less unequally than the income in the non-agricultural sector of the underdeveloped and most of the developed countries. According to Wolff (2009) the basic logic behind Kuznets’ hypothesis is that in the early stage of economic development because of higher growth rate and higher-income level in the non-agricultural/modern industrial sector the labor force shifts from low-income sectors to high-income sectors. Therefore, income inequality increases as the gap between mean income levels of the agricultural and non-agricultural sectors widens.

3.3.5. Income Inequality in Turkey

According to the OECD, income is defined as “household disposable income in a particular year”. It consists of earnings, self-employment, capital income, public cash transfers and income taxes. Social security contributions paid by households are deducted from it. The income of the household is attributed to each of its members with an adjustment to reflect the differences in needs for households of different sizes. Income inequality among individuals is measured by five indicators: (i) The GINI coefficient is based on the comparison of cumulative proportions of the population against cumulative proportions of the income they receive, and it ranges between 0 in the case of perfect equality and 1 in the case of perfect inequality. (ii) The S80/S20 is the ratio of the average income of the 20 percent of the richest to the 20 percent of the poorest of the total population. (iii) The P90/P10 is the ratio of the upper bound value of the richest ninth decile (i.e., the 10 percent of people with highest income) to that of the poorest first decile. (iv) The P90/P50 is the ratio of the upper bound value of the richest ninth decile to the median income and P50/P10 is the ratio of median income to the upper bound value of the poorest first decile. (v) The “Palma Ratio” is the share of all income received by the 10 percent of people with highest disposable income divided by the share of all income received by the 40 percent of people with the lowest disposable income.

Another common way to measure income inequality is to construct the “Lorenz Curve” that was introduced to the literature by Max Otto Lorenz (1905). The Lorenz Curve is a graph which indicates the variance of the size distribution of income from perfect income equality in a given year. The curvature of the Lorenz line indicates the degree of inequality. In other words, as the Lorenz line curves away from the line of perfect equality, the degree of inequality increases and vice versa.

The “Gini Coefficient” is estimated from the Lorenz Curve, and it ranges between 0 and 1. The estimation of “Gini Coefficient” is calculated by dividing the area between the “Lorenz Curve” and the perfect equality line to the total covered size of the right area of the equality line in a Lorenz diagram. The “Gini Coefficient” is equal to half of the relative mean difference. A Gini Coefficient closer to 1 indicates higher inequality and a Gini Coefficient closer to 0 indicates lower inequality. The “Gini Coefficient” is also expressed as an index which is called the “Gini Index” which is equal to the “Gini Coefficient” multiplied by 100.

Table 12 - Gini Coefficients of the OECD Countries and Turkey (2018)			
Country	Gini Coefficient	Country	Gini Coefficient
Australia	0.330	Latvia	0.346
Austria	0.284	Lithuania	0.378
Belgium	0.266	Luxembourg	0.304
Canada	0.310	Mexico	0.458
Chile	0.460	Netherlands	0.285
Costa Rica	0.479	New Zealand	0.349
Czech Republic	0.253	Norway	0.262
Denmark	0.261	Poland	0.284
Estonia	0.314	Portugal	0.331
Finland	0.266	Russia	0.331
France	0.291	Slovak Republic	0.241
Germany	0.294	Slovenia	0.244
Greece	0.333	South Africa	0.620
Hungary	0.282	Spain	0.341
Iceland	0.255	Sweden	0.282
Ireland	0.309	Switzerland	0.296
Israel	0.344	Turkey	0.404
Italy	0.328	United Kingdom	0.357
Japan	0.339	United States	0.390

Korea	0.355	OECD Average	0.330
Source: OECD Income Distribution Database, 2018			

As seen in Table 12, the average value of the “Gini Coefficients” among the 39 OECD countries in 2018 is 0.330 and median value is 0.314. The best performing country is Slovak Republic with the value of 0.241 and the worst performing country is South Africa with the value of 0.620. The “Gini Coefficient” of the developed countries tend to fluctuate between 0.200 and 0.300 and the “Gini Coefficient” of the developing or non-developed countries are higher than 0.500. Turkey ranked as the fifth worst performing country among the 39 OECD countries in terms of income inequality in 2018. The worst ranking countries were: South Africa 0.62, Costa Rica 0.48, Chile 0.46, Mexico 0.46, and Turkey 0.40. Turkey’s “Gini Coefficient” is slightly higher than the average at 0.404. However, her” Gini Coefficient” was below South Africa who is also a competitor of Turkey as an emerging/developing economy.

Figure 14 below reflects the Gini Index score for Turkey between the 2002 and 2019 period and the World Average Gini Index score of the 164 selected countries listed by the World Bank (the World Average score is calculated by the author). As may be seen clearly from Figure 14, after 2010 the spread between Turkey’s Gini Index Score and World Average Gini Index started to increase until 2019.

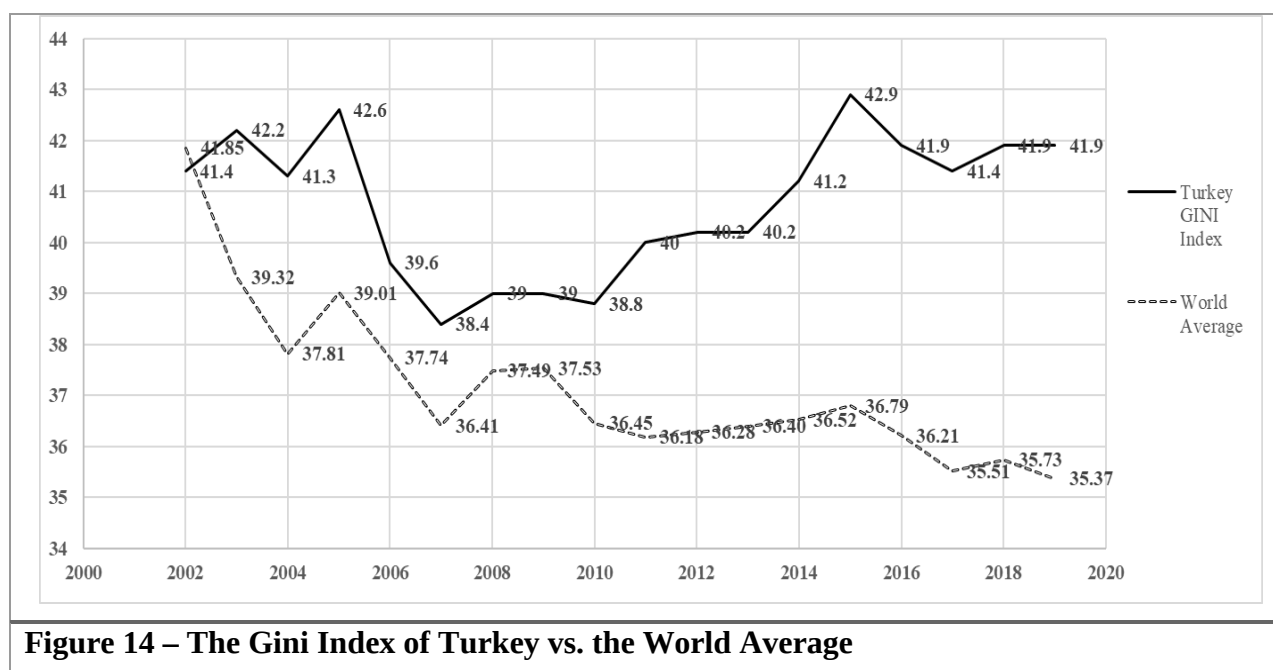


Figure 14 – The Gini Index of Turkey vs. the World Average

Source: World Bank DataBank, 2018

In Table 13, the historical “Gini Index” of Turkey is shared. The World Bank publishes the “Gini Index” data since 1979. The “Gini Index” measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The “Gini Index” measures the area between the “Lorenz Curve” and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus, while a Gini Index of 0 represents perfect equality, an index of 100 implies perfect inequality.

As seen in Table 13 below, the “Gini Index” of Turkey, real GDP YoY change in percentage and Real Effective Exchange Rate (REER) YoY change in percentage between 2003 and 2019 is given. As clearly seen in the table, although the Gini Index of Turkey fluctuated between 38.40 and 42.20 as Turkey experienced high growth rates between 2003 and 2019; she was not successful in decreasing its “Gini Index” level below the OECD average.

Table 13 - Gini Index, Real GDP Growth and REER of Turkey between 2003 - 2019

Year	GINI Index	Real GDP YoY %	REER YoY %
2003	42.20	5.61	5.24%
2004	41.30	9.64	1.02%
2005	42.60	9.01	16.79%
2006	39.60	7.11	-8.04%
2007	38.40	5.03	16.28%
2008	39.00	0.85	-12.98%
2009	39.00	-4.7	2.24%
2010	38.80	8.49	5.76%
2011	40.00	11.11	-14.03%
2012	40.20	4.79	7.39%
2013	40.20	8.49	-9.06%
2014	41.20	5.17	4.76%
2015	42.90	6.09	-6.34%
2016	41.90	3.18	-5.57%
2017	41.40	7.44	-7.72%
2018	41.90	2.83	-11.57%

2019	41.90	0.9	-0.31%
Source: World Bank, IMF and CBRT, 2019			

According to the Table 14, the average value of S80/S20 ratio among the 39 OECD countries in 2018 was 6.49 and the median value was 5.30. The best performing countries were: the Czech Republic, Iceland, and Slovenia sharing the same value of 3.6 and the worst performing country was South Africa with the value of 37.6 for the same year.

Table 14 shows that the S80/S20 ratio of Turkey which is 7.8 makes Turkey the sixth most unequal country among the 39 OECD countries. In other words, average income of the richest 20 percent is 7.8 times higher than the average income of the poorest 20 percent in Turkey. The OECD average is 6.5 where the highest ratio is achieved by South Africa with 37.6 and the lowest ratio is achieved by Czech Republic with 3.6 for 2018.

**Table 14 - S80/S20 Disposable Income Quintile Share
for 29 OECD countries and Turkey (2018)**

Country	S80/S20 Ratio	Country	S80/S20 Ratio
Australia	5.5	Latvia	6.4
Austria	4.5	Lithuania	7.5
Belgium	3.9	Luxembourg	4.9
Canada	5.1	Mexico	10.3
Chile	10.3	Netherlands	4.3
Costa Rica	13.2	New Zealand	5.8
Czech Republic	3.6	Norway	4.0
Denmark	3.7	Poland	4.4
Estonia	5.3	Portugal	5.6
Finland	3.8	Russia	5.5
France	4.3	Slovak Republic	3.7
Germany	4.6	Slovenia	3.6
Greece	6.0	South Africa	37.6
Hungary	4.3	Spain	6.5
Iceland	3.6	Sweden	4.2

Ireland	4.7	Switzerland	4.5
Israel	6.5	Turkey	7.8
Italy	5.9	United Kingdom	6.2
Japan	6.2	United States	8.4
Korea	7.0	OECD Average	6.5

Source: OECD Income Distribution Database, 2018.

The Turkish Statistical Institute (TurkStat) publishes the Income and Living Conditions Survey annually. According to the Table 15, Wage and Salary make up the highest proportion of income in Turkey which is declining since 2015. Rental Income and Property Income increased until 2010 and then started to decrease since 2010 which may be due to the depreciation of the Turkish Lira against the USD between January 1st, 2010, and December 31st, 2021. The Turkish Lira was 1.50 against USD on January 1st, 2010, and closed the year at 13.4029 on December 31st, 2021. The highest level recorded was on December 20th, 2021, as 18.3674. The rate of depreciation for this period is 793.53 percent. In the same given period, according to the TurkStat's Consumer Price Index, the cumulative inflation rate was 294.64 percent, and the cumulative minimum wage increase rate was 463.83 percent. The minimum wage increase is based on the previous YoY inflation, for example the 2021 minimum wage increase is announced based on YoY inflation of 2020. The high increase of minimum wage between 2010-2021 period is because of the harsh depreciation of TL in the same period; however, as USDTRY increased 793.53 percent, minimum wage only increased 463.83 percent between 2010-2021. Entrepreneurial income has been continuously declining since 2006 and between 2006–2021 the decline has been 6.71 percent which shows a considerable change.

Table 15 – Turkey Income and Living Conditions Survey 2006 - 2021 (percent)

Year	Wage & Salary	Casual	Entrepreneurial	Rental Income	Property Income	Social Transfers	Other
2006	40.83	3.66	24.21	3.10	6.09	17.78	4.34
2007	39.74	4.02	23.22	4.05	6.99	18.18	3.79
2008	41.88	4.11	22.36	4.40	4.20	19.12	3.93
2009	42.91	3.54	20.41	4.98	5.35	19.56	3.25
2010	43.74	3.63	20.17	4.18	4.51	20.47	3.30
2011	44.80	3.56	21.43	3.86	3.81	19.38	3.16
2012	46.51	3.42	20.40	3.50	3.30	19.98	2.89
2013	48.28	3.24	19.61	3.32	3.11	19.71	2.73

2014	49.09	3.27	18.51	3.32	2.91	20.13	2.77
2015	49.70	2.80	18.80	3.30	2.60	20.00	2.80
2016	49.70	2.50	19.80	3.10	2.50	19.60	2.70
2017	48.90	2.60	19.60	3.40	3.20	19.70	2.60
2018	48.50	2.70	18.80	3.40	3.60	20.10	2.90
2019	46.70	2.60	17.70	3.60	4.30	21.90	3.20
2020	47.10	2.50	17.70	3.50	4.30	21.80	3.10
2021	47.10	2.40	17.50	3.35	2.64	23.94	3.07

Source: TurkStat, 2021.

Torul and Öztunalı (2018) studied income and wealth inequality in Turkey by using a model-based approach. The study concluded that Turkey is one of the most unequal economies regarding income inequality. But due to lack of data the study has little information acquired on wealth inequality in Turkey. The study also reported that “in order not to switch to the unequal Turkish economy, a utilitarian benevolent planner of Turkey's counter-factual representative-agent economy would be indifferent between forgoing an indefinite 43.24% of steady-state consumption if labor is supplied inelastically, or 25.16% of steady state consumption accompanied by an extra 33.61% of steady state hours worked if labor is supplied elastically.”

Filiztekin (2020) studied the income inequality in Turkey between the 2003-2015 period and concluded that Turkey has one of the highest income inequality levels within the OECD countries. Although, Turkey has been successful in decreasing the Gini Coefficient at the beginning of 21st century, the momentum reversed, and the Gini Coefficient started to rise again due to the changing macroeconomic developments. The study stated that there is a high correlation between the education of households and inequality in Turkey. The study also added that the assurance on salaries, social transfers, and the decline in self-employment and asset generated incomes cause an erosion in the incomes of the middle-class in Turkey.



4. RESEARCH DESIGN AND EMPIRICAL TEST RESULTS

This section first describes the data, methodology, model specification, and then, interprets econometric test results and explains other findings. The results are composed of two sections. The first section investigates the relationship between the depreciation of the TL and dollarization in Turkey. The second section investigates the relationship between the depreciation of the TL and income inequality, and dollarization and income inequality in Turkey.

4.1. Data

Monthly and annual data is used to test the empirical analyses in the models.

DEP: Currency depreciation is a decline in the value of a domestic currency in terms of its exchange rate against a foreign currency. The CBRT USD/TRY data is used in this study.

DI: Dollarization Index is the ratio of Foreign Currency Deposits to M2Y Broad Money. The CBRT data is used in this study.

GDP: Gross Domestic Product per Capita is a metric that shows a country's economic output per person which is calculated by dividing the GDP of a country to its population. The World Bank data is used in this study.

GINI: Is an index that measures the inequality of income distribution. The World Bank data is used in this study.

I: Interest Rate is the amount a lender charges the borrower for the use of assets expressed as a percentage of the principal. The CBRT monthly Deposit Rate data is used in this study.

INF: Inflation is a rise in the price level of an economy over a period of time. The Consumer Price Index (CPI) data of the TurkStat is used in this study.

LNNER: It is the log of the nominal exchange rate. The CBRT data is used in this study.

TR: Trade openness is measured as the sum of a country's exports and imports as a share of that country's GDP. The CBRT data is used in this study.

UNP: Unemployment is a term referring to individuals who are employable and actively seeking a job but are unable to find a job. The TurkStat data is used in this study.

4.2. Methodology

This thesis tries to determine the effect of currency depreciation and dollarization on income inequality in Turkey. As Bahmani-Oskooee (1997) stated “Although the simple approach would be to relate the degree of devaluation to a measure of income inequality and see whether devaluation will have unequalizing effect on income distribution, this method will leave other determinants of income distribution out of the model.” Thus, this study shall test its hypothesis with a well-developed model. Cline (1975) examined the theories of relationship between development

and income distribution by applying a survey which describes theoretical and empirical works. According to Cline's (1975) comprehensive study; per capita income, economic growth, and population growth are major determinants that have been used to assess income distribution in the literature. Adelman and Morris (1971) studied the inequalities of income distribution in 44 underdeveloped countries and examined Kuznets' (1955) inverted-U curve and concluded that the most important variables affecting the inequality of income distribution are ecological, socio-economic, and political. As a result, studies like Cline (1975) and Adelman and Morris (1971), Bahmani-Oskooee (1997) examined the effect of currency depreciation on income inequality by using Kuznets' (1955) inverted-U curve hypothesis. The per capita income is also used as a variable in the model. Kuznets hypothesizes that as a country develops economically, an increase in per capita income first affects income distribution negatively and then, with further economic development it affects income distribution positively. Bahmani-Oskooee (1997) formulated Kuznets' hypothesis by relying upon the model used by Papanek and Kyn (1986) as follows:

$$I_i = \alpha_0 + \alpha_1 \log y_i + \alpha_2 (\log y_i)^2 + e_i \quad (4.1.)$$

where, I_i is the measure of income inequality of distribution in country i , y_i is real income per capita of country i , e is the disturbance term. The logarithm of y_i is used because according to Ahluwalia (1976) "...logarithmic transformation gives equal weight to equal proportional differences in GNP in measuring the levels of development and growth which occurs at a compound rate". Also, the square of $\log y_i$ is used to capture the inverted-U shape of Kuznets' curve. The estimates of $\alpha_1 > 0$ and $\alpha_2 < 0$ according to Kuznets's hypothesis indicates that as income per capita rises at first income distribution worsens and then, becomes more equal. Bahmani-Oskooee (1997) used three other determinants as **YG** (growth rate of real GNP), **PG** (population growth), and **DEV** (the degree of devaluation in each country) in the model. Hence, Equation 4.1. becomes Equation 4.2. stated below which is used as the basis of his study:

$$I_i = \alpha_0 + \alpha_1 \log y_i + \alpha_2 (\log y_i)^2 + \alpha_3 YG_i + \alpha_4 PG_i + \alpha_5 DEV_i + u_i \quad (4.2.)$$

In the model, real GNP growth and population growth estimates α_3 and α_4 were expected to be positive according to the other studies in the literature. α_5 was also expected to be positive since an increase in **DEV** may decrease the share of the poor and increase the share of the rich

which may then cause an increase in I_i . Due to the unavailability of time-series on the measure of income distribution, the study used cross-sectional data from 24 countries. Equation 4.2. was estimated by the Ordinary Least Squares (OLS) method, and the reported results showed that the estimated coefficient of the DEV variable was highly significant and positive. As a result, the study showed that devaluations have an unequalizing effect on income distribution. However, the study also pointed out that the results can be sensitive depending on the year in which income distribution data is available (Bahmani-Oskooee, 1997).

There are two comprehensive time-series studies in the literature about the effects of devaluation/depreciation on income distribution: (i) Bahmani-Oskooee and Motavallizadeh-Ardakani (2017a) based on the 51 states of the U.S. and (ii) Shahbaz, Islam, and Butt (2011) based on Pakistan. All these studies are based on the assumption that exchange rate changes affect income distribution symmetrically. However, Bahmani-Oskooee and Motavallizadeh-Ardakani (2017b) stated that exchange rate changes may affect income distribution asymmetrically, because wages cannot decrease because of inflation considering the minimum wage and labor contracts laws. As inflation increases because of the exchange rate depreciations due to the pass-through effect, income will be transferred from workers to producers considering lagged adjustment of wages. On the other hand, if exchange rate appreciates it is expected to lower inflation, but on the wage side income will not be able to be transferred from producers to workers. In line with Bahmani-Oskooee and Motavallizadeh-Ardakani (2017a), Delatte and Lopez-Villavicencio (2012) also studied the effects of devaluation/depreciation on income distribution through inflationary effects of depreciation and concluded that the response is asymmetric.

In the literature, almost all the studies are concentrated on Kuznets' (1955) inverted-U hypothesis. But Bahmani-Oskooee and Gelan (2008 and 2012) argued that "the income-squared term should not be included since the short-run dynamics of the relationship between a measure of income distribution and income will reveal the turning point." So, instead of using Equation 4.2., Bahmani-Oskooee and Motavallizadeh-Ardakani's (2017b) employed a new model (Equation 4.3.):

$$\ln Gini_t = a + b \ln RGDP_t + c \ln REX_t + \varepsilon_t$$

(4.3.)

In Equation 4.3., **Gini** is the statistical measure of distribution of income across income percentiles in a country where a value closer to 1 reflects higher income inequality and closer to 0 reflects lower income inequality; 1 reflecting perfect income inequality and 0 reflecting perfect income equality. **RGDP** is the real Gross Domestic Product (GDP) and **REX** is the real effective exchange rate.

The model presented in Equation 4.3. is a long-run model which differentiates from most of the studies in the literature. Estimate **b** is expected to be negative when an increase in real GDP is expected to reflect an increase or decrease in income inequality. Estimate **c** is also expected to be negative because if exchange rate depreciates, income inequality is expected to worsen in the long run.

Bahmani-Oskooee and Motavallizadeh-Ardakani's (2017b) Equation 4.3., introduces short-run dynamics by specifying Equation 4.3. as an Error Correction Model (ECM) to differentiate the short-run effects of RGDP and REX on GINI. However, unlike Bahmani-Oskooee and Motavallizadeh-Ardakani's (2017b) this study employs a two-legged approach to test its hypotheses.

Hypotheses of Model I:

H_0 : There is no relationship between dollarization and currency depreciation in Turkey.

H_1 : There is a relationship between dollarization and currency depreciation in Turkey.

and

Hypotheses of Model II:

H_0 : Dollarization and currency depreciation do not affect income inequality in Turkey.

H_1 : Dollarization and currency depreciation have negative impacts on income inequality in Turkey

This study hypothesis that dollarization causes currency depreciation and vice versa, and hence, currency depreciation and dollarization increase income inequality.

4.2.1. Methodology of Model I

The first leg to examine the hypothesis of this study is to examine the relationship between dollarization and exchange rate movements by following the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model of Akçay, Alper, and Karasulu (1997), Cavoli and Rajan (2007), Behera (2008), Lay, Kakinaka, and Kotani (2010). This study will secondly examine the impact of currency depreciation on income inequality in Turkey by following the work of Shahbaz, Islam, and Butt (2011).

Lay, Kakinaka, and Kotani (2010) empirically examined the relationship between dollarization and exchange movements in Cambodia and their GARCH analysis results reflect that dollarization induces the depreciation of Cambodia's domestic currency Cambodian Riel. The study also added that dollarization is also a constraint on poverty reduction because it affects the living standard of low-income class who earn their income in domestic currency. The study conducted two empirical methods which are the Granger Causality test and the GARCH model. The Granger Causality test showed that dollarization causes an increase in exchange rates in the Granger's sense. The GARCH model showed that dollarization incites the depreciation of domestic currency, Cambodian Riel, and solidifies its volatility. This study differentiates from the others in the literature by applying the GARCH analysis, with which it shows how dollarization affects both the value of exchange rate and its volatility. The results are also consistent with McKinnon (1982, 1993) which found that dollarization causes exchange rate instability. According to the study, dollarization has both benefits and costs. The benefits are hedging against exchange rate risks, lower risk of national default, opportunity for re-intermediation, and financial deepening. The costs are distortion of income distribution, which is crucial, losing both monetary independence and seigniorage.

The study used the ratio of foreign currency deposits to broad money as the Dollarization Index (DI) which is also used in the literature by Clements and Schwartz (1993), Agenor and Khan (1996), Sahay and Vegh (1995), Komarek and Melecky (2001), Kem (2002), Rennhack and Nozaki (2006) and Yinusa (2008). Since the interest rate is an important factor affecting the exchange rate, this study incorporated it in the empirical model to stick to the base study of Lay, Kakinaka, and Kotani (2010). At first, the study examined the Granger Causality between the DI and the nominal exchange rate and then checked whether each variable is non-stationary or not by applying the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The study chose the lag length

according to the Akaike Information Criterion (AIC) or Schwarz Information Criterion (SIC). According to the results of the Granger Causality between DI and nominal exchange rates found that the DI, Granger causes nominal exchange rate but not vice versa. As a result, the value of the DI helps to forecast the future value of nominal exchange rate. This means that the current and the past value of DI, helps to forecast the future values of nominal exchange rate.

The method of examining exchange rate volatility is to estimate a GARCH model which is commonly used in the literature due to the explicit modeling of conditional exchange rate volatility. Therefore, this study followed Akçay, Alper, and Uslu (1997), Cavoli and Rajan (2007), and Behera, Narasimhan, and Murty (2008)'s studies and applied the GARCH model which employed the mean and variance equations below:

$$\Delta e_t = b_0 + \sum_{i=1}^j b_i e_{t-i} + \gamma_1 \Delta X_t + \gamma_2 \Delta Y_t + \mu_t, \quad \mu_t = h_t^{1/2} \varepsilon_t \quad (4.4.)$$

$$h_t = \omega + \sum_{i=1}^j \delta_i \mu_{t-i}^2 + \sum_{i=1}^q \phi_i h_{t-i} + \eta_1 \Delta X_t + \eta_2 \Delta Y_t \quad (4.5.)$$

where dependent variable is the log difference of exchange rate, and the independent variables are the autoregressive of the log difference of exchange rate, the difference of dollarization index, and the difference of interest rate. Nelson's (1991) Exponential GARCH (EGARCH) model is also used for robustness check and the variance equation is:

$$\ln(h_t) = \omega + \sum_{i=1}^j \delta_i \varepsilon_{t-i} + \sum_{i=1}^q \phi_i \ln(h_{t-i}) + \eta_1 \Delta X_t + \eta_2 \Delta Y_t \quad (4.6.)$$

where ε_t is a dependent white noise process with zero mean unit variance. According to Cavoli and Rajan (2007), the GARCH model helps us to observe the conditional volatility of the exchange rate and it also offer information about the factors underlying the movements. According to Hamilton (1994), the EGARCH is more advantageous than the GARCH, since the logarithm of the variance of h_t will be positive regardless of the signs of the ARCH coefficients.

4.2.2. Methodology of the Model II

The second leg to examine the hypothesis of this study is to examine the relationship between dollarization and currency depreciation on income inequality in Turkey. The impact of currency depreciation on income distribution in Turkey is analyzed by following the study of Shahbaz, Islam, and Butt (2011). The paper included GDP per capita (GDPC), trade-openness (TR), foreign direct investment (FDI), unemployment (UNP), and inflation rate (INF) as independent variables in the empirical model. The paper employed the Auto Regressive Distributed Lag (ARDL) Bounds Testing Approach to cointegration for the long-run relationship analysis and the Vector Error Correction Model (VECM) for the short-run dynamics. The paper also tested the Kuznets' inverted-U relationship between economic growth and income inequality. The paper found that in the long-run, nominal devaluation/currency depreciation (DEP) worsens income inequality.

The GDPC, TR, FDI, UNP, and INF variables are included in the model to avoid the potential problem of misspecification. This is the main reason why this study used Shahbaz, Islam, and Butt's (2011) model instead of Bahmani-Oskooee and Motavallizadeh-Ardakani (2017b)'s model. GINI is a function of the GDPC, and its square term is used to test the Kuznets' relationship hence the model is:

$$\text{Gini} = \gamma_1 + \gamma_2 A + \gamma_3 A^2 + \gamma_4 B + \gamma_5 C + \gamma_6 D + \gamma_7 E + \gamma_8 F + \mu_t \quad (4.7.)$$

where dependent variable is Gini and the independent variables are GDPC, GDPC square, DEP, TR, FDI, UNP, and INF are independent variables. This study then applies the ADF test to check for stationarity. The critical values of the distribution for the test statistics are adopted from Dickey and Fuller's (1979) study.

Currency depreciation transfers income from wage earners (high marginal propensity to absorb) to profiteers (low marginal propensity to absorb) is the traditionally accepted impact of currency depreciation on income distribution. In our model, the Gini coefficient is a function of economic growth per capita (GDPC), DEP, FDI, TR, INF, and UNP. ARDL Bounds Testing Approach to cointegration is applied to examine the long-run relationship between x_t and y_t where the vector is $x_t = \{DEP, FDI, TR, INF, UNP\}$, and $y_t = \text{Gini}$. Thus, the unrestricted Vector Autoregression (VAR) is represented below:

$$\mathbf{z}_t = \mu + \sum_{j=1}^q \delta_j \mathbf{z}_t + \varepsilon_t$$

(4.8.)

where,

$\mathbf{z}_t = [y_t, x_t]'$; μ , is a vector of constants, $\boldsymbol{\mu} = [\mu_y, \mu_x]'$, and $\boldsymbol{\delta}$ is a matrix of VAR parameters of lag j . Pesaran, Shin, and Smith (2001) proposed a new approach to test the existence of a relationship between a dependent variable and a set of regressors based on a Single Equation Approach. The study stated that the time series y_t is integrated at I(1), and x_t can have different orders of integration i.e., I(1) or I(0). Hence the equation can be rewritten as:

$$\Delta y_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 x_{t-1} + \sum_{j=1}^{q-1} \beta_{y,j} \Delta y_{t-j} + \sum_{j=1}^{q-1} \beta_{x,j} \Delta y_{t-j} + \varphi \Delta x_t + \mu_t \quad (4.9.)$$

where,

$$\beta_0 = \mu_y - \omega' \mu_x; \beta_1 = \lambda_{yy}; \beta_2 = \lambda_{yx} - \omega' \lambda_{xx}; \beta_{y,j} = \lambda_{yy,j} - \omega' \lambda_{xy,j} \text{ and } \beta_{x,j} = \lambda_{yx,j} - \omega' \lambda_{xx,j}. \quad (4.10)$$

The coefficients in Equation (4.10) can be estimated by the OLS method. Lack of a long-run relationship between the series, implied by the null hypothesis $\beta_1 = \beta_2 = 0$, is tested using the F-statistic. The alternate hypothesis $\beta_1 \neq \beta_2 \neq 0$ confirms the long-run relationship between the series. The Sensitivity Analyses are conducted for the stability of the ARDL model which are Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Squared Recursive Residuals (CUSUMsq).

4.3. Model Specifications

In this part, this study defines which independent variables are selected to be included in both of the models used.

4.3.1. Model Specification of Model I

This study followed Akçay, Alper, and Uslu (1997), Cavoli and Rajan (2007) and Behera, Narasimhan, and Murty (2008)'s studies and applied the GARCH model which employed the mean and variance equations. When the variables stated in Equation (4.4.) and (4.5.) are specified the GARCH model's mean and variance equations become:

$$\Delta e_t = b_0 + \sum_{i=1}^j b_i e_{t-i} + \gamma_1 \Delta DI_t + \gamma_2 \Delta I_t + \mu_t, \quad \mu_t = h_t^{1/2} \varepsilon_t \quad (4.11.)$$

$$h_t = \omega + \sum_{i=1}^j \delta_i \mu_{t-i}^2 + \sum_{i=1}^q \phi_i h_{t-i} + \eta_1 \Delta DI_t + \eta_2 \Delta I_t \quad (4.12.)$$

where the dependent variable is the log difference of the nominal exchange rate ($\Delta LNNER$) abbreviated as Δe_t and the independent variables are: (i) the autoregressive of $\Delta LNNER$, (ii) the difference of the DI which is ΔDI , (iii) the difference of interest rate which is ΔI . Nelson's (1991) EGARCH model is also used for robustness check and hence variance equation is:

$$\ln(h_t) = \omega + \sum_{i=1}^j \delta_i \varepsilon_{t-i} + \sum_{i=1}^q \phi_i \ln(h_{t-i}) + \eta_1 \Delta DI_t + \eta_2 \Delta I_t \quad (4.13.)$$

where ε_t is a dependent white noise process with zero mean and unit variance.

Being based on the SIC, the study used AR (3) for the mean equation, and GARCH (p=1, q=0), and EGARCH (p=3, q=2) for the variance equation. The results of the variance of GARCH (1,0) and EGARCH (3,2) and the coefficients of ΔDI should significantly be positive.

4.3.2. Model Specification of Model II

The variables stated in Equation (4.7.) are: The Gini which is a function of the GDPC and the square term of GDPC to test the Kuznets' relationship, DEP, FDI, TR, UNP, and INF. The model is stated below:

$$Gini = \gamma_1 + \gamma_2 GDPC + \gamma_3 GDPC^2 + \gamma_4 DEP + \gamma_5 FDI + \gamma_6 TR + \gamma_7 UNP + \gamma_8 INF + \mu_t \quad (4.14)$$

The model expects α_4 to be greater than 0 ($\alpha_4 > 0$) because of the findings of the effect of nominal currency depreciation on income distribution. The FDI should deteriorate income distribution and competition may lower rent-seeking behavior which may then reduce income inequality so, $\alpha_5 > 0$, or $\alpha_5 < 0$. Bensidoun, Jean, and Sztulman (2005) found that TR deteriorates income inequality. Therefore, the model expects α_5 to be greater than 0 ($\alpha_6 > 0$). In the literature, Bhagwati and Srinivasan (2002), David, and Scott (2005), Osmani (2005), Shahbaz and Amir (2008), and Shahbaz (2009) also found that TR increases income inequality. According to Aparicio and Araujo (2011) inflation worsens income distribution. Shahbaz, Wahid, and Kalim (2010) stated that the poor can benefit from inflation in the context of debtor-credit relation. As a result, the estimation of α_7 being greater or less than 0 ($\alpha_7 > 0$ or $\alpha_7 < 0$) is left to empirical determination. Unemployment increases income inequality; as a result the model expects α_8 to be greater than 0 ($\alpha_8 > 0$).

According to the **widening inequality hypothesis**, γ_2 is greater than 0 ($\gamma_2 > 0$) and γ_3 is equal to 0 ($\gamma_3 = 0$) is predicted. According to the **Kuznets' inverted-U hypothesis**, $\gamma_2 > 0$ and $\gamma_3 < 0$ are predicted. According to the **inequality narrowing hypothesis**, $\gamma_2 < 0$ and $\gamma_3 = 0$ are predicted. If $\gamma_2 < 0$ and $\gamma_3 > 0$; then; a U-shaped relationship occurs.

The critical values of the distribution for the test statistics are adopted from Dickey and Fuller's (1979) study by applying the ADF test to check for stationarity. Then the ARDL Bounds Testing Approach to cointegration is applied to examine the long-run relationship between x_t and y_t , where the vector $x_t = \{CD, FDI, TR, INF, UNP\}$, and $y_t = Gini$. Then, the Equation (4.10) is estimated by the OLS method. Lack of a long-run relationship between the series, implied by the null hypothesis $\beta_1 = \beta_2 = 0$, is tested using the F-statistic. The alternate hypothesis $\beta_1 \neq \beta_2 \neq 0$ confirms the long-run relationship. The Sensitivity Analyses are conducted for the stability of the ARDL model which are Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Squared Recursive Residuals (CUSUMsq).

4.4. Results

The results are presented in two parts. The first part shows the empirical analysis of the relationship between dollarization and currency depreciation in Turkey which is stated as Model I. The second

part shows the empirical analysis of the impacts of dollarization and currency depreciation separately on income inequality in Turkey which is stated as Model II.

4.4.1. Results of Model I

This section investigates the relationship between dollarization and nominal exchange rate movements in Turkey by using the monthly data between January 2001 and September 2021. This analysis follows the study and the model of Lay, Kakinaka, and Kotani (2010). The data was taken from the Electronic Data Delivery System of the CBRT. The abbreviations of the data used in the study are given below.

DI: Dollarization Index (FCD/M2Y derived from The Banks Association of Turkey)

I: Interest Rate (Deposit Rate) (CBRT – Statistical Data)

LNNER: Logarithmic Average Nominal Exchange Rate (Derived from the IMF - International Financial Statistics)

EViews is used to test the model. The time-series graphs of the variables used in the research are presented in Figures 15,16, and 17.

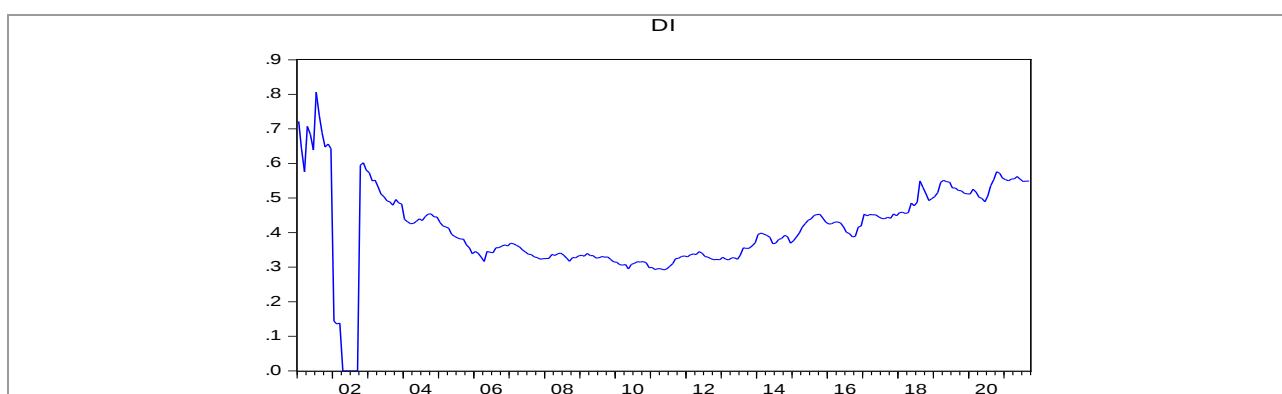
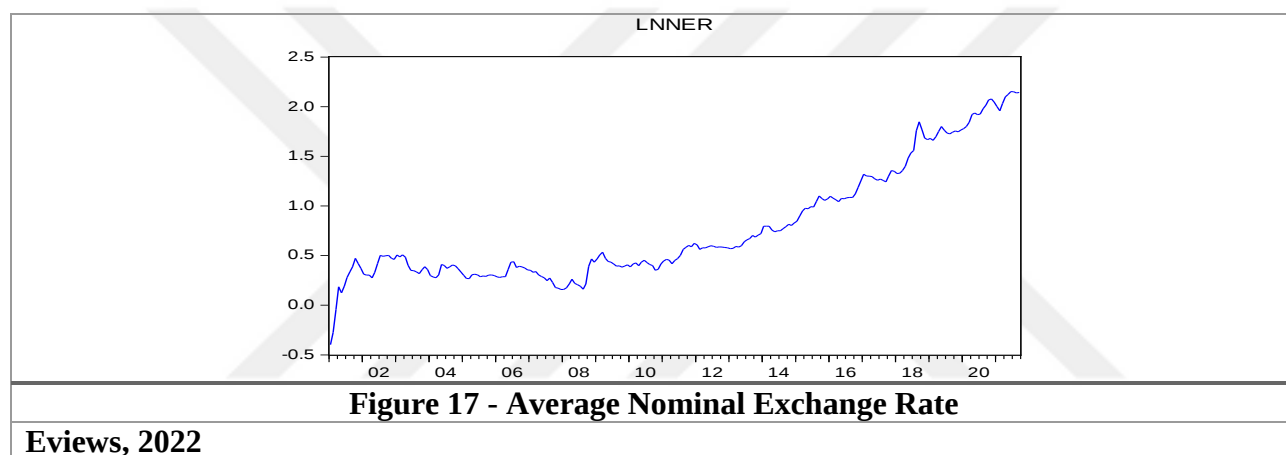
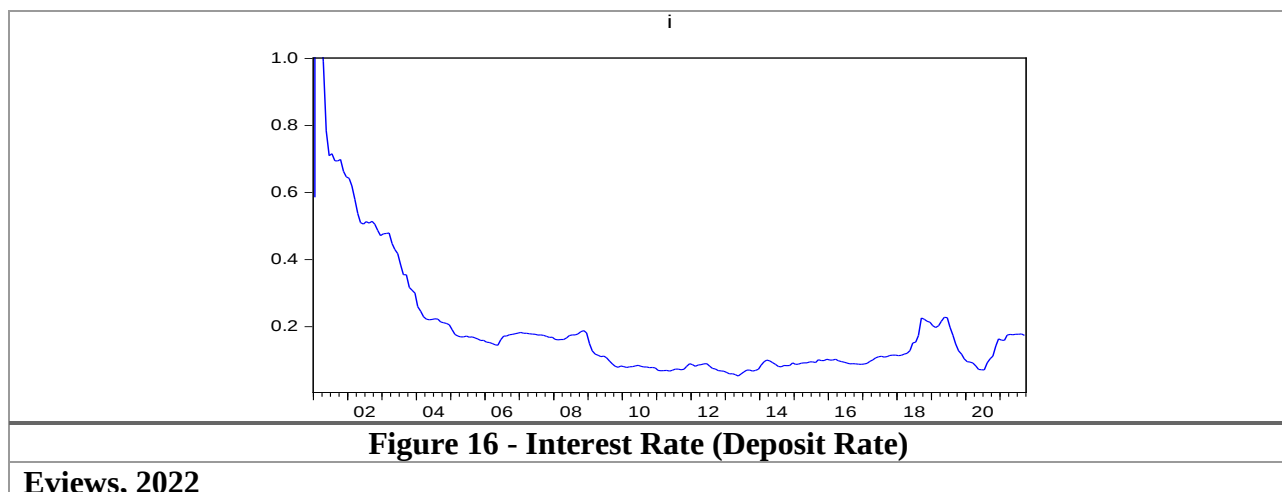


Figure 15 - Evolution of Dollarization

Eviews, 2022

Figure 16 - Interest Rate (Deposit Rate)



The figures clearly show that all three of the series are non-stationary. Non-stationary series can be made stationary by using the difference stationary process. In general, at the first process non-stationary series can be made stationary. However, if not, non-stationary time series are differenced until stationarity is achieved. For this reason, unit root tests should be applied to determine the stationarity precisely. This study analyzes whether or not each variable is non-stationary by applying ADF and PP tests respectively.

Variables used in the analysis are given at Table 16. In the table, DI shows the Dollarization Index, I show the interest rate and LNNER shows the logarithmic average nominal exchange rate.

Table 16 - Description Statistics for Main Variables

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
DI	0.41	0.39	0.81	0.00	0.12	-0.34	5.29
I	0.47	0.13	70.22	0.05	4.45	15.62	245.31
LNNER	0.78	0.51	2.15	-0.27	0.57	0.99	2.74
ΔLNNER	0.01	0.00	0.23	-0.08	0.04	1.65	8.99

Eviews, 2022

Notes: Δ represents the first difference. DI is the dollarization index; LNNER is the log of the nominal exchange rate; and i is interest rate

Before examining the time series statistically, it is necessary to examine whether the time series is stationarity or not. If time series is stationarity, it means that the statistical properties of that time series (or the process generating it) do not change over time. In non-stationary series, some analysis results may be biased. Therefore, stationarity in regression models is a condition that must be examined. There are a few methods which are used to determine the stationarity. This paper applies the ADF and PP tests. The unit root tests that are used show which stationary processes of the series adapt. Before examining the relationship between the variables in the model, the stationarity of the variables was examined by the ADF and PP unit root tests. In the ADF and PP tests, the null hypothesis is that the series are not stationary which means they contain a unit root; the alternative hypothesis states that there is no unit root in the series. The results are given in Table 17 and Table 18.

Table 17 - Augmented Dickey Fuller (ADF) Unit Root Test

Variable	t-Statistic	1%	5%	10%	p-value	Test Conclusion
DI	-4.6606	-3.9969	-3.4287	-3.1378	0.001	Stationary at I (0)
I	-3.8154	-3.9961	-3.4283	-3.1375	0.017	Stationary at I (0)
LNNER	-0.8722	-3.9958	-3.4281	-3.1374	0.956	Non-Stationary at I (0)
ΔLNNE	-11.5291	-3.4568	-2.873	-2.573	0	Stationary at I (1)

Eview2022

According to the ADF test results in Table 17, DI and I series are stationary because the t-statistic values calculated at the I (0) level and at the 5% significance level are lower than the MacKinnon (1996) critical values. On the other hand, the test statistics of the LNNER are greater than the critical value of MacKinnon at the 5% significance level. Since the probability values are greater than 0.05, the hypothesis of "there is a unit root" cannot be rejected; as a result, there is unit root at LNNER series. In this case, the first difference of the LNNER series is taken. According to the ADF unit root test results for the 1st difference of LNNER series, it is observed that the level test statistics are lower than the MacKinnon critical value. Since the probability value is lower than 0.05, it can be stated that the LNNER series are not have a unit root in the 1st difference and becomes stationary. Therefore, the LNNER series are made stationary by taking the first difference.

Table 18 - Unit Root with Break Test

Variable	t-Statistic	1%	5%	10%	p-value	Test Conclusion
DI	-6.0304	-5.3475	-4.8598	-4.6073	0.01	Stationary at I (0)
I	-782.421	-5.3475	-4.8598	-4.6073	0.01	Stationary at I (0)
LNNER	-2.4944	-5.3475	-4.8598	-4.6073	0.984	Non-Stationary at I (0)
ΔLNNER	-12.3927	-4.9491	-4.4436	-4.1936	0.01	Stationary at I (1)
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The results obtained are evaluated at the 5% significance level. The results, summarized in Table 18, indicate that although the DI and I series are stationary at level, the LNNER series are not, and the series contain a unit root therefore first difference of the series is taken. The PP test results also support the ADF test results. The next stage will be continued with DI, I, ΔLNNER series.

There are cases where the direction of the relationship between economic variables cannot be determined by economic theory. In this context, Granger Causality (1969) test should be applied. In order to apply the Granger Causality test, the series must be stationary. After determining the stationarity of the variables, the ideal lag length is determined according to the Akaike Information Criteria (AIC). Then, the causality relationship between the variables is examined with Granger Causality analysis. According to the results of the analysis, the optimal lag length to be handled should be "1" because it is the lowest value that ensures the model will be stable.

Table 19 - Lag Length

Lag	AIC	SIC	HQ
0	-5.25559	-5.24658	-5.26390
1	-6.98600	-6.89898*	-6.95094
2	-7.02738	-6.88235	-6.96895*
3	-7.00750	-6.79771	-6.91894
4	-7.04091	-6.77986	-6.93573
5	-7.05540	-6.73634	-6.92685
6	-7.06680	-6.68973	-6.91486
7	-7.08451*	-6.64943	-6.90920
8	-7.08065	-6.58756	-6.88197

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AIC: Akaike information criterion

SIC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Notes: * the lowest value indicates that the optimal lag length for the model

The appropriate lag length was calculated and included in the analysis in the Granger Causality test results that are given in Table 19. The Granger Causality test H_0 hypothesis states that the independent variable is not the cause of the dependent variable. The H_1 hypothesis of the Granger Causality test states that the independent variable is the cause of the dependent variable. After the series were adapted, the Granger Causality test is applied to find the direction of the effect. The Granger Causality test analyzes whether there is a causal relationship between the variables. The results are presented in Table 20.

Table 20 - Granger Causality Test

Variables	$\Delta LNNER$	DI
DI_{t-1}	0.0125 [2.0476]	0.9862 [119.226]
$\Delta LNNER_{t-1}$	0.4014 [6.9188]	0.1636 [2.0873]
Summary Stat.		
F-statistic	6.5463	4.6000
S.E of regression	0.0518	0.0391
Prob.	0.0417*	0.0171*

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Notes: * indicates significance at 5% confidence level. T-statistics are in []

LNNER $\longrightarrow$ DI (LNNER is the Granger Causality of DI)

$$\Delta \text{DI}(t) = \alpha_0 + \sum_{i=1}^p \delta_i \Delta \text{DI}(t-i) + \sum_{j=1}^q \gamma_j \Delta \text{LNNER}(t-j) + \varepsilon_t \quad (4.14.)$$

Hypothesis;

$H_0: \delta_i = 0$ “LNNER is not the cause of DI”

$H_1: \delta_i \neq 0$ “LNNER is the cause of DI”

According to the results, the nominal exchange rate at the 5% significance level is the Granger cause of the dollarization index.

DI $\rightarrow$ LNNER (DI is the Granger Causality of LNNER)

$$\Delta \text{LNNER}(t) = \alpha_0 + \sum_{i=1}^p \gamma_i \Delta \text{DI}(t-i) + \sum_{j=1}^q \delta_j \Delta \text{LNNER}(t-j) + \varepsilon_t \quad (4.15.)$$

Hypothesis;

$H_0: \gamma_i = 0$ “DI is not the cause of LNNER.”

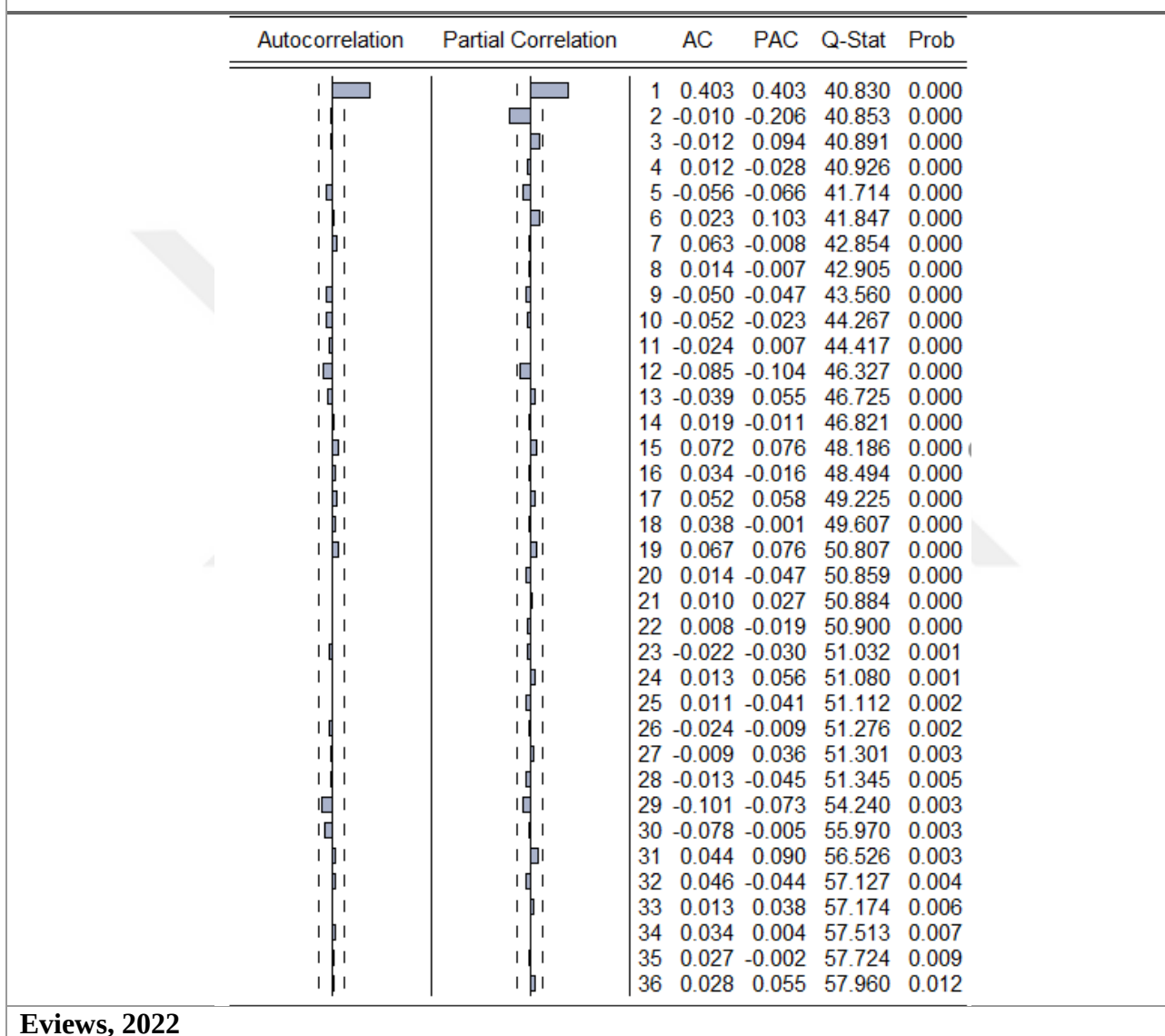
$H_1: \gamma_i \neq 0$ “DI is the cause of LNNER”

According to the results given in Table 20, the DI, at the 5% significance level, is the Granger cause of the LNNER. Also, the LNNER, at the 5% significance level, is the Granger cause of the DI.

From this point of view, GARCH is applied to determine the direction of the relationship between the variables. In order to be able to choose between stationary models, first the autocorrelation and Partial Autocorrelation (PAC) functions of the series are determined and their correlograms are drawn. By examining the course of these correlograms together, the type of the appropriate model is determined. When Figure 18 is examined, the PAC part determines the delay order of the AR model, while the AC part determines the delay order of the Moving Average (MA) model. According to Figure 18, lags orders of 3 is optimal for the AR model and lag orders of 2 is optimal for the MA model.

First, the most appropriate model is estimated. Afterwards, ARCH/GARCH test is performed. The GARCH method is similar to the Autoregressive Moving Average (ARMA) model which includes the Autoregressive Process (AR) of the error term, as well as the lagged values of the error term variance. First of all, the correlation graphs are examined to determine the delay for the ARMA models.

Figure 18 - Autocorrelation Function of Δ LNNER Series



The Linear Stochastic Models are the Autoregressive (AR), Moving Average (MA) and Autoregressive Moving Average (ARMA) models. To model time series which have volatility, nonlinear econometric models like ARCH and GARCH are used because these models accept that the variance does not remain constant. In this context, GARCH models are widely used in modeling the volatility, but these models do not consider the asymmetric effect. In addition to ARCH and

GARCH models, EGARCH, which is proposed by Nelson (1991), is used to determine whether volatility responds asymmetrically to positive and negative shocks. In this study EGARCH is used which takes the asymmetric effect into account. The results are given in Table 21.

Table 21 - Lag Order Selection for AR, GARCH, and EGARCH

AR(p), MA(q), ARMA(p,q)		GARCH(p,q)		EGARCH(p,q)	
Lag	SIC	Order	SIC	Order	SIC
AR (1)	-3.5707	(0,1)	-8.9509	(0,1)	-8.5909
AR (2)	-3.5781	(0,2)	-8.9686*	(0,2)	-8.5725
AR (3)	-3.5712	(0,3)	-9.0234	(0,3)	-9.0458
MA (1)	-3.6064*	(0,4)	-8.8865	(0,4)	-9.1456
MA (2)	-1.3336	(1,0)	-8.0006	(1,0)	-8.7626
MA (3)	-1.3247	(1,1)	-8.9601	(1,1)	-8.8003
ARMA (1,1)	-1.3331	(1,2)	-8.9531	(1,2)	-8.9289
ARMA (1,2)	-1.3234	(1,3)	-8.8967	(1,3)	-8.9256
ARMA (2,1)	-1.3103	(1,4)	-8.6999	(1,4)	-9.4669
ARMA (2,2)	-1.3019	(2,0)	-8.0235	(2,0)	-8.7490
ARMA (3,2)	-1.2798	(2,1)	-8.6260	(2,1)	-9.0739
ARMA (2,3)	-1.2628	(2,2)	-8.5296	(2,2)	-9.2106*
ARMA (3,3)	-1.2582	(2,3)	-8.6074	(2,3)	-9.6418
		(2,4)	-8.4568	(2,4)	-9.5990
		(3,0)	-8.0323	(3,0)	-9.1132
		(3,1)	-8.8488	(3,1)	-9.1295
		(3,2)	-8.5266	(3,2)	-9.1075
		(3,3)	-9.1474	(3,3)	-9.5752
		(3,4)	-8.5857	(3,4)	-9.2237
		(4,0)	-8.0280	(4,0)	-9.1740
		(4,1)	-8.4563	(4,1)	-9.3106
		(4,2)	-8.4574	(4,2)	-9.2944
		(4,3)	-8.3523	(4,3)	-9.2738
		(4,4)	-8.5347	(4,4)	-9.2053
* Indicates lag order selected by the criterion. SIC: Schwarz Information Criterion.					
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According to Table 21, based on SIC, MA (1) is chosen since it gives the smallest value and is a significant model. By choosing MA (1), the relevant assumptions were tested. First, the existence of autocorrelation is tested and then, ARCH-LM, which is proposed by Engle (1982), is used to detect autoregressive conditional heteroskedasticity.

LM Autocorrelation Test for MA (1)			
Table 22 - Breusch-Godfrey Serial Correlation LM Test			
F-statistic	2.448851	Prob. F(12,235)	0.0051
Obs*R-squared	20.79961	Prob. Chi-Square(12)	0.0534
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The LM test results examined in Table 11 show that since $0.0534 > 0.05$ for the MA (1) model, H_0 cannot be rejected and there is no autocorrelation.

ARCH-LM Test for MA (1)			
Table 23 - Heteroskedasticity Test: ARCH			
F-statistic	4.051917	Prob. F(4,239)	0.0034
Obs*R-squared	15.49589	Prob. Chi-Square(4)	0.0038
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The ARCH-LM test results in Table 23 reflect that the ARCH effect was determined for MA (1). After this stage, ARCH family models are used.

The most appropriate and significant of the ARCH/GARCH models is the GARCH (0,2) model. In the EGARCH model, which considers the asymmetric effect, the most appropriate and significant model is EGARCH (2,2).

As a result, in the estimation of Model I, firstly the Extended Dickey-Fuller and Phillip-Perron unit root tests are run based on monthly data covering the years 2001M1-2021M9. Granger Causality is applied to analyze whether or not there is a causal relationship between the variables. According to the results of the analysis, the nominal exchange rate is the Granger cause of the dollarization index and vice versa. From this point of view, GARCH is applied to determine the direction of the relationship between the variables. When GARCH and EGARCH model results are examined the coefficient of the DI variable is positive; therefore, we move to Model II.

Table 24 - GARCH (0,2) Model Results

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(1)	0.630621	0.031469	20.03974	0.0000
Variance Equation				
C	-5.70E-06	8.29E-07	-6.867348	0.0000
RESID(-1)^2	1.255990	0.185545	6.769180	0.0000
RESID(-2)^2	1.005188	0.230348	4.363775	0.0000
DI	1.51E-05	2.68E-06	5.607237	0.0000
I	1.50E-05	2.34E-06	6.397479	0.0000

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Table 25 - EGARCH (2,2) Model Results				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
MA(1)	0.437446	0.024763	17.66566	0.0000
Variance Equation				
C(2)	-2.040400	0.120540	-16.92713	0.0000
C(3)	1.641061	0.114593	14.32077	0.0000
C(4)	-1.365046	0.092294	-14.79017	0.0000
C(5)	-0.588932	0.069731	-8.445724	0.0000
C(6)	1.505907	0.033051	45.56315	0.0000
C(7)	-0.645012	0.030517	-21.13586	0.0000
C(8)	0.375127	0.098927	3.791953	0.0001
C(9)	0.030218	0.008925	3.385964	0.0007

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4.4.2. Results of Model II

This section investigates the relationship between currency depreciation and income inequality in Turkey by using yearly data between January 2001 and December 2020. This examination follows the study and the model of Shahbaz, Islam, and Butt (2011).

The abbreviations of the data used in the study are given below.

GINI: Gini Index (World Bank – Databank)

DEP: Currency Depreciation (IMF – International Financial Statistics, average)

GDPC: Economic Growth per Capita (World Bank – Databank)

GDPC2: Economic Growth per Capita Squared (Derived from GDPC)

- FDI:** Foreign Direct Investment (CBRT – Statistical Data)
- TR:** Trade Openness (Penn World Tables until 2017 and World Bank – Databank after 2017)
- INF:** Inflation Rate (TurkStat)
- UNP:** Unemployment (World Bank – Databank)
- DI:** Dollarization Index (FCD/M2Y derived from The Banks Association of Turkey)

The time series graphs of the variables used in the research are presented in between Figures 19 and Figure 27. It is clearly seen from the figures that variables are non-stationary.

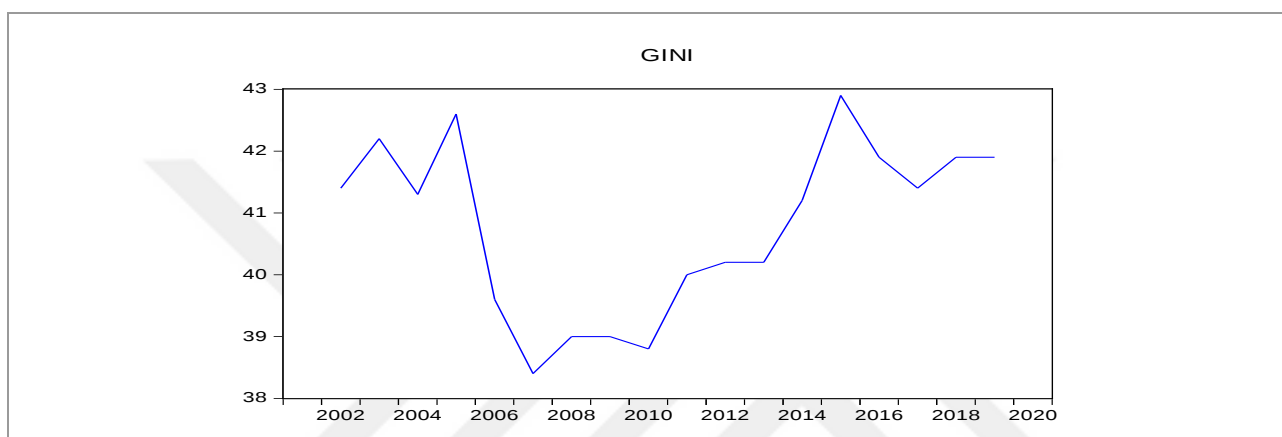


Figure 19 - Gini Index

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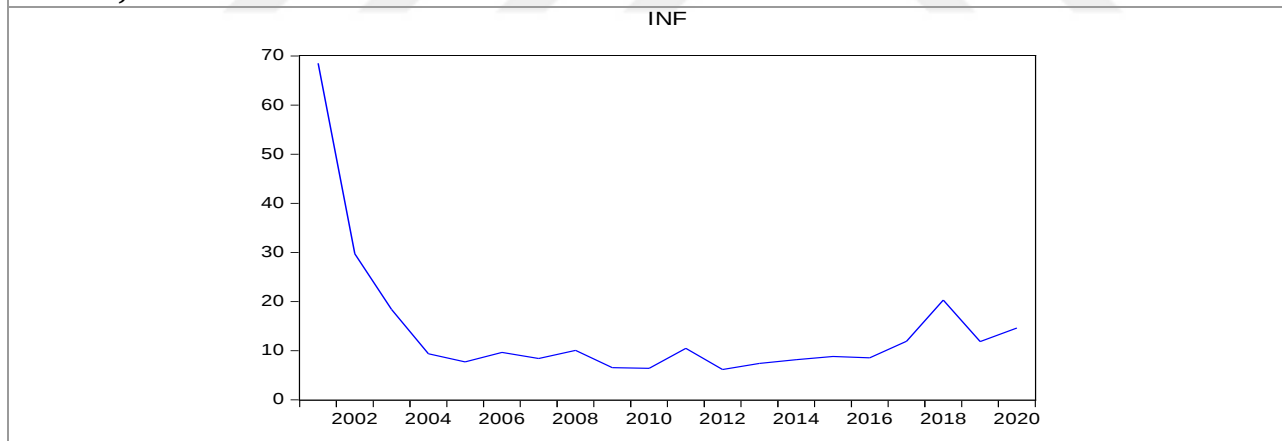


Figure 20 - Inflation Rate

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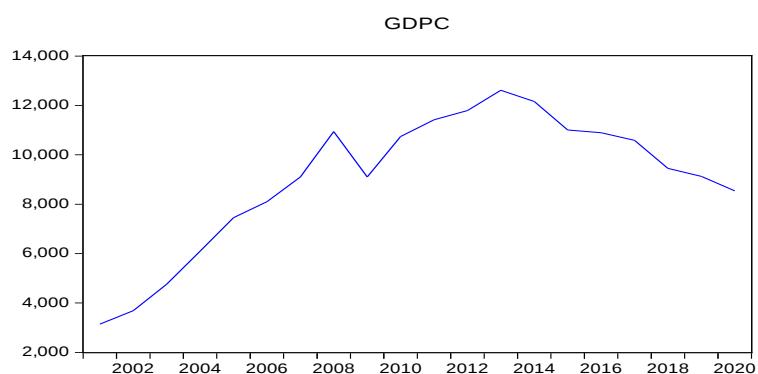


Figure 21 - Economic Growth per Capita

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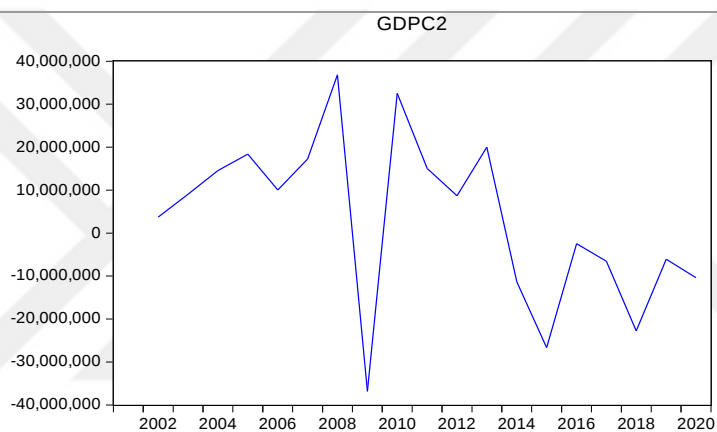


Figure 22 - Economic Growth per Capita Squared

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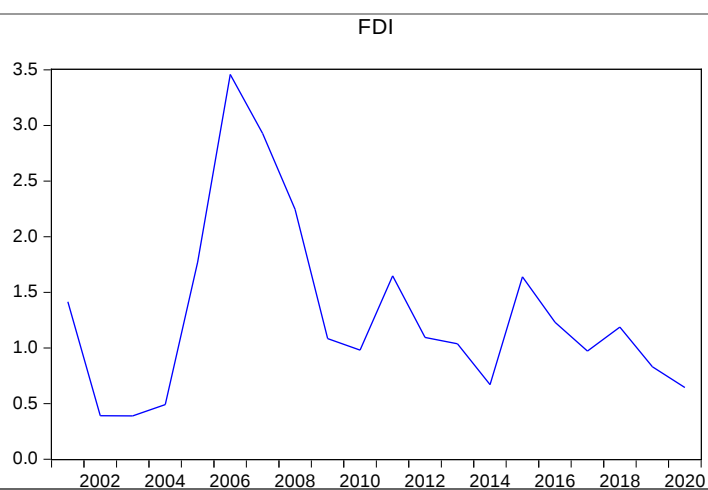
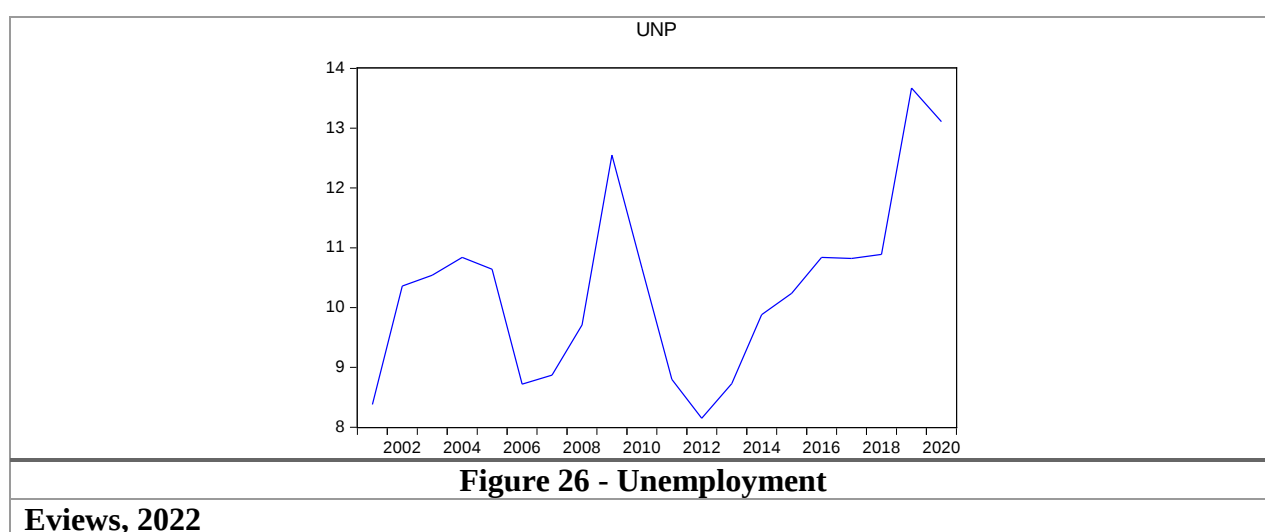
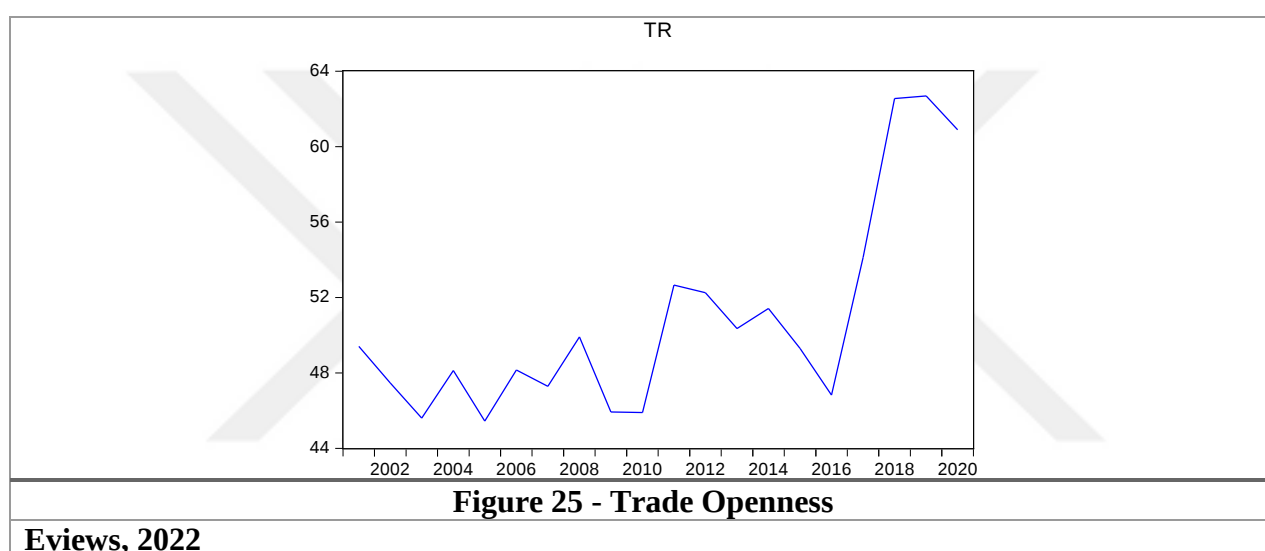
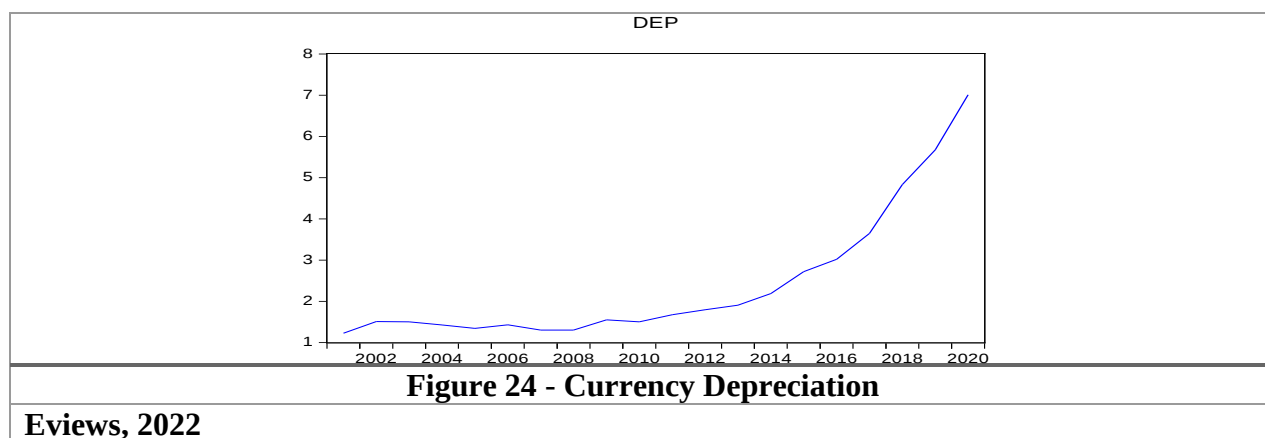


Figure 23 - Foreign Direct Investment

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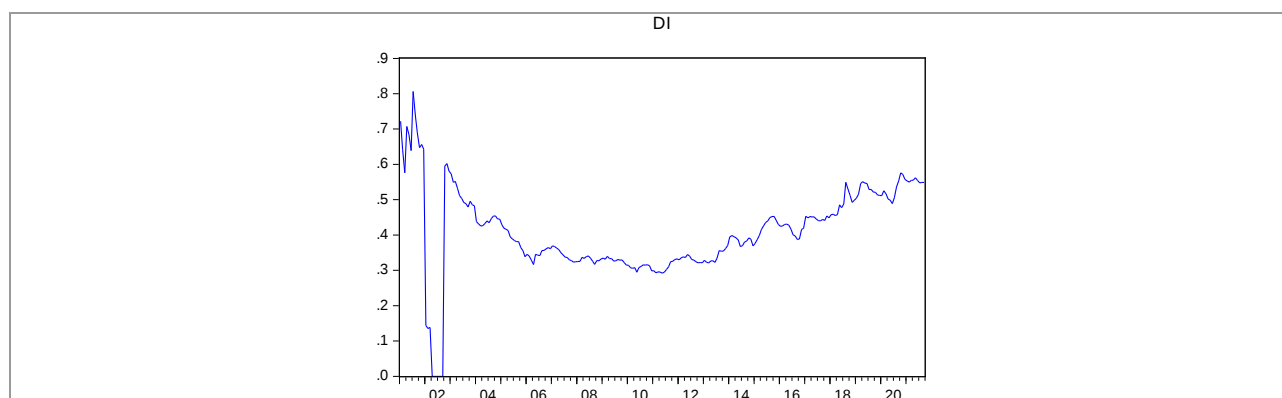


Figure 27 - Dollarization

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Descriptive statistics for main variables used in the analysis are given at Table 26. In the table, Gini shows the Gini Index, DEP shows Currency Depreciation, GDPC shows Economic Growth (GDP) per Capita, GDPC2 shows the Economic Growth (GDP) per Capita Squared, FDI shows the Foreign Direct Investment, TR shows the Trade Openness, INF shows the Inflation Rate, and UNP shows the Unemployment Rate.

Table 26 - Description Statistics for Main Variables

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
GINI	40.77	41.25	42.90	38.40	1.40	-0.24	1.78
DEP	2.239	1.612	5.673	1.301	1.281	1.607	4.444
GDPC	9391.6	10021.0	12614.0	3687.0	2531.2	-0.89	2.87
GDPC2	4078428.	8884628.	36840872	-36840872	19794275	-0.41	2.54
FDI	1.34	1.09	3.46	0.39	0.84	1.19	3.76
TR	50.33	48.73	62.68	45.44	5.16	1.44	4.22
INF	11.10	9.08	29.70	6.16	6.00	1.99	6.33
UNP	10.27	10.45	13.67	8.15	1.38	0.66	3.46

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In time series analysis, the first analysis to make is about the properties of the series. The graphs of the series clearly show that they are not stationary. More than one method is used for the determination of the stationarity in non-stationary series in this study.

Unit root tests are widely used to examine the existence of a unit root in the observed series; in other words, to investigate the stationarity of the series. If a series contains a unit root, it means that the series in question is not stationary.

The PP is used to analyze the stationarity for this model. In this test, the null hypothesis is that the series are not stationary, which is, they contain a unit root; the alternative hypothesis states that there is no unit root process in the series. The results are presented in Table 27.

Table 27 - Unit Root Test with Break Test

Variable	t-Statistic	1%	5%	10%	p-value	Test Conclusion
GINI	-3.9912	-5.0674	-4.5248	-4.2610	0.178	Non-Stationary at I (0)
ΔGINI	-5.2517	-5.3475	-4.8598	-4.6073	0.015	Stationary at I (1)
GDPC	-3.5901	-5.7191	-5.1757	-4.8939	0.771	Non-Stationary at I (0)
ΔGDPC	-6.1834	-4.9491	-4.4436	-4.1936	0.010	Stationary at I (1)
GDPC2	-5.7347	-5.7191	-5.1757	-4.8939	0.010	Stationary at I (0)
DEP	0.1879	-5.7191	-5.1757	-4.8939	0.990	Non-Stationary at I (0)
ΔDEP	-5.8858	-5.3475	-4.8598	-4.6073	0.010	Stationary at I (1)
FDI	-4.3815	-5.7191	-5.1757	-4.8939	0.294	Non-Stationary at I (0)
ΔFDI	-4.9684	-5.3475	-4.8598	-4.6073	0.036	Stationary at I (1)
INF	-11.0694	-4.5325	-3.6737	-3.2773	0.000	Stationary at I (0)
TR	-5.7356	-5.7191	-5.1757	-4.8939	0.010	Stationary at I (0)
UNP	-5.7809	-5.7191	-5.1757	-4.8939	0.010	Stationary at I (0)
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According to the PP unit root test results in Table 23, GDPC2, INF, TR, and UNP series are stationary; because their t-statistic values calculated at the I (0) level and the significance level chosen as 5%, for example: Gini -3.9912 < -are absolutely smaller than the MacKinnon (1996) critical value. Therefore, GDPC2, INF, TR, and UNP series are stationary at the significance level.

On the other hand, it is seen that the test statistics of the GINI, GDPC, DEP, and FDI series are greater than the critical value of MacKinnon (1996) at the 5% significance level. Since the probability values are greater than 0.05, the hypothesis of "there is a unit root" cannot be rejected. So, the GINI, GDPC, DEP, and FDI series have unit root. In this case, the first difference of the series is taken. According to the ADF unit root test results for the GINI, GDPC, DEP, and FDI series at the 1st difference, it is seen that the level test statistics are smaller than the MacKinnon (1996) critical value. Since the probability value is less than 0.05, it can be said that the GINI, GDPC, DEP and FDI series do not contain unit root in the 1st difference and become stationary. Therefore, the GINI, GDPC, DEP, and FDI series are made stationary by taking the 1st difference. Therefore, there is first-order stationarity.

After the determination of the appropriate values at which stationarity is achieved, the cointegration test can be applied by using the ARDL model. At this stage, one may proceed with the model after determining the appropriate lag values.

ARDL is estimated to test the existence of cointegration between series. The stationarity order of the dependent variable should be stationary at the 1st difference for ARDL model estimation, and the stationarity orders of the explanatory variables should be stationary at the level or at the 1st difference. GINI, the dependent variable in this study, is at the 1st difference (Δ GINI), and the stationarities of the explanatory variables are Δ GDPC, Δ FDI, Δ DEP, GDPC2, TR, INF, and UNP. The lag of the ARDL model is determined by the SIC (1978) with the automatic option. The appropriate lag ARDL model estimation is given in the Table 28 below:

Table 28 - ARDL (1,1,1,1,0,1,1,1) Model Estimation		
Dependent Variable: GINI		
Maximum Dependent Lags: 1 (Automatic Selection)		
Model Selection Method: Akaike Info Criterion (AIC)		
Selected Model: ARDL (1,1,1,1,0,1,1,1)		
Variable	Coefficient	t-Statistics
GINI (-1)	0.1060	0.4264
DEP	10.1873	2.5021
DEP (-1)	-8.6098	-2.1867
GDPC	0.0093	6.1972
GDPC (-1)	-0.0086	-6.4611
GDPC2	-3.58E-07	-5.1615
GDPC2 (-1)	7.30E-08	4.1890
FDI	-0.2465	-0.9054
TR	-0.6245	-3.7366
TR (-1)	0.2588	3.3399
INF	-0.0817	-0.5394
INF (-1)	0.0690	0.8605
UNP	-0.5702	-1.7524
UNP (-1)	0.5794	2.6840
C	41.964	1.8516
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Descriptive test statistics are made for the ARDL model, and the results are given below. First, autocorrelation test and then varying variance, ARCH test, normality test, and specification test were performed.

Table 29 - Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	0.715976	Prob. F(1,1)	0.5529
Obs*R-squared	7.093101	Prob. Chi-Square(1)	0.0077

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In Table 29, when we examine the test results, H_0 cannot be rejected because F is $0.5529 > 0.05$, therefore there is no autocorrelation.

Table 30 - Breusch-Pagan-Godfrey Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	3.849672	Prob. F(14,2)	0.2251
Obs*R-squared	16.39172	Prob. Chi-Square(14)	0.2900
Scaled explained SS	0.165147	Prob. Chi-Square(14)	1.0000

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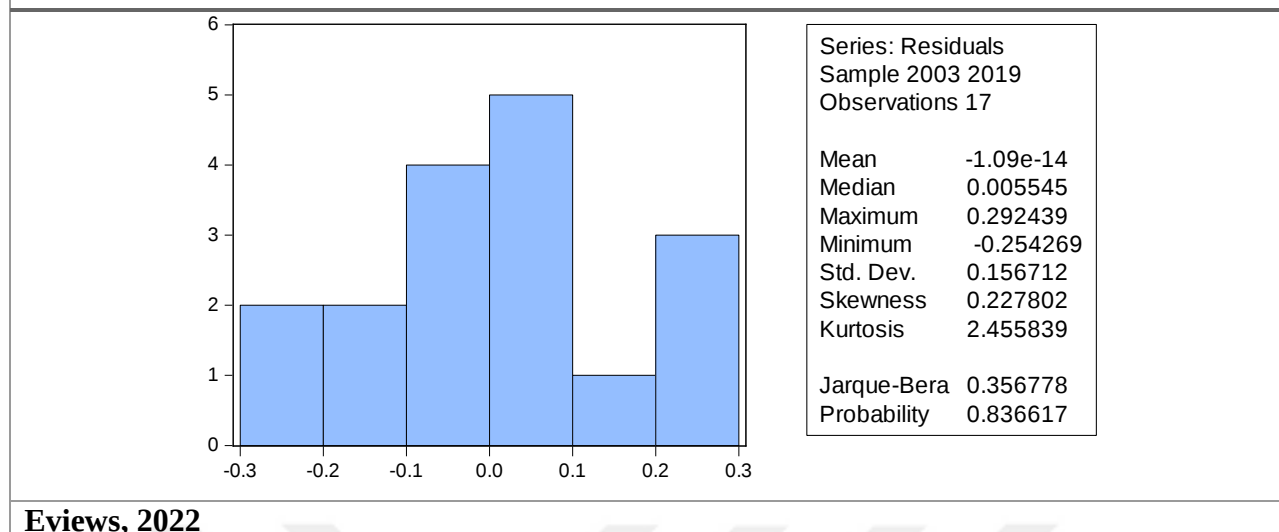
The test results of Table 30 show that, H_0 cannot be rejected because F is $0.2251 > 0.05$, hence, there is no heteroscedasticity.

Table 31 - ARCH Test

Heteroskedasticity Test: ARCH			
F-statistic	0.171159	Prob. F(1,14)	0.6854
Obs*R-squared	0.193248	Prob. Chi-Square(1)	0.6602

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In Table 31, the examination of the test results show that no ARCH effect is detected.

Table 32 - Normality Test

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Since the Jarque and Bera (1987) Test statistical probability value is greater than 5% ($0.836 > 0.05$), the residuals are normally distributed.

Table 33 - Ramsey Reset Test

Ramsey RESET Test Equation: UNTITLED Specification: GINI GINI(-1) DEP DEP(-1) GDPC GDPC(-1) GDPC2 GDPC2(-1) FDI TR TR(-1) INF INF(-1) UNP UNP(-1) C Omitted Variables: Squares of fitted values			
	Value	df	Probability
t-statistic	0.259016	1	0.8387
F-statistic	0.067089	(1, 1)	0.8387
F-test summary:			
	Sum of Sq.	df	Mean Squares
Test SSR	0.024704	1	0.024704
Restricted SSR	0.392937	2	0.196469
Unrestricted SSR	0.368233	1	0.368233

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Since the probability value of the Ramsey (1969) Regression Equation Specification Error Test (RESET) F statistic is greater than 5% ($0.838 > 0.05$), it is concluded that there is no specification error in the model.

The analysis of above tables reflects the diagnostic test results of the estimated ARDL (1,1,1,1,0,1,1,1) model. Accordingly, it is understood that there is no autocorrelation and

heteroscedasticity in the estimated model, the error term has a normal distribution, and there is no model building error. All assumptions of the ARDL model are provided. In the next step, ARDL Bounds test is used to test the existence of cointegration.

After determining the appropriate lag order for the ARDL model, the ARDL (1,1,1,1,0,1,1,1) model is estimated. Then, it is tested with autocorrelation, heteroscedasticity, normality, and specification error tests to determine whether the assumptions are met.

After it is determined that the assumptions of the model are met, ARDL Bounds test is applied to determine the existence of cointegration between the variables. The test results are given in the table below:

Table 34 - ARDL Bounds Test			
	Test Statistic	Value	k
	F Statistic	10.098	7
	Critical Value Bounds		
	Significance Level	I (0) Bound	I (1) Bound
	10%	2.03	3.13
	5%	2.32	3.50
	2.5%	2.60	3.84
	1%	2.96	4.26
Eviews, 2022			

Since significance levels for 1% ($4.26 < 10.09$), 2.5% ($3.84 < 10.09$), 5% ($3.50 < 10.09$) and 10% ($3.13 < 10.09$), F Statistics' value is greater than the upper limit values; it is concluded that there is cointegration. Hence there is cointegration, long- and short-term relationship models are estimated in the next step (Table 34).

Table 35 - Estimation of the Short-Term Relationship			
Dependent Variable: GINI			
Variable	Coefficient	T-statistics	Prob
ΔDEP_t	0.5013	0.1231	0.9133
ΔGDPC_t	-172225.4	-114493	0.0000
ΔGDPC2_t	32084.6	462975	0.0000
ΔFDI_t	-0.2465	-0.9054	0.4608
ΔTR_t	-0.6245	-3.7366	0.0647
ΔINF_t	-0.0817	-0.5394	0.6436

ΔUNP_t	-0.5702	-1.7524	0.2218
ECM_{t-1}	-2.3497	-9.4496	0.0110
Eviews, 2022			

In Table 35, the ARDL model is used to examine the relationship between the variables in the short-term. The error correction model (ECM) coefficient is found to be -2.34, suggesting that the error correction coefficient is significant. Therefore, the short-run coefficient estimation yields consistent results. In addition, the error correction term, which is found as -2.34, indicates that the imbalances that may occur in the short-term are corrected in the long-term.

CointEq (-1) is negative, and the t-statistics probability value is significant. Therefore, the short-run model is valid. CointEq (-1) interpretation ($1/2.34=0.42$) means that a short-term deviation will improve after 0.42 years and reach the long-term balance.

Table 36 - Estimation of the Long-Term Relationship			
Dependent Variable: GINI			
Variable	Coefficient	T-statistics	Prob
DEP	1331464	9.4496	0.0110*
GDPC	-240316	-9.4496	0.0110*
GDPC2	1570779	9.4496	0.0110*
FDI	-0.1049	-0.9314	0.4500
TR	-0.1556	-2.2603	0.1523
INF	-0.0054	-0.1072	0.9244
UNP	0.0039	0.0230	0.9837
C	17.8591	2.2550	0.1528
Eviews, 2022			

In Table 36, the ARDL model is used to examine the relationship between the variables in the long term. DEP, GDPC, and GDPC2 coefficients are statistically significant. It is seen that although a positive relationship between DEP and GINI exists; there is a negative relationship between the GDPC and GINI.

As a result, in the second model estimation, the period between 2001 and 2020 is tested with a structural break unit root. According to the test, the stationarity order of the dependent variable is found to be stationary at the 1st difference, and the stationarity order of the explanatory variables are found to be stationary at the significance level. The ARDL cointegration is applied in order to determine whether there is a relationship between the variables. However, when the statistical significance of the long-term correlation coefficients is examined, there are meaningless variables in the long-term associated with the estimated model, and therefore this study suggests

that it is not useful to interpret this model with these independent variables. The cointegration is explained by the Bounds Test. However, due to the insufficient number of observations this study reflects that there is no relationship between nonsignificant variables in the long-term relationship models. With a time dimension of 20 years and too many parameters (k), the results of the estimated model will not be very useful. The sample size $n > 30$ would be appropriate for an accurate ARDL model. The original model applied by Shahbaz, Islam, and Butt (2011) focused on Pakistan for the period between 1973 and 2006 and covered $n > 30$ -time dimension. Also, Pakistan is structurally different than Turkey. As a result, this study will perform ARDL cointegration analysis again by revising the model and reducing the number of explanatory variables.

4.4.3. Revised and Valid Model II Tests

This part revises Model II by employing fewer independent variables as stated above to prove the validity of the second model.

The abbreviations of the data used in the study are given below.

GINI: Gini Index (World Bank – Databank)

DI: Dollarization Index (FCD/M2Y derived from The Banks Association of Turkey)

UNP: Unemployment (World Bank – Databank)

GDPC: Economic Growth per Capita (World Bank – Databank)

INF: Inflation Rate (TurkStat)

The new model excluded GDPC2, in line with Bahmani-Oskooee and Gelan (2012) who argued that “the income-squared term should not be included since the short-run dynamics of the relationship between a measure of income distribution and income will reveal the turning point”. LNNER is changed with DI, and TR and FDI are also excluded. The determination of the appropriate values at which stationarity is achieved was applied before in section 4.4.1. Therefore, this section directly employs the cointegration test by using the Auto Regressive Distributed Lag Models (ARDL) model. The lag of the ARDL model is determined by the SIC (1978) with the automatic option. The appropriate lag ARDL model estimation is given in the Table 37 below.

Table 37 - ARDL (2,2,2,1,0) Model Estimation		
Dependent Variable: GINI		
Maximum Dependent Lags: 2 (Automatic Selection)		
Model Selection Method: Akaike Info Criterion (AIC)		
Selected Model: ARDL (2,2,2,1,0)		
Variable	Coefficient	T-Statistics
GINI (-1)	-1.5057	-16.0530
GINI (-2)	-0.3372	-6.0024
DI	-10.4335	-3.5603
DI (-1)	88.9041	18.6076
DI (-2)	23.7258	17.2777
UNP	-1.6731	-21.2329
UNP (-1)	0.5790	11.4228
UNP (-2)	-0.1532	-3.5206
GDPC	-0.0006	-10.0172
GDPC (-1)	0.0018	18.8794
INF	-0.3620	-16.9368
C	81.443	25.2115
Eviews, 2022		

The stationarity order of the dependent variable should be stationary at the 2nd difference for ARDL model estimation, and the stationarity orders of the explanatory variables should be stationary at the level or at the 2nd difference. GINI, the dependent variable in this study, is at the 2nd difference (Δ GINI), and the stationarities of the explanatory variables are Δ DI (2nd difference), Δ UNP (2nd difference), Δ GDPC (1st difference) and INF.

Tests have been applied for the ARDL model and the results are given below. At first the autocorrelation test and then the heteroscedasticity test, ARCH test, normality test, and specification tests are applied.

Table 38 - Breusch-Godfrey Serial Correlation LM Test			
Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.434645	Prob. F(2,2)	0.6970
Obs*R-squared	4.847414	Prob. Chi-Square(2)	0.0886
Eviews, 2022			

The test results in Table 38 show that H_0 cannot be rejected since $0.6970 > 0.05$, hence, there is no autocorrelation.

Table 39 - Breusch-Pagan-Godfrey Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.363025	Prob. F(11,4)	0.9175
Obs*R-squared	7.993268	Prob. Chi-Square(11)	0.7139
Scaled explained SS	0.559418	Prob. Chi-Square(11)	1.0000

Eviews, 2022

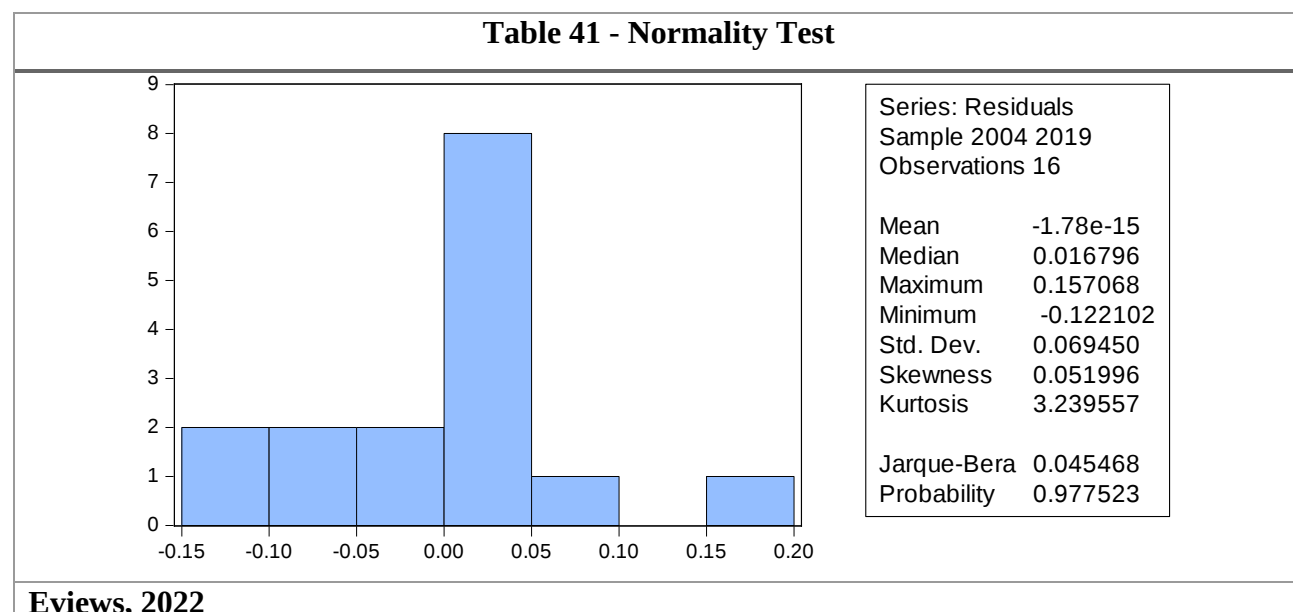
The test results in Table 39 reflect that H_0 cannot be rejected since $0.9175 > 0.05$, therefore there is no heteroscedasticity.

Table 40 - ARCH Test

Heteroskedasticity Test: ARCH			
F-statistic	0.309187	Prob. F(1,13)	0.5876
Obs*R-squared	0.348466	Prob. Chi-Square(1)	0.5550

Eviews, 2022

According to the test results in Table 40, no ARCH effect is detected since p-value is not significant.

Table 41 - Normality Test

Eviews, 2022

Since the Jarque and Bera (1987) Test statistical probability value is greater than 5% ($0.977 > 0.05$), the residuals are normally distributed.

Table 42 - Ramsey Reset Test

Ramsey RESET Test Equation: UNTITLED Specification: GINI GINI(-1) GINI(-2) DI DI(-1) DI(-2) UNP UNP(-1) UNP(-2) GDPC GDPC(-1) INF C Omitted Variables: Squares of fitted values			
	Value	df	Probability
t-statistic	0.422635	3	0.7010
F-statistic	0.178620	(1, 3)	0.7010
F-test summary:			
	Sum of Sq.	df	Mean Squares
Test SSR	0.004066	1	0.004066
Restricted SSR	0.072350	4	0.018087
Unrestricted SSR	0.068284	3	0.022761

Eviews, 2022

The probability value of the Ramsey (1969) Regression Equation Specification Error Test (RESET) F statistic is greater than 5% ($0.701 > 0.05$), and hence it is concluded that there is no specification error between fitted values.

The analysis of above tables reflects the diagnostic test results of the estimated ARDL (2,2,2,1,0) model are given. Accordingly, it is understood that there is no autocorrelation and heteroscedasticity in the estimated model, the error term has a normal distribution, and there is no model building error. All assumptions of the ARDL model are provided. In the next step, ARDL Bounds Test is used to test the existence of cointegration.

After determining the appropriate lag order for the ARDL model, the ARDL (2,2,2,1,0) model is estimated. Then, the tests for autocorrelation, heteroscedasticity, normality, and specification error are applied to determine whether the assumptions are met.

After it is determined that the assumptions of the model are met, the ARDL Bounds Test is applied to determine the existence of the cointegration between the variables. The test results are given in the table below:

Table 43 - ARDL Bounds Test

	Test Statistic	Value	k
	F Statistic	173.12	4
	Critical Value Bounds		
	Significance Level	I (0) Bound	I (1) Bound
	10%	2.45	3.52
	5%	2.86	4.01
	2.5%	3.25	4.49
	1%	3.74	5.06
Eviews, 2022			

Since significance levels for 1% ($5.06 < 173.12$), 2.5% ($4.49 < 173.12$), 5% ($4.01 < 173.12$) and 10% ($3.52 < 173.12$), F Statistics' value is greater than the upper limit values, so it is concluded that there is cointegration. Hence, long- and short-term relationship models are estimated in the next step (Table 43).

Table 44 - Estimation of the Short-Term Relationship

Dependent Variable: GINI			
Variable	Coefficient	t-statistics	Prob
ΔGINI_{t-1}	0.3372	6.0024	0.0039*
ΔDI_t	-10.4335	-3.5603	0.0236*
ΔDI_{t-1}	-23.7258	-17.2777	0.0001*
ΔUNP_t	-1.6731	-21.2329	0.0000*
ΔUNP_{t-1}	0.1532	3.5206	0.0244*
ΔGDPC_t	-0.0006	-10.0172	0.0006*
ΔINF_t	-0.3620	-16.9368	0.0001*
ECM_{t-1}	-2.8429	-28.4907	0.0000*
Eviews, 2022			

In Table 44, the ARDL model is used to examine the relationship between the variables in the short-term. The error correction term (ECM) coefficient is found to be -2.84, which shows that the error correction coefficient is significant. Therefore, the short-term coefficient estimation yields consistent results. In addition, the error correction term, which is found as -2.84, indicates that the imbalances that may occur in the short-term are corrected in the long-term.

CointEq (-1) is negative, and the t-statistics probability value is significant. Therefore, the short-term model is valid. CointEq (-1) interpretation ($1/2.84=0.35$) means that a short-term deviation will improve after 0.35 years and reach the long-term balance.

Table 45 - Estimation of the Long-Term Relationship

Dependent Variable: GINI			
Variable	Coefficient	T-statistics	Prob
DI	35.9470	75.4135	0.000*
UNP	-0.4387	-21.4620	0.000*
GDPC	0.00041	20.0536	0.000*
INF	-0.1273	-20.3093	0.000*
C	28.6475	70.9247	0.000*
Eviews, 2022			

The ARDL model is used to examine the relationship between the variables in the long-term. All of the coefficients of the variables are statistically significant. The coefficients obtained show that if the DI increases by 1%, the Gini coefficient increases by 35.9%. If the unemployment rate increases by 1%, the Gini coefficient decreases by -0.43%. If GDPC increases by 1%, the Gini coefficient increases by 0.0004%. If the inflation rate increases by 1%, the Gini coefficient decreases by -0.12%. Therefore, it is clearly seen that there is a positive relationship between the DI and GDPC variables and GINI, while there is a negative relationship between UNP and INF variables and GINI (Table 45).

As a result, in this revised and valid estimation of the Model II, the annual data covering the years 2001 and 2020 was first tested with a structural break unit root. According to the test, the stationarity order of the dependent variable was found to be stationary at the 1st difference, and the stationarity order of the explanatory variables was found to be stationary at the significance level. In order to determine whether there is a relationship between the variables, the ARDL cointegration analysis is performed. As a result of cointegration, short- and long-term relationships between the series were examined.

5. CONCLUSION

This study investigates the impacts of the depreciation of the TL and dollarization on income inequality. At first, the dollarization, devaluation/depreciation and income inequality are defined and the causes and effects of them are expressed according to the literature. Then, the history of dollarization, devaluation/depreciation, and income inequality in Turkey is shared in detail. Since foreign currency transactions were allowed in 1984 in Turkey, dollarization has always been a crucial problem and a solid reality. The average monthly dollarization ratio between January 2001 and December 2021 is 41.08% for Turkey reflecting a higher percentage than most of the emerging market economies. Turkey is in the group of “de facto dollarization” countries since the 1990s and the intention of the Turkish residents to buy the USD against the TL is to hedge against inflation, political risks, and default risk. The TL depreciated against the USD by 1928.77%, and compound annual growth rate (CAGR) %16.24, between the January 2001 and December 2021 period. The GINI Index of Turkey fluctuated between 38.4 and 42.9 with an average of 40.77 between 2002 and 2019 which is slightly higher than the OECD average of 0.33 (Table 12).

The milestones of liberalization in Turkey were that the; stock market and interest prohibitions were canceled in 1980, import substitution ended in 1981, capital market was established in 1982, foreign currency transactions were allowed in 1984, Banking Law was announced in 1985, Interbank was established in 1986, Open Market Operations (OMO) started in 1987, effective foreign currency market was established in 1988, and gold market was established in 1989 until the liberalization process in 1990. This 10-year process of liberalization started the chronic dollarization problem in Turkey because of chronically high inflation, economic crisis, political instabilities, undeveloped or semi developed financial markets, and the insufficient legal structure directed economic units towards foreign currency to hedge against inflation and devaluation risk. Since 1985, Turkey failed to keep the TL stable sustainably and the dollarization process cyclically accelerated.

Two different models are applied in this thesis. The first one investigated the relationship between the exchange rate movements and dollarization by applying the GARCH models with monthly data between January 2001 and September 2021. The empirical findings presented that the nominal exchange rate is the Granger cause of dollarization and vice versa. As stated by Beresford et al. (2004), the domestic currency is the currency of the poor, and the foreign currency is the

currency of the rich in a dollarized country. From this point of view this study hypothesizes that income inequality may increase under a high dollarization level and the depreciation of the TL. Therefore, this study applied a second model to investigate the short and long-term relationships between income inequality and depreciation of the TL, and income inequality and dollarization.

The second model implemented the ARDL bounds testing approach to cointegration which examined long and short-term relationships between variables. At first, Shahbaz, Islam, and Butt's (2011) model was referenced and applied precisely, by using the yearly data between 2001 and 2020. The result only confirmed the existence of a cointegration between the variables of our model in the short-term and reflected that the nominal depreciation of the TL aggravates income inequality in Turkey in the short-term. However, due to the insufficient number of observations ($n=20$ which would be better if $n>30$) and too many parameters (k), the results of the estimated model could not be very useful in explaining the relationship between the variables. So, the model is revised and focused on investigating the long and short-term relationship between dollarization and income inequality.

The results of the revised model confirmed the existence of a cointegration between the variables. As a result, this study found that dollarization aggravates income inequality in Turkey. Due to the empirical findings of the revised model, an increase in unemployment decreases income inequality, an increase in economic growth per capita increases income inequality and an increase in inflation decreases income inequality in Turkey. The effects of the changes in unemployment and inflation on income inequality are opposite than the expected. This study suggests that with a longer-term data this relationship could be examined in more detail. The high level of dollarization in Turkey is also a constraint on poverty reduction because it affects the living standards of low-income class who earn their income in domestic currency.

Historically, the TL devaluated first in 1946 and then in 1958, 1970, 1979, 1980, 1981, 1982, and 1994. After the adoption of the floating exchange rate regime in 2001, the USD appreciated against the TL approximately tenfold until the end of 2021. As a result, Turkey's biggest challenge is to decrease the dollarization via stabilizing the TL in order to find a balance between growth and poverty. Turkey is a net importer of energy, intermediate goods, electronic, and most of the consumption products. So, if the TL continuously depreciates in the long term, inflation rises

due to the pass-through effect and the disposable income of the household melts down. Therefore, dollarization is not a policy option for Turkey. As stated, before in this study, USD is the currency of the rich and TL is the currency of the poor in Turkey. In order to reduce poverty, de-dollarization may be a solid policy to improve the living standards of low income and middle-income class through stabilizing the value of TL. De-dollarization is difficult to implement and may also have various costs. This study offers various implementations for de-dollarizing Turkey like, a new macro-economic model, acceptance, and dissemination of the rule of law to attract foreign investors to invest in Turkey in the long-term, implementing orthodox policies especially by the CBRT, legal reforms, and stabilizing foreign relations are key factors to stabilize the TL in the long-term. Plus, financial reforms and educational reforms are also a must for Turkey in the long-term to attract greenfield investment, improve skilled labor, and produce high value-added products to export. Also, to stabilize the effects of de-dollarization, a market-driven approach may be implemented. Otherwise, the TL will continue to depreciate in the long-term and dollarization may always be high. Hence, income inequality will be volatile in the short-term due to the cyclical financial environment both domestically and internationally. However, in the long-term income inequality will worsen. Also, high dollarization level is one of the biggest obstacles to sustainable development. One other possible solution, may be adopting official dollarization, giving up on the TL and adopting Euro as the official currency of Turkey (by being accepted as a member of the European Union) but this is a topic that needs to be examined in detail in another study.

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