Examining the Effects of Remittances, Labor Productivity and Trade on Real Effective Exchange Rate: Case of Turkey

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ABSTRACT

Financial and economic development of a country is a crucial matter for every nation. There are various factors and elements that carry a major role in this regard and the literature shows numerous variables that are regarded as vital for this improvement. However, most studies examined countries in regions that are relatively far from the Middle East and Especially, Turkey. Hence, the current research entails a number of influential factors that have been noted to be significant for improving real effective exchange rate of the country, especially in the long-term. It is assumed that changes in Remittances, Labor Productivity, Trade (Openness) could impact on the changes in Real Effective Exchange Rate in the context of Turkey. These factors are remittances, labor productivity, and trade openness. It is important to note that while these factors have been under examination since early ages of research on econometric variables, the literature lacks consensus upon findings, particularly, empirical evidence. Thus, the current research aims to provide a better understanding of underlying effects and linkages among these variables. Data (2000-2017) from central bank of Turkey that was made public is used as well as indicators of OECD. Modern tools and analytical approaches have been undertaken to examine the relationships between the included factors and measures have been derived from the extant literature to ensure the reliability and validity of the results. All hypotheses of the research have been supported through data analysis. It can be said that increased remittances have a positive effect on a country's real effective exchange rate in long-term. Increased trade openness was found to be negatively associated with REER. This is due to the fact that trade openness leads to increased price of domestic goods for other nations. Labor productivity is positively related with REER as Turkey exhibits

high productivity in its labor, which further impacts its economic state in terms of effectiveness of its exchange rate. The findings of this research are aimed to contribute to the literature as well as practical approach towards analyzing and understanding connections among the aforementioned variables.

ÖZ

Bir ülkenin mali ve ekonomik kalkınması her millet için çok önemli bir konudur. Bu konuda önemli rol oynayan çeşitli faktörler ve unsurlar vardır ve Literatür, bu gelişme için hayati sayıda değişkeni göstermektedir. Bununla birlikte, çoğu çalışmalar, Orta Doğu'dan ve özellikle Türkiye'den nispeten uzak bölgelerdeki ülkeleri incelemiştir. Dolayısıyla, mevcut araştırmada özellikle uzun vadede ülkenin reel efektif döviz kurunun iyileştirilmesi için önemli olduğu belirtilen bir etkili faktörü gerektirmektedir. Bu nedenle, mevcut araştırmaya gore özellikle uzun vadede, ülkenin gerçek etkin kur geliştirilmesi için önemli olduğu not edilmiştir. Bu faktörler işçi dövizleri, işgücü verimliliği ve ticarete açıklıktır. Bu faktörler ekonometriki değişkenler üzerine yapılan araştırmaların erken yaşlarından beri incelenirken, literatürde bulgular, özellikle de ampirik kanıtlar üzerinde fikir birliği bulunmadığını belirtmek önemlidir. Bu nedenle, mevcut araştırma, bu değişkenler arasındaki altta yatan etkilerin ve bağlantıların daha iyi anlaşılmasını sağlamayı amaçlamaktadır. OECD göstergelerinin yanı sıra Türkiye merkez bankasından kamuoyuna açıklanan veriler (2000-2017) kullanılmaktadır. Dahil edilen faktörler arasındaki ilişkileri incelemek için modern araçlar ve analitik yaklaşımlar üstlenilmiştir ve sonuçların güvenilirliğini ve geçerliliğini sağlamak için mevcut literatürden türetilmiştir. Araştırmanın tüm hipotezleri veri analizi ile desteklenmiştir. Artan işçi dövizlerinin uzun vadede bir ülkenin reel efektif döviz kuru üzerinde olumlu bir etkisi olduğu söylenebilir. Artan ticaret açıklığının REER ile olumsuz bir şekilde ilişkili olduğu bulundu. Bunun nedeni, ticarete açıklığın diğer ülkeler için yerli malların fiyatlarının artmasına yol açmasıdır. Türkiye emeğinde yüksek verimlilik sergilediğinden, döviz kurunun etkinliği açısından ekonomik durumunu daha da etkilediğinden, işgücü verimliliği REER ile pozitif yönde

ilişkilidir.Bu araştırmanın bulguları, söz konusu değişkenler arasındaki bağlantıları analiz etmeye ve anlamaya yönelik pratik yaklaşımın yanı sıra literatüre de katkı sağlamayı amaçlamaktadır.

Anahtar Kelimeler: Reel Efektif Döviz Kuru, Havale, Emek Verimliliği, Ticaret Açıklığı, Türkiye, Ekono.

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LIST OF ABBREVIATIONS

CPI   Consumer Price Index

EPI   Export Price Index

GDP   Gross Domestic Product

MENA   Middle East and Northern Africa

OECD   Organization for Economic Cooperation Development

ULC   Unit Labor Cost

OLS   Ordinary Least Squares

PPI   Producer Price Index

PPP   Purchasing Power Parity

REER   Real Effective Exchange Rate

WPI   Wholesale Price Index

Chapter 1

INTRODUCTION

This chapter introduces the topic at hand, while providing a background to the topic and indicating significance of the research. Additionally, aims and objectives as well as key factors of the research are highlighted to provide an initial understanding on the research.

1.1 Background and Significance of the Topic

Financial and monetary effects and influences on exchange rate are a topic that is although interesting for scholars, is yet to be understood fully due to its complex nature. In this sense, effects of productivity of labor on real effective exchange rate has been viewed as a matter that received more consensus in the literature compared to other variables such as, trade openness, and remittances (Lartey, Mandelman, and Acosta, 2012; Hassan and Holmes, 2013). This notion becomes more important, when the cases are addressing long-term effects. Accordingly, the current research includes variables of econometrics to investigate their effects in the context of Turkey. Hence, a time series data is used to measure effects of remittances, labor productivity, and trade openness on real effective exchange rate. A major driver for conducting this research is the fact that the literature of the subject shows inconsistency and lack of consensus. It is therefore appropriate to introduce the variables included in the current research with regards to the findings existing in the literature. Within the extant literature, there are numerous studies that regard remittances as an influential factor on

the economy of a country (e.g. Ratha, 2003; Hassan and Holmes, 2013; Comunale, 2017; Acosta, Baerg, & Mandelman, 2009).

Relative productivity has been noted as an important factor influencing real effective exchange rate (REER) (Faleiros, Da Silva, and Nakaguma, 2016). This factor is related to increases in relative prices of goods that are traded among countries, which leads to appreciation of REER. Hence, increased productivity is noted to have real impact on the growth of REER (Balassa, 1964). In this sense, both sectors of tradable goods and non-tradable goods are regarded and assessed to conclude effects of labor productivity on REER. The input of labor is described as the total amount of hours that labor was in place (work) for all individuals, who were engaged in the process of production (Faleiros, da Silva, & Nakaguma, 2016). In addition, remittances that are generated by migrants are vital for understanding economics of a country. It has been noted that remittances are an influential factor that cannot be neglected (Lartey, et al., 2012). There was an increase of 263% in terms of received remittances among developing nations in a period of 20 years between years of 1990 and 2010 from $338 billion (Ratha et al., 2009). As remittances are foreign incomes, and have faced vast increase in recent years, it has become a major factor for analysis among both scholars and practitioners.

It has been further reported that remittances comply a third of total flows of financial means towards developing countries (Lartey et al., 2012). This further justifies inclusion of this variable in the current model as remittances are crucial for economics of countries. Especially for the case of Turkey, since there are various migrants in the country sending monetary means back to their country as well as Turkish residents elsewhere flowing financial means back to the country. In international economics and

studies surrounding the topic, openness of trade has been a topic that had had scholars paying attention to the matter. While early works such as, Cassel (1922) have established a conceptualized approach towards the topic, more recent studies have regarded the notion as a matter that requires further analysis and investigation (Gantman and Dabos, 2017). Trade and/or international openness is regarded to be an influential factor on REER. This factor is the total sum of exports and imports of a nation, which includes tradable goods of a state on the basis of percentage of GDP (Gantman and Dabos, 2017). It is important to note that empirical evidence that lies in the extant literature does not show a consensus upon findings regarding underlying effects and outcomes of this matter, which further justifies the conduct of this research. Additionally, as majority of studies in this context have been conducted in countries located in Latin America, Southeast Asia and/or Eastern Europe, it is further deemed appropriate that this research addresses Turkey with regard to the long-term effects of aforementioned factors on its REER. As development of financial sector is vital for every country, flow of financial means and investigation of this matter aids the country under study to better understand various effects that can enhance the process of developing sectors. There are various measures used in the current study. It is important to note that this research follows the work of relevant and recent studies in the field of economics (e.g. Katircioglu, 2010).

1.2 Aims and Contributions

The current research tends to provide additional empirical evidence to the topic at hand, to contribute to the extant literature of the subject regarding REER and factors that have influence on this element. This research studies how the changes in Remittances, Labor Productivity, Trade (Openness) could impact on the changes in Real Effective Exchange Rate in the context of Turkey. In this regard,

methodological approaches used in this research are a pathway towards better understanding the phenomenon through implying relatively modern tools and new models to address economies of regions that have been relatively less studies (i.e. Turkey). This is mainly based on the fact that there is no consensus among empirical evidence found in the literature of the subject at hand. Hence, methodologies used in the current research are aligned in a manner, from which independent variables are not restricted in terms of their slope. It has been suggested that a mere devaluation (nominal) cannot resolve issues of over-appreciated REER due to policies that limit monetary means (e.g. Turkey not being able to use Euro as its monetary unit, or Ecuador that uses monetary unit of USD). Through the current research model, a depreciation of REER is taken into consideration, where trade openness is amongst its causes based on various economic measures. Therefore, the contributions of this research are threefold. Initially, the current research contributes to the geographical borders of the extant literature through conducting such analysis in Turkey, which has relatively been less examined, compared to other nations. Additionally, this research contributes to the literature in terms of empirical evidence, with aims to provide a better understanding of the effects of independent economic variables on REER. Lastly, the current research aims to contribute to the practical aspect of the matter at hand through provision of tangible findings, which are derived from sound and modern analytical approaches.

1.3 Research Outline

The current research is formed by a number of chapters that are namely, introduction chapter, which is the initial chapter of this research providing a basic understanding of the approach and included variables as well as highlighting aims and objectives of the research; this is followed by chapter two, where the literature of the subject is reviewed

and most recent and relevant works as well as fundamental studies that contribute to current understanding are gathered and presented; chapter three provides a framework for the conduct of this research through development of hypotheses and indicating methodological approach undertaken; analysis chapter includes the results of data analysis that was conducted on the time series data used for this research; and final chapter of this research includes concluding the findings as well as highlighting research limitations, and recommendations for future studies.

Chapter 2

LITERATURE REVIEW

This chapter gathers information regarding variables of the current research based on most recent and relevant studies found within the literature of the subject. This extensive review of the literature allows the researcher to establish theoretical foundation for the conduct of this research, which shape the development of hypotheses as well as flow of research. Work of experts in the field is reviewed and secondary data is gathered to create a bedrock for the current study.

2.1 Remittances

Remittances are defined in the literature of the subject as a sum of monetary and goods, which immigrants in a country send back to their native state (Reinert, Rajan, Glass, & Davis, 2009). This notion has been regarded in many studies within the literature (e.g. Giuliano & Ruiz-Arranz, 2009). However, the definition is the same across the literature and does not vary among scholars. Hence, there is a consensus on defining the meaning of remittances. On an international scale, topic of remittances have been a matter of interest for scholars as well as practitioners (e.g. government agencies, central banks, Reinert et al, 2009). In this sense, banking individuals, economists, authorities in departments of policymaking and academic individuals have paid an extensive attention towards this topic (Reinert et al., 2009). Traditionally, this notion was not regarded extensively as the assumption was that remittances are small in terms of magnitude and for macroeconomics of a state, these remittances are insignificant (Giuliano & Ruiz-Arranz, 2009). However, vivid evidence of the impact of remittances

on the economics of countries have led to the point, where all parties related to economics and policy-issuing bodies to focus on this aspect and investigate and measure its related factors.

According to World Bank Indicators (2008, 2016), remittances (and compensation for employees abroad) on international scale have had over $37 billion in 1980 to $249 billion in 2005. This shows that the increase has been significant, which further is aligned with the aforementioned statement regarding increased attention towards the topic. Notably, the amount of increase has been more than the increase that was seen for world trade during the same period, similar to a number of other macroeconomic factors (Lartey, Mandelman, and Acosta, 2012). It has been further reported that this vivid growth is bound to the fact that reports and tracking of remittances have significantly improved over the years, which is gathered through microeconomic surveying, which address immigrants and their flow of financial means towards their families back in their native countries (Adams, and Page. 2005; Amuedo Dorantes, Catalina, and Pozo, 2006; Lartey et al., 2012). As world migration is increasing, it is expected that the growth of remittances will not cease as this is noted to be a byproduct of migration on global scale (Adams and Page, 2005). It has been further reported that regions, which have the most flow are Latin America, East Asia, and Pacific Regions. This is followed by South Asia, Middle East and Northern Africa (MENA) regions (Adams and Page, 2005; Lartey et al., 2012).

Following what was mentioned above, *data sources* that collect information regarding remittances are important to be noted as it is related to the core and context of current research. The Balance of Payments Statistics Yearbook, which is a publication for International Monetary Fund (IMF), releases data regarding yearly remittances on

country-level, which can be used for those, who are interested in such data. This is while this data is not detailed, which further directs researchers towards obtaining information regarding remittances directly from sources that are domestic (e.g. agencies of country that is under investigation) (Lartey et al., 2012; International Monetary Fund, 2005). For instance, monthly remittance data for Mexico can be found on an official domestic website (www.banxico.org.mx). Money orders, receipts, checks, electronic transfers as well as cash transfers are recorded on a disaggregated manner, which allows researchers and practitioners to draw conclusions from analyzing the data. It is important to note that that for an individual to comprehend effects of remittances on behaviors of household and individuals, it is imperative that microeconomic data and reports are available for receipts of remittances as well as other characteristics of the household under study (Lartey et al., 2012; Fajnzylber, Pablo, and Lo´pez, 2007; Chami, Ralph, Connel Fullenkamp, and Jahjah, 2005; Cox Edwards, Alejandra, and Ureta. 2003). In this sense, behavior of household is defined through variables such as, schooling, labor participation and the like. Such data can be found in various sources, which entail national income, expenditure surveys and migration surveys (International Monetary Fund, 2005; Pablo and Lopez, 2007; Lartey et al., 2012).

2.2 International Remittances Measurement

Upon reviewing the extant literature of the subject, remittances as a term is used to describe three concepts that can be used simultaneously and combined or on separate terms. These are namely, workers' remittances, compensation for employees, and transfers of migrants. The first concept refers to nonresidents of a state transferring financial means to residents (households) (Lartey et al., 2012; Edwards et al., 2003; Lucas, Robert and Stark. 1985; McKenzie, 2005). An instance can be a Syrian

nationality with Turkish resident, transferring a sum of money to Syria on a monthly basis. This is while if the Syrian residing in Turkey would be hired for a short-term occupation of few months in Turkey, earnings would be categorized as classified expenses as compensation for the employee (e.g. travel expenses) (McKenzie, 2005). These two terms are distinguished with regards to the classification of a temporary stay, which does not read to one year. Regarding the third concept that is transfers of migrants, changes in designations of assets is taken into consideration in terms of changing residency of an individual (McKenzie, 2005). For instance, when an individual moves to Thailand from the US, accounts are distinguished from a US resident to a Thai resident, which can then be regarded as a transfer for a migrant (Hillel, and Docquier, 2006; Ratha, Dilip, 2003). It has been noted that distinction among these three concepts is not easy and it is the cause of confusion in practical terms. International Monetary Fund initiated a simplification process in 2005 (see IMF, 2005).

While the aforementioned difficulties exist in terms of defining concepts, it is not regarded as a major challenge for researchers, as non-comparability of data among countries and various data sources is a matter, which causes issues for researchers in this context (Hillel, and Docquier, 2006; Ratha, Dilip, 2003). It is important to note that data regarding remittances are submitted through reported to the IMF. However, the methodology of collecting the data varies among nations (e.g. aggregated reports of inflow, banking system, money transfer firms such as Western Union). Thus, reports are different in terms of scope, thresholds and requirements for creation and are specific for each country (McKenzie, 2005). Household surveys are used by central banks to measure flows in some cases (Edwards et al., 2003). These surveys rely heavily on the instrumentation process to include all flows to increase their reliability.

It is important to note that instrumentation can merely collect information of remittances based on monetary terms, or include in-kind transfers as well as monetary means (Amuedo Dorantes, 2006; Hillel, and Docquier, 2006; McKenzie, 2005; Edwards et al., 2003).

The existence of differences among time series is a nexus of problems for both researchers and practitioners (Rosenzweig, and Stark, 1989; Woodruff, and Zenteno, 2007). Statistical agencies, where data is tracked, and collected vary in terms of capabilities within their methodology as well as their transmission. This can be an insignificant matter for central banks as they can easily track transfers of monetary means through legal regulations (banks and money transferring agencies). In this sense, there are forms of transferring monetary means that are informal. These can be namely, cash mails, hand carrying, swifts or Electronic Fund Transfers (EFT), which are relatively more difficult to be tracked. Similarly, Hawala is another system of transferring money, which is informal and is used through a participant providing a direct counterpart in another state, who pays same amount of money to another recipient (Woodruff and Zeneteno, 2007). A determinant factor in this regard is regulations and policies surrounding transmission methods for immigrants being able to remit monetary means to their home country. This has an impact on reports that are made for remittances on an overall basis and can deviate the actual flow that is remitted between or among borders (McKenzie, 2005; Woodruff and Zeneteno, 2007). The case of Mexican Matricula Consular, which was recognized by a number of large banks in the US as an identification, which led to Mexicans being able to open bank account in other countries, is an example of the aforementioned statement (Woodruff and Zeneteno, 2007).

2.3 Determinants of Remittances

The reason behind remittances occurring in the first place by migrants is a matter, which can be helpful for understanding and comprehending effects of remittances. Motivations, responses in both native and residing countries in terms of economics, and incentives and policies can be understood to aid for predicting effects of remittances on economic variables. This is deemed adequate for the context of current research as it examines remittances and their effects on real effective exchange rate of Turkey. In this regard, a number of studies have examined motivational aspects for remittances (e.g. Rapoport and Docquier, 2006). The most common motive and stimuli among migrants is noted to be altruism, which allows individuals to facilitate and foster compensation on high levels with regards to their families back in their home country. When individuals tend to earn high wages in a country abroad, they are able to aid their families back in their country, especially when the earnings in home country is relatively lower. This notion justifies the migration process (Rapoport and Docquier, 2006). However, there are other factors related to motives of migration, which can be namely, purchasing houses, accumulation of assets, lands, capitals, expansion of a business, and/or provision of support of a venture that is risky.

According to Lucas and Stark, migration and remittances are regarded as a strategy, from which family of the individual is aided to gain more from the dispersion of geography of members of the family (1985). Income streams can be a diversified through marriages with migration presence, which can be of aid for families (Rosenzweig and Stark, 1989). The total income of households can become more stable as the dispersion in geographic terms increases. This is due to the fact that incomes can be compensated through transfers from abroad. Determinants of

remittances are often isolated, which can increase the extent of predictability for remittances in response to policies and economic states that are in constant changes. Remittances can face a fall with economic shocks, collapse, inflations, or crises (Rosenzweig and Stark, 1989). Volume and timing of remittance flows can be affected by exchange rate policies of origin nation, especially if the remit is to be used for investments.

2.4 Impacts of Remittances

Remittances are commonly argued to be beneficial for families and can significantly improve quality of life of those in the process of remits. This is while some argue that remittances and their inflow can have a negative impact (e.g. De Haas, 2009). This notion impacts policymaking processes as it creates a confusion for appropriateness of the policy. Hence, the issue rises to whether increase and support remittances, or slow them down. As it can be understood, the notion is of complex nature and can have solid points from both perspectives.

2.4.1 Macroeconomic Impacts

Ratha (2003) suggests that stabilized remittances with more reliability are more appropriate than Foreign Direct Investments (FDI) or obtaining aids from other nations, which in turn makes remittances a vital source for the process of developing a nations' financial state. In another study conducted by Chami et al. (2005) another view is provided regarding macroeconomic effects of remittances that are noted to be negative in terms of correlation with economic growth. Additionally, they have noted that remittances are compensatory, and are transferred to those families in the origin country, only in times of difficulty. Hence, in this perspective, remittances are not regarded as a mean for increasing investments or economic growth. It has been further noted that remittances can be a source, which contributes more significantly to modest

economic growths (Fajnzylber and Ló´pez, 2007). This is while Adams and Page have suggested that the rate of poverty can be reduced on a significant level in those nations that are developing (2005). In a study, it was noted that while impact of remittances on economic growth is limited, it is significant (Fajnzylber and Ló´pez, 2007). This implies that domestic currency of a nation can be positively affected by existence and increase of remittances, which is the core aspect of this research.

As mentioned earlier, there are contradictory findings within the literature regarding the effects of remittances on an economy. It was noted that remittances are compensatory, which are related to loss and sufferance (Chami et al., 2005). This hinders the status of remittances as a nexus for financial development and economic growth. This is due to the fact that increased remittances occur in times of difficulty, which directs migrants to transfer money to their home country to support their families. Adams and Page (2005) have reported that remittances can have a negative impact on domestic economy for those countries that are in developing stage. Domestic industries of the origin country, which has relatively lower income can be negatively impacted, according to their study. These contradictory means lead to a state, where interpretations become difficult. Hence, it is important to note that time sensitivity, distributions and redistributive effects are taken into consideration. In this regard, as international migration is a matter that has high costs, in most cases, those with lowest monetary means are more affected as remittances bypass the state for financing migration. However, migration networks are entitled to be more widespread throughout time, which allows those individuals with lower incomes to be able to overcome financing migration issues and migrate to another country, which in turn allows them to benefit from remittances (McKenzie, 2005). Redistributive effects are more likely to occur, when prices (relative) of nontraded goods are inclined through

patterns of remittances. This leads to an appreciation of REER. Export sector accordingly is affected and yields in lowered competitiveness in international market. Efforts for increasing and developing export can be hindered or prevented, when economic development policies are directed towards remittances (McKenzie, 2005).

2.4.2 Microeconomic Impacts

As mentioned above, effects of remittances on macroeconomic terms is difficult to interpret and comprehend due to contradictory results and lack of consensus. However, understanding microeconomic effects can provide a bedrock for overcoming the issue. In this sense, flows of investments, and capital stocks (human and physical) are addressed to better understand the matter at hand (McKenzie, 2005). There are surveys for monetary transactions that require senders to indicate the reason of transfer. However, consumed share and invested share are difficult to be determined through this mere requirement. This is due to the fact that while senders can indicate the reason of transfer, the true indicator of the reason are recipients of the sum, whom allocate those sums (Edwards and Ureta, 2003). Hence, microeconomic surveys are commonly used by researchers to understand characteristics of households and their connection with remittances. Cox Edwards and Ureta (2003) have suggested that there is a positive impact on schooling (particularly for children) from remittances. This is while some studies have found a relatively lower level of impact on schooling (e.g. Acosta, 2006). It has been noted by Acosta (2006) that differences and contradictions in results can be due to the fact that migration and remittance effects are not properly distinguished. Furthermore, it has been suggested that while remittances are a byproduct of migration of a member and can enhance schooling, children may feel a lack in their family, which directs them to work. Subsequently, this can decrease their time of schooling and attendance (Alcaraz, Chiquiar, & Salcedo, 2012).

In addition to what was mentioned above, remittances have an impact on work behaviors of individuals, and can be a source for encouraging individuals to be more dependent on remits. It has been noted in a study conducted by Amuede Dorantes and Pozo (2006) that women in Mexico tend to have less working hours, when they are recipients of remits. They further interpret that this is the result of additional income, which further allows them to spend more time with their children. This change of behavior has also been witnessed among men in terms of working hours. Self-employment is increased and movement to informal sectors are noticed from formal sectors. This can be due to added capital, which allows individuals to have adequate and sufficient resources to fund their businesses and become entrepreneurs (Woodruff and Zenteno, 2007). This yields in an increase in amount of investments in microenterprises. It is important to highlight that individuals, who migrate, face more choices, events and also limitations, which affects their motives regarding remitting. Each incident or choice of option can be influential on an individuals' decision for remitting. These effects can be positive or negative for those, who are on the receiving end (Woodruff and Zenteno, 2007).

2.5 Real Effective Exchange Rate

The effective exchange rate is the trade weighted average of the bilateral real exchange rate among all the trading partners of the country. Hence, Real Exchange Rate (RER) = e*(CPI(f)/CPI(l)), where e is nominal exchange rate, CPI(f) is the consumer price index in the foreign country and the CPI (l) is the consumer price index in the local country. Then the Real Effective Exchange Rate (REER) = trade weighted average of real bilateral exchange rates among all trading partners of a country (Comunale, 2017; Katircioglu, 2010; Gantman, E& Dabós, 2018). Effective exchange rate can be defined as a summary measure of the rate that a currency is exchanged with regard to

other nations' currencies. This can be described in real or nominal terminologies. Conducting trade and/or investments by a country makes the effective exchange rate a relevant matter. It is important to highlight that rates differ in various aspects such as, country coverage, weighting, and inflation impacts to be taken into consideration (distinguishing nominal and real rates). Calculation, estimation and definition of effective exchange rate then becomes reliant on interactions among theoretical frameworks of interest, and degree of reliability and availability of data, which is a complicated matter (Ganrman and Dabos, 2018; Comunale, 2017; Black, 1976). In this regard, addressing the attributions of relative weights to all the currencies that are included and involved is of importance for calculation of effective exchange rate. Exchange rate can carry the role of relative price of traded goods in majority of situations (Comunale, 2017; Acosta, Baerg, & Mandelman, 2009; Golub, 1994). As trading assets became more prominent in recent years, appropriateness of weights is more linked to owed assets, and liabilities of other countries that are involved in the trade process.

2.5.1 Trade-Weighted Effective Exchange Rates

Throughout the literature of the subject, weighing currencies based on trade-weight has been regarded as the most common way of calculating effective exchange rate (e.g. Armington, 1969; Golub, 1994; Acosta, Baerg, & Mandelman, 2009; Bayoumi, Tamim, Lee, and Jayantha, 2006; Menzie, 2006; Gourinchas, Olivier, and Rey, 2005). This is a geometric average weight of bilateral exchange rates. It is important to note that trade weighting is a complicated matter, from which competitions in third markets is enabled. This is commonly obtained through adaptation of Armington's assumption, which states that goods are differentiated based on location of the production process (1969). In this sense, third market weight is considered to be the same as weighted

average across all third-country markets based on import share of a country (j) divided by average weight of combined competitors of country (i). Shares are country I are exports to numerous markets in this scenario. Notwithstanding that this expression is vastly simplified and is based on the assumption that differentiated goods and their share are equal to a constant elasticity of substitute goods that are not necessary for all instances (Spilimbergo & Vamvakidis, 2003).

2.5.2 Nominal Versus Real

It is common that economists face with models, in which real, inflation adjusted and exchange rates have an elemental role. Relative prices or real exchange rates within the literature and effective exchange rate are sources of confusion within the extant literature of the subject at hand. Emphasis is on relative price on specific manner that reflect the category of real exchange rate in majority of models (Gourinchas et al., 2005; Golub, 1994). Real exchange rate is classified with regards to a specified relative price that is the center of emphasis. Accordingly, relative price of non-tradable goods are noted to be vital, which then a broader index of prices is used to incorporate and address tradable and non-tradable goods. Such indices are commonly used in productivity-based definitions of real exchange rate. An example of such indices can be found in the model proposed by Balassa-Samuelson (Tille, 2003; Spilimbergo & Vamvakidis, 2003; Lane and Ferretti, 2005; Balassa, 1964). This is while, when account balance (external) is the key aspect of consideration, relatively smaller indices for traded goods can be more appropriate for deflation (Gourinchas et al., 2005). This is also noted in terms of policymaking on macroeconomic scales, which addresses lowered power of domestic currencies (real terms), which implies that domestic goods are enhances in terms of being sold abroad (Lane and Ferretti, 2005; Menzie, 2006). Extent of competitiveness for cost is a relevant concept in this regard. Cost-markup

pricing model is assumed, which can lead to calculation of a measure for real effective exchange rate (REER). Unit of labor costs replace prices in such models (Golub, 1994). Real exchange rate is considered to be an appropriate measurement for relative production costs, compare to mere prices of goods (Black, 1976; Armington, 1969; Menzie, 2006).

It is important to note that in terms of practical implications, a few deflators of price can be used. On monthly frequent basis, consumer price index (CPI), producer price index (PPI) or wholesale price index (WPI), or export price index (EPI) are incorporated in the models at hand (Tille, 2003). When frequencies are low (e.g. quarterly data), deflators in set can be increased, which can include indices such as, gross domestic product (GDP), and price indices for indicators of GDP (e.g. personal consumption expenditure deflator) (Golub, 1994). Common in terms of literature, CPI is used to weight nontraded products (e.g. consumer services). On a similar notion, GDP deflator and CPI are used to weight expenditures of non-tradable goods with regards to proportion of their vitality on an aggregated basis. This is contradictory to PPI and WPI, in which retail sales are excluded, which are possibly nontraded (Lane and Ferretti, 2005; Menzie, 2006).

It has been noted within the literature that unit labor cost (ULC) deflated index can represent and reflect issues regarding trade more significantly than other indices (Lane and Feretti, 2005; Menzie, 2006; Klau and Fung, 2006). This is due to the fact that unit labor cost is a measure for cost competitiveness. However, it has been noted that using such indices are entitled to be highly complicated and difficult (e.g. Klau and Fung, 2006). Firstly, ULCs are not with high rates of availability, nor are consistent in terms of time, which entitles them to be revised substantially. Secondly, covariations are

higher with business cycles that are impeded trends with series of deflated ULC. Thirdly, relativeness of ULCs are regarding manufacturing sector, which can hinder interpretation as service industry is increasingly improving in terms of tradability (Belloumi, 2010; Klau and Fung, 2006). Lastly, which is noted to be highly important, ULCs are commonly accessible and available merely for those nations that are developed in terms of economics. Hence, calculation of effective exchange rate regarding ULC deflated has to be compared and references with a certain number of countries. This yields in lowered extent of relevance for the group being analyzed (Belloumi, 2010).

2.5.3 Asset and Liability Weights

It is important to note that in above noted discussions and theoretical frameworks, the condition is that weights used are appropriate and are linked with flows of trade. However, in practice, trade weighting is not necessarily appropriate for addressing questions of a model or research on a holistic manner. Tille, Rey and Gourinchas (2003) have suggested that exchange rates are prone to be changed with substantial impacts on investments on international scale with regards to US position. Similarly, Tille (2003) has reported that due to the fact that the United States has assets that are denominated with regards to foreign currencies. This is while the US has liabilities that are denominated in terms of dollars. Hence, depreciation of USD leads to a persuasion of increased effect on dollar valuation with regards to the assets of US abroad. This is vivid in both short and medium-term and has a significant influence on net international investment based on changes of dollar.

2.6 Trade and REER

As it has been noted earlier in this section, real exchange rate is a topic of interest for both academicians and practitioners in the field of economics and international

economics. A theoretical approach that allows the research to conceptualize the matter is derived from an early work conducted by Cassel (1918, 1922), in which an equilibrium of exchange rate regarding money among various nations is noted to exist, which drives exchange rates to be converged according to that value despite its temporary fluctuation/increases (inflation rates). This is the bedrock of Purchasing Power Parity (PPP) theory, which has been examined and analyzed in various terms and empirical evidence are abundant upon the matter that have been gathered through numerous methodologies. This has been used to exhibit stationarity of exchange rates with regards to time series. It is important to note that these evidences within the literature are somewhat mixed (Froot and Rogoff, 1995), which has yielded in a lack of consensus. This has been reported to be linked to (A), time frames of observations being relatively short, and (B) dynamics of a specific exchange rate of a country that is being analyzed (high inflation, which is held by PPP, while being challenged by evidence from normal economies). As deviations were observed regarding PPP and its application in different locations, it has directed the attention of a number of scholars to investigate the matter (Gantman and Dabos, 2017).

In accord with the literature of the subject, it has been seen that majority of studies tend to reach to a consensus for trade openness having a depreciative impact on REER (Dornbusch, 1974; Gantman and Dabos, 2017). This notion has significant implications on both theoretical format of research in the field as well as effects on policies made in terms of economics of a state. It has been suggested that a mere devaluation (nominal) cannot resolve issues of over-appreciated REER due to policies that limit monetary means (e.g. Turkey not being able to use Euro as its monetary unit, or Ecuador that uses monetary unit of USD). Through the current research model, a depreciation of REER is taken into consideration, where trade openness is amongst its

causes based on various economic measures. Trade openness and REER have been regarded in a number of studies in the literature. The linkage is explained, when real effective exchange rate is appreciated, domestic products face increased in their prices for other countries, and demand for those products is increased (Balassa, 1975). It is important to note that over-appreciation of exchange rates can lead to a point, where foreign products (tradable) tend to lose their value, compared with domestic products. This can lead to an increase in imports, which is commonly controlled by government through tariffs or other means such as, quotas (Romelli et al., 2016). This poses a restriction over imports, which in turn consolidates REER. Hence, this has been relatively argued since early works of Dornbusch (1974) to more recent works such as Romelli et al. (2016) that liberalization of trade can have a depreciating effect on REER.

When tariffs are implied by a government on import, the balance is tilted in the account that leads to increased demand for those imports (Balassa, 1975). Subsequently, real exchange rate requires a depreciation. This is while according to Edwards (1989) early theoretical frameworks have made the notion awkwardly simple. It has been noted in his study that liberalization of trade is explicit regarding its effect on a binary manner that are namely, substitution, and income effects. These two effects work in contradictory directions. He further propose a model, in which real exchange rate led to similar findings. This was notably under the assumption that tradable and non-tradable goods are substitutes and this effect is relatively higher in strength than the effect of income. A similar finding was noted in a study conducted by Khan and Ostry (1992), which reported that income effect is less significant, compared to substitute effect. It has been suggested that through declined tariffs, depreciation takes place in real terms as substitution effect becomes prominent. This is while, if liberalization of

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trade initiates with a high tariff level, income effect can be increased. This can in turn lead to increased demand for non-tradable goods, which leads to increased price (Edwards, 1989). This further adds to the existence of inconsistency in terms of empirical evidence within the literature of the subject.

Trade volume is commonly used to address the issue of operations of trade openness that is the total sum of exports-imports with regards to GDP. The aforementioned notion incorporates the matter of protecting (protectionism), which decreases values of import indicators (Gantman and Dabos, 2017; Romelli et al., 2016). Estimation of average of quotas/tariffs are commonly used as an alternative approach towards this issue. However, in practice, there are various limitations and restrictions in using such alternatives. Most significant limit is the lack of available data that is relevant and entails long-term data. Additionally, reliability of these data is another aspect that is to be taken into consideration. In this regard, import penetration ratio (import based on share of GDP) is used as an alternative in a number of studies (e.g. Yanikkaya, 2003; Romelli et al., 2016; Gantman and Dabos, 2017). Another alternative used by Pritchett (1991) is structure-adjusted intensity of trade that is defined as differentiation between actual trade volume of a nation and its theoretical estimation. This estimation is based on functions of size and other characteristics that are structurally looked into.

There have been other studies looking into the linkage between trade openness and REER, form which the work of Devereux and Connolly (1996) is regarded as a vital one. In their study, which addressed a number of countries in the context of Latin America, import taxes that are a manner of protection have led to an appreciation of REER. This was based upon the assumption that liberalization of trade leads to depreciation of REER. In another study conducted by Li (2004) it was noted that while

there is a depreciating effect on REER through liberalized trade, the effect tends to be insignificant, when partial policies are made in this aspect. It is important to note and report more recent studies found in the literature that have relevance to the current research. Accordingly, Zakaria and Ghauri (2011) and Yusoff and Febrina (2014) have reported that openness of trade can lead to depreciation of REER in a number of states. Contradictory to aforementioned studies, there have been works, in which no linkage was found between the two variables of trade openness and REER (i.e. Elbadawi, 1994). It has been suggested by Gantman and Dabos (2017) that these differences may have occurred due to the fact that these studies have included a large number of trade policies/indicators and other aspects of economic models.

2.7 Labor Productivity

Economies in modern world are intact with strategic elements that relate to economic growth. In this sense, labor productivity has been regarded as a vital matter. Availability and quality of labor resources as well as technologies that are used for labor, are determinants of the productivity of labor (Faleiros, da Silva, & Nakaguma, 2016). Therefore, it can be said that labor productivity is a factor that is linked on a significant manner to entrepreneurship and activities in the realm of economy, specialization, employment, and subsequently, competitive advantage (Lisboa and Pessoa, 2013). Hence, there are various influences that are posed on production processes and costs by productivity level of labor. As these processes and costs influence competitiveness of countries on international scale, it can be deduced that labor productivity has a direct influence on competitiveness (Rhee and Pyo, 2010). However, the topic has been regarded to call for further analysis and investigation in various contexts due to its important that was noted. The issue surrounding understanding effects of labor productivity are more vivid in contexts that are linked

to post-crises such as the case of Korea (Rhee and Pyo, 2010) or the case of Russia (Ahrend, 2006).

With regards to what was mentioned above, it has to be noted that economic crises in recent years can be important determinants of the factor of labor productivity, especially if specific countries are investigated or analyzed. There are various studies investigating the notion in countries such as Latvia, Lituania, Estonia, Russia and Korea (e.g. Ahrend, 2006; Rhee and Pyo, 2010; Masso and Vahter, 2012). Technological innovativeness and productivity of labor were found to have a significant relationship in a study that address Estonia (Masso and Vahter, 2012). Furthermore, they found that the aforementioned linkage is more significant for service sectors that have relatively lower knowledge intensity. Similarly, studies were found in the literature that stated foreign direct investment and productivity are intertwined (e.g. Degutis and Tvaronaviciene, 2006; Snieska and Simkunaite, 2009). Global competitiveness Index (GCI), which was noted by World Economic Forum (WEF) is used commonly for assessing countries and their level of reliance on competitiveness on a global scale. This index is related to the environment of business conduct and its setting with efficiency and innovation factors take into account.

Throughout the literature, Balassa-Samuelson effect is commonly used to address the linkage between REER and labor productivity. However, it has been reported that majority of studies in this context face challenges as time series data that include long-term sectoral data are lacking in terms of availability (Loko and Tuladhar, 2005). This challenge has been relatively overcame in the current research as the data at hand resembles information for a period of seventeen years for Turkey. The number of studies, in which long-term factors predicting nominal exchange rates have been

increasing in recent years (Beckmann, Belke, and Czudaj, 2015). Traditionally, consumer prices, interest rates and PPP are regarded to be amongst the most important determinants. Factor of labor productivity has become more dominant in recent years with accord to Balassa-Samuelson effect as well as New Open Economy that includes macroeconomic models (Beckmann et al., 2015). There are two main processes are noted in a study conducted by Grabowski and Self (2019) in terms of economic growth and development that are namely, increased productivity in sectors of economy, and movement of resources from those sections that have a relatively smaller rate of productivity such as, agriculture to those sectors with higher rates such as, manufacturing sector. In their study, it has been noted that when economic growth takes its pace, it is more likely that REER faces a depreciation, which is linked to labor productivity as a major element that is influential in this process. This further encourages the current research to include this factor in its model to be analyzed in terms of its effects on REER for the context of Turkey as majority of studies have been conducted in other countries and regions as previously mentioned in this section.

Chapter 3

METHODOLOGY

This chapter is dedicated to elaborate on the approach undertaken to conduct the current research. In this sense, this chapter entails explanations of data procedures, formulas used, tools utilized for analyzing the data, and indicating the hypotheses of this research. Analytical methods are also noted and explained.

3.1 Data Procedure

As the notion of this research is to examine the effects of remittance, labor productivity, and trade (openness) on real effective exchange rate, the data used to test the hypotheses of this research have been gathered from monthly sample data made public by Central Bank of Republic of Turkey (TCMB) database. This data is monthly and ranges from the year 2000 to 2017 expanding 17 years of collected official data. Additionally, relevant data have been extracted from Federal Reserve Economic Data (FRED) as well as Organization for Economic Cooperation and Development (OECD), which have public data (secondary) available to be used in such studies.

3.2 Measurements

There are various measures used in the current study. It is important to note that this research follows the work of relevant and recent studies in the field of economics (e.g. Katircioglu, 2010). In this regard, definitions of measures and their corresponding equations that have been employed in the context of macroeconomic discipline of this research are presented in the table below. Notably, these measurement equations address percentages of change (variations) in a macroeconomic scale with regards to

the variables included in the current research. These variables are converted to a natural logarithm from their econometric analysis. This process aids the researcher to capture growth effects of variables among series of data (Katircioglu, 2010).

Table 1. Measurements (Author)

Symbol	Variable	Measurement
RMT	Remittances	$\Delta RMT = (RMT_t - RMT_{t-1}) / RMT_{t-1}$
TR	Trade	$\Delta TR = (TR_t - TR_{t-1}) / TR_{t-1}$
LP	Labor Productivity	$\Delta LP = (LP_t - LP_{t-1}) / LP_{t-1}$
REER	Real Effective Exchange Rate	$\Delta REER = (REER_t - REER_{t-1}) / REER_{t-1}$

It is further appropriate to provide an explanation on the above noted variables. Effective exchange rate can be regarded as a summary measure of rates that currency of a state/country is exchanged to other currencies. This exchange is whether nominal or real terms. Therefore, Effective Exchange Rate is turned to a relevant measure as a country initiates trade and/or investment transactions (financial) with another country or a group of countries. Effectiveness then can be entitled to a trade that weighs average of the bilateral real exchange rate among all parties of countries involved in the trade (Comunale, 2017). It is important to note that effective exchange rate is a variable that is influenced by a number of factors and cannot be regarded on a singular perspective. For instance, Japan's effective exchange rate on an international scale that is highly competitive cannot be measured merely by examining and analyzing individual exchange rates between Yen and a singular currency (Comunale, 2017; Katircioglu, 2010; Gantman, E& Dabós, 2018).

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3.3 Hypothesis Development

As majority of studies in this context have been conducted in regions such as southern America (e.g. Brazil or Argentina), the conduct of this research is justified as Turkey is addressed in the case of this research as an Islamic country located in the Middle East and Northern Africa (MENA) region. Within the extant literature, there are numerous studies that regard remittances as an influential factor on the economy of a country (e.g. Ratha, 2003; Hassan and Holmes, 2013; Comunale, 2017; Acosta, Baerg, & Mandelman, 2009). In an early study conducted by Ratha (2003) it was noted that remittances are a monetary element that sufficiently yield in flow of financial means, when compared with foreign aids and foreign direct investments (FDI). This positive effect on domestic economic is also noted in other studies such as Hassan and Holmes (2013) and Acosta et al. (2009). Additionally, financial development planning with taking remittances into account provides a more stable and solid basis for rates, compared to financial investments or FDI, which is emerged from foreign aids. Similarly, economic growth has been noted to be under the influence of remittances. However, this effect has been reported to be partial and limited (Fajnzylber and Lo´pez, 2007). Remittances have a positive impact on domestic currency, which can in turn impact real exchange rate of the state. REER can be comprehended through a lead towards deterioration of extent of competitiveness on an external manner, which is linked to relative prices that other parties in the trade hold (Hassan and Holmes, 2013). A high rate of REER or an increase in its state can imply that REE is depreciated and competitiveness on international scale is increased. This is more vivid in small economies that are open, in which remittances can increase (on a sustained basis) household income. In other words, increased remittances can result in in more spending in various sectors such as, tradable goods as well as non-tradable goods

(Hassan and Holmes, 2013; Bourdet and Falck, 2008). A number of studies have noted that through analysis of time series data, remittances have proven to be effective upon REER (i.e. Amuedo-Dorantes and Pozo, 2004; Lopez et al., 2007; Hassan and Holmes, 2013). The current research follows the work of experts in this field and utilizes time series data as described earlier in this chapter to analyze the effects of remittance on REER in the context of Turkey during years of 2000 to 2017. It is important to note that similar studies in regions such as Latin America and Cyprus have been found to be in a positive result regarding this effect. Hence, the following hypothesis is emerged:

Hypothesis 1: There is a positive association among remittances and real effective exchange rate.

Labor productivity is another factor that is included in the analytical model of current research. Gross Domestic Product per hour (GDP) is commonly used to measure labor productivity. This indicator addressed the degree of effectiveness and efficiency of labor input that is mixed with other elements or production, which are utilized within the process of production. The input of labor is described as the total amount of hours that labor was in place (work) for all individuals, who were engaged in the process of production (Faleiros, da Silva, & Nakaguma, 2016). This is while labor productivity is a partial reflection of the extent of productivity of labor on an individual basis for each worker and their personal effort at workplace. Measuring output and its ratio difference with labor input is a dependent factor on presence and adequate usage of input (e.g. capital, intermediate input, technical matter, organizational efficiency, and economies of scale) (Faleiros et al., 2016; Loko, & Tuladhar, 2005). Indices of OECD and measurements used in terms of USD (constant prices) are used to measure labor productivity. Domestic currency is assumed and expected to have more value, when

labor productivity is increased. As a consequent, this will yield in increased REER. This notion has led to the point, where the following hypothesis is formed:

Hypothesis 2: There is a positive relationship between Labor Productivity and Real Effective Exchange Rate.

Trade and/or international openness is regarded to be an influential factor on REER. This factor is the total sum of exports and imports of a nation, which includes tradable goods of a state on the basis of percentage of GDP (Gantman and Dabos, 2017). For a state to be able to increase its extent of competitiveness on a global scale, it is imperative that prices offered are in fact competitive within the international market of tradable goods. Therefore, REER is expected to be decreased in times, when a nation increases its level of openness to international trade. This is a major driver for this factor to be included in the current research. In a study conducted by Gantman and Dabos (2017) a number of 101 countries were addressed in a period of 40 years in terms of trade openness and effects on REER. Additionally, productivity factor was included in their study, which is similar to the context of this research. It was reported in their study that increased trade openness leads to a reduction in REER on a significant manner. Thus, with regards to aforementioned statements and the premise of extant literature of the subject, it is expected that a negative impact on REER is to be observed through increased international trade openness. Therefore, the following hypothesis is shaped as below:

Hypothesis 3: Trade has a negative relationship with Real Effective Exchange Rate.

3.4 Methodology

This research studies how the changes in Remittances, Labor Productivity, Trade (Openness) could impact on the changes in Real Effective Exchange Rate

in the context of Turkey. As mentioned earlier in this chapter, majority of studies have been conducted in different countries and in locations such as South America and Europe, which drives the notion of this research in terms of conduct. Therefore, macroeconomic variables included in this study address Turkey to expand and extend the existing literature and provide a better understanding of the matter at hand through comparative measures. Ordinary Least Squares (OLS) methodology is used to investigate and test the hypotheses of this research that were noted above. In this regard, properties of data series are examined through unit root tests. Following unit root tests, regression analysis is used to further examine the linkages among variables. This is followed by residual diagnosis to examine robustness. E-views version 10 is used to conduct all the aforementioned analyses.

3.4.1 Logarithmic Transformation

Logarithmic transformation is used on variables within regression equations to improve effectiveness of non-linear relationships within a linear framework. This process is commonly used in analysis of econometric variables (Benoit, 2011; Zax, 2011). Furthermore, logarithmic transformation can result in higher rates of normal distribution for variables. This is more vivid for skewed variables (Zax, 2011). Particularly, for long-normal distribution levels that require higher more flexibility in modeling regression analysis (Zax, 2011). There are two equations that are noted below, in which functional relationships stated in logarithmic forms that can lead to growth impact of variables in a long-term economic manner (Katircioglu, 2010). Thus, for increasing effectiveness of regression model through normally distributed variables, logarithmic transformation is used on variables of the study as below:

$(Y_t - Y_{t-1}) / Y_{t-1} = Ln (Y_t - Y_{t-1})$

Where Y is the macroeconomic variable of interest. Hence, the percentage change in macroeconomic variables transformed to their respective first difference of their logarithm:

$Ln (Y_t - Y_{t-1}) = DIFF (LOG(Y))$

LOG is used in most statistical analysis software instead of Ln (e.g. EViews and Statgraphics).

3.4.2 Unit Root Test

Time series analysis that is stationary is used for analyzing variables. This is imperative as stationary data is constant and unconditional with regards to joint probability distribution in a stochastic process. This means that stationary data has a mean and variance within time series analysis that is constant in terms of value. Moreover, autocorrelation structure in stationary data is stable that is vital for analyzing time series. This allows the researcher to identify internal structures of patterns. A data with unit root that is non-stationary can result in inaccurate results. This has been referred as "spurious" estimates or regressions within the extant literature of the subject (Patterson, 2004). In regression analysis, spurious estimates can yield in results that are invalid and are desirable outputs for statistical analysis (such as high R-square values and t-statistics with high values). However, this is not aligned with economics and theories that are used in this context (Granger & Newbold, 1974). A rigorous Augmented-Dickey Fuller (ADF) unit root test is employed in the current research. This enables the researcher to test the presence of unit root within the data at hand with consideration of all model specifications. Accordingly, this test is described in the next section.

3.4.2.1 Augmented Dickey-Fuller Unit Root Test

Developed and augmented version of Dickey-Fuller, which has improved its classic form is able to test the presence of unit autoregressive root in complex time series models. In this sense, the null hypothesis is defined as there is no unit root within the time series under analysis. Alternatives to the null hypothesis are defined with regards to model specifications, which is used to shape ADF test (Stock and Watson, 2015). These specifications of ADF model are as below:

Model 1: Random walk only or "None" in E-Views unit root test settings (neither the trend, nor the intercept are included in the equation).

$$\Delta Y_t = \phi Y_{t-1} + \sum_{j=1}^{p} \Omega_j \, \Delta Y_{t-j} + \mu_t, \tag{1}$$

Model 2: Random walk with "constant" or "Intercept" in E-Views unit root test settings.

$$\Delta Y_t = \alpha_1 + \phi Y_{t-1} + \sum_{j=1}^{p} \Omega_j \, \Delta Y_{t-j} + \mu_t, \tag{2}$$

Model 3: Random walk with "constant and a deterministic trend" or "Trend and Intercept" in E-views unit root test settings.

$$\Delta Y_t = \alpha_1 + \phi Y_{t-1} + \alpha_2 t + s \sum_{j=1}^{p} \Omega_j \, \Delta Y_{t-j} + \mu_t, \tag{3}$$

where, $Y (\phi = \Pi - 1)$ is a representation of the variable of interest; α_1 the constant or intercept term; $\alpha_2 t$ the drift component or trend; p the lagged differenced terms and μ_t the white noise term. The ARMA structure of the residuals is approximated by ΔY_{t-j} such that μ_t with no autocorrelation and no heteroscedasticity. The null and alternative hypotheses are as follows:

H$_0$: $\phi = 0$ (Y_t has a unit root and is non-stationary)

H$_1$: $\phi < 0$ (Y_t is stationary)

3.4.3 Model Specification and Regression Analysis

Macroeconomic factors and their relationships with performance of banking sector has been investigated prior to this research (e.g. Stock and Watson, 2015). Bank index returns (i.e. stock market returns), variations in gold price and oil price with regards to exchange rates have been used to reflect changes of labor productivity and trade openness that are shown in the formula below, which represents a functional relationship:

$$\Delta REER = f\ \{\Delta LP,\ \Delta RMT,\ \Delta Trade\} \tag{6}$$

where Real Effective Exchange Rate ($\Delta REER$) is a function of Labor Productivity changes Remittances and International Trade (Openness).

Regression Analysis: This study employs OLS estimation technique in investigating the functional relationship among the variables of interest (Greene, 2008. Pindyck, and Rubinfeld, 1998; Wooldridge, Jeffrey, 2013). Given that the relationship is investigated with more than one dependent variable, a multiple regression (Hair et al., 2006; Davidson, and MacKinnon, 1993) is used. Multiple Linear regression function is expressed as:

$$Yi = \alpha + \beta_1\ X_1i + \beta_2 X2i + \dots \beta_n Xni + ui \tag{7}$$

where Y is the dependent variable, X is independent variable, α intercept, $\beta_{1\dots}\ \beta_n$ the partial regression coefficients of the independent variables, u the residual term and i the *ith* observation. Under the CLRM, OLS estimates of $\beta_{1\dots}\ \beta_n$ denoted as $\widehat{\beta 1}_{\dots}\ \widehat{\beta n}$ are considered to be BLUE (Best Linear Unbiased Estimates) with homoscedastic and uncorrelated terms ($u\sim N\ (0,\ \boldsymbol{\sigma})$). Taking the intercept into account, the error term and expected signs of the independent variables, the regression equation for current model is specified as:

$$\Delta REER_t = \beta_0 + \beta_1 \Delta LP_t + \beta_2 \Delta RMT_t + \beta_3 Trade_t + \varepsilon_t \tag{8}$$

where by β_1, β_2 and β_3 represent partial regression coefficients for LP, RMT and Trade respectively and β_0 represent the intercept and ε_t the error term.

Residuals Diagnostics: The authenticity of current regression estimates relies heavily on the CLRM assumption that error terms follow a white noise process. The validity of this assumption for this regression output is verified by applying normality, autocorrelation and heteroscedasticity tests. Autocorrelation and normality were tested using the Breusch-Godfrey Serial Correlation LM Test and Jarque-Bera test respectively. Meanwhile, heteroscedasticity was verified by using the Glesjer and Harvey-Godfrey tests (Asma'Mustafa, & Ismail, 2016). Next chapter of this research presents the results of data analysis that has been explained in this chapter.

Chapter 4

DATA ANALYSIS AND RESULTS

This chapter is dedicated to present the results of data analysis through the methods and equations mentioned in previous chapter. It is noteworthy that E-views is used (version 10), which allows researchers to test econometric models, time series and time series data on a profound manner.

4.1 Data Analysis

In this section, the findings of the empirical analysis are discussed. The properties of series are tested for unit root prior to the point of regression as noted chapter three. The econometric analysis starts by analyzing the stochastic properties of the data, which indicates that majority of variables are non-stationary. After logarithmic transformation, all of data samples have been found stationary at first difference level. Hence, the first difference of logarithmic data, which has been mentioned and used to capture percentage changes in variables, are stationary. Enabling the estimates to be used in short-run.

4.1.1 Unit Root Tests

Considering what was mentioned above, first difference of logarithmic data, which has been mentioned and used to capture percentage changes in variables are stationary. Current research has employed a rigorous Augmented-Dickey Fuller (ADF) unit root test (applying all three of model specifications) to examine the presence of unit root in employed dataset. "Intercept", "Intercept and Trend"

and "None" are the three-model specification of ADF test (Paparoditis, & Politis, 2018). This test has been proven to be an effective approach towards analyzing such models (Paparoditis & Politis, 2018).

Table 2. Unit Root Test (Author)

	Level			First Difference		
	Intercept	Intercept and Trend	None	Intercept	Intercept and Trade	None
RMT	1.343385(4)	4.640582(4)	-0.184619(4)	4.305332(3)	4.411585(3)	4.410669(3)
	[-3.029970]	[-3.759743]	[-1.960171]	[-3.040391]	[-3.690814]	[-1.961409]
Trade	0.418372(4)	3.614698(4)	3.367402(4)	4.038340(3)	3.799865(3)	2.673787(3)
	[-3.029970]	[-3.690814]	[-1.960171]	[-3.065585]	[-3.733200]	[-1.961409]
LP	1.709505(4)	1.743605(4)	1.800183(4)	4.911927(3)	-5.008275(3)	5.047512(3)
	[-3.081002]	[-3.733200]	[-1.966270]	[-3.081002]	[-3.759743]	[-1.966270]
REER	2.243959(4)	3.199028(4)	1.285593(4)	4.605460(3)	4.546653(3)	4.306209(3)
	[-3.029970]	[-3.673616]	[-1.962813]	[-3.052169]	[-3.710482]	[-1.962813]

In table 2, the values in parentheses refer to the lag lengths criteria based on the SIC criterion. The values in the bracketed parentheses are MacKinnon (1996) critical values in the 5% significant level for ADF test. This shows that the values are significant, which implies that variables are stationary. This means that values of mean, variance and autocorrelation are constant over time. Therefore, the null hypothesis noted in chapter three, which implied presence of a unit root is rejected as unit roots are causes of non-stationarity. Therefore, it can be said that as variables are nonstationary at significant levels, the estimations can be used for short term analysis and interpretation.

4.1.2 Correlation Analysis

The OLS estimation requires that there is a less than perfect linear relationship among the estimators for validation. To check for preliminary, the correlation matrix was employed to investigate the linear association between the variables. The coefficients of variables under investigation are shown in table below:

Table 3. Correlation Analysis (Author)

	LP	REER	RMT	TRADE
LP	1	0.7470611367942852	-0.6127157318626149	0.3358831243501167
REER	0.7470611367942852	1	0.7504005566277278	-0.42880402797449
RMT	-0.6127157318626149	0.7504005566277278	1	0.7093104958499368
Trade	0.3358831243501167	-0.42880402797449	-0.7093104958499368	1

The results above assert that the relation among predictors is "moderate" ($\rho \leq 0.5$) for Trade variable. Lower coefficients indicate low probability of being affected by common factors. In other words, signaling the absence of multi-collinearity among the predictors.

4.1.3 OLS Estimation Test

Subsequent to checking the properties of the variables, regression was used and analyzed. Table below represents a summary of regression analysis. As earlier mentioned, the sample formed a total amount of 215 observations with a monthly frequency. In data analysis, we use OLS for estimating the unknown parameters in a linear regression model. The goal is minimizing the differences between the collected observations in some arbitrary dataset and the responses predicted by the linear approximation of the data. Hence, following the work of experts in this field, OLS has been chosen to be used regarding the matter at hand and addressing the notion of this research (e.g. Hassan and Holmes, 2013; Hyder and Mahboob, 2006).

Table 4. OLS (Author)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.026478	0.016636	1.591635	0.1375
D(LP)	1.335705	0.360424	3.705923	0.0030
D(RMT)	0.015479	0.045747	0.338356	0.7409
D(TRADE)	-0.716386	0.205684	-3.482941	0.0045
R-squared	0.663494	Mean dependent var		0.013010
Adjusted R-squared	0.579367	S.D. dependent var		0.089985
S.E. of regression	0.058361	Akaike info criterion		-2.632025
Sum squared resid.	0.040872	Schwarz criterion		-2.438878
Log likelihood	25.05620	Hannan-Quinn criter.		-2.622134
F-statistic	7.886853	Durbin-Watson stat		1.970690
Prob. (F-statistic)	0.003590			

With the p-value of the LP (Labor Productivity) less than 0.05 (0.003), it can be said that LP has the significant effect on the changes of REER. In addition, positive coefficient of LP reveals a positive relationship between LP and REER. Thus, the developed hypothesis is aligned with the findings and LP has positive and significant impact on REER. For the independent variable RMT (Remittances), it has a p-value that is more than 0.05, thus is insignificant when increased or decreased when patterned to the activity of the exchange rate. This is due to the probability of remittances not being clearly the focus of economy as governments tend to focus more on trade and other economic areas. Another reason why remittance is not significant is that even though the exchange rate or any other economic factor adjusts in the economy, the remittance wouldn't change. This is because remittances are a quantitative variable that are utilized upon choice and would not decrease or increase with movement of economic factors. Remittances comes from the extra income from overseas workers which they send to their family back home and it will only increase and decrease, if the overseas workers increase or decrease in number. Finally, the

corresponding p-value for TRADE is less than 0.05 (0.004) and it can be said that Trade has a significant effect on REER. The negative sign of coefficient shows the negative relationship between TRADE and REER which is aligned with the prior developed hypothesis. Thus, it can be said according to statistical estimation that Trade has a negative and significant impact on REER.

4.1.4 Robustness of Regression Output

The robustness of the regression output was investigated via a residual analysis. To this aim, tests of normality, autocorrelation and heteroscedasticity were applied on the model's residuals. As it can be seen in tables below, the values of the skewness (0.341202) and that of the kurtosis (2.039954) appear to slightly deviate from their boundaries of 0 and $\pm$ 2 respectively. However, the Jarque-Bera test summarized the normality of the error terms by failing to reject the null hypothesis of normality at a 1% (prob. (0.02)) level of significance (Jarque-Bera: 0.92, Probability: 0.62). Furthermore, the residuals were tested for autocorrelation using the Breusch-Godfrey Serial Correlation LM Test. At a 5% (prob. 0.6664) level of significance, the test failed to reject the null hypothesis of no autocorrelation thus concluding in favor of no autocorrelation among residual terms. Similarly, the Glesjer and Harvey-Godfrey test were used to test for heteroscedasticity in the error terms. At a 5% (prob. 0.25; 0.80) level of significance, they both fail to reject the null hypothesis of no heteroscedasticity and therefor conclude in favor of no heteroscedasticity in error the terms.

Table 5. Breusch-Godfrey Serial Correlation LM Test (Author)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004138	0.028216	0.146655	0.8891
D(LP)	0.130115	0.677000	0.192193	0.8552
D(RMT)	-0.055296	0.125346	-0.441145	0.6775
D(TRADE)	0.141300	0.409175	0.345328	0.7439
RESID(-1)	-0.226961	0.608247	-0.373140	0.7243
RESID(-2)	-0.044715	0.481399	-0.092885	0.9296
RESID(-3)	-0.535623	0.835398	-0.641158	0.5496
RESID(-4)	-0.582027	0.828297	-0.702680	0.5136
RESID(-5)	0.202938	0.652573	0.310981	0.7684
RESID(-6)	-0.775110	0.611543	-1.267465	0.2608
RESID(-7)	0.250100	0.744489	0.335936	0.7506
R-squared	0.309186	Mean dependent var		1.73E-18
Adjusted R-squared	-1.072442	S.D. dependent var		0.052200
S.E. of regression	0.075146	Akaike info criterion		-2.126909
Sum squared resid	0.028235	Schwarz criterion		-1.595754
Log likelihood	28.01527	Hannan-Quinn criter.		-2.099710
F-statistic	0.223784	Durbin-Watson stat		1.479058
Prob(F-statistic)	0.978774			

H_0: Residuals are not serially correlated. H_1: Residuals are serially correlated.

Results fail to reject null hypothesis at a 5% level of significance and therefore conclude that the residuals are not serially correlated. This shows that cross-section observations and different error terms (adjacent) are not correlated. Variables that are serially correlated possess patterns and are not random. When adjacent residuals show correlation, it can be said that a residual is able to predict the next residual. It is deduced that the current variables of this study are not stationary at level, and that first differences have been analyzed in this research. This implies that long-term relationships are not explained in the findings of current research. In other words, current findings exhibit a correlation and/or effect that is explaining results in a short-term basis. Hence, explanatory information or data of independent variable is not described, which is the definition of autocorrelation. While time-series models are

susceptible to such issues, current results show that the model for this research does not have autocorrelation issues as residuals are not serially correlated.

Table 6. Heteroscedasticity Test Harvey (Author)

Heteroscedasticity Test: Harvey				
F-statistic	2.324930	Prob. F (3,12)		0.1265
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-6.495818	0.392078	-16.56767	0.0000
D(LP)	-10.09207	8.494753	-1.188036	0.2578
D(RMT)	1.991405	1.078201	1.846969	0.0895
D(TRADE)	3.244354	4.847717	0.669254	0.5160
R-squared	0.367582	Mean dependent var		-6.736167
Adjusted R-squared	0.209477	S.D. dependent var		1.547038
S.E. of regression	1.375492	Akaike info criterion		3.687818
Sum squared resid	22.70375	Schwarz criterion		3.880965
Log likelihood	-25.50255	Hannan-Quinn criter.		3.697709
F-statistic	2.324930	Durbin-Watson stat		1.572779
Prob. (F-statistic)	0.126536			

H_0: The residuals are not heteroskedastic H_1: The residuals are heteroskedastic

Results fail to reject null hypothesis at a 5% level of significance and therefore conclude that the residuals are not heteroskedastic.

Table 7. Heteroscedasticity Test Gleiser (Author)

Heteroscedasticity Test: Gleiser				
F-statistic	0.899146	Prob. F (3,12)		0.4700
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.045239	0.007699	5.876134	0.0001
D(LP)	-0.140316	0.166801	-0.841215	0.4167
D(RMT)	0.019694	0.021171	0.930230	0.3706
D(TRADE)	0.067441	0.095189	0.708500	0.4922
R-squared	0.183531	Mean dependent var		0.043410
Adjusted R-squared	-0.020586	S.D. dependent var		0.026735
S.E. of regression	0.027009	Akaike info criterion		-4.172983
Sum squared resid	0.008754	Schwarz criterion		-3.979836
Log likelihood	37.38387	Hannan-Quinn criter.		-4.163093
F-statistic	0.899146	Durbin-Watson stat		1.706004
Prob(F-statistic)	0.469984			

H_0: The residuals are not heteroskedastic H_1: The residuals are heteroskedastic

Constant to previous tests, the results in table above fail to reject null hypothesis at a 5% level of significance and therefore conclude that the residuals are not heteroskedastic. Hence, the standard deviations of a predicted variable, monitored over different values of an independent variable or as related to prior time periods, are non-constant. In other words, as variables are not stationary at level, and that first differences have been analyzed in this research, it can be said that long-term relationships are not explained in the findings of current research and findings address changes in the short term.

As discussion upon findings of this research are presented in this chapter, the next chapter finalizes these findings and provides conclusion, recommendations for future studies, while indicating limitations of this research in terms of conduct.

Chapter 5

CONCLUSION

This chapter concludes the current research with regards to its analysis and hypotheses. Implications of findings are provided and results are explained. Moreover, this chapter presents recommendations for future studies as well as indicating limitations that restricted the conduct of this research.

5.1 Implications and Conclusion

The results of data analysis that were exhibited in the previous chapter implied that all three hypotheses of the study are supported. It can be said that increased remittances have a positive effect on a country's real effective exchange rate in long-term. This is in consensus with previous findings within the literature (e.g. Amuedo-Dorantes and Pozo, 2004; Hassan and Holmes, 2013). However, it is important to note that previous studies have been conducted in contexts such as Latin America. The results of current research show that this notion can be generalized as time series data of 17 years for Turkey has yielded in the same results. Therefore, remittances and an increase in their amount can lead to a rise in REER in the long-run, which implies the importance of this factor. Barajas et al. (2010) has reported that REER faces an appreciation, when remittances are flowed on a sustainable manner in an open economy. When remittances increase, resources are moved (Hassan and Holmes, 2013), which implies that relative prices of non-tradable goods produced can yield in more profit in comparison with tradable ones. This in turn increases the rate of production, which is linked to demand factors. Therefore, resources are moved from tradable productions

to non-tradable. Therefore, wages and salaries are positively affected, which leads to increased spending capabilities for workers. Hence, increased inflow of remittances for workers is seen to have a positive impact on REER through increased extent of competitive rivalry.

As the variables included in the current model are interrelated and in terms of macroeconomics, factors are intertwined in long-run, the aforementioned notion leads to second hypothesis of this research, which assumed a negative impact to be observed from trade openness on REER. While this notion has been previously studied, due to its importance it has been regarded in the current research. Results of this research are in consensus with prior studies with same context (e.g. Gantman and Dabos, 2017), in which increased trade openness was found to be negatively associated with REER (table 5). This is due to the fact that trade openness leads to increased price of domestic goods for other nations. Additionally, this negatively impacts foreign goods and their prices for domestic usage. However, governments defined tariffs to prevent increased imports in this case. A number of studies have noted that trade liberalization can negatively impact REER (e.g. Dornbusch, 1974) (table 4). Current results show that there is a negative impact on REER, when trade openness is increased. Recent studies such as Zakaria and Ghauri (2011) and Yusoff and Febrina (2014) have shown similar results, where REER is depreciated through increased trade openness. This implies the importance of adequate policies of trade for countries, which allows the nation to increase its economic state, especially in the long-run. As it can be seen, Turkey has vividly made a pathway towards sustained increase of its economic state through various means, which openness of trade is amongst them. While other variables have been found to have a moderate correlation, trade statistically has been found with lower significance in the current research. This can be due to the fact that data from Turkey's

trade is not rationed. Especially, since the secondary data that was used in the current research is gathered from central bank, which in times does not include various trade factors in public data. However, the importance of Turkey's trade openness can be seen with its influence on REER in short-term.

Labor productivity was also analyzed in the current research regarding its influence on REER in the context of Turkey (tables 2, 3, and 4). Balassa-Samuelson effect implies that productivity is a determinant factor for REER (Balassa, 1964, 1975). This has been noted in more recent studies such as Hassan and Holmes (2017). This effect implies that due to the existing gap between those nations with high income and low-income levels, differences in labor productivity among tradable products is higher relative to non-tradable goods. Thus, REER in countries that are relatively richer is "over-appreciated" with regards to purchasing power (Hassan and Holmes, 2017, p. 6). Current findings support the aforementioned notion that labor productivity is positively related with REER as Turkey exhibits high productivity in its labor, which further impacts its economic state in terms of effectiveness of its exchange rate (tables 3 and 4). However, it is important to note that the data used for current model is from 2000 to 2017. In recent years there has been a reduction in exchange rate of Turkish Lira compared with USD, which can be linked to various factors. This was notably seen in 2019. However, as the current research examines data before this incident, this notion falls within the limitations of this research, which are described in the next section.

5.2 Limitations

This research is limited in terms of conduct similar to other studies. The most explicit restricting factor for this research was time as the current research was bound to

submission deadlines. This has affected the conduct of this study as number of resources used were limited. Additionally, current research uses various analytical methods to test its hypotheses. However, these methods were limited as the number of variables included were relatively low. This was due to the lack of extensive data, which allows the researcher to include numerous variables in the model to be analyzed. Furthermore, this research was limited in terms of context as Turkey was the mere location that was addressed. Similarly, the data used for the current research was limited to cap of 2017. As it was noted, in 2019 a rise in value of USD was observed with regards to Turkish Lira, which falls beyond the boundaries of data at hand. These elements restricted the borders of this research on an explicit manner.

5.3 Recommendations for Future Studies

With regards to the limitations of this research, future studies may use cross-sectional data to analyze various sectors. Additionally, comparative studies can be conducted to test the differences among nations within the same region. As majority of studies have been conducted in regions far from Middle East, it is recommended that this region is examined in future studies. Furthermore, more variables can be included to provide a better understanding of underlying effects influencing REER. Moreover, time series data can be used that include more elements of trade, labor, and remittances, which allow researchers to extract a more generalizable result. Additionally, more recent data can be used to test the effects of global pandemic on the subject at hand as well as the economic shifts occurring in the past year on Turkey's economy.

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