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GEBZE TEKNİK ÜNİVERSİTESİ	YÜKSEK LİSANS JÜRİ ONAY FORMU

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ABSTRACT

The models that represent the natural rate of unemployment depends on the history of the equilibrium rate are called `hysteresis` hypothesis. Although unemployment rates have increased in the course of economic shocks and subsequent recessions in some historical periods, some countries have returned to pre-crisis rates (natural rate) in a short while in some countries, it fails to return to the old equilibrium rates and continues to move on a new path of equilibrium. As a result of the studies carried out, there were differences among countries regarding the determination of unemployment hysteresis. The fact that much of the work done so far is frequently based on the determination of the existence of the unemployment hysteresis by unit roots and the conclusions made in this context are normative assessments. The main weakness of most of the studies is done so far, that did not attempt to identify and diagnose the effect of macroeconomic components affecting unemployment.

The distinctive aspect of the study from most of the work done in the past, it not only aims about the determination of the presence of unemployment hysteresis with unit root test applications; it is the evaluation of the shocks which are effective in the structure of unemployment hysteresis by employing several critical economic variables. In this respect, the structural vector autoregressive model based on stylized cases covering the wage-price block implemented. The findings apparently reveal that, there is evidence for the unemployment hysteresis in Chile, Greece, Mexico, Russia and Turkey and the origin of fluctuations in unemployment for all nations managed by non-demand shocks.

Keywords: Unemployment Hysteresis, Natural Rate of Unemployment, Unemployment

ÖZET

Doğal işsizlik oranlarının geçmiş denge işsizlik oranlardan etkilendiğine dair hipotezlerin dayanak noktası histerezis etkisidir. Tarihsel süreçte ekonomik şoklar ve takibindeki resesyon dönemlerinde işsizlik oranları artmış olsa da kimi ülkelerde kısa bir süre sonra kriz öncesi oranlarına (doğal oranı) döndüğü görülmüştür. Bazı ülkelerde ise eski dengesine dönmeyi başaramamakta ve yeni bir denge patikasında hareket etmeye devam etmektedir. İşsizlik histerezisi tespitine yönelik yapılan çalışmaların sonucunda ülkeler arası farklılıklar gözlemlenmiştir. Şimdiye kadar yapılan çalışmaların büyük bir kısmı işsizlik histerezisi varlığının tespitine dayandırılması ve bu bağlamda yapılan çıkarımların ekseriyetinin normatif bir değerlendirmeden ibaret olmuştur. Önceki çalışmaların çoğunun ana zayıflığı, işsizliğin makroekonomik bileşenlerini teşhis etmemesidir.

Yapılan çalışmanın geçmişte yapılan çalışmaların çoğundan ayırıcı yönü, işsizlik histerezisinin varlığının tespitini birim kök test uygulamaları ile yetinilmeyip; işsizlik histerezisinin oluşmasında etkili olan şokları diğer ekonomik değişkenlerden yararlanarak ele almasıdır. Bu doğrultuda, ücret-fiyat bloğunu kapsayan stilize olgulara dayanan yapısal vektör otoregresif model uygulaması gerçekleştirilmiştir. Yapılan uygulamada elde edilen bulgular Şili, Yunanistan, Meksika, Rusya ve Türkiye'de işsizlik histerezisi tespit edilmiş, ayrıca yapılan analiz sonucunda işsizlikteki dalgalanmaların kaynağının talep yönlü olmadığı ortaya konmuştur.

Anahtar Kelimeler: İşsizlik Histerezisi, İşsizlik Oranı, Doğal İşsizlik Oranı

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Lastly, but most important to my family, I want to thank my parents Fatma Yıldız and Mehmet Yıldız for their understanding and unconditional support.

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LIST of ABBREVIATIONS and ACRONYMS

ADF:	Augmented Dickey Fuller
ARFIMA:	Autoregressive Fractionally Integrated Moving Average
ARIMA:	Autoregressive Integrated Moving Average
CGMRT:	Chile, Greece, Mexico, Russia and Turkey.
EG:	Enders and Granger
ESTAR:	Exponential Smooth Transition Autoregressive
IMF:	International Monetary Fund
ILO:	International Labour Organization
MA:	Moving Averages
NAIRU:	Non-accelarating Inflation Rate of Unemployment
NIRU:	Non-inflationary rate of unemployment
OECD:	Organisation for Economic Co-operation and Development
CFI:	Consumer Price Index
KPSS:	Kwiatkowski Phillips Schmidt and Shin Test
LM:	Lagrange Multiplier
LKT:	Leybourne, Kim and Taylor
LNV:	Leybourne, Newbold,Vougas
PP:	Phillips-Perron
STAR:	Smooth Transition Autoregressive
TAR:	Threshold Autoregressive
VAR:	Vector Autoregressive
SVAR:	Structural Vector Autoregressive
UVAR:	Unrestricted Vector Autoregressive Methodology

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1. INTRODUCTION

How vital it is to get rid of a malignant tumour for a person; it is equally essential for a society to get rid of the problem of unemployment. Apart from being a graduate student of economics, as a human being, the motivation to work against unemployment problem arose, which is expected to be more harmful in the near future. It creates the knock-on effect and leads to several difficulties to deal with in sociologically; crime, rebellion, illegal migration and generates individual psychological disorders; feeling of vulnerability and helplessness accompanying depression, loss of self-confidence and self-depreciation. This is exemplified in the supportive work revealing psychological disorders occurring by unemployment conducted by eminent social psychologists with a consensus, Parnes and King (1977), O`Brien and Kabanoff (1979), Liem and Liem (1988), Kessler, Turner and House (1988).

The labour force is an important component of the economic system and plays a key role in economic growth and welfare. In the new global economy, unemployment has become one of the biggest central issues to deal with for the world. Accordingly, the global debate concerning unemployment has gained increased prominence especially owing to the 1973 oil crisis unemployment rates. In addition to this, the crisis induced by the neoliberal contemporary economic structure and the economic growth which not creates employment provokes long-standing disputes about what policies are adequately equipped to handle the unemployment problem. The authorities should seek to overcome the problem of unemployment with the light of the information provided by scholars that diagnose its dynamics. It is critical to apprehend the persistence of the impact of a shock on unemployment rates for making provisions whether it is lingeringly or not. If the effect of the shock does not stay long after the shock evaporates, therefore, there is no need to take strict measures for this type of unemployment rate we call NAIRU (or natural rate); but for the one which acts contrarily—the impact of the shocks lingering that would need very firm intervention to fix the economy— defined as unemployment hysteresis.

During the past 35 years, what we know about unemployment hysteresis is started to emerge and generally empirical analysis practised with the conventional unit roots tests that do not allow us to investigate the mechanism of unemployment concerning

nonlinearity. Such investigations are unsatisfactory because traditional unit roots tests disregard the outcomes of business cycles over the unemployment rate that causes nonlinear moves: while expansion period, it lowers gently; on the contrary situation, it rises distinctly. Notwithstanding this, numerous studies conducted with taking into account asymmetric motilities of macroeconomic variables—in this master's thesis our concern is unemployment rates—to distinguish forecasting achievement for a variety type of linear and non-linear time series analysis respectively: Mitchell`s (1927) milestone article regarding business cycles and their asymmetries; Neftçi`s (1984) implementation by Markov chains, to determine asymmetric behaviour. In view of all mentioned has been mentioned so far, Luukkonen and Teräsvirta (1991) present in-depth and richer variety analysis of the work for testing the non-linearity of economic time series supported by Montgomery et al. (1998), Rothman (1998), and Bodman (1998). During the 2000s, Skalin and Teräsvirta (2002) also centred and inferred that the unemployment series display cyclical asymmetries similarly as Chauvet et al. (2002) and Cancelo (2007). Together, these studies highlight and providing important insights into the development of empirical analysis methods concerning unemployment rates. Now that we are in the information age, the workforce is slowly shifting to computer-aided automation systems and intelligent robots rather than humans. This reduces employers' costs from the ranch owner to the banking sector. For this reason, unemployment will probably increase even more, and this could be the starting point to the destructive century. It is obvious that the masses of people who will not be able to consume the goods produced is going to be the sign of the new crises are waiting for us.

We will investigate unemployment hysteresis hypothesis in unemployment for CGMRT (Chile, Greece, Mexico, Russia, Turkey). Next, the differences between these countries compared according to several shocks. Apart from the Keynesian demand-side view, we believe it is from the supply side. In this thesis, I attempt to defend the view same as Fabiani, Locarno, Oneto, and Sestito (2001) that the countries unemployment rate which turns to ex-shock level will probably have relatively less affected by wage bargaining and productivity shocks—that is most effective in determining the cyclicality of real wages and unemployment—in comparison with those countries which have unemployment hysteresis. Summarily, this paper aims to

discover the source of shocks and their significance, duration and endurance of them in the component of unemployment. The reason for the selection of these 5 countries is the difficulties experienced in finding data. Additionally, the fact that they have different characteristics is another effective issue in the selection process.

The overall structure of this work takes the form of 4 chapters, including this introductory chapter. Chapter 2 begins by devising the theoretical dimensions of the literature of hypotheses of unemployment gives fundamental information about them. In the second half of chapter 2, namely starting from section 2.4, we will present abundant observational studies conducted on hysteresis in unemployment and their results under three subtopics: In section 2.4, The studies resulted in Hysteresis; in section 2.5 the studies resulted with natural rate; in section 2.6 the studies that show mixed result. Chapter 3 starts with the methodological structure of the thesis. Afterwards, we share the findings of our empirical analysis. Finally, in Chapter 4, we will make the conclusion and give a brief summary and critique of the findings for future researchers in this area.

2. LITERATURE REVIEW

The definition of unemployment, the development background of theoretical literature provided between the sections 2.1 to 2.3. Afterwards the empirical literature divided into three sections reviews the existing empirical literature depending on their outcomes under three subheadings: The studies resulted in unemployment hysteresis in section 2.4; the studies resulted in the natural rate of unemployment in section 2.5; The studies resulted in diverse outcomes in section 2.6. Tables presented per section particularly beneficial for readers who would like a summative assessment of the extant empirical literature. In this chapter, we report 49 empirical studies. 19 of the existing studies approve the hysteresis hypothesis in unemployment while 14 of them validate the natural rate of unemployment. Additionally, 16 of the extant studies present diverse results.

2.1 The Concept of Unemployment

Population divided into two: Those who are in labour force and who are not into. Labour force comprises of all people who are eligible for work within specified age range —according to OECD, the working age population refers to people aged 15 to 64— who are employed and unemployed but would like to be employed in reference time. Despite the fact that unemployment principally has a single definition there is some difference to some degree. Theoretically, it is the circumstance that represents a lack of work for individuals in a given market wage. Unemployment is the situation of actively looking for employment but not being currently employed. The unemployment rate is a measure of the prevalence of unemployment and it is calculated as a per cent. Governmental institutions define unemployed people in a more beneficiary way, those without a job who actively search for a job in a preceding month and who are on temporary layoff waiting to be recalled by their prior employer. As we stated the terms above, we conclude that the unemployment rate is calculated as the ratio of unemployed people to the number of people in a total workforce which generally represented in a percentage. Several reasons acknowledged the cause of unemployment is the unemployment protection system, wage bargaining, employment

security legislation, mismatch, prices and global competition, public policies affecting aggregate demand etc.

2.2 The Natural Rate Hypothesis

The fundamentally significant seminal papers concerning the natural rate of unemployment emerged by Phelps (1967) and Friedman (1968) betoken that the shocks have a temporary impact on the unemployment time series, viz, the unemployment level represent stationary process shocks dissipate in the short run and reverts the mean value.

The NAIRU (non-accelerating inflation rate of unemployment) was apparently the first enunciated by Papademos and Modigliani (1975) in acronym form as NIRU stands for "non-inflationary rate of unemployment". Roughly spoken, so long as the unemployment rate is above the NIRU level, inflation expectation is declining. After five years James Tobin (1980) used the term NAIRU which is often using by lots of economists interchangeably with the natural rate of unemployment. Whereas there is King`s (1999) study which compares the difference of both terms: The natural rate of unemployment is independent of the inflation rate; indicates vertical, long-run Phillips Curve that written down in the Walrasian system of general equilibrium equations—it can be modified with non-Walrasian behaviours introduced by Friedman and Phelps—showing the structural features of the labour and product markets. The term NAIRU is affected by the effects which natural rate of unemployment indicates but also affected by developing progressive changes to past economic shocks. In addition to this, we can distinguish natural rate from NAIRU by the microeconomic approach that natural rate belongs to market clearing notion, in fact, NAIRU relates imperfect competition. Despite the fact that this differentiation of both terms Carlin and Soskice (1990), Layard, Nickell, and Japman (1991) due to the abovementioned reasons, Ball and Mankiw (2002) suggest that natural rate of unemployment and NAIRU is almost synonym at all.

Natural rate hypothesis asserts that changes in aggregate demand have no effect on the natural rate of unemployment but do aggregate supply changes effects (Snowdon&Vane,2005, p. 403.). Briefly, demand shocks induce temporary short-run

fluctuations in the actual rate of unemployment but in the end, it will return to its natural level with the adjustments of expectations in the long run. Below, Figure 1 provides a simple overview of the natural rate hypothesis (or NAIRU). According to Figure 1, The point H.I representing long run equilibrium unemployment level which is in other words natural rate of unemployment.

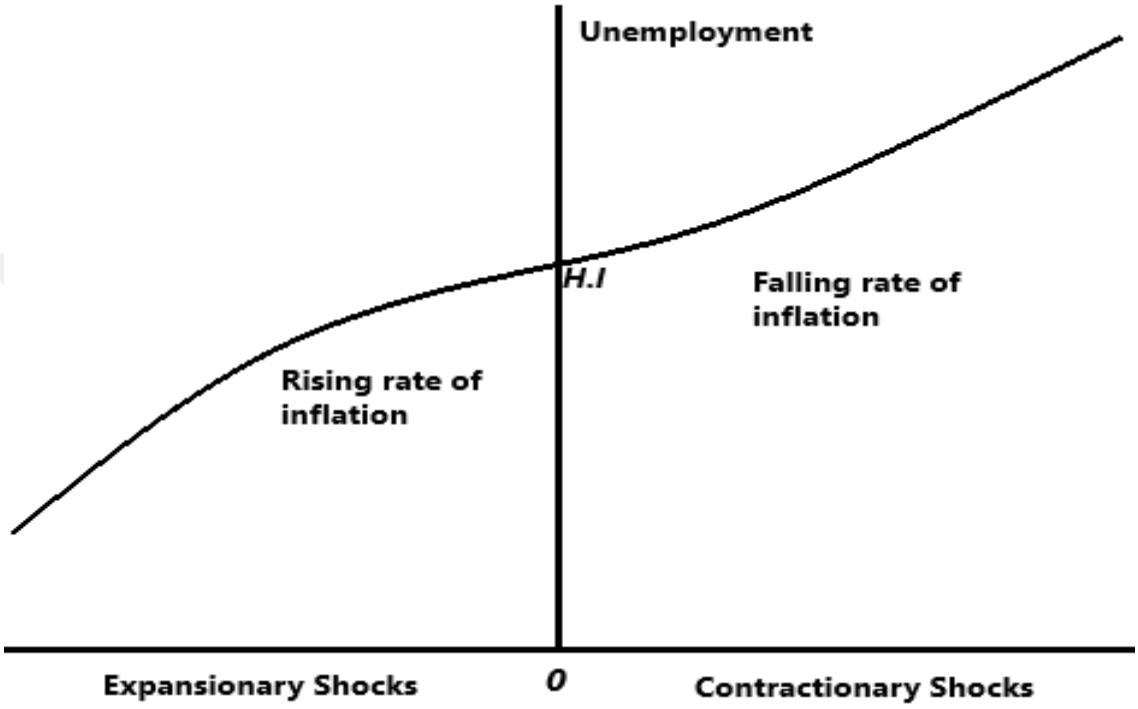

Figure 2.1*: A Representation of Natural Rate of Unemployment. Adapted from "Modern macroeconomics: its origins, development and current state," by* Snowdon, B., & Vane, H. R. (2005), Edward Elgar Publishing. p. 404.

The Natural rate of unemployment does not abnegate the cyclical movements, or short-run disruptions, in other words, swings around a specific rate; it emphasizes returns the equilibrium in the long run. Accordingly, by all manners of means each shock to the series evanescing by the time of progress. Taken together with the information mentioned above, the empirical findings of the series of unemployment must be a stationary process to support this theory, however, there is a degree of uncertainty regarding terminology.

2.3 The Hysteresis Phenomenon and Unemployment Hysteresis

In broad terms, Buiter (1987) defines hysteresis, that it has characteristics of dynamic systems which subordinates the path. These systems have a long-lasting memory that the long run solution of these systems affected by both, the long-run values of the exogenous variables and the initial state of each condition variable. We can simplify the term briefly in a sentence: Where you get to is determined by how you get there.

By analyzing in general for OECD countries since the late 1970s, unemployment was higher than 1950-73 period. It is clear that one of the most important events of the 1970s was two OPEC oil price shocks, therefore, in 1973 and 1979, caused rising unemployment rates unrelentingly (Phelps and Zoega, 1998); Several studies revealed that in the early 1960s, the world experienced unemployment rate averaged 1.7 per cent but noteworthy reached a peak of 11 per cent by the mid-1990s. According to Gordon`s (1997,1998) work, we conclude the United States natural unemployment rate fluctuated in the same direction as Phelps and Zoega`s work. This historical process starts a debate about NAIRU due to the persistent higher level of unemployment rates and gained prominence with many arguing that why new equilibrium at higher levels occurred. Scholars have long debated the causes of new higher NAIRU levels (the hysteresis effect) and several explanations they ascertained that some policy changes rigidify the labour market due to improved employee rights causing more redundancy payment acts and higher provisions for employee termination benefits; moreover, unionization, causes influential and effective trade unions in minimum wage determination commission led to employment protection (see Minford, 1991; Nickell, 1997; Siebert, 1997; Ljungquist and Sargent, 1998; Fitoussi et al., 2000; Røed and Zhang, 2003). We can add up three key reasons underlying hysteresis effect are the mismatch in the labour market, global competitiveness of each country and price levels and public policies affecting aggregate demand; despite those above-cited reasons, it is believed that cannot give a perfect description.

While varieties of studies made regarding natural rate (or NAIRU), Phelps (1972) was certainly the first scientist to use the phrase "hysteresis", the simplest description about it: actual NAIRU level is dependent to former unemployment rate levels.

Figure 2 presents the logic of the hysteresis effect with additional instructions. Suggesting that the natural rate of unemployment in point B, after contractionary shocks the unemployment rates move to point F. After contractionary shocks disappear, new equilibrium unemployment rate become point Y.

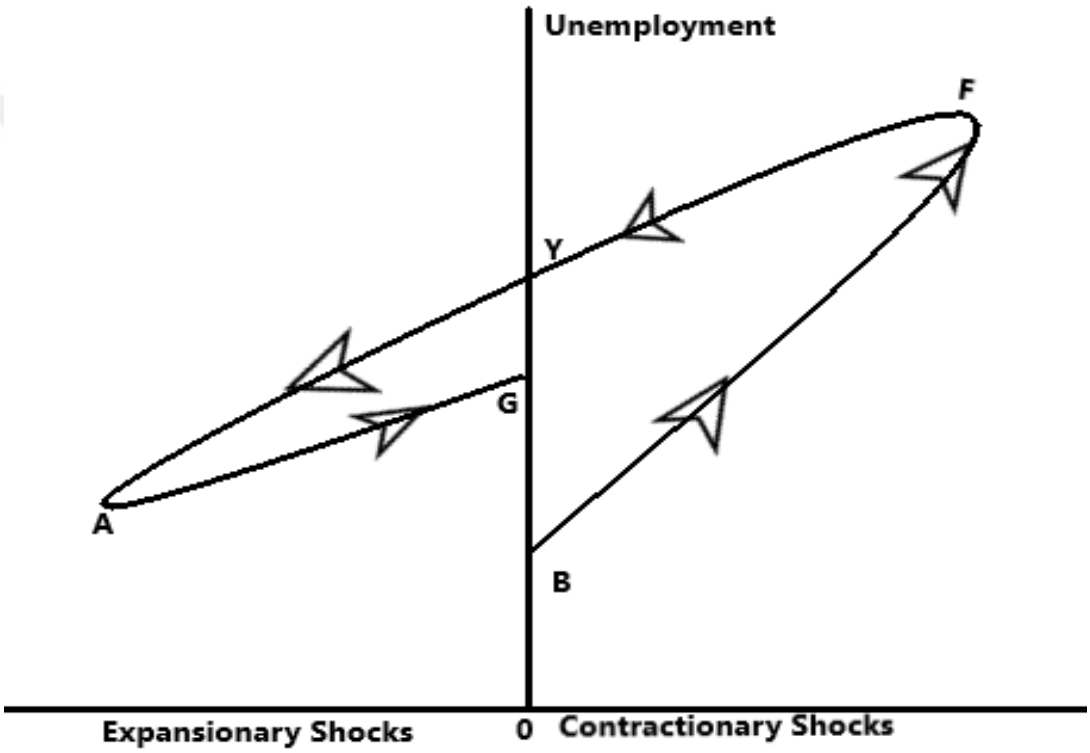

Figure 2.2: A Representation of the Unemployment Hysteresis. Adapted from "*Modern macroeconomics: its origins, development and current state," by* Snowdon, B., & Vane, H. R. (2005), Edward Elgar Publishing. p. 406.

The Unemployment Hysteresis does not deny the cyclical disturbances, in other words, fluctuations around a specific rate; it indicates by all manners of means any shocks to the series not disappearing with time and leading to new NAIRU levels. According to the definition provided by (Snowdon&Vane,2005, p. 406.), unemployment hysteresis can be classified into two sub-groups: The first is duration

theories; the second is insider-outsider theories. The first one demonstrates that when the current unemployment rate higher than the NAIRU level, unsurprisingly, the problem of structural unemployment arises and get worse because of bearing a reduction of unemployed talents for working. It occurs by the deterioration of human capital increases as much as the duration of lack of job practices and aggravates by governments benefits provided to unemployed; consequently, lead to reducing search activities result in higher level of the natural rate of unemployment.

The second one divides the labour force into two sub-categories: The insiders are who currently working and have an important role for in the wage bargaining process, in another saying, they are the cause of downwardly rigid wages; the outsiders are the ones currently not employed, have no or fewer control in the wage bargaining process by underbidding. The reason that outsiders have almost no effect by underbidding is the firm's possible burden that we call turnover expenses summarily by hiring and firing.

Our final remark about duration theory and insider-outsider theory is that they are expressing somewhat the equivalent mechanisms due to the long-run worklessness associated with the outsiders' state with hiring the long-run jobless need higher amount of expenditure in the form of training costs constitute the insider-outsider theory. On the other hand, Graafland (1988) states a noticeable difference between those theories is that in the insider-outsider theory pays the utmost concentration to the inside of the firm, yet the duration theory concentrates on the supply side returns in the labour market. To support the aforesaid theory, the unemployment series got to have a unit root process—or non-stationary process. Throughout this thesis, the term natural rate will be used refer to NAIRU to avoid incomprehensibility.

2.4 The Studies That Resulted in Hysteresis

Table 2.1 contains the studies which resulted in the unemployment hysteresis. In the 1990s, to determine the unemployment hysteresis conventional unit root tests conducted by (Neudorfer, Pichellman, & Wagner, 1990; Brunello, 1990; Mitchell,1993) find evidence in favour of unemployment hysteresis in the countries respectively: Austria; Japan and other G5 countries; 15 OECD countries.

Mikhail, Eberwein, and Handa (2006) argue that their evaluation about Canadian unemployment with R/S tests (Lou, 1991; Doukhan, Oppenheim, & Taqqu, 2003) — the corrected for short-range dependency modified rescaled range tests—holds Gil-Alana (2002) practised ARFIMA (long memory) models by Sowell's (1992). Likewise, Strazizich, Tieslau, and Lee (2002) implements LM (Lagrange Multiplier) test statistics, considering France, Germany, Italy, Spain and the United Kingdom both with and without structural breaks. The crucial work Fabiani, et al. (2001) constructed a SVAR approach that not only considering the stationarity of unemployment is also the principal stimulus of our study. The aim of the aforesaid work to distinguish the shock affecting the unemployment and formed the restrictions regarding the role of unemployment. They found evidence shows hysteresis of unemployment in Italy with the explanation of the innovations both in the structural and cyclical pattern. The amount of innovations on unemployment is based on supply-side such as wage-bargaining shocks, explain rise around 2.45 per cent started the late 1960s to 1980s; conversely, the period starts with 1980 to end date of study not negatively affecting the unemployment rate. The positive effect of wage-bargaining shocks to the movement of real wages barely seen, noteworthy for 20 quarters, but significantly fade away.

Additionally, the same result is gotten for unemployment hysteresis in Spain, by Romero-Ávila And Usabiaga (2008) conducted Panel Unit Root tests with structural breaks between the years 1976 and 2004.

In most recent studies considering unemployment series of Turkey by several authors, (Barışık & Çevik 2008a; Barışık & Çevik 2008b; Yilanci, 2009; Koçyiğit, Bayat &Tüfekçi, 2011; Gözgör, 2012; Arısoy, 2013; Bayat, Kayhan, & Koçyiğit,2013) agreed evidence for hysteresis within various periods.

In the same vein but with a distinctive method is applied by Kalbasi and Ashtary for (2011) Iran. Their seminal work contributes to literature with SVAR approach resulted with hysteresis effect on unemployment rates also investigates mainly effects of monetary policy. They found monetary policy have not a significant effect but might

be affected substantially significant by supply-side shocks such as oil prices, labour market rigidities and sanctions.

24 OECD countries examination by Tartıcı (2015) not used traditional unit roots tests because of that they not considering either structural breaks and asymmetrical adjustment. Her findings further support the idea of unemployment hysteresis with implementing respectively EG tests by Enders and Granger (1998), LNV tests by Leybourne, Newbold, and Vougas (1998), and Sollis (2004) Tests.In 2017, García, Hernandez, and Bolívar (2017) applied the UVAR method by Maurer and Doris (1994) over Mexico to experience the effects of macroeconomic shocks for the period between 1999-2014. They found that shocks to the money supply and gross capital formation influence unemployment rates probably through liquidity channel due to the non-inflationary policy of Mexico.

We end this section with the research implemented on U.S., 28 OECD countries and 4 grouping countries by Marques Lima and Troster (2017) implement a variety of unit root test. In addition, the examination of the changes in the half-live of impulse response functions done with bootstrap permutation tests by Efron and Tibshirani (1993) verified significant changes in the Great Recession.

Table 2.1: The Studies Resulted in the Unemployment Hysteresis

Author(s)	Sample	Period	Method	Outcome
Brunello (1990)	Japan and other G5	1968-1987	Unit Root Tests	Hysteresis
Neudorfer et al. (1990)	**Austria**	**(1966-1986)**	**Unit Root Tests**	**Hysteresis**
Mitchell (1993)	15 OECD Countries	(1960Q1 1991Q3)	Unit Root Tests	Hysteresis
Fabiani et al. (2001)	**Italy**	**(1954Q1-1998Q4)**	**SVAR**	**Hysteresis**
Gil-Alana (2002)	Canada	(1966:1-2002:2)	ARFIMA	Hysteresis
Strazicich et al. (2002)	**France, Germany, Italy, Spain and UK**	**(1955-1999)**	**LM Test with and without Structural Breaks**	**Hysteresis**

Mikhail et al. (2006)	Canada	(1976:1-1999:4)	R/S tests	Hysteresis
Romero-Ávila and Usabiaga (2008)	**Spain**	**(1976-2004)**	**Panel Unit Root with Structural Breaks**	**Hysteresis**
Barışık and Çevik (2008a)	Turkey	(1923-2006)	Unit Root tests with Structural Breaks	Hysteresis
Barışık and Çevik (2008b)	**Turkey**	**(1988:1-2007:2)**	**Unit Root Tests with Structural Breaks**	**Hysteresis**
Yılancı (2009)	Turkey	(1923-2007)	Unit Root Tests with Structural Breaks	Hysteresis
Kalbasi and Ashtary (2011)	**Iran**	**(1971-2010)**	**SVAR**	**Hysteresis**
Koçyiğit et al. (2011)	Turkey	(1923-2010)	Smooth Transition Autoregressive (STAR), Nonlinear Impulse-Response Function	Hysteresis
Gözgör (2012)	**Turkey**	**(2004-2011)**	**Panel Unit Root Tests**	**Hysteresis**
Arısoy (2013)	Turkey	(2005:05-2011:1)	Unit Root Tests and Long Memory Analysis	Hysteresis
Bayat et al. (2013)	**Turkey**	**(1923-2011)**	**Linear Unit Roots and Markov Switching Model**	**Hysteresis**
Tartici (2015)	24 OECD	(1998:04 2013:09)	ADF,LNV,EG, SOLLIS	Hysteresis
García et al(2017)	**Mexico**	**(1999-2014)**	**UVAR**	**Hysteresis**
Marques et al. (2017)	The U.S., 28 OECD and 4 Grouping Countries	(2000-2014)	Unit Root Tests Bootstrap Permutation	Hysteresis

2.5 The Studies That Resulted in Natural Rate

The presentation of the investigations which resulted with natural rate on Table 2.2, firstly we would like to mention various panel unit root tests employed for different samples by (Song & Wu, 1998; Christopoulos & León-Ledesma, 2007; Camerero, Carrion-i-Silvestre,& Tamarit,2008; Gomes& da Silva, 2008; Lee, J. D., Lee, C. C.,& Chang, C. P. 2009) , (Khraief, Shahbaz, Heshmati, & Azam, 2015; Koçbulut & Bolat, 2017) to detect unemployment hysteresis; The conclusion of the studies were able to reject the null hypothesis for unit root.

Similarly, supportive evidence unveiled by using the same type of methodology as the above works by Güloğlu and İspir (2011) for sectorally specified analysis in Turkish unemployment; Munir and Ching (2015) work show evidence for natural rate concerning 11 Asian countries. An investigation of unemployment hysteresis for Turkey beginning from post Second World War period to 1990s implemented by Küçükkale (2001), Kalman Filter application resulted in supportive evidence about the natural rate of unemployment.

Cancelo (2007), investigates 6 developed countries by smooth transition autoregressions, in abbreviation form STAR, conclude unemployment rates mean reverting and shows asymmetricity due to business cycles.

In her graduate work, Akçay (2013) has found no evidence for hysteresis unlike conventional unit root tests; She implemented threshold autoregressive type of unit root test, in abbreviation form TAR, contributed to literature by Caner and Hansen (2001).

Fresh studies were done by Furuoka (2015), Jiang and Chang (2016), respectively for Estonia and the USA provides evidence for the natural rate hypothesis. The study for Estonia exposed to IP and FIPS but for the USA quantile unit root tests.

Table 2.2: The Studies Resulted in The Natural Rate of Unemployment

Author(s)	Sample	Period	Method	Outcome
Song and Wu (1998)	15 OECD Countries	(1972Q1–1992Q2)	Panel Unit Root Tests	Natural Rate
Küçükkale (2001)	**Turkey**	**(1950-1995)**	**Kalman Filter**	**Natural Rate**
Cancelo (2007)	6 Developed countries	(1970: Q1 2004:Q4) But for Italy (1974:Q1 2004:Q4)	STAR Model	Natural Rate
Christopoulos and Ledesma (2007)	**12EU Countries**	**(1985-1999)**	**Multivariate and univariate Panel Unit Root tests**	**Natural Rate**
Camarero et al. (2008)	Central and Eastern European Countries (CEECs)	1991-2003	Panel LM Unit Root tests with Structural Breaks	Natural Rate
Gomes and da Silva (2008)	**Chile&Brasil**	**Brasil (1980-2002)** **Chile (1982-2004)**	**Panel LM Unit Root Tests with Structural Breaks**	**Natural Rate**
Lee et al. (2009)	19 OECD Countries	(1960-2004)	Panel LM Unit Root Tests	Natural rate
Güloğlu and İspir (2011)	**Turkey**	**(1988-2008)**	**Panel Unit Root Tests**	**Natural Rate**
Akçay (2013)	Turkey	(2005:01-2013:05)	Tar Type Unit Root Tests	Natural Rate
Munir and Ching (2015)	**11 Asian Countries**	**(1980-2008)**	**Panel Unit Root Tests**	**Natural Rate**
Furuoka (2015)	Estonia	(1993-2011)	(Fourier) Im-Pesaran-Shin Tests	Natural rate
Khraeif N. et al. (2015)	**29 OECD**	**(1980-2013)**	**ESTAR; Panel Unit Root with structural break**	**Natural rate**
Jiang and Chang (2016)	USA	(1928-2014)	Quantile Unit Root Tests	Natural Rate
Koçbulut and Bolat (2017)	**7 Balkan Countries**	**(2004:1-2016:1)**	**Panel Unit Root Tests**	**Natural Rate**

2.6 The Studies That Resulted in Mixed Conclusions

This section provides more intriguing works that have mixed results, details presented in table 2.3. The glittering part of the table is the countries tend to have a natural rate or hysteresis commonly aside from research and methodology such as the U.S and so forth. Unit root tests of various types are performed in several dates and samples by Blanchard and Summers (1986), Røed (1996), Papell, Murray, and Ghiblawi (2000), Arestis and Mariscal (2000), Chang, Lee, Nieh, and Wei (2005), Dreger and Reimers (2009), Lee (2010), Chang and Lee (2011), Furuoka (2012), Bolat, Tiwari, and Erdayi (2014), Chang and Su (2014), Saraç (2014) found mixed results regarding to the hypothesis of unemployment hysteresis. Jaeger and Parkinson (1991) accomplished one of the primary works separates unemployment into two parts, namely natural rate and cyclical, by unobserved components model (UC) to better understand the mechanism of unemployment examines four developed countries. Furthermore, Flexible Fourier unit root tests by Enders and Lee (2012) also used to analyze the problematical countries in acronym form called PIIGS: "Portugal, Ireland, Italy, Greece and Spain" by Cheng, Wu, Lee, and Chang (2014) approves the hypothesis of unemployment hysteresis for all but not in Portugal and Spain. the same method used for 17 OECD countries, which is nonlinear analysis, applied by Chang (2011) reveals evidence for unemployment hysteresis for 11 of the sample countries while 6 of them support natural rate. Fosten and Ghoshray (2011) draw our attention with their distinctive work by their method and use of a wide range of data period. They utilised LKT tests, contributed to literature via Leybourne, Kim and Taylor (2007), that allows us to examine unemployment into two regimes: either natural rate or hysteresis. The summing-up of the study separated into two: During the phase post second world war, the United Kingdom and Canada validate natural rate hypothesis highly associated with infrastructural spending due to the reconstruction of the world. Besides after the 1970s, the phase turns out to hysteresis that Blanchard and Summers' (1986) probable explanation is that due to high unionization which we not disagree with. The results are respectively is the detection of hysteresis for Sweden and Australia, but one phase of hysteresis only in the great depression for the USA. Lastly, Denmark shows almost the same behaviour of stationarity as the United States.

Table 2.3: The Studies That Resulted in Mixed Conclusion

Author(s)	Sample	Period	Method	Outcome
Blanchard and Summers (1986)	France, West Germany, UK,U.S	(1953-1984)	Unit Root Tests	Natural rate: USA Hysteresis: for other countries
Jaeger and Parkinson (1991)	**Canada, Germany UK,USA**	**(1954:1-1989:1)**	**(Unobserved ComponentsModel)**	**Hysteresis: Canada,Germana and UK Natural rate: USA**
Røed (1996)	16 OECD	(1970:1-1994:4)	Unit Root Tests	Hysteresis Australia and Canada other European countries; but natural rate found in the USA
Papell et al. (2000)	**16 OECD**	**(1955–1997)**	**Unit Root Tests (With Structural Breaks)**	**Natural rate: Belgium, Canada, Denmark, Finland, Ireland, Norway, Sweden, Spain, U.S.,UK; others hysteresis**
Arestis and Mariscal (2000)	22 OECD	(1960Q1–1997Q2)	Unit Root Tests (With Structural Breaks)	Natural rate: Australia, Belgium, Canada, Denmark, Finland, Germany, Luxembourg, Switzerland and UK
Chang et al. (2005)	**10 European**	**(1961-1999)**	**Panel Unit Root (SURADF)**	**Natural rate: Belgium and Netherlands; Hysteresis: other 8 countries**
Dreger and Reimers (2009)	14 EU and 51 U.S states	(1983-2004)	(First And Second Generation) Panel Unit Root Tests	First generation tests: natural rate; second generation tests: mixed results
Lee (2010)	**29 OECD**	**Different period samples**	**Nonlinear Panel Unit Root test (SPSM)**	**Hysteresis: 6 countries Natural rate: 23 countries**
Fosten and Ghoshray (2011)	6 Developed Countries	(1855-2008)	(LKT Tests)	Evaluate unemployment in two regimes and got mixed results
Chang and Lee (2011)	**G-7 countries**	**(1992:01-2008:09)**	**(Threshold Unit Root Tests)**	**Hysteresis:3 countries; Natural rate:4 countries**
Chang (2011)	17 OECD	(1960-2009)	(Fourier Unit Root Tests)	Hysteresis: 11 countries; Natural rate in 6 countries
Furuoka (2012)	**12 countries in East AsiaPacific**	**Different time periods**	**(Unit Root Tests)**	**Natural Rate: South Korea and New Zealand;Hysteresis:Others**
Cheng et al. (2014)	PIIGS	(1960 -2011)	(Fourier Unit Root Tests)	Hysteresis: other countries Natural rate: Portugal and Spain
Bolat et al. (2014)	**17 Eurozone countries**	**(2000-2013)**	**(Nonlinear Panel Unit Root Tests)**	**Panel unit root test and SPSM without Fourier: All countries have hysteresis Panel KSS with Fourier: 6 countries have hysteresis, 11 Natural rates**
Saraç (2014)	Turkey	(01/2005-07/2013)	Linear and Nonlinear Unit Root Tests	Hysteresis in one regime but not in regime two
Chang and Su (2014)	**Taiwan**	**(01/1978-07/2012)**	**(First and Second Generations Panel Unit Root Tests)**	**Natural rate: Junior college graduate's hysteresis: other five educational categories**

3. THE METHODOLOGY

3.1 Econometric Framework of the Model

In this section the model which is designed by Fabiani et. al. (2001) is explained, that is an enhancement of the structure arranged in Blanchard and Quah (1989), especially with a wage-price block framework constructed upon the work Layard Nickell and Japman (1991) is very crucial for the literature. It can be said that the intuitive way to explain the unemployment hysteresis by the function of institutional properties determined in wage bargaining equation, that represents: the law for employment protections; and increasing strength of institutional representation process of trade unions against employer—which we clearly state activity of unions in collective wage bargaining— in the labour market. Hopefully, the aim of this thesis will clarify and unravel whether this factor an obstacle for the economy that causes real wages rigid and hinders self-equilibration of the labour market. The mathematical description given below to readers serve efficiently reader to grasp the framework. The definition of each numbered equation about stylized facts provided one by one. Accordingly, considering all the variable in logs with disregarding the constants, the equation below all considered with their standard economic meanings: Equation 3.1 is the structure of random walk processes, expressing the aggregate demand by equation 3.7 pointing to productivity changes and 3.10 outlines the policy changes, id est fiscal and monetary policy changes. Equation 3.7 is a comprehensive indication of the productivity cause to fertility changes in the permanent income, therefore, consumption and the increase of innovations consolidated into the stock of capital. While the equation 3.10 is the equation of another exogenous reflection of fiscal policy and monetary policy to form the aggregate demand. Constant returns to scale presented in equation 3.2, is describing a kind of Cobb Douglas type of production function, the capital is displaced causing no availability to a substitution of capital-labour. Price setting equation which exhibits in equation 3.3, showing the mechanism of firms' market power, consequently, price setting depends on the data expenses for unit labour also depending on the situation of the labour market. Equation 3.4 provides insight concerning labour supply, that conditional on demography and different exogenous representatives inside equation 3.8 (e.g., immigrational issues, health, etc.). The other

variables inside equation 3.4 do not include short-run effects of the real wages due to the technical process applied by our methodological process, though, in the long run, labour supply is affected by the spread associating real wage and productivity. Structure of wage determination is instructed by equation 3.5: unions try to fit the real wage on the purpose of expected amount of productivity increases, price levels and especially by the key variable of our research, which is exogenous impact that called (k_t), representing wage-push shocks and earnings outside of the salaries, (e.g., additional benefits, all security payments to unemployed etc.) that lies in equation 3.9, defines the structure of unemployment rates (u_t). The behaviour of the unemployment series designates the variable ρ given in 3.9 assessed persistence degree. Moreover, to these equations the endogenous variables explained in the informative solution sub section part to allow the reader to apprehend chained explanation of the variables that explained exogenously.

(3.1) $y_t = \emptyset\,(d_t - p_t) + a\vartheta_t$

(3.2) $y_t = n_t + \vartheta_t$

(3.3) $p_t = w_t - \vartheta_t + \beta u_t$

(3.4) $l_t = \alpha E_{t-1}(w_t - p_t - \vartheta_t) + \tau_t$

(3.5) $w_t = E_{t-1}(p_t + \vartheta_t) + k_t - \sigma E_{t-1} u_t$

(3.6) $u_t = l_t - n_t$

(3.7) $\vartheta_t = \vartheta_{t-1} + \varepsilon_t^s$

(3.8) $\tau_t = \tau_{t-1} + \varepsilon_t^l$

(3.9) $k_t = \rho k_{t-1} + \varepsilon_t^w$

(3.10) $d_t = d_{t-1} + \varepsilon_t^d$

The shocks are defined as follows:

- ε_t^w *wage bargaining shocks*
- ε_t^s *technological shocks*
- ε_t^l *labour supply shocks*
- ε_t^d *demand shocks*

Additionally, it is useful to know: (1) Each variable in logs but other variables are; (2) Wages determined by workers at the beginning of the periods: The realization of the wage bargaining shocks (ε_t^w) realized before other shocks, naturally, price determined by firms after all the information provided. Therefore, we will find $E_{t-1}u_t$ in the solution 1 as below:

Interpretative Solution 1:

To determine unemployment by wage push shocks, Let's place (3.3) into (3.5)

(3.1.1) $w_t = E_{t-1}(w_t - \vartheta_t + \beta u_t + \vartheta_t) + k_t - \sigma E_{t-1}u_t$

(3.1.2) $w_t = E_{t-1}(w_t + \beta u_t) + k_t - \sigma E_{t-1}u_t$

(3.1.3) $w_t = (E_{t-1}w_t + E_{t-1}\beta u_t) + k_t - \sigma E_{t-1}u_t$

(3.1.4) $\sigma E_{t-1}u_t - E_{t-1}\beta u_t = E_{t-1}w_t - w_t + k_t$

Due to Wages are predetermined,

(3.1.5) $E_{t-1}(\sigma u_t - \beta u_t) = k_t$

(3.1.6) $E_{t-1}u_t(\sigma - \beta) = k_t$

Finally, the conclusion is in 3.1.7 provided below

(3.1.7) $E_{t-1}u_t = \frac{1}{(\sigma-\beta)}k_t$

Interpretative Solution 2:

Our second interpretation to describe labour force, use (3.5) into (3.4).

(3.2.1) $l_t = \alpha E_{t-1}(E_{t-1}p_t + E_{t-1}\,\vartheta_t + k_t - \sigma E_{t-1}u_t - p_t - \vartheta_t) + \tau_t$

(3.2.2) $l_t = \alpha E_{t-1}(k_t - \sigma E_{t-1}u_t) + \tau_t$

Recall (3.1.7) and use in the solution of (3.2.3)

(3.2.3) $l_t = \alpha E_{t-1}\left(k_t - \sigma\frac{1}{(\sigma-\beta)}k_t\right) + \tau_t$

(3.2.4) $l_t = \alpha E_{t-1}\left(k_t - \sigma\frac{1}{(\sigma-\beta)}k_t\right) + \tau_t$

Wage bargaining predetermined so

(3.2.5) $l_t = \left((\alpha\sigma - \alpha\beta)\frac{1}{(\sigma-\beta)}k_t - \alpha\,\sigma\frac{1}{(\sigma-\beta)}k_t\right) + \tau_t$

(3.2.6) $l_t = \tau_t - \left(\alpha\beta\frac{1}{(\sigma-\beta)}k_t\right)$

Interpretative Solution 3:

To demonstrate unemployment rates with exogenous parameters, use (3.2.6) in (3.6) and then get

(3.3.1) $u_t = \tau_t - \left(\alpha\beta\frac{1}{(\sigma-\beta)}k_t\right) - n_t$

Now from equation (3.2), (3.3.2) is obtained as below.

(3.3.2) $n_t = y_t - \vartheta_t$

(3.3.3) $u_t = \tau_t - \left(\alpha\beta\frac{1}{(\sigma-\beta)}k_t\right) - y_t + \vartheta_t$

Use (3.1) into (3.3.3)

(3.3.4) $u_t = \tau_t - \left(\alpha\beta\frac{1}{(\sigma-\beta)}k_t\right) - \left(\emptyset\left(d_t - p_t\right) + a\vartheta_t\right) + \vartheta_t$

(3.3.5) $u_t = \tau_t - \left(\alpha\beta \frac{1}{(\sigma-\beta)} k_t\right) - \emptyset\, d_t + \emptyset\ p_t - a\vartheta_t + \vartheta_t$

Now (3.3) used into (3.3.5)

(3.3.6) $u_t = \tau_t - \left(\alpha\beta \frac{1}{(\sigma-\beta)} k_t\right) - \emptyset\, d_t + \emptyset\ (w_t - \vartheta_t + \beta u_t) - a\vartheta_t + \vartheta_t$

(3.3.7) $u_t = \tau_t - \left(\alpha\beta \frac{1}{(\sigma-\beta)} k_t\right) - \emptyset\, d_t + \emptyset\ w_t - \emptyset\,\vartheta_t + \emptyset\,\beta u_t - a\vartheta_t + \vartheta_t$

(3.3.8) $(1 - \emptyset\,\beta)u_t = \tau_t - \left(\alpha\beta \frac{1}{(\sigma-\beta)} k_t\right) - \emptyset\, d_t + \emptyset\ w_t - (a + \emptyset - 1)\,\vartheta_t$

Then finally u_t is obtained:

(3.3.9) $u_t = \frac{1}{(1-\ \emptyset\,\beta)}\left[\tau_t - \left(\alpha\beta \frac{1}{(\sigma-\beta)} k_t\right) - \emptyset\, d_t + \emptyset\ w_t - (a + \emptyset - 1)\,\vartheta_t\right]$

Interpretative Solution 4:

Obtaining w_t, Remember (3.1.7) and use in (3.3.9) on the left-hand side, Then the equation becomes

(3.4.1) $\frac{1}{(\sigma-\beta)} k_t = \frac{1}{(1-\ \emptyset\,\beta)}\left[\tau_{t-1} - \left(\frac{\alpha\beta}{(\sigma-\beta)} k_t\right) - \emptyset\, d_{t-1} + \emptyset\ w_t - (a + \emptyset - 1)\,\vartheta_{t-1}\right]$

(3.4.2) $\frac{\emptyset}{(1-\ \emptyset\,\beta)}\ w_t = \frac{k_t}{(\sigma-\beta)} - \frac{1}{(1-\ \emptyset\,\beta)}\left[\tau_t - \left(\frac{\alpha\beta}{(\sigma-\beta)} k_t\right) - \emptyset\, d_t - (a + \emptyset - 1)\,\vartheta_t\right]$

Leave the w_t alone on the left-hand side

(3.4.3) $w_t = \frac{(1-\ \emptyset\,\beta)}{\emptyset} \frac{k_t}{(\sigma-\beta)} - \frac{(1-\ \emptyset\,\beta)}{\emptyset} \frac{1}{(1-\ \emptyset\,\beta)}\left[\tau_{t-1} - \left(\alpha\beta \frac{1}{(\sigma-\beta)} k_t\right) - \emptyset\, d_{t-1} - (a + \emptyset - 1)\,\vartheta_{t-1}\right]$

(3.4.4) $w_t = \frac{(1-\ \emptyset\,\beta)}{\emptyset(\sigma-\beta)} k_t - \frac{1}{\emptyset}\left[\tau_{t-1} - \left(\frac{\alpha\beta}{(\sigma-\beta)} k_t\right) - \emptyset\, d_{t-1} - (a + \emptyset - 1)\,\vartheta_{t-1}\right]$

Use the coefficient $\frac{1}{\emptyset}$ inside of the brackets and then demonstrate wage equation:

(3.4.5) $w_t = \frac{1}{\emptyset}\left[\frac{(1-\emptyset\,\beta)}{(\sigma-\beta)}k_t - \tau_{t-1} + \left(\frac{\alpha\beta}{(\sigma-\beta)}k_t\right) + \emptyset\, d_{t-1} + (a+\emptyset-1)\,\vartheta_{t-1}\right]$

Now consider Solution 5 below:

Interpretative Solution 5:

Place (3.4.5) into (3.3.9)

(3.5.1) $u_t = \frac{1}{(1-\emptyset\,\beta)}\left[\tau_t - \left(\alpha\beta\,\frac{1}{(\sigma-\beta)}k_t\right) - \emptyset\, d_t + \emptyset\ \left(\frac{1}{\emptyset}\left[\frac{(1-\emptyset\,\beta)}{(\sigma-\beta)}k_t - \tau_{t-1} + \left(\frac{\alpha\beta}{(\sigma-\beta)}k_t\right) + \emptyset\, d_{t-1} + (a+\emptyset-1)\,\vartheta_{t-1}\right]\right) - (a+\emptyset-1)\,\vartheta_t\right]$

(3.5.2) $u_t = \frac{1}{(1-\emptyset\,\beta)}\left[\tau_t - \tau_{t-1} + \left(\frac{\alpha\beta}{(\sigma-\beta)}k_t\right) - \left(\frac{\alpha\beta}{(\sigma-\beta)}k_t\right) + \frac{(1-\emptyset\,\beta)}{\emptyset(\sigma-\beta)}k_t - \emptyset\,(d_t - d_{t-1}) - (a+\emptyset-1)\,(\vartheta_t - \vartheta_{t-1})\right]$

Now the calculation is over and explanations by all with shocks make explain it by shocks found in equation 4.5.3 below:

(3.5.3) $u_t = \frac{1}{(1-\emptyset\,\beta)}\left[\varepsilon_t^l + \frac{(1-\emptyset\,\beta)}{\emptyset(\sigma-\beta)}k_t - \emptyset\varepsilon_t^d\ - (a+\emptyset-1)\varepsilon_t^s\right]$

Equation (3.5.3) bestows if the unemployment I(0) process, accordingly, there are no restrictions on the aggregate of the MA parameters concerning each of the essential shocks. On the other hand, because the unemployment rate is stationary, the price index constrained by productivity and the other term influence wages in the long

run leading the MA representation matrix of Δp_t have a single zero, namely, wage-push shocks.

Now consider the solution 6 provided below:

Interpretative Solution 6:

There can be added new demonstration for (3.2) by using (3.6)

(3.6.1) $y_t = l_t - u_t + \vartheta_t$

As you apprehend from (3.6.1), if the unemployment stationary, it is affected by both technological shocks and labour supply shocks. Together with these factors, by taking into account the equations (4.3) and (3.5.3) the course of the real wages, its tendency to react only to productivity shocks. If the results of the univariate pretesting of the unemployment rate condition convincing us natural rate hypothesis, in other words, the stationarity of |ρ|<1, the identification restrictions hence in the matrix form regarding the 3.11:

(3.11)
$$\begin{pmatrix} \Delta(w_t - p_t) \\ \Delta y_t \\ \Delta p_t \\ u_t \end{pmatrix} = \begin{bmatrix} c_{11} & 0 & 0 & 0 \\ c_{21} & c_{22} & 0 & 0 \\ c_{31} & c_{32} & c_{33} & 0 \\ c_{41} & c_{42} & c_{43} & c_{44} \end{bmatrix} \begin{bmatrix} \varepsilon_t^s \\ \varepsilon_t^l \\ \varepsilon_t^d \\ \varepsilon_t^w \end{bmatrix} + C^*(L) \begin{bmatrix} \Delta\varepsilon_t^s \\ \Delta\varepsilon_t^l \\ \Delta\varepsilon_t^d \\ \Delta\varepsilon_t^w \end{bmatrix}$$

If one assumes $\rho = 1$, then the innovations (shocks) to wage bargaining have long lasting effect, barely means, it is the determiner of the hysteresis of unemployment seen in (3.5.3) and the real wages are driven only by wage bargaining shocks and technological shocks. Then our matrix framework given in 3.12:

(3.12)
$$\begin{pmatrix} \Delta u_t \\ \Delta(w_t - p_t) \\ \Delta y_t \\ \Delta p_t \end{pmatrix} = \begin{bmatrix} c_{11} & 0 & 0 & 0 \\ c_{21} & c_{22} & 0 & 0 \\ c_{31} & c_{32} & c_{33} & 0 \\ c_{41} & c_{42} & c_{43} & c_{44} \end{bmatrix} \begin{bmatrix} \varepsilon_t^w \\ \varepsilon_t^s \\ \varepsilon_t^l \\ \varepsilon_t^d \end{bmatrix} + C^*(L) \begin{bmatrix} \Delta\varepsilon_t^w \\ \Delta\varepsilon_t^s \\ \Delta\varepsilon_t^l \\ \Delta\varepsilon_t^d \end{bmatrix}$$

The structural innovations accessible is explained the variable affecting the unemployment rate, which is the variable ε_t^w, i.e. innovations of wage-push. Further,

it is seen from equation 3.3 after simple reordering: the real wages behavior is tied to two variables that is, ϑ_t, productivity and wage push shocks k_t.

3.2 Structural Vector Autoregressions

Vector autoregressive models, which are requisite support for empirical research, first began with Sims (1980), as an alternative and powerful device to conventional large-scale and less consistent macro-econometric models (particularly, simultaneous equation models).

According to Kilian (2011), SVAR studies are identification driven, hence, they demand for identification restrictions that must be driven by proficiency in the economic hypothesis, cult theories of economics, and or other external factors to get the reaction of the model. Simply following disintegration forecast errors into fundamental shocks—that are respectively uncorrelated and have an economic theory behind—evaluation of the causality of these shocks easily accessible on the studied model.

Last but not least, the identification restriction divided into two sub-groups: short-run restrictions are harder to determine leading controversy due to making simultaneous restrictions only; long-run restrictions are based on less controversy and most economists are generally agrees—like monetary politic stance are neutral in the long run but technological shocks are not.

In their pivotal manuscript, Kilian and Lütkepohl (2017) emphasized, the structural VAR models have not very much, but some central uses. Primarily, it is mainly applied to analyse the average and impulse responses of the model to a given structural innovation. They are fundamental instrument that provide information about economic policy. In practical operations, it is important to associate the response of one variable to an impulse in different ones.

The Forecast Error Variance Decomposition (FEVD) is giving details about the source of uncertainty of a variable evolves over time. FEVD inform concerning the amount of the future uncertainty of a variable is because of future innovations into the other variables in the system. The innovations effect may be not very important in the

short-run but very influential in the long run. For example, you could learn that coal price shocks account only for 5% of the variance of future electricity price movements in the next 7 days, but for 40% in the next 6 months.

Apart from these features, the SVAR models allow us to map the collective contribution of historical decompositions of any structural shock to all variable in the course of time.

It consists of other variables and its own lagged values, that specified by its lag number n, such as VAR(n) model. To exemplify, considering h_t denotes M dimensional vector consisting of Δu_t, which is expressing unemployment rates, Δy_t is GDP growth rate of Turkey and Δp_t price levels in quarterly levels. Var (1) process then:

$$\begin{aligned} \Delta u_t &= b_{11}\Delta u_{t-1} + b_{12}\Delta y_{t-1} + b_{13}\Delta p_{t-1} + v_{1t} \\ \Delta y_t &= b_{21}\Delta u_{t-1} + b_{22}\Delta y_{t-1} + b_{23}\Delta p_{t-1} + v_{2t} \\ \Delta p_t &= b_{31}\Delta u_{t-1} + b_{32}\Delta y_{t-1} + b_{33}\Delta p_{t-1} + v_{3t} \end{aligned} \qquad (3.13)$$

Where M=3 and innovations are v_{jt}, j= 1, 2, 3, are uncorrelated and another expression of reduced form, Var (1) process is

$$h_t = B_1 h_{t-1} + v_t \qquad (3.14)$$

In a matrix description, it further is

$$h_t = \begin{pmatrix} \Delta u_t \\ \Delta y_t \\ \Delta p_t \end{pmatrix}, \quad B_j = \begin{bmatrix} b_{11,j} & b_{12,j} & b_{13,j} \\ b_{21,j} & b_{22,j} & b_{23,j} \\ b_{31,j} & b_{32,j} & b_{33},j \end{bmatrix} v_t = \begin{pmatrix} v_{1t} \\ v_{2t} \\ v_{3t} \end{pmatrix} \qquad (3.15)$$

Besides over this case, the idea that forms the foundation of reduced form VAR(n) model, representing the data seized from structural VAR(n).

$$I_0 h_t = I_1 h_{t-1} + I_n h_{t-n} + s_t \quad (3.16)$$

Where s_t is Mx1 vector display structural innovations. I_0 shows contemporaneous relations among the variables that are j= 1, …, n. Inverse of I_0, that is I_0^{-1}, captures the all structural innovations that hitting the model variables, by multiplying both side of Equation (3.16) resulted with reduced form below.

$$h_t = B_1 h_{t-1} + B_n h_{t-n} + v_t \quad (3.17)$$

The values $B_j = I_0^{-1} I_j$, $v_t = I_0^{-1} s_t$ is possible to estimate if only with the correct specification, in other words, by applying economically reliable identification restrictions is key topic of SVAR analysis. Knowing the fact that $v_t = I_0^{-1} s_t$, reduced form shocks v_t are weighted averages, that represented by I_0^{-1}, of structural shocks s_t that are uncorrelated.

3.3 Dataset

The data in this work drawn from three main sources: International Financial Statistics database of International Monetary Fund; Main Economic Indicators Publication Database by Organisation for Economic Co-operation and Development; Key Indicators of Labour Market by International Labour Organization that whole seasonally adjusted. The calculation of subjected series such as real gross domestic product, consumer price index, wage rates and unit labour costs indexed on 2015 prices (2015 = 100), except differently defined.

To analyze Chilean Economy, the dataset collected over the period Q1: 1995 – Q4: 2017. The dataset consists of real GDP series obtained from OECD; unemployment rates data were from ILOSTAT based on survey Encuesta Nacional de Empleo conducted over the age of 15; wage rates and consumer price indexes used from International Monetary Fund.

Data for Greece utilized for the period Q1:1999 – Q1:2018, the real gross domestic product and unit labour cost series taken from OECD, unemployment rates taken from ILOSTAT based on EU Labour Force Survey; consumer price index got from International Monetary Fund.

To interpret Mexican Economy between the period Q1:1994- Q3:2017, wage rates and consumer price index procured from International Monetary Fund; real gross domestic product from OECD records and unemployment rates received from ILO based on Encuesta Nacional de Ocupación y Empleo.

Separate from other countries, the quarterly based average monthly earnings of labour in national currency from OECD for Russia; unemployment series received from ILO based on Population Survey on Employment Problems. The prices and real GDP used with same sources stated above between the dates Q1:1999 and Q1:2018.

It is unfortunate to use dataset a relatively smaller scale for Turkey between Q1:2006 - Q1:2018. We use similar sources for GDP and consumer prices as mentioned earlier, unit labour costs from OECD, and quarterly based unemployment rates based on EU Labour Force Survey.

3.4 The Unit Root Tests Results

In the analysis of the observed time series variable, stationarity is required to achieve reliable and consistent results. Therefore, dozens of unit root tests concerning stationarity of time series data developed and their performance in unit root analysis become an essential issue. For this purpose, the stability analysis of our data was performed by KPSS, ADF and PP tests for the model specification. ADF tests The Augmented Dickey-Fuller (ADF) grant us to test the possibility that the subjected variables are stationary or not, shortly, If the calculated t statistics value of the subject series is less than the t-critical values, the subjected series are stationary.

Table 3.1.1 provides information about variables on log levels concerning Chile that show non-stationary series, but the significance of Kwiatkowski Phillips Schmidt and Shin Test test statistic result for the unemployment rates of Chile relatively with lower significance. The Phillips-Perron test result for the unemployment series of

Chile show I(1) process; therefore the series are non-stationary for the selected time period. As it clearly understood in the table 3.1.1, ADF and KPSS tests for the economy of Chile demonstrate the non-stationarity of Gross Domestic Product, real wages, unemployment and consumer price index.

Table 3.1.1: Unit Root Tests on subject series of Chile on log-levels

Country	**Variables**	**ADF Tests**		**PP Tests**		**KPSS**
		None	Intercept	None	Intercept	Intercept
Chile	Unemp.	-0.25	-2.05	-0.34	-1.84	0.35**
	Real W.	0.39	-2.55	0.40	-2.02	0.19
	GDP	4.18	-1.00	6.31	-1.41	1.25***
	CPI	3.67	-1.02	7.44	-2.14	1.25***
Critical V.	%1	-2.59	-3.51	-2.59	-3.50	0.73
	%5	-1.94	-2.89	-1.94	-2.89	0.46
	%10	-1.61	-2.58	-1.61	-2.58	0.34
The expressions in turn indicates * p <0,10; ** p <0,05; *** p <0,01						

While considering table 3.1.2, the results for differenced series of Chilean unemployment, real wages, real gross domestic product and consumer price index, showing I(0) processes. The ADF tests application of the Chilean unemployment, real wages, gross domestic product and GDP resulted as a stationary time series with high significance. However, the results of the KPSS test for Greece's subjected series showed the same results as the results of the other tests.

Table 3.1.2: Unit Root Tests on subject series of Chile on log difference

Country	**Variable**	**ADF Tests**		**PP Tests**		**KPSS**
		None	Intercept	None	Intercept	Intercept
Chile	Unemp.	-7.16***	-7.12***	-3.69***	-5.93***	0.32
	Real W.	-6.42***	-6.40***	-6.65***	-6.62***	0.13
	GDP	-4.71***	-6.70***	-4.55***	-6.75***	0.16
	CPI	-2.38***	-4.56***	-3.69***	-5.93***	0.32
Critical V.	%1	-2.59	-3.51	-2.59	-3.50	0.73
	%5	-1.94	-2.89	-1.94	-2.89	0.46
	%10	-1.61	-2.58	-1.61	-2.58	0.34
The expressions in turn indicates * p <0,10; ** p <0,05; *** p <0,01						

Table 3.1.3 is representing that majority of the unit root test results for macroeconomic variables of Greece show I(1) process, however, KPSS stationarity test results for real wage and real gross domestic product series showing evidence for unit root when the significance level is respectively with 5 per cent and 10 per cent.

Table 3.1.3: Unit Root Tests on subject series of Greece on log-levels

Country	Variable	ADF Tests		PP Tests		KPSS
		None	Intercept	None	Intercept	Intercept
Greece	Unemp.	-0.01	-2.05	0.55	-0.77	0.79*
	Real W.	-0.45	-1.07	-0.44	-1.70	0.56**
	GDP	-0.28	-2.5	0.17	-1.29	0.3
	CPI	3.67	-1.02	7.44	-2.14	1.25***
Critical V.	%1	-2.59	-3.51	-2.59	-3.50	0.73
	%5	-1.94	-2.89	-1.94	-2.89	0.46
	%10	-1.61	-2.58	-1.61	-2.58	0.34

The expressions in turn shows * p <0,10; ** p <0,05; *** p <0,01

As can be seen from Table 3.1.4, the test for stationarity of subjected series of Greece notifies obvious stationarity but only one test representing differenced series of real wages pointing unit root with 1 per cent significance level. Table 3.1.4 proves; for unemployment rates, GDP, real wages and CPI of the Greece the standard ADF, PP tests including intercept terms rejects the null hypothesis that means there is no unit roots.

Table 3.1.4: Unit Root Tests on subject series of Greece on log difference

Country	Variable	ADF Tests		PP Tests		KPSS
		None	Intercept	None	Intercept	Intercept
Greece	Unemp.	-2.30**	-2.43	-3.47***	-3.48**	0.18
	Real W.	-3.23***	-3.23**	-13.4***	-13.3***	0.13
	GDP	-4.71***	-6.70***	-4.55***	-6.75***	0.16
	CPI	-1.14***	-1.80***	-12.6***	-14.3***	0.5***
Critical V.	%1	-2.59	-3.51	-2.59	-3.50	0.73
	%5	-1.94	-2.89	-1.94	-2.89	0.46
	%10	-1.61	-2.58	-1.61	-2.58	0.34

The expressions in turn shows * p <0,10; ** p <0,05; *** p <0,01

In Table 3.1.5, There is clear non-stationarity for all variables belong to Mexico on log levels. There is clear sign of non-stationarity for each variable by implementing Kwiatkowski Phillips Schmidt and Shin Tests, Augmented Dickey Fuller Tests and

Phillips-Perron tests to the variables of Mexico respectively including intercept term. The evidence shows unit roots for Mexica's variables that respectively unemployment, real wages, gross domestic product and consumer price index.

Table 3.1.5: Unit Root Tests on subject series of Mexico on log levels

Country	**Variable**	**ADF Tests**		**PP Tests**		**KPSS**
		None	Intercept	None	Intercept	Intercept
Mexico	Unemp.	-0.52	-2.33	-0.39	-1.87	0.30
	Real W.	-0.83	-1.47	-2.21**	-5.07***	0.93***
	GDP	2.98	-0.48	0.99	0.85	1.24***
	CPI	2.54	-1.70	3.18	-7.37***	1.15***
Critical V.	%1	-2.59	-3.51	-2.59	-3.50	0.73
	%5	-1.94	-2.89	-1.94	-2.89	0.46
	%10	-1.61	-2.58	-1.61	-2.58	0.34
The expressions in turn indicates * p <0,10; ** p <0,05; *** p <0,01						

From the data in Table 3.1.6, It is apparent that differencing México's macroeconomic variables make all I(0) processes, despite adding intercept term to the PP, KPSS and ADF tests. In other words, unit root testing the GDP, unemployment rates, real wages and consumer price index of Mexico on log differences shows that there is no unit root.

Table 3.1.6: Unit Root Tests on subject series of Mexico on log differences

Country	**Variable**	**ADF Tests**		**PP Tests**		**KPSS**
		None	Intercept	None	Intercept	Intercept
Mexico	Unemp.	-4.62***	-4.59***	-7.20***	-7.16***	0.08
	Real W.	-6.36***	-6.44***	-11.8***	-12.8***	0.07
	GDP	-6.74***	-6.78***	-5.63***	-5.99***	0.03
	CPI	-3.78***	-4.92***	-2.59***	-3.62***	0.80***
Critical V.	%1	-2.59	-3.51	-2.59	-3.50	0.73
	%5	-1.94	-2.89	-1.94	-2.89	0.46
	%10	-1.61	-2.58	-1.61	-2.58	0.34
The expressions in turn indicates * p <0,10; ** p <0,05; *** p<0,01						

Despite controversial results seen on ADF test part for log levels of unemployment rates and consumer price index of Russia in Table 3.1.7, the comparison with other test results, it is not hard to determine that all series on log-

levels showing unit root, in other saying, we fail to reject the null hypothesis for the subjected series of Russia.

Table 3.1.7: Unit Root Tests on subject series of Russia on log levels

Country	Variable	ADF Tests		PP Tests		KPSS
		None	Intercept	None	Intercept	Intercept
Russia	Unemp.	-2.20**	-2.21	-2.19	-2.21	1.02***
	Real W.	2.99	-3.97***	3.49	-4.93***	1.08***
	GDP	1.82	-2.55	3.31	-3.54***	1.10***
	CPI	0.93	-2.7*	6.19	-6.76***	1.18***
Critical V.	%1	-2.59	-3.52	-2.59	-3.52	0.73
	%5	-1.94	-2.90	-1.94	-2.90	0.46
	%10	-1.61	-2.58	-1.61	-2.58	0.34

The expressions in turn indicates * p <0,10; ** p <0,05; *** p <0,01

The Table 3.1.8 under illustrates the log-differenced components of Russia's macroeconomic variables, that is clearly showing stationary, but only the three of them represent a smaller degree of significance than other tests results. The ADF tests for the real wage of Russia shows stationarity only in ten per cent level due to not adding significant intercept term. The consumer price index of Russia provides a little bit less significance than the ADF test with intercept term.

Table 3.1.8: Unit Root Tests on subject series of Russia on log differences

Country	Variable	ADF Tests		PP Tests		KPSS
		None	Intercept	None	Intercept	Intercept
Russia	Unemp.	-4.7***	-5.0***	-8.67***	-9.02***	0.14
	Real W.	-2.2**	-5.29***	-3.75***	-5.42***	0.87**
	GDP	-3.18***	-3.50***	-3.22***	-3.87***	0.68**
	CPI	-2.34**	-1.81	-3.37***	-5.49***	0.91***
Critical V.	%1	-2.59	-3.52	-2.59	-3.52	0.73
	%5	-1.94	-2.90	-1.94	-2.90	0.46
	%10	-1.61	-2.58	-1.61	-2.58	0.34

The expressions in turn indicates * p <0,10; ** p <0,05; *** p <0,01

To overview the log-level output of unit root tests including with intercepts for four variables, that they are unemployment rates, real wages, gross domestic products

and consumer price indexes of Turkey in Table 3.1.9, show no sign for stationarity, therefore, all the subjected macroeconomic variables for Turkey is I (1) process. The results are shown in the table 3.1.9 for Turkey's macroeconomic variables that are in line with results obtained for the other four countries.

Table 3.1.9: Unit Root Tests on subject series of Turkey on log levels

Country	Variable	ADF Tests		PP Tests		KPSS
		None	Intercept	None	Intercept	Intercept
Turkey	Unemp.	0.04	-2.9*	-0.02	-1.93	0.12
	Real W.	0.02	-2.7	0.29	-3.30**	0.12
	GDP	3.41	0.06	5.82	-0.03	0.90***
	CPI	2.12	1.93	19.85	0.58	0.92***
Critical V.	%1	-2.62	-3.60	-2.61	-3.57	0.73
	%5	-1.94	-2.93	-1.94	-2.92	0.46
	%10	-1.61	-2.60	-1.61	-2.5	0.34
The expressions in turn indicates * p <0,10; ** p <0,05; *** p <0,01						

The difference between ADF and other tests results are noticeable for differenced logarithmic values of consumer prices index of Turkey in Table 3.1.10, but the bulk of results reveal stationarity. Implementing ADF tests without intercept to unemployment rates of Turkey shows evidence for stationarity that is the calculated t-statistics value of unemployment rates -2.63 but the critic value is -2.62. Due to that -2.63 is smaller than the critical value in one per cent level, the unemployment rates of Turkey on log difference shows evidence for stationarity.

Table 3.1.10: Unit Root Tests on subject series of Turkey on log differences

Country	Variable	ADF Tests		PP Tests		KPSS
		None	Intercept	None	Intercept	Intercept
Turkey	Unemp.	-2.63***	-2.58*	-4.27***	-4.24***	0.06
	Real W.	-5.87***	-5.80***	-9.45***	-9.38***	0.17
	GDP	-3.41***	-3.30**	-5.07***	-5.07***	0.15
	CPI	0.30	-1.35	-3.20***	-10.5***	0.20
Critical V.	%1	-2.62	-3.59	-2.61	-3.57	0.73
	%5	-1.94	-2.93	-1.94	-2.92	0.46
	%10	-1.61	-2.60	-1.61	-2.60	0.34
The expressions in turn indicates * p <0,10; ** p <0,05; *** p <0,01						

The same inference we get by implementing the PP tests with intercept also that the calculated t value of the unemployment rates of Turkey is -4.24 and the critical value in one per cent level is -3.57, consequently, we reject the null hypothesis of non-stationarity.

To summarize the results of stationarity analysis in this section, respectively for the nations, that the series of unemployment rates of the countries of Chile, Greece, Mexico, Russia and Turkey providing evidence for the unemployment hysteresis. In addition to this, gross domestic products, real wages and consumer price index variables of the countries subjected to unit root analysis have a difference stationary process.

It was not extraordinary to obtain these results; however, it sheds light on the determination of the model that will be used in the next process which shown in matrix form 3.12.

3.5 Forecast Error Variance Decomposition

The lag length for Chile, Greece, Mexico, Russia and Turkey chosen according to the information criterions for each country. Table 3.2.1 gives the conclusions of forecast error variance decomposition of the variable of Chile in terms of each shock in a different horizon of time.

At the start-up period of Chile's unemployment, most of the variability are based on wage-bargaining (wage-push) shocks. While examining the beginning effects of demand shocks in unemployment is 0.01 per cent, however, in the long run it is around 16.5 per cent. Surprisingly, we got considerably different results from other nations regarding to real wage of Chile, real wage changes almost by productivity shocks. In the first forecast horizon, the variability of real wage fluctuations affected by productivity shocks %98.7; though, in the long run, it is approximately %96.

The reason for the fluctuations in the total output was the labor supply shocks with 83 per cent, the 5 per cent demand and productivity while the 7 per cent was due to the wage-bargaining shocks.

Essentially in the short-term, forecast error variance of Chile's inflation is stating almost all the fluctuations sourced from the demand side (%94.2). Nonetheless, we see the contribution of labour supply shocks increased to 70 per cent, but the demand shocks decreased to 22.64 per cent in the long-time horizon.

Table 3.2.1: Forecast Error Variance Decomposition of Chile

Periods Ahead FEVD in the Growth of	h	Bargaining Shocks	Productivity Shock	Labour Supply Shocks	Demand Shocks
Unemployment	1	92.13	1.08	6.76	0.01
	4	63.60	8.82	22.86	4.70
	10	39.36	16.85	28.65	15.12
	∞	35.76	19.38	28.02	16.87
Real Wage	1	0.13	98.77	0.43	0.65
	4	0.36	96.17	1.29	1.88
	10	0.31	96.44	1.15	2.07
	∞	0.35	96.12	1.19	2.33
Output	1	4.71	0.93	93.88	0.46
	4	1.63	2.32	92.03	4.01
	10	3.00	4.43	85.84	6.71
	∞	7.04	4.50	83.10	4.99
Inflation	1	0.01	4.73	1.12	94.12
	4	0.04	4.24	6.77	88.93
	10	0.20	3.62	42.52	53.64
	∞	2.62	4.10	70.62	22.64

It is apparent in the Table 3.2.2 that the FEVD of unemployment in Greece attributed to labour supply shocks in the long-time horizon. 20.70 per cent of the fluctuations based on wage-push shocks, while 12.90 per cent of them to attributed to demand shocks.

It is evident that the variability of real wages of Greece highly depends on the labour supply shocks and productivity shocks, that is nearly 80 per cent. It is self-evident from this table that demand shocks are relatively trivial for real wages of Greece.

Labour supply disturbances is striking for the FEVD of output in Greece, it is around 83.68 per cent, but productivity shock is 7.04 per cent.

What stands out in the table 5.2.2 is change of inflation in Greece highly dependent to demand shocks. Dominance of demand shocks in inflation is relatively higher in the beginning period but later it evaporates about 20 per cent.

Table 3.2.2: Forecast Error Variance Decomposition of Greece

Periods Ahead FEVD in the Growth of	H	Bargaining Shocks	Productivity Shock	Labour Supply Shocks	Demand Shocks
Unemployment	1	98.41	0.61	0.95	0.01
	4	75.61	9.43	13.78	1.17
	10	36.49	12.22	45.36	5.91
	∞	20.70	6.02	60.37	12.90
Real Wage	1	3.82	94.38	0.65	1.14
	4	5.06	92.24	0.62	2.06
	10	16.21	73.77	7.58	2.42
	∞	13.00	38.76	39.45	8.77
Output	1	20.8	1.35	77.7	0.00
	4	22.46	2.27	74.70	0.54
	10	11.51	3.59	81.65	3.23
	∞	6.96	2.30	83.68	7.04
Inflation	1	5.34	6.97	3.57	84.10
	4	3.48	5.40	2.09	88.4
	10	4.67	7.68	2.07	85.5
	∞	11.97	4.56	24.66	58.78

Closer inspection of Table 3.2.3 shows the dominant driving forces for unemployment in Mexico are wage-bargaining shocks (27.87%) and productivity shocks (58.47%)).

Substantial proportion of real wage movements in Mexico explained by demand and productivity shocks, which have approximately 86 per cent share.

In order to address FEVD of the output in Mexico, the following contributions of the shocks were given: 27.65 per cent wage bargaining shocks, 27.59 per cent productivity shocks, 38.15 per cent labour supply and 6.59 from demand shocks.

The bottom part of the table shows FEVD of inflation in Mexico is highly dependent on the shocks from the demand side, though, the weight of productivity and wage-push shocks inflated its weights. 26.73 percantage of the inflation fluctuations in Mexico is attributed to productivity shocks and 33.72 percentage is belong to shocks from wage-bargaining.

Table 3.2.3: Forecast Error Variance Decomposition of Mexico

Periods Ahead FEVD in the Growth of	H	Bargaining Shocks	Productivity Shock	Labour Supply Shocks	Demand Shocks
Unemployment	1	95.85	0.04	3.82	0.280
	4	70.23	19.20	6.78	3.78
	10	35.94	50.79	3.57	9.68
	∞	27.87	58.47	3.61	10.03
Real Wage	1	1.86	70.20	4.45	23.47
	4	2.48	64.62	8.16	24.72
	10	2.68	62.17	7.58	27.54
	∞	7.34	58.11	8.27	26.25
Output	1	6.21	8.10	85.42	0.25
	4	3.60	4.70	86.74	4.95
	10	11.37	7.13	69.77	11.71
	∞	27.65	27.59	38.15	6.59
Inflation	1	5.67	14.52	11.36	68.43
	4	9.99	15.12	11.67	63.20
	10	15.52	12.26	7.93	64.27
	∞	33.72	26.73	8.08	31.53

The results for FEVD of unemployment Russia are in Table 3.2.4, considerably distinctive that wage-bargaining shocks account for 55.84 per cent in long-term forecasts. The second striking fact for the variability of unemployment in Russia brings about by productivity shocks that approximately 25 per cent.

The FEVD of the real wage fluctuations in Russia mainly driven by productivity shocks which are moving around 85-75 per cent in all time horizons.

The productivity shocks have a weak influence on FEVD of output within Russia account for 10 per cent in the short-run, but in the long run, it increases around to 50

per cent. The opposite occurred in the share of labour supply shocks in output fluctuations in Russia. While labour-supply shocks have a share of 79.43 per cent FEVD of output in the beginning time, this effect reduced by up to 45.28 per cent. The FEVD of inflation changes in Russia is assigned to respectively by 42.82 per cent to demand shocks, 35.93 per cent by productivity shocks, 10.86 wage by wage-bargaining shocks and 10.38 to labour supply shocks.

Table 3.2.4: Forecast Error Variance Decomposition of Russia

Periods Ahead FEVD in the Growth of	h	Bargaining Shocks	Productivity Shock	Labour Supply Shocks	Demand Shocks
Unemployment	1	93.09	2.52	4.32	0.05
	4	83.53	4.57	11.83	0.060
	10	81.23	5.45	12.35	0.96
	∞	55.84	25.77	9.24	9.13
Real Wage	1	9.32	85.78	2.69	2.18
	4	7.95	73.77	15.71	2.55
	10	5.04	73.34	19.29	2.31
	∞	2.87	76.02	8.55	2.54
Output	1	9.71	10.85	79.43	0.01
	4	9.32	21.43	69.15	0.08
	10	6.84	35.00	57.93	0.22
	∞	4.61	49.42	45.28	0.67
Inflation	1	0.06	46.83	0.41	52.68
	4	0.35	50.36	0.42	48.85
	10	5.17	44.27	5.86	44.6
	∞	10.86	35.93	10.38	42.82

It is evident from the table 3.2.5 that FEVD of unemployment in Turkey shows strong dependency to the wage-bargaining shocks (about 76.92 per cent). The second important factor for variability in unemployment of Turkey based on labour supply shocks (about 16.07 per cent).

The variability of real wage in Turkey is dependent on productivity and labour supply shocks in the long run, which are respectively about 74.50 and 19.86 per cent. The effect of wage-bargaining shocks relatively unimportant that has a share of approximately %4, while the demand shock has % 1 effect on it.

Almost half of the output fluctuations in Turkey accounted for labour supply shocks; while 27.65 percentage of change underlies by productivity shocks.

The FEVD of inflation in Turkey is proving that about 80 per cent of inflation fluctuations are supply-side shocks (bargaining, productivity and labour supply), but 20 per cent is growing from demand shocks.

Table 3.2.5: Forecast Error Variance Decomposition of Turkey

Periods Ahead FEVD in the Growth of	H	Bargaining Shocks	Productivity Shock	Labour Supply Shocks	Demand Shocks
Unemployment	1	93.69	4.71	0.63	0.96
	4	86.09	5.34	7.10	1.45
	10	77.31	5.47	16.02	1.19
	∞	76.92	5.73	16.07	1.18
Real Wage	1	0.63	97.67	0.62	1.07
	4	2.97	83.24	12.76	1.00
	10	4.34	75.00	19.69	0.94
	∞	4.50	74.50	19.86	1.12
Output	1	1.38	0.84	97.58	0.17
	4	1.73	7.14	90.09	1.02
	10	2.32	16.14	78.12	3.40
	∞	6.82	27.61	49.53	16.01
Inflation	1	3.70	36.68	0.18	59.42
	4	11.45	35.77	7.03	45.73
	10	11.17	31.82	24.30	32.69
	∞	8.11	31.09	40.01	20.76

3.6 Impulse Responses

Figure 3.3.1 represents impulse responses of the macro components of Chile to wage-bargaining and productivity shocks. A single wage-bargaining shock equivalent to one standard deviation effect unemployment rates of Chile by approximately 6 percentage point. A productivity shock equivalent to one standard deviation in Chile increase both unemployment (%2.5) and real wages (%3.5) but have insignificantly negative effect on inflation and output.

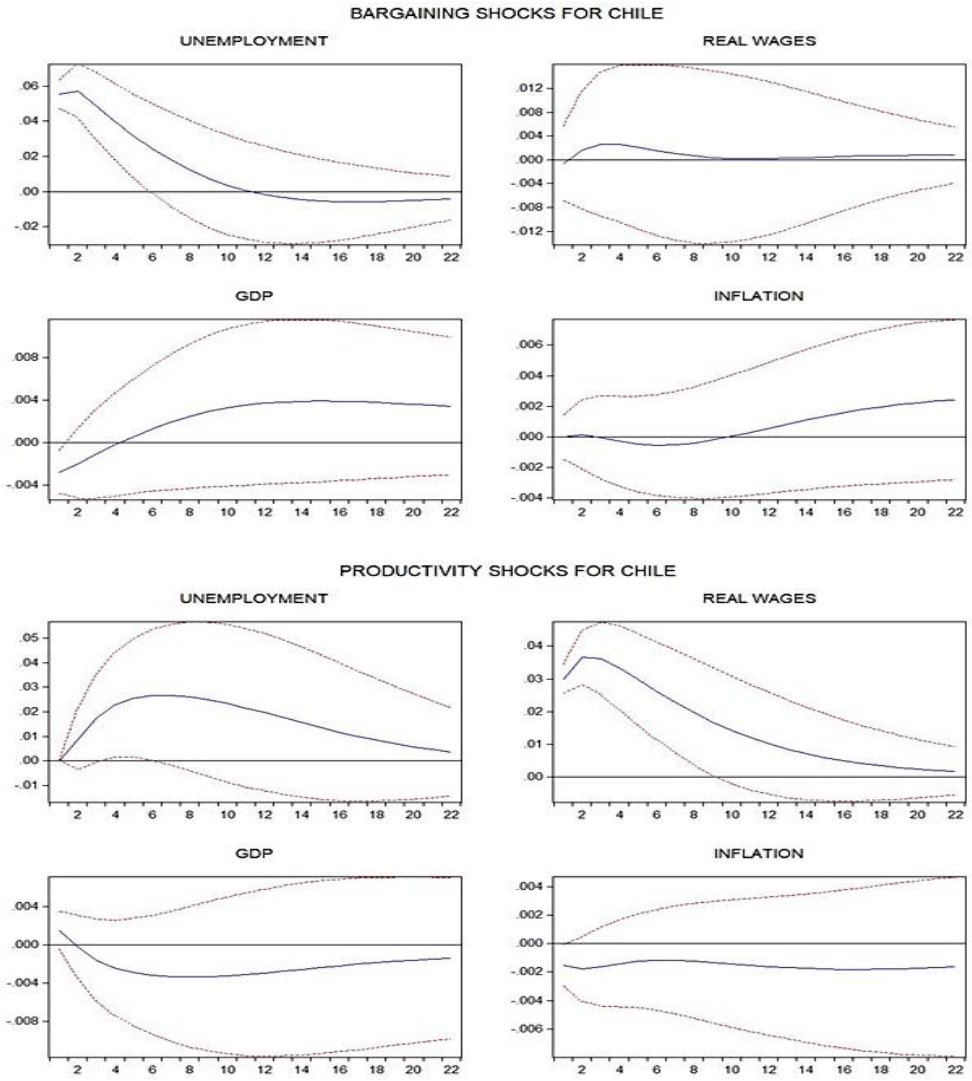

Figure 3.3.1: Wage-bargaining and Productivity Shocks for Chile

In Figure 3.3.2, A random positive shock in labour supply of Chile have a reducing impact on unemployment and real wages, however, increases inflation and output.

A unit standard deviation in demand shocks in Chile lead to significant increase in unemployment real wages and inflation but leading insignificant decrease in output.

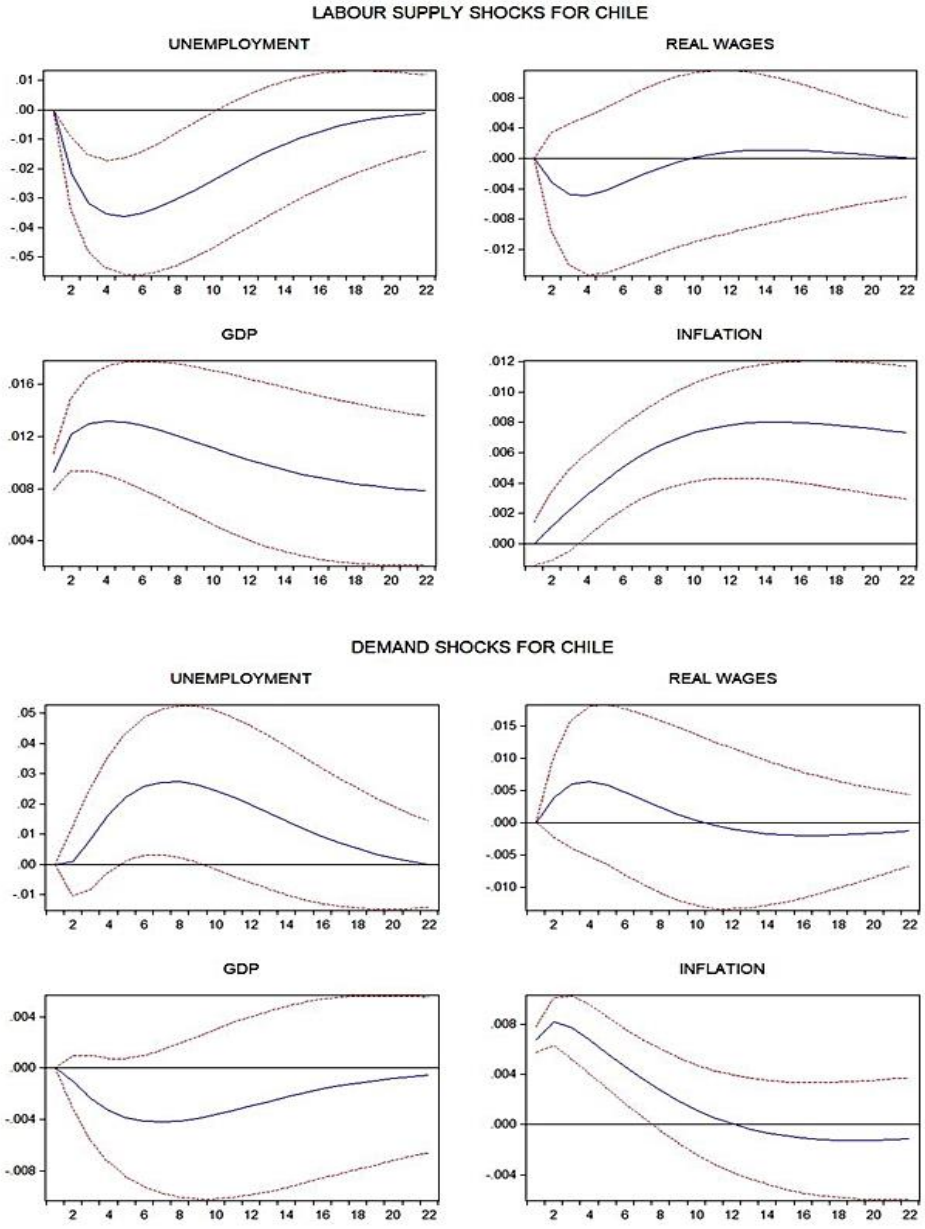

Figure 3.3.2: Labour Supply and Demand Shocks for Chile

What is fascinating in Figure 3.3.3, after a wage-bargaining shock, unemployment in Greece raises about 4 per cent approximately in 4 quarters but die out around after the 13th quarter. The real wage present insignificant upward tendency in the first four quarter but then reduces after a while. The response of inflation and output is in a sluggish pattern. The same type of impact seen such as in Chile that the productivity shocks shows the positive response for real wages but raises unemployment. A unit standard deviation in productivity shocks in Greece lead to

significant increase in real wages for short forecast horizon. Additionally, productivity shocks to real wage growth of Greece reduced roughly in six quarter period. The responses of output and inflation of Greece to productivity shocks have an adverse effect on economy.

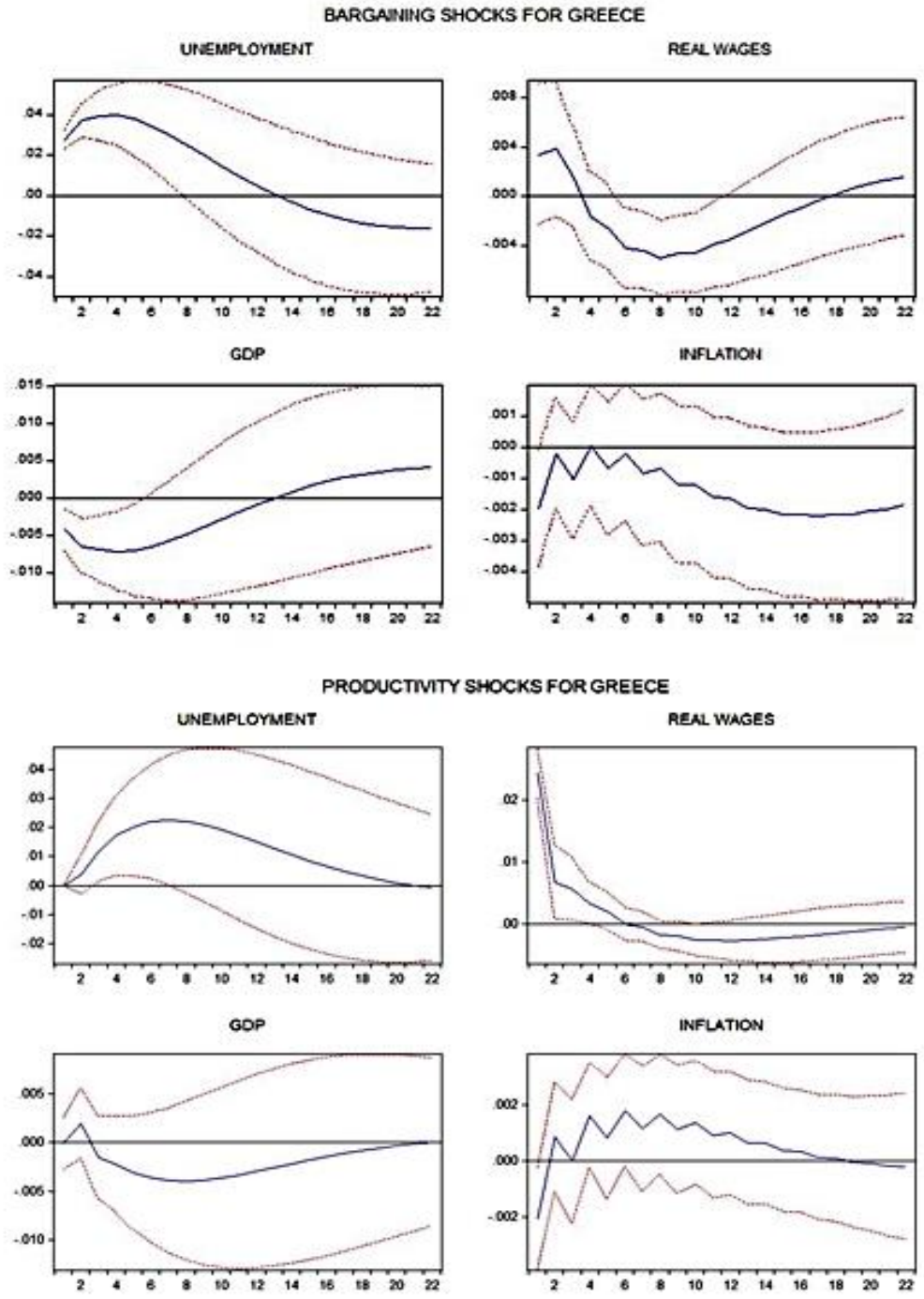

Figure 3.3.3: Wage-bargaining and Productivity Shocks for Greece

The response of unemployment and GDP variables of Greece positively react to labour supply shock, real wage and inflation are showing lagged responses which is economically logical. The response of Greece economy to a unit standard error demand shock is generating complex conditions for all the variables. Unit standard error labour supply shocks in Greece cause unemployment to fall about 5 per cent around the 12th period.

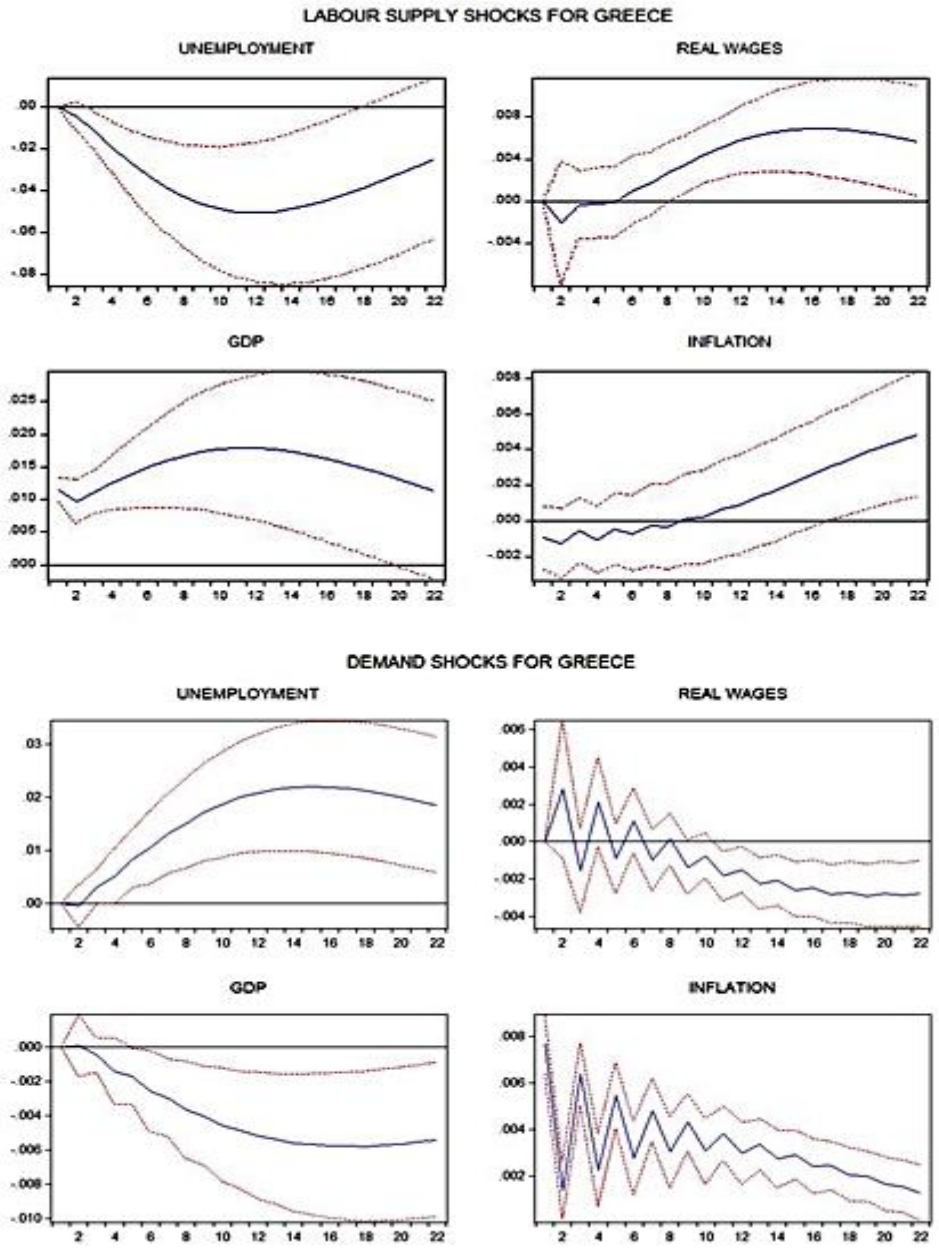

Figure 3.3.4: Labour Supply and Demand Shocks for Greece

The response of unemployment in Mexico to wage-bargaining shocks is visible and around six per cent in Figure 3.3.5.; Yet, other variables such as real wages, inflation and output not significantly swaying. After unit productivity shock hitting Mexico, the pattern of a trade-off between unemployment and real wages easily recognizable. The inflations response to productivity shows negative tendency that dying out by the time goes by.

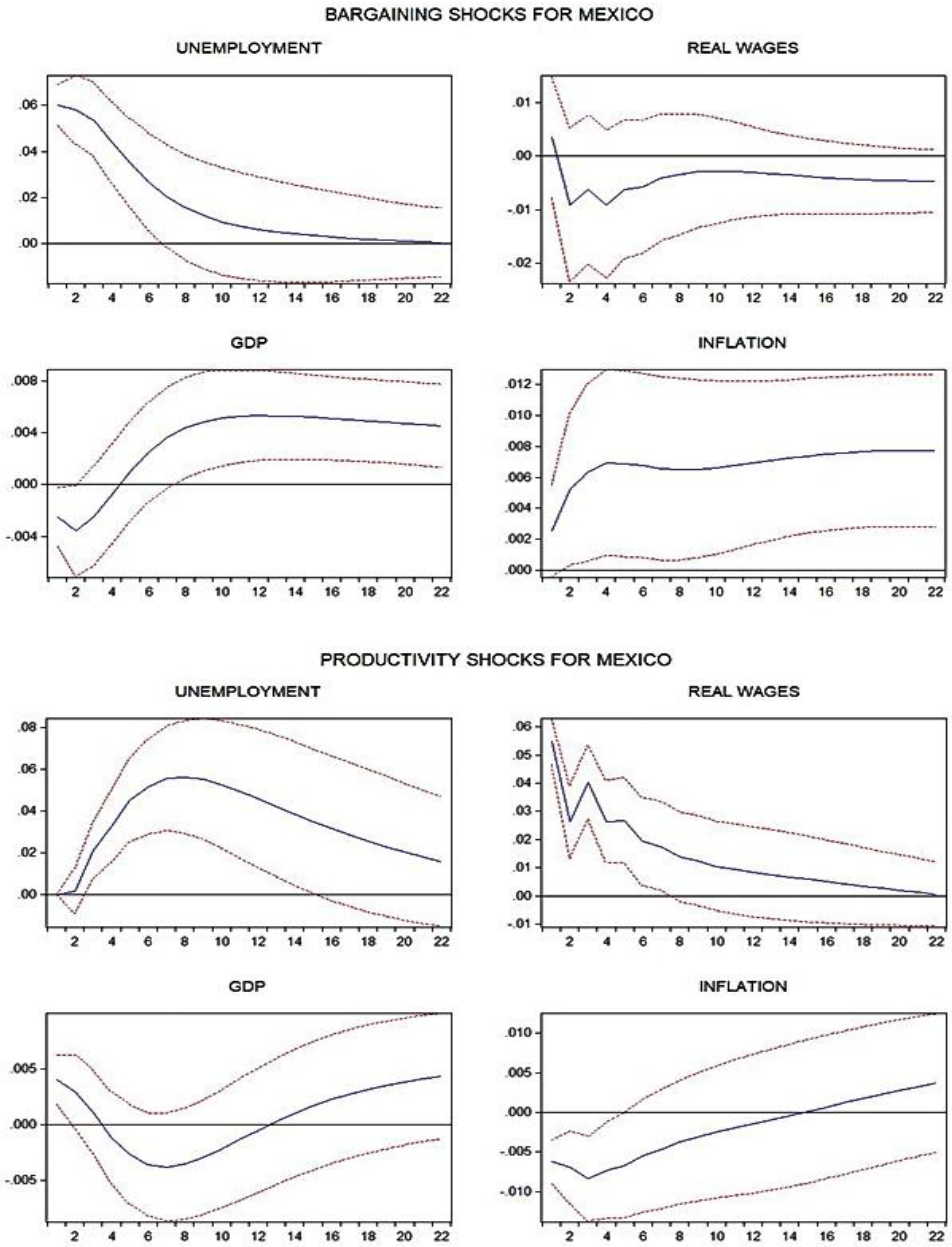

Figure 3.3.5 Wage-bargaining and productivity shocks for Mexico

It is apparent from the table 3.3.6 that labour supply shocks to Mexico die out approximately in ten quarters. Additionally, it reduces unemployment and inflation; meanwhile leads to an increase in real wages and output. In a case considering a demand shock to Mexico, the reaction of inflation and output is positive, while unemployment and real wages show a decreasing pattern.

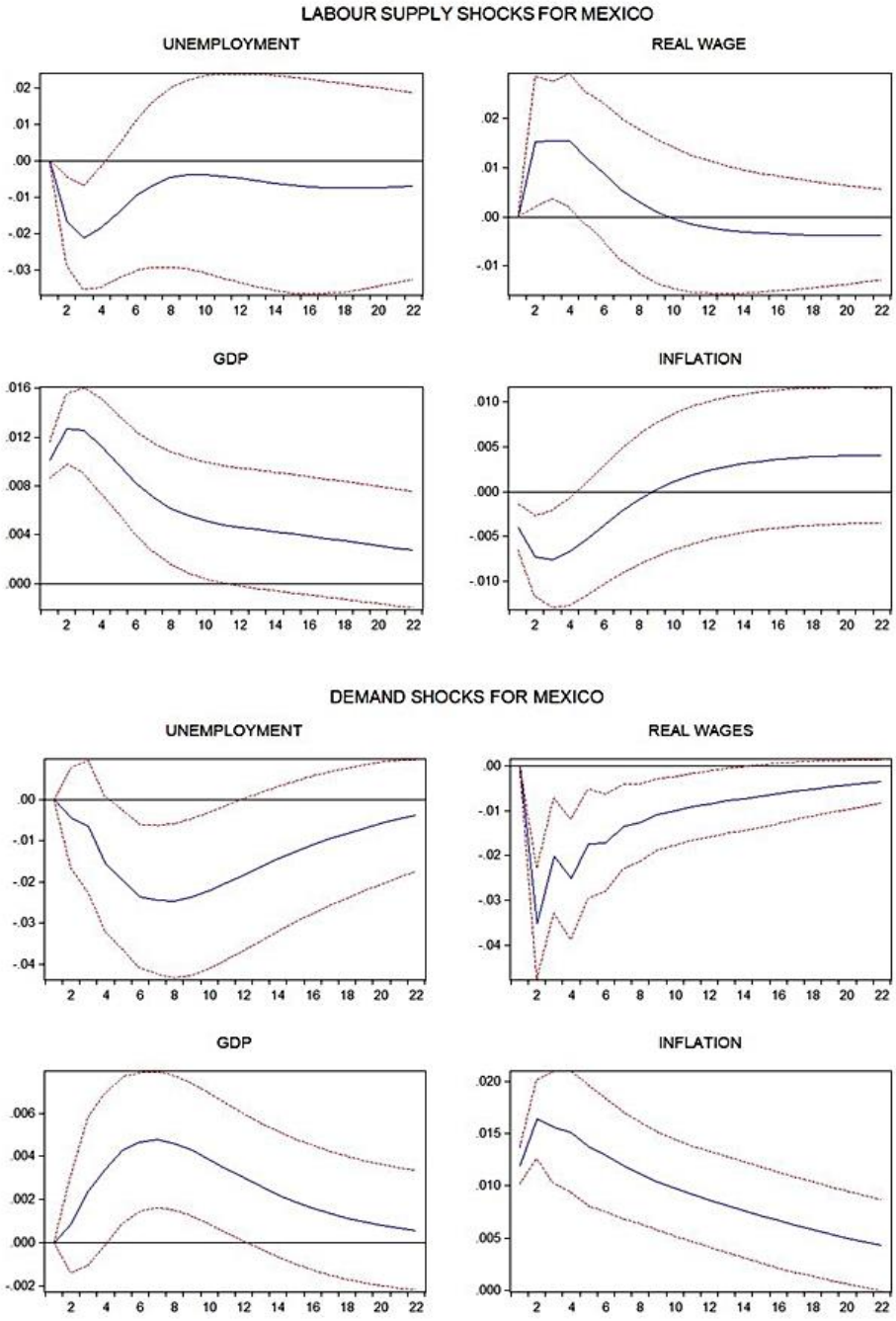

Figure 3.3.6: Labour Supply and Demand Shocks for Mexico

Unlike other four countries, unemployment in Russia reduces by productivity shocks in the inception period. Nonetheless, it again rises up after 12 quarters. The price level of Russia declines about 1.2 per cent, and output and real wages positively affected seen in Figure 3.3.7.

Despite one standard deviation shock by wage-bargaining hitting the economy, its impact on unemployment 0.5 points to increase, but the response of other variables is not sharp.

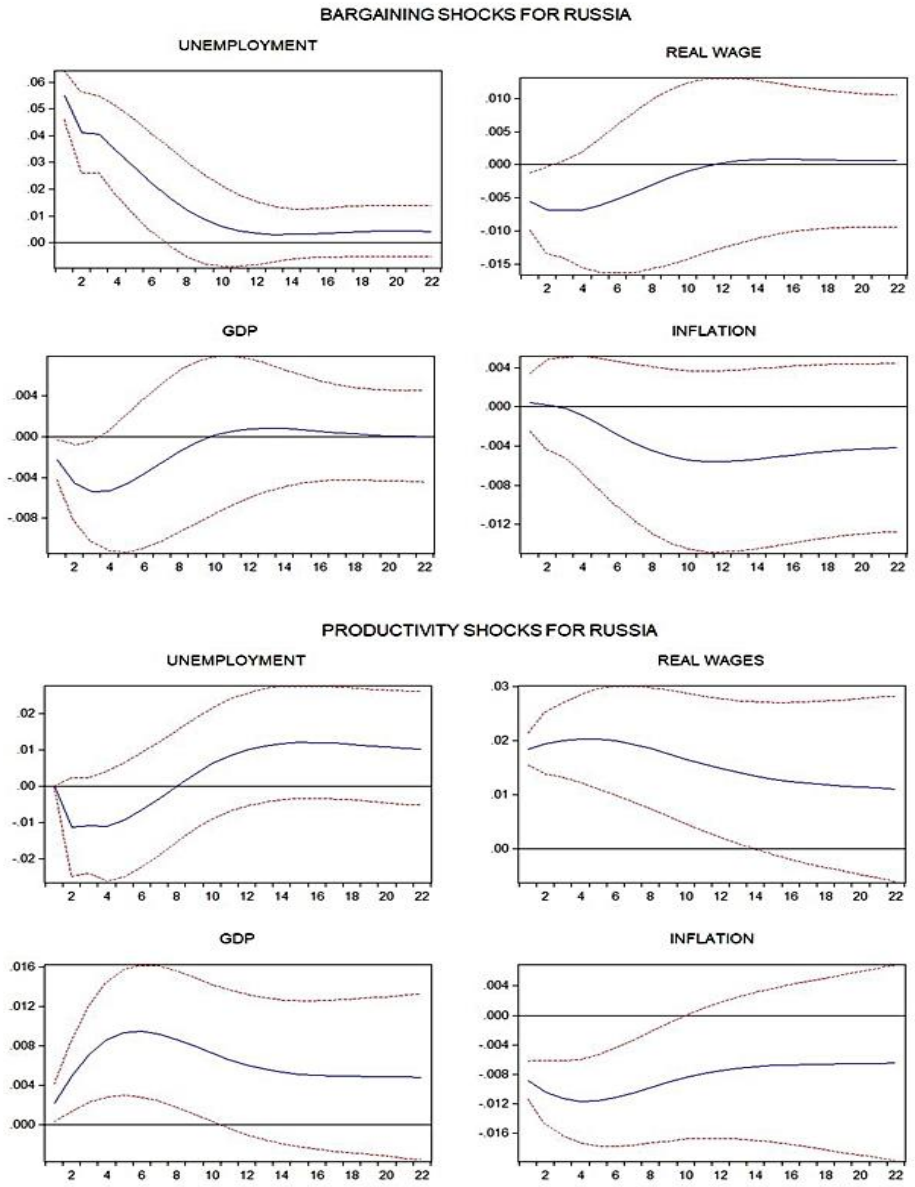

Figure 3.3.7: Wage-bargaining and Productivity Shocks for Russia

The impact of labour supply shocks in Russia arranged on Figure 3.3.8, that accompanied with a gain in real wages, inflation and output but lowers the unemployment. Unemployment rates falling in the first four quarters, but the influence falls about eighth quarters. The response of real wages topped in fifth lag. The response of inflation starts at the equivalent time that the real wage peaks, while it reaches to top nearby 10th-12th quarter. During the inflation reaches the top, the positive response on output disappears. However, there was no clear influence of demand shocks on the variables besides inflation. There is a minor tendency to reducing real wages and unemployment.

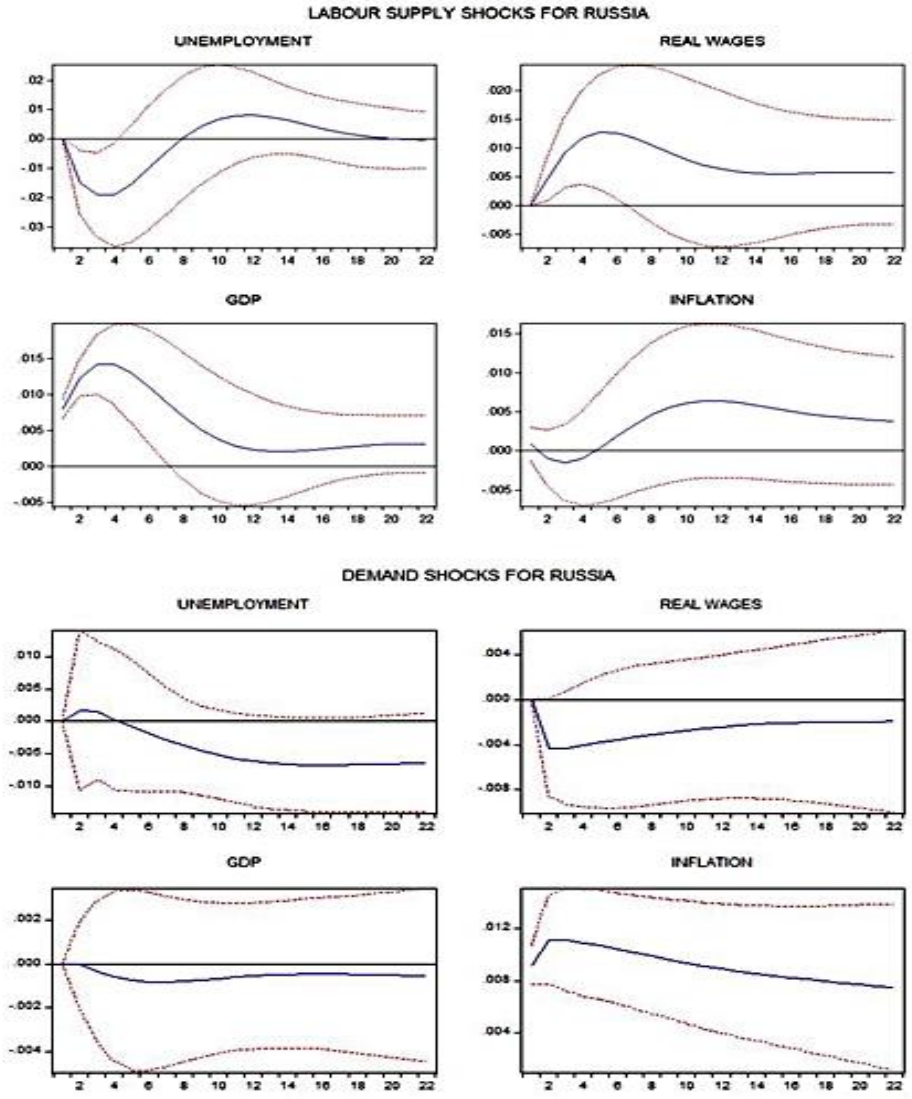

Figure 3.3.8: Labour Supply and Demand Shocks for Russia

Figure 3.3.9 shows that one standard deviation of a positive wage-bargaining shock for Turkey cause to raise 0.05 points in unemployment rates, 0.004 points in real wages; 0.005 points slump in inflation.

The underneath part of Figure 3.3.9, illustrate one positive standard deviation of productivity shock, creates a movement unemployment rates and real wages to increase but its impact on output and inflation is negative. The impact of productivity shock on real wages dies out in 5th forecast horizon.

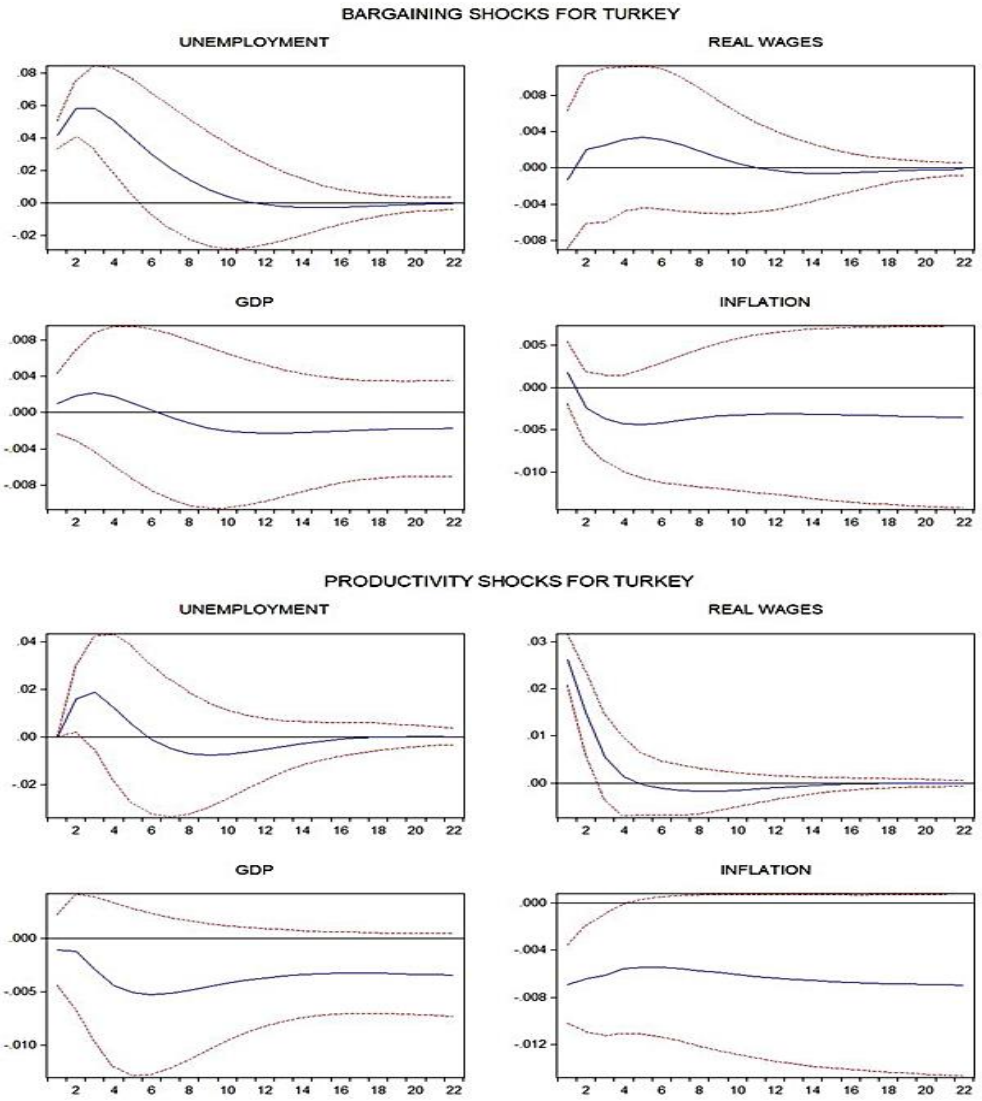

Figure 3.3.9: Wage-bargaining and Productivity Shocks for Turkey

As can be seen from Figure 3.3.10, the labour supply shocks cause all the variables reveals rising pattern. If the effects of shock indicated by approximate numbers: it raises unemployment rates 0.02 points, real wages 0.007 points, output 0.125 points and inflation 0.05 points.

The effect of unit standard deviation positive demand shock to Turkish Economy did not provide significant effects, except extra burden in inflation for small amount of time.

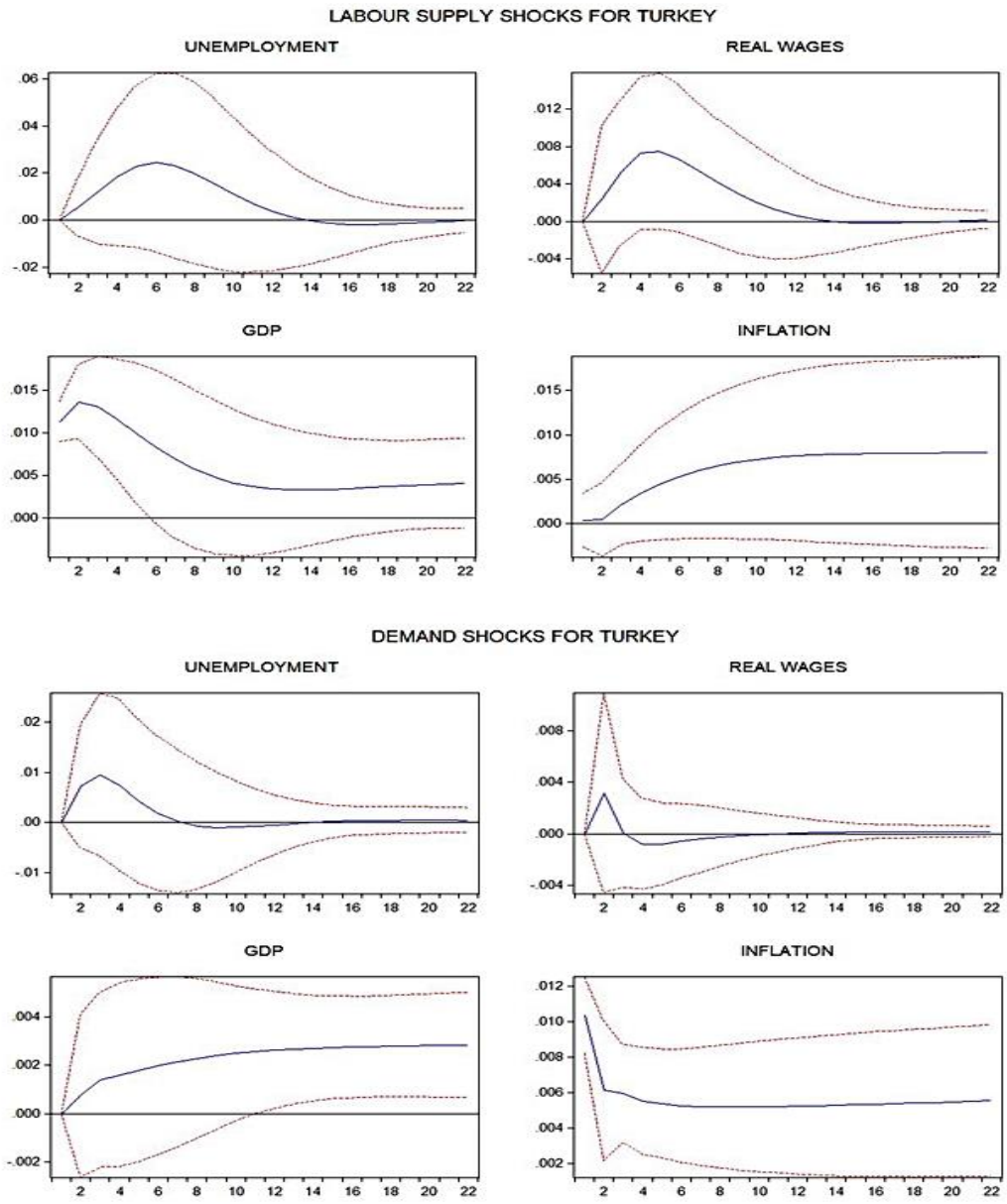

Figure 3.3.10: Labour Supply and Demand Shocks for Turkey

3.7 The Cyclicality of Real Wages in Subjected Countries

There was not an adequate association between unemployment and real wages (The FEVD). Nevertheless, it would be beneficial to share the propagation of the cyclical movements of real wages in each country. As can be seen in Figure 5.4.1 the cyclicality of real wages: -0.04 to +0.04 in Turkey; In Russia -0.059 to +0.073; excluding 1994 crisis period in Mexico -0.16 to + 0.15 points; In Greece between -0.076 to +0.073 points, In Chile -0.17 to -0.17 points.

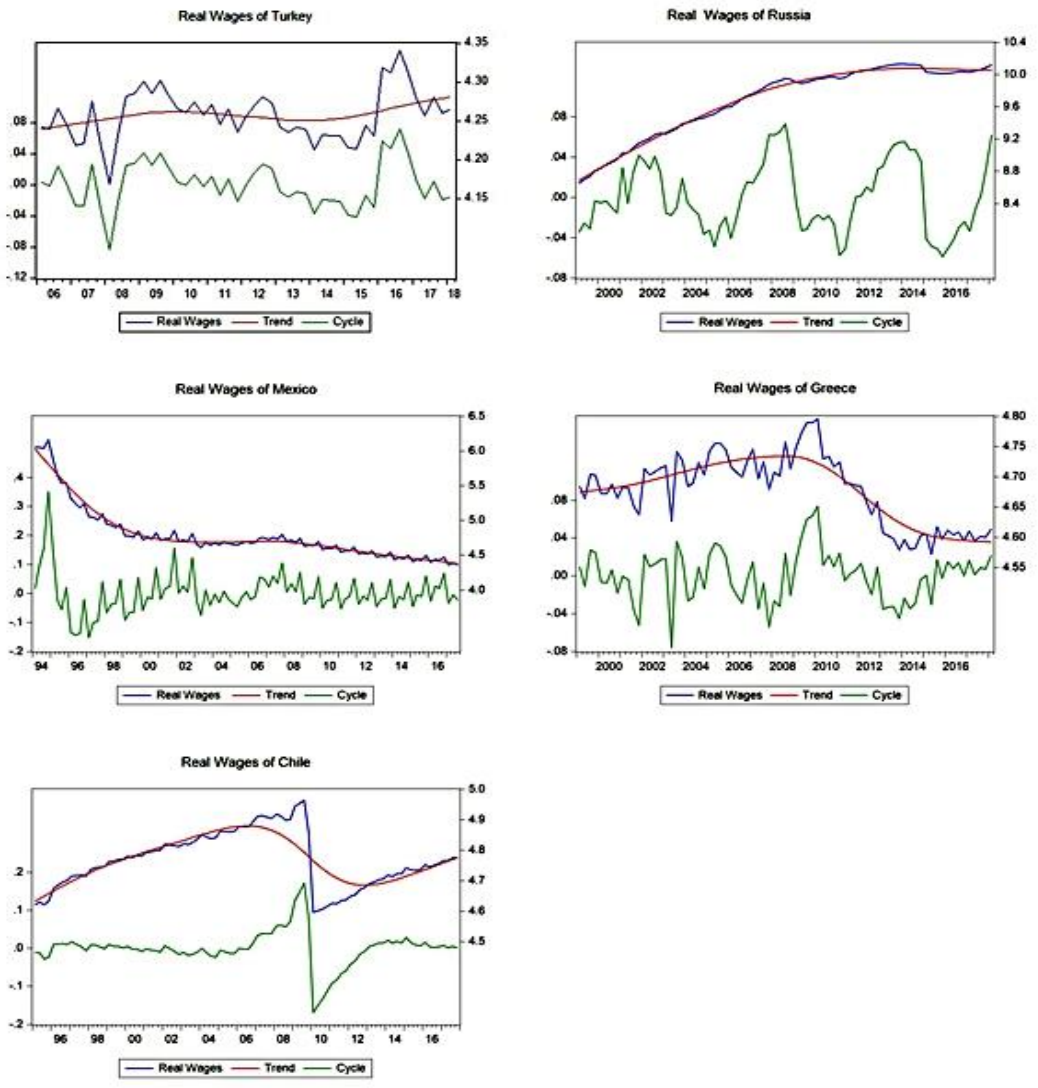

Figure 3.4.1: The Cyclicalities of Real Wages in CGMRT Countries.

4. CONCLUSIONS

This study set out to discover whether there is unemployment hysteresis or not by conventional unit root tests in Chile, Greece, Mexico, Russia and Turkey. After diagnosing the unemployment hysteresis in subjected countries, the structural vector autoregressions utilised according to the restrictions in 3.12. By applying the mentioned restrictions, the assessment of unemployment hysteresis by varying types of shocks become feasible.

The findings show that the source of fluctuations in unemployment for all subjected countries managed by supply-side (non-demand) shocks. The leading element for the variations in the unemployment rates in Russia and Turkey is wage-bargaining shocks. Moreover, two major determinants for unemployment changes in Chile is labour supply and wage-bargaining shocks. On the other hand, productivity shocks are the principal driving source for fluctuations unemployment in Mexico; However, labour supply shocks essential to explain the movements of unemployment in Greece.

The real wages fluctuations heavily driven by productivity shocks for Chile, Mexico, Russia and Turkey; separately for Greece, the substantial factors are both labour supply and productivity shocks. The wage-bargaining shocks made no significant difference in real wages for all subjected countries.

The massive contributor to FEVD of output is productivity (technology) and labour supply shocks for Russia, Mexico and Turkey, but for Chile and Greece, labour supply shocks are managing cause. The source of the labour supply shocks probably occurred by immigrational issues, boosting female participation to labour markets et cetera. The variability of inflation in Greece and Russia massively account for demand shocks, which is respectively 58% and 42%, however, for other nations non-demand factors are more efficient.

The impulse response functions of CGMRT countries generally exhibit economically consistent actions: productivity shocks present beneficial effects for all variables of Russia but causes an initial rise in unemployment in Chile, Greece,

Mexico and Turkey could be a sign that technology generates crowding out effect on a low skilled labour force of these countries. The innovations to wage-bargaining could be interpreted adverse shocks for all CGMRT countries. Moreover, labour supply shocks create positive effects with a small amount of rising in inflation on Chile, Greece, Russia and Mexico, but it produces controversial results for Turkey with a tendency to grow in all variables. Apart from Mexico and Russia the responses to demand shocks were complex and did not create significant economic conclusions.

The key strengths of the present study that the findings reported here shed new light on the sources of unemployment hysteresis and provided deeper insight into existing knowledge. Before this study, the utmost of the studies solely based on unit root tests with personal suggestions. The evidence from this study provides empirical evidence that healing unemployment hysteresis better attainable by focusing on supply-side strategies increasing productivity (Not Keynesian Recipe). By saying Keynesian Recipe, this study does not suggest expansionary fiscal policies to cure unemployment problem like developed countries. It is an economic policy implemented by a state to provide full employment in the context of deficiency of demand. There are two suggestions for countries struggling with unemployment hysteresis that they should imply education politics to avoid mismatch in the market, also should increase the quality of the labour force. Second, instead of triggering consumption behaviour of households, it is better to apply long-run investment and capital accumulating policies. The limit of this study is the identification of the wage-bargaining shock as main factor leading the real wage movements of subjected countries. Also, there are not influential cyclical movements on real wages of the subjected countries and not a strong link with unemployment hysteresis.

In terms of future work, it would be interesting to study whether technological innovations create crowding out effect on the labour force causing unemployment hysteresis and repeat the application described here with other countries or other SVAR models.

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