TITLE: REAL WAGES, INFLATION AND LABOR PRODUCTIVITY: AN EVALUATION WITHIN

TURKISH CONTEXT

AUTHORS: Filiz ERYILMAZ,Hasan BAKIR

PAGES: 1946-1959

ORIGINAL PDF URL: https://dergipark.org.tr/tr/download/article-file/588359

REAL WAGES, INFLATION AND LABOR PRODUCTIVITY: AN EVALUATION WITHIN TURKISH CONTEXT

Filiz ERYILMAZ[1]

Hasan BAKIR[2]

Abstract: Nowadays, where being competitive is considered equal to productivity, productivity and factors affecting productivity constitute a popular discussion area. Hence, as the relevant literature is reviewed, it was observed that attention focuses on labor productivity and on the relationship between wages and inflation, which are considered as the factors that affect the productivity. In this study, while cointegration test of Johansen (1988) and Johansen/Juselius (1990) was used to investigate whether there is a long-term relationship or not between real wages, productivity and inflation in Turkey during the period 1988-2012, the direction of this relationship was examined via the Vector Error Correction Model (VECM). The results demonstrated a long-term relationship between all three variables and the direction of this relationship in the long-term was determined as, from productivity and inflation towards the real wages. Moreover, in short-term, a causality relationship was determined both from inflation to real wages and from inflation to productivity. On the other hand, the identification of the negative effect of the crises on productivity is one of the important results reached by this study.

Keywords: Labor Productivity, Real Wages, Inflation, Cointegration Analysis, VECM.

Reel Ücretler, Enflasyon ve İşgücü Verimliliği: Türkiye Bağlamında Bir Değerlendirme

Özet: Rekabetçi olmanın verimlilikle eş tutulduğu günümüzde çağda verimlilik ve verimliliği etkileyen faktörler popüler bir tartışma alanını oluşturmaktadır. Nitekim ilgili literatür incelendiğinde dikkatlerin emek verimliliği ve verimliliği etkileyecek faktörler olarak görülen ücretler ve enflasyon arasındaki ilişkide toplandığı gözlenmiştir. Bu çalışmada 1988-2012 döneminde Türkiye'de reel ücretler, verimlilik ve enflasyon arasında uzun dönemli ilişki olup olmadığı kointegrasyon analizi araştırılırken söz konusu ilişkinin yönü Vektör Hata Düzeltme Modeli (VECM) ile incelenmiştir. Çalışma sonucunda her üç değişken arasında uzun dönemli ilişki olduğu görülmüş ve uzun dönemde söz konusu ilişkinin yönünün verimlilik ve enflasyondan reel ücretlere doğru olduğu tespit edilmiştir. Yine kısa dönemde de hem enflasyondan reel ücretlere hem de enflasyondan verimliliğe doğru bir

[1]Sorumlu Yazar Dr. Öğr.Üyesi Filiz Eryılmaz, Uludağ Üniversitesi, İİBF Fakültesi, İktisat Bölümü, filizgaygusuz@gmail.com, http://orcid.org/0000-0002-3010-8421
[2]Dr. Öğr.Üyesi Hasan Bakır, İstanbul Kültür Üniversitesi, İİBF Fakültesi, Uluslararası Ticaret Bölümü, hasanbakir16@gmail.com, http://orcid.org/0000-0002-8248-6643

_____

nedensellik ilişkisi olduğu tespit edilmiştir. Öte yandan Türkiye'de yaşanan krizlerin verimliliği azaltıcı etkisinin belirlenmesi de bu bağlamda çalışmanın ulaştığı önemli sonuçlardandır.

Anahtar Kelimeler: *Emek Verimliliği, Reel Ücretler, Enflasyon, Kointegrasyon Analizi, VECM*

1. INTRODUCTION

One of the most widely used concept in combination with the process of globalization is competition. The growth and development of both the companies and the countries are related to how much of a competitive structure they have. The existence of such competitive structure is related to how effective they use the resources in hand, consequently their productivity. Therefore, productivity and factors affecting productivity became one of the important debates today. In this study, the aim was to investigate the relationship between real wages, inflation and labor productivity. Understanding this relationship is important in terms of creating the competitive structure by increasing productivity, accordingly of introducing a perspective towards the provision of sustainable economic development.

The relevant literature is composed of studies that deal with the analysis of labor productivity-real wages, labor productivity-inflation or all of these three variables together (Ram, 1984; Wakeford, 2004; Straus and Wohar, 2004; Christopoulos and Tsionas, 2005; Narayan and Smyth, 2009; Kumar et al., 2012). Again, the relevant literature associates labor productivity negatively with inflation, positively with real wages. Indeed, inflation is a variable that negatively affects both the motivation and efforts of employees and the investment decisions of firms. A raise in real wages increases the opportunity cost of job loss, hence makes the employees to exhibit greater efforts in order to not to lose their job. This increasing effort brings along increased efficiency. This approach is called as *efficiency-wage type hypothesis*. On the other hand, an escalation experienced in real wages causes a cost increase for companies, and this increase drives the companies to use more capital rather than labor. This increase in the amount of capital per employee would provide an increase in the marginal productivity of labor.

This study aims to examine the relationship between real wages, inflation and labor productivity in Turkey's economy by using time series analysis techniques. The study consists of four parts. In the second part of the study, the theoretical relationship between productivity, real wages and inflation will be explained, and in the third part, literature review will be presented. Subsequent to addressing the econometric methodology in the fourth part, fifth part covers the data and empirical results, and the results will be discussed in the final section.

2. THE THEORETICAL RELATIONSHIP BETWEEN PRODUCTIVITY, REAL WAGES AND INFLATION

The survival of the companies is associated with their competitive structures, in today's global era. The highlighted points here become the quality products and low cost. In the framework of reducing costs, appears the productivity concept. In this scope, the determination, which addresses that productivity and increase in competitive capacity at company level would contribute to the increase of the country's competitive structure in international context and thus contribute to the increase in welfare, is important (Pazarlıoğlu and Çevik, 2007, p. 2; Eryılmaz and Eryılmaz, 2015, p. 601).

Therefore, productivity and the factors affecting productivity became an area that attention was focused on. In this context, various studies were conducted on the relationship between productivity, inflation and the real wages. The studies that use different data sets and sample space (Hondroyiannis and Papapetrou, 1997; Strauss and Wohar, 2004; Narayan and Smyth,

_____

_____

2009; Kumar et al., 2012; Tang, 2014) provided significant contribution to literature (Kumar et al., 2012, p. 2946).

2.1. Literature Review on the Relationship between Inflation and Productivity

As a result of studies carried on the relationship between inflation and productivity demonstrated a negative relationship (Jarretti and Selody, 1982, p. 361; Clark, 1982, p. 149; Ram, 1984, p. 472; Kumar, 2012, p. 2945). Certainly inflation brings the accumulation of capital to a standstill by reducing the incentive to work. These developments lead to a decrease in productivity (Jarret and Selody, 1982, p. 361-362; Kumar et al., 2012, p. 2946). In addition, inflation is indicated to reduce labor productivity by causing inefficient mix of factor input, impairing the informative function of price signals, forcing the companies to make inefficient buffer stocks and to reduce research expenditures in the long-term, eroding tax reductions (Clark, 1982; Narayan and Smyth, 2009, p. 1286; Tsionas, 2003a, p. 114).

As the analyses conducted on the relationship between inflation and productivity in the literature was reviewed, it was observed that the different results were obtained. Ram (1984) conducted a study on inflation and productivity in the United States for years 1953-1982. In this study, it was identified that inflation has an adverse effect on productivity. This effect exhibited itself as a reduction in the total output and an increase in working hours. Freeman and Yerger (2000), in their study, examined the effect of inflation on labor productivity taking into account 12 OECD countries and indicated that the obtained results did not support the general conviction that the decline in inflation increased labor productivity. Bitros and Panas (2001) examined the effect of inflation on the total factor productivity for the Greek manufacturing industry in the years 1964-80 by using time series data of inflation and concluded that inflation decreased the total factor productivity. Tsionas (2003a; 2003b) scrutinized the existence of a long-term relationship between inflation and productivity focusing on 15 European countries between the years 1960 and 1997, and reached the conclusion that there was no long-term relationship between inflation and productivity in many cases. Mahadevan and Asafu-Adyaje (2005) established that inflation causes a negative effect on productivity due to the panel data analysis they conducted for five key mining sectors in Australia. It was as well concluded that the direction of the relationship was unidirectional from inflation to productivity. Similarly, Clark (1982), Buck and Fitzroy (1988) and Dritsakis (2004) reached to the conclusion that the direction of causality is from inflation to productivity. In their research on the Turkish manufacturing industry, Ulusoy et al. (2008) determined a negative and statistically significant negative relationship between inflation and productivity. Yıldırım (2015) found that the relationship between inflation and productivity is negative in the analysis conducted on the Turkish manufacturing industry, thus determined that the decline in inflation positively affects the labor productivity. In addition, Yıldırım (2015) argued that a strong and interacting causality exists between these two variables.

2.2. Literature Review on the Relationship between Real Wages and Productivity

The relationship detected between the real wages and productivity are generally positive (Wakeford, 2004, p. 130; Kumar, 2012, p. 2945). Since the increase in real wages causes labor to become expensive as a cost factor, the investors are directed to labor savings. Therefore, labor is substituted with capital, and the increase in capital stock caused an increase in the marginal productivity of labor. On the other hand, the accumulation experienced in the capital stock again brings forward the labor demand and this has a positive contribution to real wages (Kumar et al., 2012, p. 2946).

_____

_____

Another determination on the assumption that an increase in real wages increases the labor productivity is called the *efficiency-wage type hypothesis.* Higher or in other terms efficiency wages rather than the market-determined wages offered by companies are investigated on the basis of four micro-economic models. The first model, named as *the adverse selection model,* aims to provide a skilled workforce for a company. Labor markets consist of heterogeneous individuals who are informed about their capabilities and companies that are imperfectly informed about the ability of these individuals. As a solution to this asymmetric information, employers would like to include skilled labor to their companies by paying higher wages. The second model is *the labor turnover model.* In this model, the companies offer higher wages in order to reduce the labor turnover costs. Thus, the employee requests to quit jobs would be reduced. The third model is *the shirking model.* The companies aim to decrease the shirking desire of their employees by providing higher wages. Firms are intended to decrease the work of its employees out of work requests by higher wages. The fourth model used to explain the efficiency wage as a sociological factor is *the fairness model.* In this model, it is expressed that low wages have a negative the effect on the motivation of the workers, where a fair wage increases the morale and motivation of employees (Akerlof, 1982, p. 543; Akerlof, 1984, p. 79; Yellen, 1984, pp. 201-204; Snowdon and Vane, 2005, pp. 388-391).

While Alexander (1993) could not identify a relationship between wages and productivity between 1955 and 1979 in the UK, in the latter years, with Thatcher, reached to results which are in conflict with the efficiency-wage type model. Erenburg (1998) examined the relationship between the real wages and productivity in the United States between the years 1948 and 1990. Erenburg concluded that in case of a fixed public capital stock, both the real wage and the productivity increased. Strausss ve Wohar (2004) argued that unidirectional granger causality existed between the real wages and productivity based on their study conducted on the US manufacturing industry. In addition, they noted that the change in real wages causing a difference in productivity is in line with the hypothesis of efficiency wages. Tang (2014) obtained results that support efficiency wage theory in Malaysia. Taymaz et al. (2014) determined that the direction of causality is from real wages to productivity in the analysis they conducted for Turkey. In addition, Yıldırım (2015) reached the conclusion that the effect of inflation on labor productivity in Turkish manufacturing industry is higher than that of real wages.

2.3. Literature Review on the Relationship between Inflation, Real Wages and Productivity

There are numerous studies, both in national and international literature, on productivity, real wages and inflation. Majority of these studies examine the causal relationship between these three variables. In this regard, since these analyses are conducted on different countries and country groups, obtaining different results becomes an important issue. Hondroyiannis and Papapetrou (1997) studied the relationship between inflation, productivity and real wages in Greece by using quarterly data sets between the years 1976 and 1992. They proved that a long-term relationship exists between these three variables. Moreover, they emphasized that the effect of real wages on productivity was not clearly evident, while making the determination that inflation had negative impact on productivity in short-term. Strausss ve Wohar (2004) examined the relationship between inflation, real wages and productivity in the US manufacturing industry between the years 1956 and 1996, by using panel analysis technique. Their results indicated a long-term relationship between inflation-productivity and real wages-productivity in many industries. Narayan and Smyth (2009) analyzed the long-term effects of inflation and real wages on productivity for G7 countries between the years 1960 and 2004, by using panel cointegration technique. While they determined a positive and statistically significant relationship between real

_____

_____

wages and productivity, they could not find a statistically significant relationship between inflation and productivity.

Kumar et al. (2012), in their study examining real wages, inflation and labor productivity in Austria between the years 1965 and 2007, obtained the result that increase in wages caused increased productivity and they indicated that inflation had a weak and negative effect on productivity. Tang's (2014) study conducted for Malaysia between the years 1970 and 2007 indicated a significant long-term relationship between real wages, labor productivity and inflation. Tang suggested that while the effect of inflation on productivity was negative, the effect of real wages on productivity exhibited a non-linear relationship. Yıldırım (2015) examined the effect of real wages and inflation on productivity for Turkish manufacturing industry. Analysis led to results that are consistent with the theoretical literature and inflation caused a larger effect on productivity than that of real wages.

3. DATA AND EMPIRICAL RESULTS

This study examines whether there is a long-term relationship between real wages, inflation and productivity variables in Turkey in 1988Q1-2014Q2 period, through the *cointegration test of Johansen (1988) and Johansen/Juselius (1990).* If there is a long-term relationship between the variables, the direction of this relationship will be determined with the help of causality analysis based on the *Vector Error Correction Model (VECM).* As it is well known, the unit root analysis of the series should be conducted before the cointegration analysis. According to the results of the unit root test the degree of integration of the variables were found to be the same, in other words the series were determined as stationary at the same degree, therefore the cointegration analysis could be carried out to investigate whether there is a long-term relationship between the variables or not. *ADF, Philips-Perron and KPSS unit root tests* were used in this study in order to investigate if the series are stationary or not. Since the econometric methodology on unit root tests are known in detail in literature, this study will not cover the methodological description of these tests. After determining whether or not the series were stationary, the presence of a structural break in the series will be investigated. It is well known that structural changes could occur in the time series due to reasons such as economic crisis, natural disasters, political instability and policy changes (Günay, 2014, p. 6307; Yılancı and Öztürk, 2010, p. 265; Nazlıoğlu et al., 2014, p. 319; Nazlıoğlu et al., 2015, p. 281). In order to increase the the accuracy and reliability of the estimates in econometric analyses, the abovementioned breaks should be included in models (İlgün, 2010, p. 242; Eryılmaz and Eryılmaz, 2011, p. 51). In this study the presence of a structural break will be determined by the multiple structural breaks test developed by *Bai and Perron (2003).*

The logarithms of the quarterly data for the 2014Q2-1988Q1 period is used. Seasonally adjusted real wages and productivity series were obtained from the Federal Reserve Bank of St. Louis (FRED). On the other hand, since the consumer price index (CPI), which is again obtained from FRED and is not seasonally adjusted, did not exhibit any seasonal effect, there was no need for any seasonal adjustment. In this study, productivity index (production/hours worked) for the manufacturing industry in 2010 was used to represent the productivity variable, hourly earnings index again for the manufacturing industry in 2010 was used to represent the real wage variable and finally consumer price index (CPI) was used for inflation. In conducting the empirical analysis for the study, EViews 9 software package was utilized.

In order to be able to examine the cointegration relationship between the series via Johansen cointegration analysis, the series have to be stationary at the same degree. For this reason, primarily, the series will be examined via unit root analysis in order to understand at what degree

_____

_____

stationary they are. Unit root analyses at level and first degree differentials for the series are presented in Table 1.

Tablo 1. Unit Root Tests of Inflation, Productivity and Wage

Variables	ADF	Philips-Perron	KPSS
Inflation	-1.94 (-3.45)	-1.76 (-3.45)	0.26 (0.14)
Productivity	-3.25 (-3.45)	-3.15 (-3.45)	0.21 (0.14)
Wage	0.68 (-3.45)	0.76 (-3.45)	0.31 (0.14)

Note: Values in brackets represent the critical values that belong to the 5% level. While the lag lengths in ADF test are determined according to the "*Schwarz Information Criteria (SIC)*", in Philips-Perron and KPSS tests *"Barlett Kernel"* method and bandwith *"Newey West Bandwith"* method were used. As the hypotheses that belong to the ADF and Philips-Perron tests are; H_0: Series have unit root and H_1: Series do not have unit root, the hypotheses that belong to the KPSS test are; H_0: Series do not have unit root and H_1: Series have unit root. In addition, while the level values for the *"fixed"* and *"not-fixed and without trend"* values that belong to the ADF, Philips- Perron and KPSS tests include unit root, the first degree differentials are stationary.

When Table 1 is examined, it is possible to observe that the series are non-stationary at their level values for the three different unit root tests performed for all three series. Therefore, primarily, first degree differentials of the series were retrieved. Consequently, according to the results of the three unit root tests for the first degree differentials of the series, the series were decided to be stationary at their first degree. If the time series that are non-stationary are integrated at the same degree, a presence of a correlation between the series could be mentioned and the regression between them would not be false. As Table 1 is scrutinized, according to the ADF, PP and KPSS tests, it was determined that the series were same degree, in other words were integrated at I (1) level. Therefore, it is possible to analyze whether there is a cointegrated relationship between the variables.

Before moving to the analysis that whether a cointegration relationship exists between the series, Bai and Perron (2003) multiple structural break test was performed in order to understand if there is structural break in the series. The maximum number of breaks was determined as four, since Turkey's economy was largely affected by the 1994 crisis, November 2000 and February 2001 crises, and the 2008 global economic crisis, during the relevant period. Bai-Perron (2003) multiple structural break test results for the series is presented in Table 2.

_____

_____

Tablo 2. Bai-Perron (2003) Multiple Structural Break Test Results

Series Statistics	Inflation	Productivity	Wage
supF$_t$ (1)	2.577146*	14.95056*	7.869083*
supF$_t$ (2)	10.88707*	175.1789*	2.405811*
supF$_t$ (3)	21.23407*	174.2704*	7.349194*
supF$_t$ (4)	13.16829*	206.6052*	4.303581*
UDMax	21.23407*	206.6052*	7.869083*
WDMax	30.56851*	355.24.50*	10.57988*
supF$_t$ (2|1)	324.0894*	84.07477*	351.3559*
supF$_t$ (3|2)	273.9431*	76.88375*	102.6684*
supF$_t$ (4|3)	20.57945*	39.53787*	30.65718*
Break Dates			
T_1	1995Q2	1991Q4	1996Q3
T_2	1991Q1	1999Q1	2000Q4
T_3	2002Q2	2005Q3	2005Q2
T_4	2008Q4	2009Q4	2010Q2

*Significant at the 95% confidence interval.

As Bai and Perron test results in Table 2 are analyzed, it is possible to observe that all three series have structural breaks. For the squared and absolute returns in Table 2; sup $FT(l)$ test statistics' zero hypothesis that state no breaks was rejected against the alternative hypothesis up to four breaks at the 95% confidence interval. In addition, zero hypothesis of the UDmax and WDmax tests, which state no breaks, is rejected against the alternative hypothesis which indicates the presence of maximum m breaks at the 95% confidence interval. As a result, Table 2 suggests that two structural breaks against one structural break, three structural breaks against two structural breaks, four structural breaks against three structural breaks were not rejected. In this case, in inflation series breaks were observed in the years 1995, 1999, 2002 and 2008, in productivity series in 1991, 1999, 2005 and 2009, and in the wage series breaks were observed in the years 1996, 2000, 2005 and 2010. Subsequent to the presence of breaks in the series, a dummy variable was created for these breaks and was included in the cointegration analysis. Since the periods 1991Q4, 1995Q2, 1996Q3, 1999Q1, 2000Q4, 2002Q4, 2005Q2, 2005Q3, 2008Q4, 2009Q4, 2010Q2 were considered the break dates for the abovementioned crisis dummy variable, its value was assigned "1" for these periods and "0" for other periods for including it within the cointegration analysis. By this means, the structural breaks in the series are taken into consideration.

In this study, the presence of cointegration relationship was tested by the cointegration analysis based on the Johansen (1988) and Johansen/Juselius (1990) method. In order to test cointegration through this method, first it is necessary to decide the most appropriate VAR model (Erdinç, 2008, p. 219). In this study, the variables vector in the VAR model is y [Productivity Inflation Wage Dummy]. The number of lag in the VAR analysis was determined as one via the LR, FPE, AIC, SC and HQ criteria. The suitable number of lag was found as 3 for VAR model. It is seen that the number of lag does not carry the problems of autocorrelation, heterodecasticity. And it also provides condition of stability and normality. Thus, presence of a cointegration is

_____

_____

investigated through the Johansen methodology, by using the estimated VAR equation. According to the cointegration test, the most appropriate model is model 4, which is a VAR model Intercept and trend in CE-no intercept in VAR, and it is determined according to the Pantula Principle. Table 3 presents the results for the cointegration test.

Table 3. Results of the Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)					
	Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
	r= 0	0.376179	113.1850*	63.87610	0.0000
	r≤ 1	0.343537	65.05205*	42.91525	0.0001
	r≤ 2	0.137408	22.12131	25.87211	0.1366
	r≤ 3	0.066731	7.044346	12.51798	0.3399
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)					
	Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.
	r= 0	0.376179	48.13296*	32.11832	0.0003
	r≤ 1	0.343537	42.93074*	25.82321	0.0001
	r≤ 2	0.137408	15.07696	19.38704	0.1895
	r≤ 3	0.066731	7.044346	12.51798	0.3399

Note: * Shows that zero hypotheses are rejected at the 5% significance level. r= Number of cointegration vector. Lag length is taken as 3 according to the AIC criterion.

According to both the Trace test statistics and the Maximum Eigenvalue test statistics test results in Table 3, it is accepted that there are two cointegrated vectors. Therefore, according to both the Trace test statistics and the Maximum Eigenvalue test statistics, there is cointegration relationship between inflation, wage and productivity variables and thus, there is a long-term relationship between these three variables.

After confirming a long-term relationship between the variables, the long-term coefficients obtained from the Johansen Cointegration test for the variables, in the case that the dependent variable is productivity, are presented in Table 4. In the light of Hondroyiannis and Papapetrou (1997), Strauss and Wohar (2004), Kumar et al. (2012) and Yıldırım (2015), the long-term empirical model in this study is specified as follows;

$$productivity_t = \alpha_0 + \alpha_1 wage + \alpha_2 \inf lation + \alpha_3 Dummy + \varepsilon_t \qquad (8)$$

In Equation (8), the dependent variable is productivity, while independent variables are real wages, inflation and dummy and ε_t is the error term. In this equation, α_1 coefficient indicates the long-term elasticity of productivity in relation to real wages. α_1 is theoretically expected to be

_____

_____

positive. α_2 coefficient, on the other hand, represents the long-term elasticity of productivity in relation to inflation and it is theoretically expected to be negative. Finally, α_3 shows long-term elasticity of productivity in relation to crisis and is theoretically expected to be negative.

Tablo 4. Long-Term Elasticity

Independent Variables	Long-Term Coefficients
Inflation	-1.622099 (0.22261)
Wage	1.519138 (0.21565)
Dummy	-4.051941 (5.24038)

Note: In this model the dependent variable is productivity. The values in brackets are t statistics.

According to the results in Table 4, it is observed that the effect of inflation and real wages on productivity in the long-term is coherent with the theoretical expectations, yet is statistically insignificant. The meaning of such a result is that real wages and inflation does not have an effect on productivity in the long-term. The determination that real wages have no effect on productivity in Turkey legitimizes those who are critical to the subject in this context. Hence, in these critical approaches, the determination that real wages decrease as the labor productivity increases in Turkey (Onaran, 2000; Onaran, 2012) is in conflict with the efficiency wage theory. On the other hand, the outcome that the effect of inflation on productivity is statistically insignificant coincide with the determination of Freeman and Yerger (2000). Hence, Freeman and Yerger argued that it is possible to mention the productivity-decreasing effects of inflation, yet these effects are considerably low and to discern the data is challenging in this context. It is observed that the dummy coefficient, which is the dummy variable that represents the break dates obtained from the Bai-Perron (2003) multiple structural break test, has a statistically significant and negative effect. According to this result, the determined break dates could be mentioned to decrease productivity in the long-term. When it is considered that the abovementioned break dates occur right after the years of crisis, it is possible to assert that economic crisis in Turkey have a highly influential effect on decreasing productivity in the long-term. The results obtained for the long-term relationship are in accordance with the Turkish research literature.

For determination of causality between the variables, causality results based on VECM are presented in Table 5. F statistical values obtained from the Wald test performed together on the explanatory variables for each variable and the t statistics values of the coefficient of error correction terms (ECM_{t-1}) could be seen in Table 5.

Tablo 5. VECM Prediction Results

Dependent Variable	Δ inflation	Δ productivity	Δ wage	ECM_{t-1}
Δ **inflation**	–	2.76 (0.06)	1.61 (0.1)	*-0.009 [-0.7]*
Δ **productivity**	3.13 (0.04)	–	0.03 (0.9)	*0.0003 [0.052]*
Δ ***wage***	*18.51 (0.00)*	*0.85 (0.42)*	–	*0.1169 [3.12]*

Note : ( ) denotes prob. values, [ ] denotes t values.

_____

_____

When the results in Table 5 are scrutinized, error correction coefficients which indicate the adjustment speed seems to be not functioning. Since, it is known that for the error correction coefficients to function, their sign should be negative and at the same time they should be statistically significant. In Table 5, it is noticed that only when wage is the dependent variable, error correction coefficient is statistically significant. According to this result, in Turkey there is a causality relationship from productivity and inflation to the real wages in the long-term. This actually reminds of the wage bargaining model, which makes the wage demand related to the labor market conditions, rather than the efficiency wage model. Indeed, in the wage bargaining model, it becomes possible to determine the flexibility degree of the wages according to the response given to productivity, inflation and unemployment rate (Onaran, 2012). Hence, in the case of Turkey, the decline in the real wages while there is increase in productivity, in other words widening of the gap between productivity and wages, and the condition in Turkey that inflation effects the wages, rather than the presence of a wage inflation are the arguments that support the asserted causality relationship (Onaran, 2012). In addition in a way that supports Equation 8 above, there is no causality relationship from inflation and real wages to productivity in the long run VECM results.

Again, when the Wald test results are studied for short-term causality relationship, a causality relationship from inflation to productivity is observed. There is also a causality relationship from inflation to wages in the short term.

4. CONCLUSION

In this study, the presence of a long-term relationship between the real wages, inflation and productivity in Turkey in the period of 1988Q1- 2014Q2 was analyzed through the cointegration analysis based on the Johansen (1988) and Johansen/Juselius (1990) method and the direction of the abovementioned relationship was tested via the causality analysis based on VECM. According to the obtained results, in the relevant period, a long-term relationship was observed between the wages, productivity and inflation. The direction of this relationship was found to be from productivity and inflation to real wages in the long-term. According to this result, it is possible to assert that efficiency wage hypothesis is invalid for Turkey, on the contrary, wage bargaining model could be considered valid for long term. In short-term, the presence of causality both from inflation to real wages and from inflation to productivity was determined. These results indicate that, economy-policy makers in Turkey should consider inflation in affecting productivity and wages in short term. Another meaning of this result is that the inflation targeting used as a monetary policy strategy by the Central Bank of the Turkish Republic since 2006 is not only significant directly on the price stability in the short-term, but also has significant effects on the real wages and productivity of the labor market indirectly in short term.

In the long-term, if the independent variable is productivity, it was confirmed that the coefficients effect of inflation and real wages on the productivity, which are obtained from the Johansen Cointegration test, are insignificant and the coefficient of the dummy that represents crises has a statistically significant effect contrary to the inflation and real wages. According to this result, the break dates determined in the series decrease productivity in the long term. As it is considered that these breaks generally occur during the years of crises and immediately after, it is possible to assert that the economic crisis in Turkey cause a significant effect that decreases productivity in the long term. In this context it is detected that the results obtained for the long-term relationship are in accordance with Turkish research. Indeed, the findings of this study coincide with the determination of Taymaz (2005) on the decrease of labor productivity due to the 2001

_____

crisis and as well with the emphasis of Taban (2011) that labor productivity decreased when compared to the previous year, during the 2008 – 2010 period. Moreover, this study is novel in terms of both focusing on Turkey as a developing country, and proposing an extended study that covers the recent global crisis by taking the structural breaks into consideration.

REFERENCES

Akerlof, G. (1982). Labor contracts as partial gift exchange. *The quarterly journal of economics*, 97(4), 543-569.

Akerlof, G. (1984). Gift exchange and efficiency-wage theory: Four views. *American economic review*, 74(2), 79-83.

Alexander, C. (1993). The changing relationship between productivity, wages and unemployment in the uk. *Oxford bulletein of economics and statistics,* 55(1), 87-102.

Badurlar, İ. Ö. (2008). Türkiye'de konut fiyatları ile makro ekonomik değişkenler arasındaki ilişkinin araştırılması. *Anadolu üniversitesi sosyal bilimler dergisi,* 8(1), 223-238.

Barışık, S. and Çevik E. İ. (2008). İşsizlikte histeri etkisi: uzun hafıza modelleri. *Kamu-İş,* 9(4), 1-36.

Bitros, G. C. and Epaminondas P. (2001). Is there an inflation productivity trade –off ? Some evidence from the manufacturing sector in Greece. *Applied economics,* 33, 1961-1969.

Buck, A. J. and Fitzroy, F. (1988). Inflation and productivity growth in the federal republic of Germany. *Journal of post keynesian economics*, 10(3), 428-444.

Christopoulous, D. and Tsionas, E. T. (2005). Productivity growth and inflation in Europe: Evidence from panel cointegration tests. *Empirical economics,* 30, 137-150.

Clark, P. (1982). Inflation and the productivity decline. *The american economic review,* 72(2), 149-154.

Çelik, İ. (2012*). Vadeli işlem piyasasında fiyat keşfi-İzmir vadeli işlem ve opsiyon borsasında ampirik bir uygulama,* Türkiye Bankalar Birliği Yayını, 1-125.

Çelik, S. and Tuba Başkonuş D. (2013). Türkiye'de 2001 krizi öncesi ve sonrası dönemler için dış borç ekonomik büyüme ilişkisi (1991–2010). *Turkish studies International periodical for the languages, literature and history of Turkish or Turkic*, 8/3, 2013, 111-135.

Çevik, E. İ. and Erdoğan, S. (2009). Bankacılık sektörü hisse senedi piyasasının etkinliği: yapısal kırılma ve güçlü hafıza. *Doğuş üniversitesi dergisi,* 10 (1), 26-40.

Dritsakis, N. (2004). A causal relationship between ınflation and poductivity: an emprical approach for romania. *American journal of applied sciences,* 1 (2), 121-128.

Ekinci, A. and Gül, E. (2007). Türkiye'de yurtiçi tasarruflar ve ekonomik büyüme arasındaki ilişki: uygulamalı bir analiz (1960- 2004). *Dumlupınar üniversitesi sosyal bilimler dergisi*, 19, 167-184.

Erdinç, Z. (2008). İkiz açıklar hipotezinin türkiye'de 1950-2005 yılları arasında eşbütünleşme analizi ve granger nedensellik testi ile incelenmesi. *Anadolu üniversitesi sosyal bilimler dergisi,* 8(1), 209–222.

Erdoğan, S., Yıldırım, D. Ç. and Tosuner, Ö. (2012). Eğitimde cinsiyet eşitsizliğinin sağlık üzerine etkisi: Türkiye örneği. *Educational sciences: Theory & practice*, 12(3), 1853-1866.

_____

_____

Erenburg, S. J. (1998). Productivity, private and public capital, and real wage in the us. *Applied economic letters,* 5(8), 491-495.

Eryılmaz, M.E. and Eryılmaz, F. (2011). Ekonomik krizlerin retoriksel stratejilere etkisi: Tky örneği. *Başkent üniversitesi yönetim araştırmaları dergisi (YAD)*, 11/1–2, 35- 78.

Eryılmaz, F. and Eryılmaz, M.E. (2015). A discussion about the possible effect of middle ıncome trap on large scale firms' selection of competitive strategy. *Elsevier procedia – social and behavioral sciences*, (207), 598-607.

Freeman, D. G. and Yerger, D. B. (2000). Does ınflation lower productivity? Time series evidence on the impact of inflation on labor productivity in 12 OECD nations. *Atlantic economic journal,* 28(3), 315-332.

Göktaş, Ö. (2008). Türkiye ekonomisinde bütçe açığının sürdürülebilirliğinin analizi. *Ekonometri ve istatistik,* Sayı:8, 45-64.

Günay, S. (2014). Yapısal kırılmalar dahilinde BİST-100 endeksi volatilitesinin uzun dönemli bellek analizi. *Journal of yaşar university,* 9(36), 6261-6380.

Türkan, E. G. and Uysal, D. (2013). Türkiye'de döviz kurlarındaki değişme ile enflasyon arasındaki ilişki (1983-2012). *Akademik araştırmalar ve çalışmalar dergisi*, Yıl 5 - Sayı 9, 141- 157.

Hondroyiannis, G. and Papapetrou, E. (1997). Seasonality- cointegration and the ıinflation, productivity and wage growth relationship in Greece. *The social science journal*, 34, 2, 235- 247.

İlgün, M. F. (2010). Genişletici mali daralma hipotezinin temelleri ve Türkiye ekonomisi üzerine bir uygulama. *Erciyes üniversitesi iktisadi ve idari bilimler fakültesi dergisi,* 234, 35, 233- 253.

İncekara, A., Demez, S. and Ustaoğlu, M. (2012). Validity of fisher effect for Turkish economy: Cointegration analysis. *Procedia - social and behavioral sciences*, 58, 396 – 405.

Jarrett, J. P. and Selody, J. G. (1982). The productivity-ınflation nexus in Canada, 1963-1979. *The review of economics and statistics*, 64, 3, 361-367.

Kıran, B. (2007). Türkiye'de reel döviz kuru ile kısa ve uzun vadeli sermaye hareketleri ilişkisi. *Marmara üniversitesi iktisadi ve idari bilimler dergisi,* XXII, 1, 269- 284.

Kızılgöl, Ö. (2006). Türkiye'de ihracata ve turizme dayalı büyüme hipotezinin analizi: eş bütünleşme ve nedensellik ilişkisi. *İktisat ve girişimcilik üniversitesi akademik bakış dergisi,* 10, 1-19.

Kumar, S., Webber, D. J. and Perry, Geoff (2012). Real wages, inflation and labour productivity in Australia. *Applied economics,* 44(23), 2945-2954.

Lebe, Fuat and Akbaş, Y. E. (2014). Türkiye'nin konut talebinin analizi: 1970-2011. *Atatürk üniversitesi iktisadi ve idari bilimler dergisi,* 28(1), 57-84.

Mahadevan, R. and Asafu-Adjaye, J. (1984). Causal ordering across inflation and productivity growth in the post-war united states. *The review of economics and statistics,* 66, 3, 472- 477.

_____

_____

Mahadevan, R. and Asafu-Adjaye, J. (2005). The productivity-ınflation nexus: The case of the Australian mining sector. *Energy economics,* 27, 209-224.

Narayan, P. and Smyth, R. (2009). The effect of inflation and real wages on productivity: New evidence from a panel of G7 countries. *Applied Economics,* 41: 10, 1285-1291.

Nazlıoğlu, Ş., Kayhan, S. and Adıgüzel, U. (2014). Electricity consumption and economic growth in Turkey: Cointegration, linear and nonlinear granger causality. *Energy sources part b: Economics, planning, and policy,* 9(4), 315-324.

Nazlıoğlu, Ş., Soytaş, U. and Gupta, R. (2015). Oil prices and financial stress: A volatility spillover analysis. *Energy policy,* 82, 278-288.

Onaran, Ö. (2000). Türkiye'de yapısal uyum sürecinde emek piyasanın esnekliği. *Toplum ve bilim,* 86.

Onaran, Ö. (2012). Measuring wage flexibility: The case of Turkey before and after structural adjustment. *Applied economics,* 36/4, 767-781.

Özel, H. A. (2012). Küreselleşme sürecinde ticari ve finansal açıklığın ekonomik büyüme üzerine etkisi: Türkiye örneği. *Yönetim bilimleri dergisi,* 10(19), 1-30.

Pazarlıoğlu, V. and Çevik, E. İ. (2007). Verimlilik, ücretler ve işsizlik oranları arasındaki ilişkinin analizi: Türkiye örneği. *Yönetim ve ekonomi,* 14, 2.

Ram, R. (1984). Causal ordering across inflation and productivity growth in the post-war United States. The review of economics and statistics, 66, 3, 472-477.

Snowdon, B. and Vane, H. R. (2005). *Modern macroeconomics: Its origins, development and current state.* Edward Elgar Publishing, USA.

Strauss, J. and Wohar, M. E. (2004). The linkage between prices, wages, and labor productivity: a panel study of manufacturing ındustries. *Southern economic journal,* 70, 4, 920-941.

Taban, S. (2011). *Küresel kriz öncesi ve sonrası dönemde Türkiye'de ekonomik büyümenin dinamikleri.* Seta, No.37.

Tang, C. F. (2014). The effect of real wages and inflation on labour productivity in Malaysia. *International review of applied economics,* 28: 3, 311-322.

Taymaz, E. and Suiçmez, H. (2005). *Türkiye'de verimlilik, büyüme ve kriz.* milli prodüktivite merkezi, Ankara.

Taymaz, E., Voyvoda, E. and Yılmaz, K. (2014). Demokrasiye geçiş, reel ücretler ve verimlilik: Türk imalat sanayiinden bulgular. *Koç university- Tüsiad economic research forum workingpaper,* 1408.

Temiz, D. (2008). Türkiye'de vergi gelirleri ve ekonomik büyüme ilişkisi: 1960-2006 dönemi. *2. Ulusal iktisat kongresi,* 20-22 Şubat, Dokuz eylül iktisat bölümü, İzmir-Türkiye.

TSIONAS, E. (2003a). Inflation and productivity: Emprical evidence from Europe. *Review of international economics,* 11(1), 114-129.

Tsionas, E. (2003b). Inflation and productivity in Europe: An empirical investigation. *Empirica,* 30, 39-62.

_____

_____

Ulusoy, V., Çakır, N. and Öğüt, Kaan (2008). Inflation, productivity and trade: Evidence from Turkish manufacturing industry. *Middle eastern finance and economics*, 2, 41-55.

Yapraklı, S. (2007). Ticari ve finansal dışa açıklık ile ekonomik büyüme arasındaki ilişki: Türkiye üzerine bir uygulama. *İstanbul üniversitesi iktisat fakültesi ekonometri ve istatistik dergisi,* 5.

Yellen, J. L. (1984). Efficiency wage models of unemployment.. *The american economic review, 17, 2,* 200-205.

Yılancı, V. and Öztürk, Z. A. (2010). Türkiye ile en büyük beş ticaret ortağının hisse senedi piyasaları arasındaki entegrasyon ilişkisinin analizi: yapısal kırılmalı birim kök ve eşbütünleşme analizi. E*rciyes üniversitesi iktisadi ve idari bilimler fakültesi dergisi,* 262, 36, 261-279.

Yıldırım, Z. (2015). Relationships among labour productivity, real wages and ınflation in turkey. E*conomic research-ekonomska ıstraživanja,* 28/1, 85-103.

Yıldız, A. and, Aksoy, E. E. (2014). Morgan stanley gelişmekte olan borsa endeksi ile bist endeksi arasındaki eşbütünleşme ilişkisinin analiz edilmesi. A*tatürk üniversitesi İktisadi Ve İdari Bilimler Dergisi,* 28, 1, 1-19.

Wakeford, J. (2004). The productivity-wage relationship in South Africa: An empirical investigation. *Development Southern Africa,* 21/1, 109-132.

_____