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RESEARCH ARTICLE / ARAŞTIRMA MAKALESİ

The Relationship Between Inflation and Welfare [*]

Enflasyon ve Refah İlişkisi

Vildan YAVUZ AKINCI [**]
Dündar Murat DEMİRÖZ [***]

Abstract
The fact that prices of goods and services do not fluctuate for a long period of time shapes the welfare level of countries through direct and indirect effects on the one hand, and on the other hand, it is of great importance in terms of preventing the distribution of income, which is one of the main economic policy objectives. In many countries with high levels of welfare, the common feature that stands out is that the general level of prices does not fluctuate significantly. The same is actually true for many developing countries. The importance of this issue for Türkiye, which is in the same country classification, has been the main motivation for this study. In this study, the relationship between the change in the general level of prices and the level of welfare has been tried to be revealed by using quarterly data between 1987-2017. Since there is no single variable that can be taken as the basic measure of welfare level in many national and international sources, we first obtain a welfare index from a utility function we use. Then, before establishing the relationship between this index and inflation rates, which are the main indicator of the general level of prices, the stationarity of the series is determined by Augmented Dickey-Fuller and Phillips Perron unit root tests. Using the Autoregressive Distributed Lag (ARDL) cointegration test, it is found that there is a long-run relationship between inflation and welfare. Moreover, the Granger causality test showed that there is a causality between these two variables from inflation to welfare. Finally, the Vector Autoregressive (VAR) model is estimated, and Impulse-Response and Variance Decomposition analysis are performed. The study shows that price changes in Türkiye reduce the rate of welfare growth, but do not prevent welfare growth as a whole.
Keywords: Inflation, Welfare, ARDL.

Öz
Mal ve hizmet fiyatlarının uzun süreli olarak dalgalanma göstermemesi bir yandan ülkelerin refah düzeyini doğrudan ve dolaylı etkilerle şekillendirmekte ve diğer yandan da temel iktisat politikası amaçlarından biri olan gelir dağılımının bozulmaması açısından büyük önem taşımaktadır. Refah düzeyinin yüksek olduğu birçok ülkede göze çarpan ortak özellik fiyatlar genel seviyesinin ciddi bir dalgalanma göstermemesidir. Aynı durum aslında birçok gelişmekte olan ülke içinde geçerlidir. Bu ülkelerden aynı ülke sınıflandırmasında yer alan Türkiye için de konunun önemi bu çalışmanın ortaya çıkmasında temel motivasyon unsuru olmuştur. Çalışmada 1987-2017 yılları arasındaki çeyrek veriler kullanılarak fiyatlar genel seviyesindeki değişimle refah düzeyi arasındaki ilişki ortaya konmaya çalışılmıştır. Refah düzeyinin birçok ulusal ve uluslararası kaynakta temel ölçütü olarak alınabilecek tek bir değişken bulunmadığından öncelikle kullandığımız bir fayda fonksiyonundan refah endeksi elde edilmiştir. Daha sonra bu endeksle fiyatlar genel seviyesinin temel göstergesi olan enflasyon oranları arasındaki ilişkiyi ortaya koymadan önce serilerin durağan olup olmadıkları Genişletilmiş Dickey-Fuller ve Phillips Perron birim kök testleri ile belirlenmiştir. Otoregresif Gecikmeli Modelinin kullanıldığı (ARDL) eş bütünleşme testi ile enflasyon ve refah arasında uzun dönemli bir ilişkinin olduğu tespit edilmiştir. Ayrıca Granger nedensellik testi bu iki değişken arasında enflasyondan refaha doğru bir nedensellik olduğunu göstermiştir. Son olarak, Vektör Otoregresif (VAR) modeli tahmin edilerek Etki-Tepki ve Varyans ayrıştırma analizi yapılmıştır. Çalışma göstermiştir ki Türkiye'de fiyatların değişmesi refah artış hızını düşürmekte, ancak refahın artmasını bir bütün olarak engellememektedir.
Anahtar Kelimeler: Enflasyon, Refah, ARDL.

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[**] Assist. Prof. Dr., Recep Tayyip Erdoğan University, Department of Economics, e-mail: vildan.yavuz@erdogan.edu.tr
ORCID: 0000-0003-3232-8265
[***] Prof. Dr., İstanbul University, Department of Economics, e-mail: dundar.demiroz@istanbul.edu.tr
ORCID: 0000-0003-1783-9905

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Bu makale araştırma ve yayın etiğine uygun şekilde hazırlanmış ve turnitin *intihal taramasından geçmiştir.*

1. Introduction

Ensuring economic growth, fair income distribution and economic stability are among the main objectives of economic policies. What is meant by economic stability is that the basic variables of the economy such as the general level of prices, the level of employment and the balance of payments are in balance. If these objectives are realized, the welfare of the society increases. Among these variables, the general level of prices is one of the most important indicators because it causes various economic and social losses. In the literature, the effect of inflation on welfare has been the subject of a wide range of theoretical and empirical analyses. The phenomenon of high inflation, which has been going on for many years in Türkiye, has affected all decision-making mechanisms in the economy and affected the living standards of individuals as well. In an inflationary environment, it becomes difficult for the economy to fulfill the optimal distribution of resources, which is one of the main goals of economics. Along with the effect of disrupting the distribution of resources, the welfare of a segment of society increases, while welfare of a certain segment of society reduces. As a result, there is an effect that disrupts social welfare as a whole.

With respect to the historical process, it has been observed that there are serious difficulties in defining the concept of welfare. This also applies to the economy. According to Pigou (1962), the only clear way to measure welfare is money. Indication of money as a measurement tool has not given clarity to explain the concept. Despite this, money can be used as an indicator with regards to welfare at the macro level. To make a definition to the concept of welfare, it may be expressed as prosperity and happiness in the broadest sense. If it is further associated with economics, it can be said that it is the wealth each individual wants to acquire and the monetary value they want to spend. For many years, the phenomenon of welfare has been a concept that has been addressed from economic, political, and philosophical perspectives. Although it is a theoretical concept, economic policies are applied to ensure welfare. From this point of view, welfare has become an appropriate concept in political economy.

The aim of this study is to examine the relationship between inflation and welfare in Türkiye. With this study, the gap in literature was tried to be completed and it was aimed to contribute to new studies on the subject. In this context, the current literature was first examined. Later, the method and empirical findings were revealed. Finally, the study was concluded with the results section.

2. Literature Summary

Studies on the relationship between inflation and welfare were intense after the Second World War. But after the 1970s, price increases, which gained momentum in many countries due to the impact of oil prices, led to a more thorough discussion of the issue. The following studies have been considered in the context of this subject.

In his study, Phelps (1965) examined the relationship between expected inflation and economic welfare. According to the results, the success of monetary and fiscal policies used to increase welfare depends on the deflationary process of the economy. In other words, although there is no direct relationship between price movements and welfare growth through the public sector, the success of the welfare restructured by the public sector depends on the price conditions in which the economy operates.

Waud (1970) addressed the relationship between inflation, unemployment, and economic welfare. The study concluded that expected inflation, which is generally accepted as a judgment, definitely and clearly has a

negative impact on welfare. Accordingly, due to inflexibility of monetary wages are downwards and therefore possibility of increase in unemployment inflation expectations can have positive consequences for Welfare.

In his research, Jovanovic (1982) examined the relationship between expected inflation and welfare in a stable equilibrium. In the study, it was found that high inflation reduces the level of welfare by reducing consumption, assuming that demand for money is an internal variable. Accordingly, as the inflation rate rises, the shares allocated from income for spending are constantly increased and thus the continuation of the consumption trend is tried to be maintained.

In their study Krugman et al. (1985), developed a simple general equilibrium model of capital market and monetary economy. According to the results obtained, inflation reduces the level of welfare due to low real balances and lower liquidity. In addition, inflation increases the nominal interest rate and reduces the real interest rate. As a result, the study referred to the welfare cost of inflation, which in the model does not benefit money on its own but is kept because it is required for transactions. Inflation has a welfare cost only because it results in consumption being misallocated.

Kimbrough (1986) examined the relationship between unemployment and inflation, assessing the opportunity costs that arise in achieving an optimal inflation rate. The result was that lower inflation resulted in higher employment, and therefore higher income and welfare levels, as lower transaction costs shifted the Philips curve to the right. Here, the key element that optimizes the inflation rate is the option that has the lowest impact on the resource costs of trading.

In their study, Aiyagari et al. (1998) acted according to the empirical observations on the comparison of the rate of money circulation, inflation, and the relative size of the credit services sector. The study estimated the volume of credit and demand for money for the American economy and made determinations about the welfare costs of inflation. Accordingly, the effect of inflation on welfare depends on the correct preferences between consumption and investment spending. While each preference alone does not affect welfare in relation to inflation, it has been determined that inflation is more impressive as a result of a wrong choice between these two preferences.

Love and Wen (1999) suggested that the cost of inflation manifested itself by affecting the temporal costs of transactions in macro-economic models, where money was used as an internal variable. Empirical studies on the subject suggest that inflation affects welfare by reducing growth. Even if the temporal cost alone is small, inflation affects consumption, employment and growth rates, which means much greater loss of wealth. As a matter of fact, according to empirical studies, reducing inflation from 5% to 0% leads to an increase in wealth equivalent to 2% of national income. According to this study, long-term inflation negatively affects growth, and this result has been supported in many panel data studies conducted in recent years. According to the results of the study, an increase in the annual growth rate of 0.09% depends on reducing inflation by 5%. In the same study, reducing inflation to null leads to a 3% increase in consumption, resulting in an increase in welfare.

Fernández V. (1999) studied both panel data and time series, covering 17 Latin American countries and 14 Asian countries between 1970 and 1995. According to the results of the study, a negative relationship was found between long-term inflation rates and long-term growth rates. In addition, higher inflation increases the financial capabilities of the transaction, which will bring about a person's loss of time, disrupts the timing of productive activities, and this slows down the growth in the economy, leading to a decrease in individual welfare.

Lucas (2000) aimed to investigate the welfare cost of inflation. Using data from 1900-1994, he produced estimates for the US that were interpreted in various ways. Through time series analyses, he found that the gain from reducing the annual inflation rate from 10% to zero is equivalent to an increase of less than 1% in real income.

Cysne (2003) made some classical criticisms of inflation's welfare costs in his study. In the definition of money, only interest rates were associated, and other elements were excluded. In addition, the “Divisia Index” was used as a measure of the use of money in measuring welfare. The study found that financial preferences had a direct negative effect on inflation's welfare costs.

Head and Kumar (2005) examined the relationship of price fluctuations and welfare with inflation in a monetary economy in their study. Under the assumption that buyers have incomplete information about the market, price fluctuations in the economy lead to increases in inflation and changes in the real values of assets. According to Friedman's inflationary approach, welfare gradually decreases due to the redistribution of resources.

In their study, Craig and Rocheteau (2008) used a monetary model to assess the welfare costs of inflation and bring a new perspective. In the model, the cost of welfare was estimated based on the ‘welfare triangle’ model used by Bailey (1956) and Lucas (2000), and monetary elements were taken into account as a measure of welfare. Here, the effect of the real value of money on social, marginal earnings is evaluated according to the inflation rate. Accordingly, inflation leads to a decrease in the marginal earning from each currency.

In their study, Janiak and Monteiro (2011) analyzed the welfare cost of inflation with a cash advance constraint and the intrinsic distribution of the productivity of companies. Inflation affects the dynamism of companies, disrupting productivity. The Model has been adapted to the US economy and has been reviewed by comparing high and low inflation in the economy, where inflation rates affect preferences between assets over the long term. In case the inflation rate was more than 10% per year compared to the quarterly changes, it was found that this reduced productivity by 0.5% compared to comparative equality. According to the same model, a 0.5% reduction in productivity doubles the cost of welfare. Accordingly, an annual increase in the inflation rate of more than 10% doubles the cost, leading to a decrease in welfare.

In their study, Chiu and Molico (2011) analyzed welfare costs and redistribution effects on inflation in the presence of liquidity risk within the scope of the theoretical monetary model at the micro level. In the study, the total demand for money and the amount of money distributed according to households and the effect of inflation on this money under the conditions of incomplete competition were analyzed. As a result, the expected long-term welfare costs of inflation were on average 40% to 55% higher in incomplete competitive markets than in full competitive markets, and the redistributive effect of incomplete competitive markets remained low.

Mushtag et al. (2012) measured the welfare costs of inflation for Pakistan for the period 1960-2007 using semilogarithmic and double logarithmic money demand functions. The results show that the welfare gains from moving from positive to zero inflation are approximately the same under both money demand specifications. However, in terms of indirect effects, they observed that the two models yield quite different results for low interest rates. Accordingly, moving from zero inflation to zero nominal interest rate is found to yield a significant welfare gain in the double logarithmic form of the model. However, the semi-logarithmic model yields higher welfare losses.

In their study, Chu and Lai (2013) analyzed the effects of inflation on R & D and innovation-driven growth. Accordingly, falling inflation as a result of shrinking monetary policy has increased social welfare. On the other hand, a negative and significant relationship was found between inflation and R & D. In other words, the increase in inflation reduces R & D spending, while price stability positively affects R & D. The numerical results showed an increase in wealth equivalent to a 0.5% increase in consumption.

Chen et al. (2014) used 2010 data to estimate the impact of inflation on welfare. Using the happiness survey approach, they find that, on average, a 0.1% increase in the inflation rate would result in a welfare loss of 73.0-164.1 Chinese Yuan. Moreover, the welfare costs for different income groups vary significantly, with the welfare loss due to a 0.1% increase in inflation only reducing about 0.057% of their income for those whose household income reaches 100,000 Chinese Yuan, but as much as 0.739%, more for the income group below 10 thousand.

Tümtürk (2017) estimates the welfare cost of inflation for Türkiye using data from the period between 1970 and 2013. In the study, two types of money demand functions are estimated. The results of the analysis indicate that the welfare cost estimated using M1 money supply is between 0.52 and 0.54 percent of GDP as a result of an increase in inflation from 0 percent to 10 percent for Türkiye.

A variety of studies provide a range of perspectives that examine the relationship between inflation and economic welfare in depth. Phelps (1965), Waud (1970), Jovanovic (1982), Krugman et al. (1985), Kimbrough (1986), Aiyagari et al. (1998), Love and Wen (1999), Fernández V. (1999), Lucas (2000), Cysne (2003), Head and Kumar (2005), Lagos and Rocheteau (2005), Craig and Rocheteau (2008), Janiak and Monteiro (2011), Chiu and Molico (2011), Mushtag et al. (2012), Chu and Lai (2013) and Chen et al. (2014) examined the effects of expected inflation on economic welfare in different periods and using different methods. The common finding of these studies is that an increase in inflation rates generally has negative effects on economic welfare. In particular, high inflation has been observed to reduce consumption expenditures, increase transaction costs and slow economic growth. However, it has also been noted that in some cases, low inflation rates can increase economic welfare with lower unemployment and higher incomes. Consequently, empirical calculation of the welfare effect is important to determine the costs of inflation on welfare.

3. Data and Econometric Method

All data of the study is quarterly and covers the period of 1987-2017. The fact that the data belonging to the variables is more useful was effective in choosing this period interval. The data used in the study was compiled from the sources of the Central Bank of the Republic of Türkiye (CBRT) and Eviews-9 package program was used for the analysis carried out in the study. A utility function was derived when examining the relationship between inflation and welfare for Türkiye. A welfare index was then created from this function and their response to changes in inflation was analyzed. The utility function used in the study is as follows:

$$U = C^{\alpha}.\left[M_0^{\beta 1} DD^{\beta 2} TD^{\beta 3} DYP^{\beta 4} \right]^{1-\alpha} \qquad (1)$$

The two main components of this function are the variables that make up the elements of consumption and wealth that are thought to determine welfare. α, the consumption variable base, shows the average consumption trend for the past eight quarters, while 1-α shows the total weight of the elements left over from income and forming the wealth effect. Therefore, the sum of both ratios is 100%. It shows the eight-period average of β1 M0/M2Y, the eight-period average of β2 DD/M2Y, the eight-period average of β3 TD/M2Y and the eight-period average of β4 DYP/M2 from the exponential values of the elements that make up the wealth effect. In

the creation of M2Y, the first quarter of 1987 was taken as the base period and the M2Y money supply was reelected by proportioning with the change in the inflation rate. The same operation was performed for M0 and thus the ratio of M0/M2Y over real values was found. By averaging the first eight periods of these obtained rates, the first value of β1, which is the welfare coefficient, was reached and thus the β1 in series was formed. After that, the same operation was performed for DD and the ratio of DD/M2Y to real values was found. By averaging the first eight periods of these obtained rates, the first value of β2, which is the welfare coefficient, was reached and thus the β2 series was formed. By repeating the same processes, β3 and β4 series were also formed.

A decrease in the value of β1, a parameter of M0, from 0.11 to 0.04, indicates that keeping is avoided and shows that the wealth effect decreases. A decrease in ß2, the parameter of DD, from 0.21 to 0.10, means that the amount of money to be deposited in the bank has decreased. This, in turn, reduces the impact of wealth. The first value of ß3, a parameter of TD, started at 0.43 and ended at 0.45. This can be interpreted as an increase in the orientation to term deposits to protect against inflation. In ß4, which is the parameter of TPP, it took various values starting from 0.23 and ending at 0.35. An increase in this value indicates that some of the available savings during the relevant period shifted to foreign currency deposits, thus increasing the wealth effect. On the other hand, the fact that the average value of α for the entire period is 0.69 and the sum of bases that make up the element of wealth is 0.31, and these values often do not change significantly shows that society does not change the preference between consumption and wealth as a means of preserving and increasing welfare. This also shows that society has a low tendency to turn to savings by giving up consumption in order to increase welfare on a long-term basis, causing the lack of savings to remain a structural problem. All variables used in the study and their definitions are given in Table 1.

Table 1. Descriptions of the Variables

Variables	Descriptions
C	Consumer
Mo	Monetary Base
DD0	Sight Deposits
TD	Time Deposits
DYP	Foreign Currency Deposits
M2Y	Broad Money Demand
ENF	Inflation Index
U	Welfare Index

The inflation and welfare function series were created by giving 100 in 1989 compared to the previous quarter value. Then, instead of working on level values, it was worked with logarithmic values to bring the data closer together.

3.1. Unit Root Tests

Before proceeding to econometric analyses, it is first investigated whether the series are stationary. For this purpose, Augmented Dickey-Fuller (ADF) and Phillps – Perron (PP) unit root tests will be used.

3.1.1. Augmented Dickey-Fuller (ADF) Test

The Dickey-Fuller (DF) test is a frequently used unit root test. It is assumed that the time series conforms to the AR (1) model (Cheung and Lai, 1995, p. 277). This model is also known as the Random Walk Model, which has an important place in the literature of economics and finance. In the Random Walk Model, the

current price y_t must be equal to the last period price and the error term. This is shown in the following equation (Enders, 2010, p. 184).

$$y_t = y_{t-1} + \varepsilon_t \quad (2)$$

$$\Delta y_t = \varepsilon_t \qquad \varepsilon_t \sim IID\ (o, \sigma^2) \quad (3)$$

In the DF unit root test, the null hypothesis indicates that the studied time series (y_t) is not stationary, that is, it is a unit root, while the alternative hypothesis indicates that the studied time series is stationary, in other words, it is not a unit root. If the DF test statistic calculated at the decision stage is more negative than the table critical value, the null hypotheses is rejected, and this series is said to be stationary at the level in this case, which does not contain a unit root. Otherwise, it is assumed that the series is not stationary. Dickey Fuller proposed adding the lagged values of the dependent variable to the right of the equations used for the Dickey Fuller test to eliminate autocorrelation. In this case, the test was named Augmented Dickey Fuller (ADF). Information criteria (AIC, SIC, HQ) and the Breusch-Godfrey (LM) test can be used to determine lagged values.

Table 2. Results for the Augmented Dickey-Fuller (ADF) Test

	Levels (Constant + Trend)		**First Differences (Constant)**		**Second Differences (None)**	
	LENF	**LUSA**	**ΔLENF**	**ΔLUSA**	**Δ2LENF**	**Δ2LUSA**
ADF	-1,9794 (4)	-3,5649 (4)	-1,1085 (3)	-2,9747(3)	-11,8714 (2)	-25,3702 (2)

*The values in square brackets indicate the optimal length of lag determined by the Schwartz information criterion for the ADF test. Table critical values are 5% fixed at the significance level in terms of levels and -3.43 for the trend and -2.88, 2 for the fixed term in terms of First differences. In terms of differences, it was taken as -1.95 without constant and without trend. (*) denotes the rejection of the null hypotheses at the importance level of 5%.*

Ho: The series studied has a unit root, the series is not stationary.
H1: There is no unit root in the series examined, the series is stationary.

According to the ADF test, the Ho hypothesis was not rejected because the tau statistic (τ) calculated for the LENF series (constant + trend) was not more negative than the table critical value (-3.43) at 5% significance level. In other words, the LENF series is not stationary. By taking the 1^{st} difference of the series, ADF test was applied again. Since the tau statistic of the LENF series of which the 1^{st} difference was received was not more negative than the critical value of the table, the Ho hypothesis could not be rejected again. By taking 2^{nd} difference of series, it was found to be stationary. According to the ADF test in this case, the inflation series ENF (2) is an integral series of the second order. ENF ~ I (2)

According to the ADF test, the Ho hypothesis was rejected because it was more negative than the table critical value (-3.43) at 5% significance level according to the tau statistic (τ) calculated for the LUSA series (constant + trend). In this case, the welfare series is stable at the level.

3.1.2. Phillps-Perron Unit Root Test

The Dickey-Fuller unit root test assumes that error terms are independently and identically (IID) distributed. When using this method, make sure that these properties related to error terms are provided. The Phillps-Perron test developed the Dickey-Fuller unit root test, introducing a new method based on more flexible assumptions about the distribution of the error term. This condition is expressed by the following regression equations (Phillips and Perron, 1988, p. 348).

$$y_t = \hat{\varepsilon} + \hat{\alpha} y_{t-1} + \hat{\varepsilon}_t, \quad (4)$$

$$y_t = \hat{\varepsilon} + \tilde{\beta}\left(t - \tfrac{1}{2}T\right) + \tilde{\alpha} y_{t-1} + \tilde{\varepsilon}_t, \quad (5)$$

Where "t" denotes the observation number and "ε" denotes the pure error process.

The table critical values of the Phillps-Perron test statistics are the same as the DF test. If the PP test statistic calculated at the decision stage is more negative than the table critical value, the null hypotheses is rejected, and this series is said to be stationary at the level in this case, which does not contain a unit root. Otherwise, it is assumed that the series is not stationary.

Table 3. Results of the Phillps – Perron Unit Root Test

	Levels (Constant + Trend)		**First Differences (Constant)**		**Second Differences (None)**	
	LENF	**LUSA**	**ΔLENF**	**ΔLUSA**	**Δ2LENF**	**Δ2LUSA**
PP	-0,7150 (8)	-3,0079 (10)	-4,8076 (9)	-12,5197(9)	-24,8162 (2)	-37,6765(12)

*The values in square brackets indicate the optimal length of lag determined by the Schwartz information criterion for the ADF test. Table critical values are 5% fixed at the significance level in terms of levels and -3.43 for the trend and -2.88 , 2 for the fixed term in terms of First differences. In terms of differences, it was taken as -1.95 without constant and without trend. (*) denotes the rejection of the null hypotheses at the importance level of 5.*

According to the Phillps – Perron test, the Ho hypothesis was not rejected because the tau statistic (τ) calculated for the LENF series (constant + trend) was not more negative than the table critical value (-3.43) at the 5% significance level according to the Phillps-Perron test. In other words, the LENF series is not stationary. PP test was applied again by taking the 1^{st} difference. The Ho hypothesis was rejected because the tau statistic of the LENF series whose first difference was received was more negative than the critical value of the table. In this case, the inflation series is a stationary and integrated series in the first difference.

Likewise, according to PP, welfare (LUSA) series is stationary in the 1^{st} difference. Again, according to the tau statistic (τ) calculated for the LUSA series (constant + trend), the Ho hypothesis was not rejected, as it was not more negative than the table critical value (-3.43) at the 5% significance level. In other words, the LUSA series is not stationary. Thus, the 1^{st} difference of the series was taken, and PP test was applied again. Ho hypothesis was rejected because the tau statistic of the LENF series for which the 1^{st} difference received was more negative than the critical value of the table. In this case, the inflation series is stationary and integrated in the 1^{st} difference.

3.2. ARDL Bound Test

Pesaran and Shin (1995) showed that the ARDL model can be used to determine the cointegration relationship and developed the Bound Test. Unlike the Engle-Granger (1987) test, the stationarity levels of variables do not have to be the same in this test. The application of this test takes place in two stages. First, a long-term relationship between the series is established. If there is priori information about the direction of the long-term relationship between the series, the relationship is established in this direction. After that, short and long-term parameters of the model can be estimated if there is a cointegration relationship between the series.

In the application of bound testing, the relationship between the $y_t$variable and other variables is expressed as the following unconstrained error correction (Pesaran and Shin, 1995).

$$\Delta y_t = a_{0t} + \alpha_1 t + \pi y_{t-1} + \sum_{i=1}^{p-1} \tau_i \, \Delta y_{t-i} + \varepsilon_t \qquad t = 1,2,\ldots \qquad (6)$$

Where π parameters are long-term coefficients, a_0 is the autonomous parameter, t is the trend variable, ε_t is a non-autocorrelation error term. The current and lagged values of the variable vector $\Delta y_t$with the y_{t-1} lagged values in the model show the short-term dynamic structure of the variables. The model in equality 6, based on the ARDL model, is estimated by OLS.

In the bound test, two different critical values are calculated: the lower and upper critical values. The lower value assumes that the variables are I(1) if I(0) is the upper value. If the F (Wald) test statistic calculated at the decision stage is greater than the upper critical value, the null hypothesis that the variables do not have a long-term relationship is rejected. If the test statistic F (Wald) is less than the subcritical value, the null hypothesis that there is no long-term relationship of variables is considered. If the test statistic remains between these two limits, it is necessary to know the stasis levels of the variables.

Table 4. ARDL (9, 1) Model Estimation Result

Variables	**Coefficient**	**T -statistic**	**Probability**
LENF (-1)	1.121	11.738	0.000
LENF (-2)	-0.015	-0.110	0.912
LENF (-3)	-0.062	-0.448	0.654
LENF (-4)	0.135	1.001	0.319
LENF (-5)	-0.248	-1.865	0.065
LENF (-6)	0.124	0.918	0.360
LENF (-7)	-0.067	-0.498	0.619
LENF (-8)	0.259	1.899	0.060
LENF (-9)	-0.259	-2.875	0.005
LUSA	-0.187	-2.777	0.006
LUSA(-1)	0.217	3.226	0.001
C	-0.017	-0.138	0.889
R2 0.999	**Corrected R2** 0.999	**F statistic 41353.63** (0.000)	**Akaike:** -3.893 **Schwarz:**-3.588
Breusch- Godfrey LM Test		**N*R2:** 0.398	**Probability:** 0.819
White Test		**N*R2:** 11.952	**Probability:** 0.367

Table 5. ARDL Bound Test Result

k	F statistic	Critical values at 5% significance level		Critical values at 10% significance level	
		Lower limit I(0)	Upper limit I(1)	Lower limit I(0)	Upper limit I(1)
1	5.847429	4.94	5.73	4.04	4.78

If the calculated F statistic is greater than the upper critical value [I(1)], the null hypothesis that the variables have no long-term relationship without knowing the levels of stasis is rejected.

The null hypothesis is rejected because the F statistic value (5.84) calculated according to the limit test result is greater than the upper critical values given according to the 5% and 10% significance levels. In other words, the long-term relationship between inflation and welfare has been determined.

Table 6. ARDL (9, 1) Cointegration and Long-Term Analysis Results

Variables	Coefficient	T statistic	Probability
D[LENF (-1)]	0.134	1.412	0.161
D[LENF (-2)]	0.118	1.250	0.214
D[LENF (-3)]	0.056	0.606	0.545
D[LENF (-4)]	0.192	2.067	0.041
D[LENF (-5)]	- 0.056	-0.612	0.541
D[LENF (-6)]	0.067	0.737	0.462
D[LENF (-7)]	0.000	0.000	0.999
D[LENF (-8)]	0.259	2.875	0.005
D[LUSA]	- 0.187	-2.777	0.006
Error Correction Coefficient (ECM)	- 0.012	-2.792	0.006
Long-Term Coefficients			
LUSA	2.431	1.490	0.139
C	-1.406	-0.143	0.886

The short-term ARDL model, designated in accordance with the long-term ARDL (9, 1) model, is reflected immediately above. In this model, a period lag value of the ECM series (cointeq) was statistically significant and the coefficient was negative. The fact that error correction coefficient is -0.012, shows that if 8.3 quarter period (about 2 years) in the short period, if there is a deviation from the long-term equilibrium, the system will come to equilibrium. In other words, the relationship between inflation and welfare that breaks down in the first eight periods is restored after eight periods.

3.3. Granger Causality Test

The Granger causality test is performed to determine the existence of a causal relationship between two or more variables and the direction of the relationship. The Granger causality test is a widely used test in applied economics to test the wondered causality relationship between variables.

Causality is obtaining future expected values of a variable of time series being affected by its or other past related time series' values (Isigicok, 1994, p.94). The Granger causality test is represented by the following equation (Granger, 1969, p.431).

$$Y_t = \sum_{i=1}^{m} \alpha_i Y_{t-i} + \sum_{i=1}^{m} \beta_i X_{t-i} + \varepsilon_{1t} \quad (7)$$

$$X_t = \sum_{i=1}^{m} \theta_i X_{t-i} + \sum_{i=1}^{m} \gamma_i Y_{t-i} + \varepsilon_{2t} \quad (8)$$

Here $\alpha_i, \beta_i, \theta_i, \gamma_i$ show the lag coefficients, m shows the lag length, $\varepsilon_{1t}, \varepsilon_{2t}$ assume that the error terms are independent of each other.

The results of the Granger causality test performed by a significance test adapted to the coefficients of the independent variable obtained from the above equation estimate are presented in Table 7 as a result of the determination of the lag length as 6.

Table 7. Granger Causality Test Results

Number of lags:6	F statistic	Probability	Result
DLUSA→DDLENF	0.456	0.838	Ho cannot be rejected.
DDLENF→DLUSA	2.503	0.027	Ho can be rejected.

***** The number of observations is 105.
H0: is not Granger cause;
H1: is Granger cause.

It is observed that there is a causal relationship from inflation to welfare, but there is no causal relationship from welfare to inflation. According to the Granger causality test, the finding supporting this relationship indicates that inflation affects welfare and is the Granger cause of welfare. But for the size of the relationship, regression analysis must be performed. Accordingly, given that there is no increase in consumption caused by the increase in wealth together with the increase in welfare in Türkiye, and the trend of consumption has not changed in the long term, it can be stated that the cause of inflation is not the increase in demand caused by welfare. In addition, increasing the total supply while increasing consumption prevents the inflationary effect of welfare growth. Especially in Türkiye, the continuity of the current account deficit over the years also supports this situation.

3.4. Regression Analysis

Regression analysis is one of the most widely used tools in econometric studies (Tari, 2011, p. 15). Regression analysis is conducted to determine the cause-and-effect relationship between two or more variables. The main purpose of regression analysis is to look at the effects of changes in the independent variable on the dependent variable.

In this direction, the information we have obtained about the direction of the relationship with the Granger causality test has been tested below by regression analysis in order to learn about the magnitude of the relationship.

Table 8. Regression Analysis Results

Dependent Variable:	DLUSA			
Number of Observation:	111			
Observation Range:	1989Q3-2017Q1			
Variables	**Coefficient**	**Standard Deviation**	**T-statistic**	**Probability**
C	0.013	0.004	2.909	0.004
DDLENF	-0.325	0.091	- 3.542	0.000
R^2	0.103	**AIC**		- 3.193
F- statistic	12.548	**SCHWARZ**		- 3.144
Probability (F statistic)	0.000	**DW**		2.212

Looking at the results, it seems that the one percent increase in inflation reduces welfare by 0.32 units.

On the other hand, the inflation rate compared to the previous quarter was 8% on average, while the rate of increase in the welfare level was 1.7% on average for the entire period in which the analyses were considered according to the available data. Given that inflation has a reducing effect on welfare, if the inflation rate was 1% on average over the same period, the increase in welfare could be expressed at approximately 4.16% for

each quarter. It is because according to the conclusion that one unit of inflation for each period will reduce welfare by 0.32 units, if we reverse the process, we can assume that each average decrease in inflation will increase welfare by 0.32 percentage points. In such a case, the rate of increase in welfare after 280 periods is 4.16%. This result also coincides with the previous findings.

3.5. VAR Analysis

Vector autoregressive models were introduced into the literature by Sims (1980). VAR models are the generalized state of autoregressive models for more than one variable. VAR models are dynamic models in which current and lagged values of variables coexist. There is no distinction between dependent and independent variables in VAR models. All variables are considered internal variables. The form of the VAR (1) model is as follows (Enders, 2010, p. 297).

$$y_t = b_{10} - b_{12}Z_t + \gamma_{11}y_{t-1} + y_{12}Z_{t-1} + \varepsilon_{yt} \quad (9)$$

$$Z_t = b_{20} - b_{21}y_t + \gamma_{21}y_{t-1} + y_{22}Z_{t-1} + \varepsilon_{zt} \quad (10)$$

Using mathematical algebra, we can also write the model in a compact way as follows.

$$\begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix}\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix}\begin{bmatrix} y_{t-1} \\ z_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{yt} \\ \varepsilon_{zt} \end{bmatrix} \quad (11)$$

$$or$$

$$B_{xt} = \Gamma_0 + \Gamma_1 x_{t-1} + \varepsilon_t \quad (12)$$

$$B = \begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix}, x_t = \begin{bmatrix} y_t \\ z_t \end{bmatrix}, \Gamma_0 = \begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix}, \quad (13)$$

$$\Gamma_1 = \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix}, \ \varepsilon_t = \begin{bmatrix} \varepsilon_{yt} \\ \varepsilon_{zt} \end{bmatrix} \quad (14)$$

Where B denotes the dependent variable vector, Γ_0 is the constant parameters vector, Γ_1 is the descriptive variable coefficients Matrix, x_{t-1} is the descriptive variables vector, and ε_t is the error terms vector.

Variables must be stationary when creating the VAR model. Information criteria (AIC, SIC, HQ) are used to determine the lag length in the VAR model. The LM test is then used to determine whether there is an autocorrelation from VAR model residues, and the White test is used to determine whether the constant variance is valid. After passing through these stages appropriately, stability analysis is performed. In stability analysis, the roots of the characteristic equation (eigenvalue) must be less than the absolute value. If the eigenvalues are less than the unit value by absolute value, it is concluded that the series is stationary, that is, it is not a unit root.

It is not used for model parameters when performing VAR analysis, but for the impulse response function and variance Decomposition.

In order to properly estimate the VAR model in the study, the optimal lag length was first determined.

Table 9. Criteria for Determining the Length of the VAR Lag

Lag	LogL	LR	FPE	AIC	SC	HQ
0	331.210	NA	5.74e-06	- 6.39244	- 6.34128	-6.37171
1	353.285	42.8638	4.04e-06	- 6.74340	- 6.58992	-6.68124
2	361.044	14.7636	3.76e-06	- 6.81638	- 6.56058	-6.71278
3	370.818	18.2211	3.36e-06	- 6.92852	- 6.57040	-6.78347
4	406.144	64.4773	1.83e-06	- 7.53678	- 7.07634*	-7.35028*
5	408.427	4.07950	1.89e-06	- 7.50345	- 6.94069	-7.27551
6	415.119	11.6935*	1.80e-06	- 7.55571	- 6.89063	-7.28633
7	419.407	7.32697	1.79e-06*	- 7.56130*	- 6.79390	-7.25048
8	422.906	5.84382	1.81e-06	- 7.55158	6.68186	-7.19932

In the analysis, the appropriate lag criterion was determined to be four.

Table 10. Autocorrelation Test Results on Residues of the VAR (4) Model

Lag	LM statistic	Probability
1	4.401353	0.3544

The basic hypothesis of the VAR model is that there is no first-order autocorrelation. The alternative hypothesis is first-order autocorrelation. Since the probability value (0.3544) is greater than the 5% significance level, the null hypothesis cannot be rejected. So, there is no first-order autocorrelation. Test results were obtained by looking at the first lag. Two or more lagged values were also examined, and similar results were obtained.

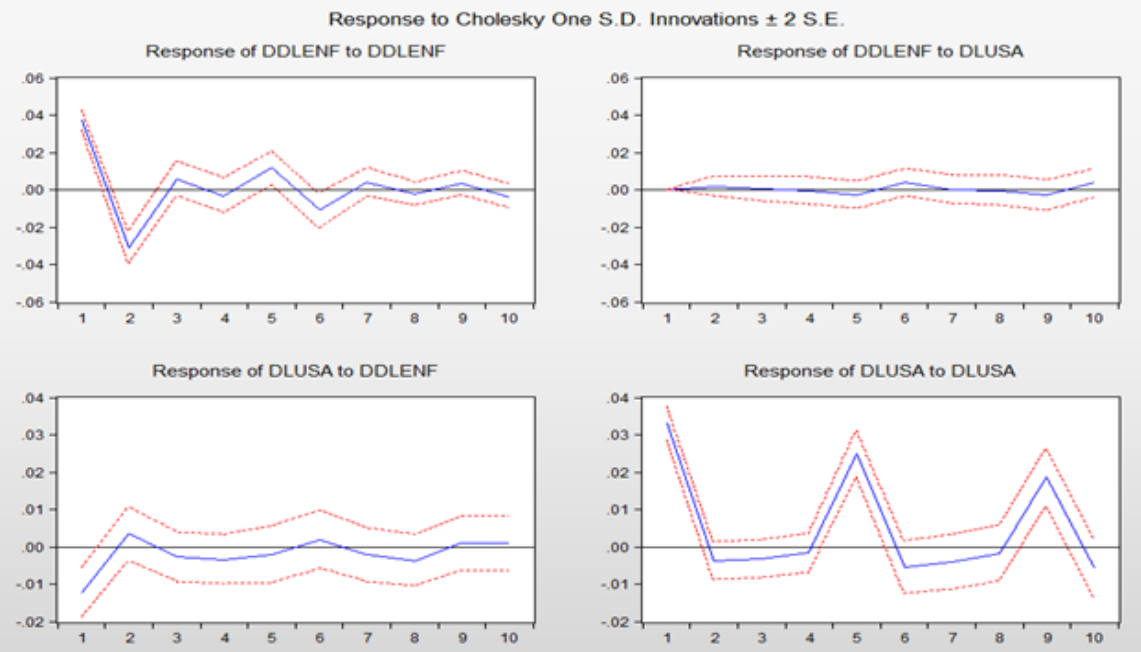
It is expected that all the roots (eigenvalues) of the characteristic equation will be less than the unit value by an absolute value of det[A-Λı]=0. In other words, there is no unit root, resulting in the series being stationary. As can be seen here, both calculated eigenvalues are less than the absolute value of the unit value. Therefore, the VAR (4) model meets the conditions of stasis (Sevuktekin and Cinar, 2014, p. 500).

3.5.1. Impulse-Response Analysis

After finding the appropriate lag lengths for VAR analysis, the impulse-response functions are implemented. IR (Impulse-Response) functions show the effects of shocks on variables and what their effect is at what time with the help of graphs (Tari, 2011, p. 465). The shock can be drawn through matrices by calculating the coefficients of the moving averages of the VAR model (Enders, 2010, p. 307).

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} \alpha_{10} \\ \alpha_{20} \end{bmatrix} + \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \end{bmatrix} \begin{bmatrix} y_{t-1} \\ z_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \qquad (15)$$

Graphic 1. Impulse-Response Analysis



With this process, in which variable the shocks occur in the graphics and how the variables react to these shocks is shown. Dashed lines in the graph show a standard deviation confidence limit while straight lines show point estimates. First, it is useful to examine the movements of variables over 10 periods. This review is given below. In the above series, the reactions of other data against the 1-unit change in shocks were tried to be explained with the help of a graph.

Table 11. Welfare Response

Periods	DDLENF	DLUSA
1	-0.01220 (0.0033)	0.03316 (0.0022)
2	0.00349 (0.0036)	-0.00388 (0.0025)
3	-0.00279 (0.0033)	-0.00324 (0.0025)
4	-0.00351 (0.0033)	-0.00167 (0.0026)
5	-0.00212 (0.0038)	0.02491 (0.0030)
6	0.00191 (0.0038)	-0.00549 (0.0035)
7	-0.00220 (0.0035)	-0.00402 (0.0036)
8	-0.00368 (0.0034)	-0.00169 (0.0037)
9	0.00098 (0.0037)	0.01864 (0.0038)
10	0.00099 (0.0036)	-0.00575 (0.0039)

According to the above table, variables have caused shocks in some periods. As a result, the variable itself and the other variable reacted to it. Accordingly, the columns show the variable in which the shocks occur, and the rows show the reactions of the other variable in response to these shocks.

If the results are to be interpreted, when a standard deviation shock occurs in the inflation series in Table 11, the welfare series shows a negative directional response of -0.01220 units in the first period. When a standard deviation shock occurs in the inflation series, the welfare series shows a negative directional response of -0.00279 units in the third period, even if 0.00349 units in the second period show a positive directional response. The positive relationship in the second period suggests that households may have spent the funds they have accumulated on their hands or under-the-mattress saving on consumption and wealth. After the second year, both positive and negative effects remain at fairly low levels. For example, when a standard deviation shock occurs in the inflation series, the welfare series displays a negative directional response of -0.00351 units in the fourth period. When a standard deviation shock occurs in the inflation series, the welfare series also shows a negative directional response of -0.00212 units in the fifth period. These examples can be further extended. In general, when a standard deviation shock occurs in the inflation series, the welfare series reacts negatively.

An inflationary effect that will occur periodically in the first period negatively affects welfare for eight periods. This, in turn, means about 24 years. It seems that the first period is the most affected. This is approximately 3 years. In this case, it suggests that economic actors have gone to a change in economic behavior within 3 years in order to protect themselves from inflation. However, the negative relationship between these two variables should not mean that inflation as a whole reduces welfare in Türkiye. It is because with inflation in Türkiye, the funds needed to make the necessary investments in the economy are realized by converting foreign resources into investment, rather than by reducing consumption of inflation and because these investments have a structure in which economic growth is sustained, the increase in wealth brought about by economic growth has a consequence of both inflation and the increase in wealth together. In this case, it can be stated that high inflation in Türkiye has somewhat curbed welfare growth, but this welfare growth continues.

3.5.2. Variance Decomposition

In shocks occurring in one of the variables, the reaction of other changes against one unit change is measured by impulse-response analysis. In variance decomposition (VDC), it is attempted to explain how many % of the change in one variable is caused by itself and how many % is caused by other variables. As a result of this research, if it explains a value close to 100% of the change in its variance on its own, it is defined as an external variable. Sorting is important in variance decomposition and is done from external to internal (Tari, 2011, p. 469).

As for analysis of variance decomposition, this analysis shows how the variances of variables affect each other. With this analysis, we can decide whether variables are external or internal (Tari, 2011, p. 468).

Table 12. Analysis Result of Variance Decomposition of Inflation

Periods	S.E	DDLENF	DLUSA
1	0.03745	100.00	0.00000
2	0.04854	99.8489	0.15105
3	0.04888	99.8361	0.16390
4	0.04900	99.8279	0.17204
5	0.05044	99.5211	0.47883
6	0.05172	99.0367	0.96328
7	0.05189	99.0423	0.95768
8	0.05194	99.0384	0.96159
9	0.05214	98.7074	1.29250
10	0.05241	98.2259	1.77408

The results in Table 12 show us that inflation is an external variable that is not affected by welfare, but rather by itself. According to the interpretation of this analysis, in Table 12 in the 1^{st} period 100% of the variance of the DDLENF variable is explained by the variable itself. This ratio indicates that the DDLENF variable is the most external variable. This rate then decreases, although the rate of disclosure is not much as the period increases.

Table 13. Analysis Result of Variance Decomposition of Welfare

Periods	S.E	DDLENF	DLUSA
1	0.03533	11.9251	88.0748
2	0.03572	12.6272	87.3727
3	0.03597	13.8416	86.9493
4	0.03618	13.8416	86.1583
5	0.04398	9.60073	90.3992
6	0.04437	9.62097	90.3790
7	0.04460	9.76411	90.2358
8	0.04479	10.3603	89.6396
9	0.04852	8.86708	91.1329
10	0.04887	8.78208	91.2179

However, if we look at Table 13, welfare is affected by inflation, but the low values of % indicate that the relationship between them is at a low level. In Table 13 in the 1^{st} period, 11.92% of inflation explains welfare while 88.08% is explained by itself. In the 2^{nd} period, 12.62% of inflation is explained by welfare, while 87.37% is explained by inflation. For 10 periods, it is seen that welfare is affected by inflation.

4. Conclusion

Studies on the relationship between inflation and welfare gained momentum after the Second World War. After the 1970s, price increases in many countries due to the impact of oil prices caused the issue to be even more comprehensive. However, it is worth noting that the studies that address the subject are mostly involved in foreign literature. From this point of view, the aim of this study is to determine the impact of inflation on Türkiye's welfare level and to try to complete the gap that exists in the domestic literature. In this nature, econometric analyses were used to determine the relationship between inflation and welfare. First, it was determined that the series is stationary by conducting Augmented Dickey-Fuller (ADF, 1979) and Phillips Perron (PP, 1988) unit root tests to determine whether the series is stationary. In the later part of the study, we applied Granger causality test to analyze the causality relationship between inflation and welfare based on the existing data. After determining the direction of the relationship, a Regression analysis was performed to obtain information about its size. In order to examine the long-term relationship between these two variables, the cointegration test was applied with the help of the autoregressive lagged Model (ARDL). Finally, the Vector Autoregressive (VAR) model is estimated, and additional impulse-response and variance decomposition analyses are performed to examine the shock relationship between the variables.

In the analysis, it was observed that there is a causal relationship from inflation to welfare, but there is no causal relationship from welfare to inflation. Accordingly, it is understood that inflation affects welfare, but welfare does not affect inflation. The fact that welfare does not affect inflation also shows that increased spending with increasing purchasing power does not lead to price growth and demand inflation, and that supply and demand imbalance is achieved by increasing total supply. In addition, even if domestic production is insufficient in the total supply, it can be stated that the inadequacy is eliminated through imports and additions

are made to the total supply. Rising current account deficits and imports support this situation, especially during periods when the economy is overheating.

On the other hand, the results of the ARDL cointegration test show a long-term relationship between inflation and welfare. According to the result of the Granger causality test conducted to determine the direction of the relationship, the finding supporting this relationship indicated that inflation affects welfare and is the cause of welfare.

After determining the direction of this relationship, regression analysis was performed to learn about its size. The regression results show that a one percent increase in inflation reduces welfare by 0.32 units. In the impulse-response analysis conducted to determine how many periods this relationship persists, it was found that the welfare series showed negative directional responses when a standard deviation shock occurred in the inflation series over one to many periods to support other analyses.

The results of the variance analysis to determine what % of variables are explained by itself and what % are explained by other variables also show us that inflation is an external variable that is not affected by welfare but rather by itself. On the other hand, welfare is affected by inflation, but the fact that the values of % are low indicates that the relationship between them is at small levels.

According to the findings obtained from our study, although inflation does not prevent welfare growth, it prevents the rate of welfare growth. In this way, continued growth and welfare growth in the inflationary environment increases the habit of the public to live together with the inflationary environment, and this causes politicians to ignore social reactions to fight inflation. Especially in periods of high inflation, meeting the savings deficit with foreign resources will make it possible to increase welfare even in an inflationary environment, which increases interest in external borrowing, but leads to a structural state of borrowing in the economy. In other words, even though it is a very strong relationship between inflation and welfare in a closed economy, achieving high growth rates through investments that will be made by using external resources through an open economy to compensate for the decline in welfare caused by inflation by hiding the decline in welfare caused by inflation allows countries to achieve high levels of welfare without reducing consumption with high inflation.

The results indicate that the acceleration of welfare growth in Türkiye is contingent upon the reduction of inflation rates to significantly lower levels. It is evident that inflation rates are considerably elevated in comparison to the averages of both the European Union and other OECD countries with which Türkiye has robust economic ties. In this context, attaining a level below 5%, which represents the average of the aforementioned country groups, in Türkiye will facilitate the advancement of welfare to a considerably higher level.

In this case, it is essential that the inflation problem is among the main priorities of economic policy in Türkiye. Instead of narrowing monetary and fiscal policies in the fight against inflation in Türkiye, it is necessary to first examine the nature of inflation very well and develop appropriate economic policies. Especially in raw materials, energy, intermediate and investment goods, external dependence process carries inflation to a structural point in Türkiye. It is because on the one hand, keeping interest rates high to ensure capital inflows, on the other hand, fluctuations in exchange rates and depreciation of the national currency create a serious environment of cost inflation. In addition, if competitive conditions are appropriate in the factor market, it is expected that labor wages will be determined according to labor productivity. However, according to world conditions, low labor productivity in Türkiye also makes wage levels an important cost element. In addition,

the fact that capital entering from abroad triggers demand inflation can lead to further deterioration of price stability along with cost and demand inflation. As a result, it can be stated that ensuring price stability in Türkiye depends on solving existing structural problems while these structural problems can be overcome by medium and long-term measures.

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