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The Impacts of Economic Crises on Health Behaviors of Population: An ARDL Bounds Testing Approach[1]

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Abstract
The main aim of this study is to reveal the impacts of 1994, 2001 and 2009 economic crisis on the four health behaviors of population in Turkey between 1974-2015 through ARDL bounds testing approach. According to the results, in terms of the impacts of economic crises on the health behaviors, it has been found the economic crises have had no significant impact on tobacco consumption ($p>0.05$). On the other hand, only the 2001 and 2009 economic crisis have had an increasing impact on alcohol consumption ($p<0.05$). For vegetable-fruit consumption, while the 1994 and 2001 economic crisis have had significantly negative impact, the 2009 economic crisis' impact was significantly positive ($p<0.05$). For sugar consumption, only the impacts of the 2001 and 2009 economic crisis were significant ($p<0.05$). From these findings it can be stated that economic crises may effect health behaviors in both negative and positive way.
Keywords: Economic Crisis, Health Behaviors, Turkey, Impacts of Economic Crises on Health Behaviors, ARDL Bounds Testing.
JEL Classification Codes: H51, I10, I12, I15

Ekenomik Krizlerin Toplumun Sağlık Davranışları Üzerine Etkisi: Bir ARDL Sınır Testi Yaklaşımı

Öz
Bu çalışmanın temel amacı, ARDL sınır testi yaklaşımı aracılığıyla ekonomik krizlerin Türkiye'de toplumun dört sağlık davarnışı üzerindeki etkisini ortaya koymaktır. Sonuçlara göre ekonomik krizlerin sağlık davranışları üzerine etkisi açısından, ekonomik krizlerin sigara tüketimi üzerinde anlamlı etkisinin olmadığı bulunmuştur ($p>0.05$) Diğer taraftan, sadece 2001 ve 2009 ekonomik krizleri alkol tüketimi üzerinde artırıcı etkide bulunmuştur ($p<0.05$). Sebze-meyve tüketimi için 1994 ve 2001 ekonomik krizleri anlamlı bir şekilde negative etkiye sahipken, 2009 ekonomik krizinin etkisi anlamlı bir şekilde pozitiftir ($p<0.05$). Şeker tüketimi için, sadece 2001 ve 2009 ekonomik krizlerinin etkileri anlamlıdır ($p<0.05$). Bu bulgulardan, ekonomik krizlerin sağlık davranışlarını hem negative hem de pozitif yönde etkileyebileceği ifade edilebilir.
Keywords: Ekonomik Krizler, Sağlık Davranışları, Türkiye, Ekonomik Krizlerin Sağlık Davranışları Üzerine Etkileri, ARDL Sınır Testi.
JEL Sınıflandırma Kodları: H51, I10, I12, I15

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1. Introduction

Health behaviors, in other words, the lifestyle are generally divided into two as the health protective or health promoting behaviors and, harmful behaviors to health. Behaviors like exercise, use of safety belts, adequate and balanced nutrition are among the protective/developing behaviors while the behaviors like unhealthy nutrition, alcohol, tobacco, drug use and excessive fat and fast-food consumption are among the harmful behaviors to health (Ásgeirsdóttir, Corman, Noonan, Ólafsdóttir & Reichman, 2014; Elliott, Harrop, Rothwell, Shepherd, & Williams, 2010; Macy, Chassin & Presson, 2013; Simsek, Koruk, & Altindag, 2007; Tokuc, 2007). As well as economic factors, health behaviors appear to be an important determinant of health in almost all the models related to health determinants (Brunner & Marmot, 2006; Dahlgren & Whitehead, 1991; Evans & Stoddart, 1990; Lalonde, 1974; Schulz & Johnson, 2003; Solar & Irwin, 2005). In this context, economic crises, which called a sudden and unexpected downturn of the economy (Aktan & Şen, 2001), may also impact health.

Economic crises may have impact on health through various mechanisms. Deterioration in economic factors, psychological and behavioral changes and changes in health system are among the most important ones (Caman & Cilingiroglu). It is possible to assume that economic crisis will negatively impact health. But evidences show that health effects of economic crises are not clear (Catalano, 2009). Some of the studies that show that economic crises are related to relatively better health outcomes explain this by various means of mechanisms focusing on health behaviors (Ruhm, 2003; Gertham & Ruhm, 2006; Riva et al., 2011; McClure et al., 2012). These studies argue that economic crises may have positive impact on health by increaseing health-promoting behaviors such as exercising, reducing alcohol, cigarette and unhealthy food consumption or using less tools (Ruhm, 2003; Gertham & Ruhm, 2006; McClure et al., 2012; Karanikolos et al., 2013).

Table 1 shows the studies examining the impacts of economic crises on health behaviors and their results. According to the Table 1, it can be said that although the impacts of economic crises on health behaviors are ambiguous (Ásgeirsdóttir et al., 2014), the impact mostly develops in the negative direction. Many studies have shown an increase in harmful behaviors in times of economic crisis (Arkes, 2007; Bor, Basu, Coutts, McKee & Stuckler, 2013; Dávalos, Fang, & French, 2012; Macy et al., 2013). On the other hand, there is evidence that health behaviors may develop in the positive direction during periods of economic crisis (Ásgeirsdóttir et al., 2014; McClure, Valdimarsdóttir, Hauksdóttir & Kawachi, 2012). It is also argued that during periods of economic crisis, mechanisms including reduced income for alcohol, tobacco and fast food consumption, and increased time for exercise, may increase health promoting behaviors (Ásgeirsdóttir et al., 2014; McClure et al., 2012; Rechel et al., 2011). However,

Elliot et al. (2010) suggest that the positive effects of economic crises on health behaviors may be short-term and that the long-term crisis is more likely to have negative effects on health behaviors.

Table 1: The Studies Investigating The Impacts of Economic Crisis on Health Behaviors

Studies	Year	Behaviors	Countries	Impact of Crisis
Arkes (2007)	1996-2004	Alcohol and drug use	USA	-
McClure et al. (2012)	2008 crisis	Tobacco consumption	Iceland	+
Macy, Chassin & Presson (2013)	2008 crisis	Various health behaviors	USA	-
Asgeirsdottir et al. (2014)	crisis	Various health behaviors	Iceland	+, -
Davalos, Fang & French (2012)	2001-2005	Alcohol consumption	USA Columbia	-
Bor et al. (2013)	2008 crisis	Alcohol consumption	USA	-

Source: Compiled by the authors.
Note: "+" indicates positive effect, while "-" indicates negative effect.

Arkes (2007) investigated the impacts of economy on youths' alcohol and drug use. In this study, it is concluded that the use of alcohol and drug increased in the economic downturns (Arkes, 2007). McClure et al. (2012) found that the prevalence of smoking in Iceland significantly decreased during the 2008 crisis. The result is that the quit rate is higher in females. Again, this study found that when compared with 2007, the risk of resuming smoking was higher in men who jumped from the high income group to the higher income group than the low income group in 2009. The researchers concluded that there may be a cyclical relationship between the economic crisis and smoking behavior and that people's health-promoting behaviors may increase during the crisis (McClure et al., 2012).

Asgeirsdottir et al. (2014), in their study of the impacts of the 2008 crisis on the health behaviors of the Icelanders, showed that the crisis caused significant increases in the harmful behaviors to health like smoking and alcohol consumption and less vegetable and fruit consumption, while the health-promoting behaviors like the fish consumption and regular increased (Ásgeirsdóttir et al., 2014).

Davalos, Fang and French (2012) have examined the impacts of economic depressions on alcohol consumption in the United States in the Columbia region between 2001 and 2005 using unemployment rates. The study found that there was a positive relationship between unemployment rates and alcohol

consumption, and alcohol consumption increased significantly as unemployment increased. The authors emphasize the importance of alcohol abuse treatment programs in times of crisis to avoid any worse health outcomes (Dávalos et al., 2012).

Bor et al. (2013) investigated alcohol consumption in the United States during the 2008-2009 Great Economic Crisis. In this study, they found that men are more likely to have frequent alcohol consumption than men. Again, in this study, those who are unemployed for less than one year are more likely to consume excessive alcohol. In this study, although the prevalence of alcohol consumption decreased in the crisis period, the general alcohol consumption level was found to increase significantly. Alcohol prevalence has decreased, but excessive alcohol consumption and the numbers of alcohol-consuming days have increased. The authors explain the decrease in prevalence of alcohol consumption by the income effect hypothesis. It is stated that low income may have reduced alcohol consumption in some consumers. Conversely, it is stated that total alcohol consumption and excessive alcohol consumption increase in direct proportion with the unemployment rates (Bor et al., 2013).

Macy, Chassin & Presson (2013) have examined the impacts of the 2008 economic crisis on health behaviors in the United States. In the study, economic troubles were found to affect the health behaviors like controlling the content of purchased materials, preferring healthy products, strong exercise frequency, daily smoking and using safety belt (Macy et al., 2013). Notara et al. (2013) found that there is a strong correlation between unemployment or low income and an increase in harmful behaviors like excessive alcohol and tobacco consumption.

Although there are many studies in the literature regarding the impacts of crises on health behaviors, the number of studies in the national literature is limited and generally outside the definition of health behavior given here. For example, Caman and Cilingiroglu (2009) investigated the relationship between unemployment and suicide behavior between 1990 and 2008. In this study, it is concluded that there is a positive relationship between unemployment rate and suicide rate, and suicide rates increase in crisis periods.

2. Methods

2. 1. Aims and Scope

The main aim of this study is to reveal the impacts of economic crises on people's health behaviors in Turkey. The scope of the study consists of health behavior data which are appropriate for time series analysis between 1974-2015, and three economic crises as 1994, 2001 and 2009. Tobacco, alcohol, vegetable-fruit and sugar consumption are included as health behaviors data in the study. In this context, the purpose of this study is to investigate the impacts of 1994, 2001 and

2009 economic crisis on the tobacco, alcohol, vegetable-fruit and sugar consumption in Turkey between 1974-2015.

2. 2. Study Design

To investigate the impacts of economic crises on health behaviors, ARDL cointegration analysis will be applied within the scope of the time series analysis as an econometric method. Cointegration tests are used to determine the long-run relationships between variables. Assumption of the stationarity of the series lie at the basis of the cointegration analyzes, developed for the determination of long-run relationships between time series and variables. Stationarity means that mean, variance and covariance of the time series do not change over time. Therefore, a stationary time series is one whose statistical properties such as mean, variance, covariance is all constant over time. ln the presence of non-stationary variables, there might be a spurious regression, which has a high R2 statistics that appear significant, but the relationship between variables are not real. Thus, the series must be stationary in the cointegration analyzes. The non-stationary series can be made stationary by applying differencing process to the series. If it is necessary "d" times differencing to make stationary a non-stationary Yt time series, this time series is stationary at its "d" order difference value, and can be shown as Yt~I(d) (Ciftci, 2009).

Ordinary least squares (OLS) technique can be used if all variables are stationary at the level values, i.e. I(0) (Ciftci & Yildiz, 2015). Nevertheless, macroeconomic time series data are generally stationary at their first difference, not in level values (Gerdtham & Ruhm, 2006; Gujarati, 2004, 2011). Some cointegration techniques including Engle & Granger (1987), Johansen (1988), Phillips & Hansen (1990) and Johansen & Juselius (1990) can be used instead of the standard regression technique when all the variables to be used in econometric analysis are stationary at their first difference, i.e. I(1) (Ciftci & Yildiz, 2015; Erdogan & Bozkurt, 2008). ARDL bounds testing approach developed by (Pesaran, Shin & Smith, 2001) is also one of these tests used to determine a log-run relationship between variables. ARDLs (Auto regressive distributed lags) are standard least squares regressions that include lags of both the dependent variable and explanatory variables as regressors (Greene, 2008). This model has advantage to predict future results based on past results because it includes lagged affects. Because the results of economic events are not immediately apparent, ARDL approach is a powerful method to account for lagged impacts.

ARDL procedure can be carried out in four stages. The first stage is to test for stationary of time series, also called unit root test. The second stage is to estimate an Unrestricted Error Correction Model (UECM) and to perform bounding test. This model includes the lagged values of variables with the appropriate differencing, one period lagged level values of variables, and dummy variables if needed (economic crisis as dummy variables in this study). In this stage, an

UECM (as shown in the equation 1.1) is estimated with ordinary lest squares technique (OLS) and the bounding test (wald test) is performed for the joint significance of the coefficients of the one period lagged level values. Then it is decided whether there is a long-run relationship (cointegration relationship) between dependent variable and explanatory variables by comparing F-statistic value obtained from Wald test with the upper and lower critical values derived by Pesaran et al. (2001). If the F test value exceeds the upper critical values, then it is decided that there is a long-run relationship between variables. However, in this stage diagnostic tests including Breusch-Godfrey autocorrelation LM test, Jarque-Berra normality test, ARCH test, Ramsey Reset test and, CUSUM and CUSUM-SQ stability test should also be performed to determine whether the predicted model is valid and appropriate.

After detecting cointegration relationship between variables, the third stage is to estimate an ARDL model with OLS technique to determine the long-run coefficients. In the model at this stage, the variables are introduced into analysis with their level values, and dummy variables are also included if there are. Once the coefficients for the long-term relationship have been determined, the model's diagnostic tests are performed again to decide whether the model is appropriate or not. The last stage is to build an Error Correction Model (ECM) to estimate the short-term coefficients. ECM can be derived from ARDL model through a simple linear transformation, which integrates short run adjustments with long run equilibrium without losing long run information. ECM includes error correction term, which refers to one period lagged value of the model's residuals in which the long-term relationship between variables is obtained, and the lagged values of the differences of all variables. The coefficient of the ECM term indicates how much of an imbalance in the short run after shocks will be corrected in the long run. The error correction term is expected to be negative and significant. Therefore, the coefficients of dummy variable as economic crises in this stage will give us the impacts of economic crisis on the health behaviors-related variables.

There are several reasons to choose the ARDL bounds testing approach in this study. First, the ARDL bounds testing approach developed by Pesaran et al. (2001) does not require all the explanatory variables to be I(1), unlike the other cointegration techniques. Therefore, it is not a necessity to test whether the variables carry the unit root in the ARDL approach (Bahmani-Oskooee & Ng, 2002; Pesaran et al., 2001). On the other hand, there is a need for dependent variable in the model being I(1), and also that none of the planned variables used in the analysis should be I(2). Because the upper and lower critical values given by Pesaran et al. (2001) were obtained according to the cases of series being I(0) and I(1). Therefore, it is useful to determine the stationary levels of the series by performing unit root tests before using the ARDL approach to ensure at least that these conditions are met (Ciftci, 2009). It is also stated that the ARDL bounds testing approach provides robust and efficient results in studies with few

observations (Musa, 2014; Narayan & Smyth, 2006; Narayan & Narayan, 2004; Wang, 2009; Yakisik & Cetin, 2014). In addition to this, since it includes error correction factors for previous years, analysis of error correction and lag difference terms can allow testing of both long and short term relationships between variables. For this reason, the ARDL approach can be used within a set of variables, including economic crises (Wang, 2009). In the ARDL procedure, there are many studies that introduce the variables such as economic crisis, policy changes to the model as dummy variables, and investigate the impacts of these variables on the independent variable (Babych, 2011; Erdem, Ilgun & Dumrul, 2011; Oskanbayev, Yilmaz & Chagirov, 2011; Salleh, Othman, & Ramachandran, 2007; Wang, 2009). The introduction of economic crises as a dummy variable is usually done by assigning 1 for the years of crisis and 0 for other years (Salleh et al., 2007; Wang, 2009). Since the health effects of economic crises are often delayed (De Belvis et al., 2012; Eurofound, 2014; Kim & Serra-Garcia, 2010; Lehto, Vrangbaek & Winbland, 2012; Stuckler, Basu, Suhrcke, Coutts & McKee, 2011; Tangcharoensathien, Harnvoravongchai, Pitayarangsarit & Kasemsup, 2000), and the lagged values of the variables are taken into account in the ARDL method, it is possible to reveal the impacts of the economic crises on health in a better way.

2. 3. Data

The data of the study were obtained annually with a total of 42 observations between 1974 and 2015, and these data are shown in Table 2. In addition to the below, three crisis dummy variables were added for the economic crises of 1994, 2001 and 2009. The coding of these variables was carried out by giving 1 for negative years of GDP and 0 for other years. Between 1974 and 2015, there are more the cases that may be expressed as economic crises (1979-80, 1988-1989, 1991, 1999). Because of insufficient number of observations, and being major economic crises that affect Turkey significantly in the data period of research (Ergenc, 2009; Pusti, 2013; Yucel & Kalyoncu, 2010; Yurekli, 2004), the economic crisis 1994, 2001 and 2009 were only included in the study.

Table 2: Data, Abbreviations and Data Source

	Data	Abbreviation	Data Source
Mother and child health indicators	Total number of tobacco sales to domestic market	TNTS	TAPDK
	Per capita alcohol consumption (Liter)	PCAC	OECD
	Annual per capita vegetable and fruit consumption (Kg)	VEGFRC	OECD
	Annual per capita sugar consumption (Kg)	SUGAR	OECD
Macroeconomic indicators (Independent variables)	Real GDP	RGDP	World Bank (2016a)
	Unemployment rate	UNEMP	TUIK (2016a), Bulutay (1995)
	Inflation rate	INF	World Bank (2016b)

2. 4. Statistical Analysis

To perform the ARDL cointegration method, EViews 9.5 statistical program has been used. The ARDL method was carried out in four stages. First, unit root tests for time series were performed. The Augmented Dickey-Fuller (ADF) test was used for the unit root test (Ciftci & Yildiz, 2015; Tuncsiper & Bicen). Second, an Unrestricted Error Correction Model (UECM) was build and the model was estimated with the OLS technique and the bounds testing (wald test) was performed. Then it was decided whether there was a cointegration relation between the variables by comparing F-statistic value obtained from Wald test with the upper and lower critical values derived by Pesaran et al. (2001). Akaike information is used to calculate the optimal lag length for each variable in the UECM. In the determination of the maximum lag length of the estimated model, it is taken into account the lag length at which no autocorrelation is found. Whether autocorrelation is present or absent has been determined by Breusch-Godfrey LM test for autocorrelation. Because the lagged values of the dependent variable are included in the model as explanatory variables, Breusch-Godfrey autocorrelation LM is used instead of the Durbin-Watson test statistic in investigating the autocorrelation problem. In addition, diagnostic tests of the selected model have been made. In this context, the Jarque-Berra test for normal distribution fit, the ARCH test for heteroscedasticity, the Ramsey Reset test for the functional form misspecification were performed. In addition, CUSUM and CUSUM-SQ tests were performed to determine the stability of the models.

In the third stage, the ARDL model was estimated to determine the long-term coefficients. At this stage, the Akaike information criterion was used to determine the maximum lag length. For the estimated model, Breusch-Godfrey autocorrelation LM test, Jarque-Berra normality test, ARCH test, Ramsey Reset

test and, CUSUM and CUSUM-SQ stability tests were performed. In the fourth stage, the Error Correction Model (ECM) was created by using the ARDL model and this model was estimated with the OLS technique.

2. 5. Limitations

It is accepted that the data obtained for our study is correct. Real GDP, unemployment and inflation rates have been used as independent (explanatory) variables in this study. There are many factors besides these variables that affect health behavior-related variables. Although the error term of the models includes the effects of the other factors which are not included as variables in the models, the results of this study is limited to the variables only included in the related models. Again in this study, the years when the real gross domestic product were negative were taken as indicators of the economic crisis. Another important limitation of our research is related to the number of observations. The data with 42 observations can be assumed as small when evaluated in the scope of the time series analysis.

3. Results

3.1. Results of Unit Root Tests

In this study, the ADF unit root test was used to determine the stationary of the time series used in the analysis. The results of unit root tests are shown in the Table 3, and for independent variables, there are the results of all model types, but for dependent variables, they are only given for the models which are used in the ARDL bounds testing. According to the unit test results, it is seen that all the variables have the condition of not being stationary in their level values but being stationary in their first difference values.

Note that it is used “No Intercept and Trend Model” in the annual per capita sugar consumption series, because other models did not have the condition of not being stationary in their level values but being stationary in their first difference values. Also, we have had to use non-transformed values of the per capita alcohol consumption series, because the models with logarithmic transformed values do not pass the bounds testing, and also there are significant violations in terms of diagnostic statistics.

Table 3: The Results of ADF Unit Root Test

Variables	Models	Level Values		First Difference Values	
		t	p	t	p
LINF	Intercept	-0.88	0.7816	**-6.26*** **	0.0000
	Int. and Trend	-2.05	0.5540	**-6.53*** **	0.0000
	No Int. and Trend	-0.53	0.4802	**-6.32*** **	0.0000
LRGDP	Intercept	-0.39	0.9013	**-6.44*** **	0.0000
	Int. and Trend	-3.20	0.0983	**-6.35*** **	0.0000
	No Int. and Trend	6.21	1.0000	**-2.66*** **	0.0090
LUNEMP	Intercept	-2.14	0.2273	**-5.50*** **	0.0000
	Intercept and Trend	-2. 40	0.3723	**-5.43*** **	0.000
	No Int. and Trend	0.40	0.7951	**-5.54*** **	0.0000
LTNTS	Intercept	-1.83	0.356	**-5.21*** **	0.000
PCAC	Intercept and Trend	-2.86	0.184	**-6.47*** **	0.000
LVEGFRC	Intercept	-2.43	0.138	**-7.16*** **	0.000
LSUGARC	No Int. and Trend	0.49	0.817	**-6.31*** **	0.000

Note: The * sign indicates variables with a significance level of 10%, the sign ** with 5% significance level, and the *** sign with variables with 1% significance level. Critical values for the ADF test were -3.60, -2.93 and -2.60 for intercept respectively at 1%, 5% and 10% significance levels in MacKinnon (1996); -4.20, -3.52 and -3.19 for intercept and trend; for no intercept and no trend, -2.62, -1.94 and -1.61.

3.2. The Results of UECM Models

The UECM models including dependent variables and independent variables as the inflation rate, the real GDP and the unemployment rate, and the dummy variables of the economic crises of 1994, 2001 and 2009 are shown in the following equations.

$$\Delta LTNTS_t = \alpha + \sum_{i=1}^{m} \lambda_{1i}\, \Delta LTNTS_{t-i} + \sum_{i=0}^{n} \lambda_{2i}\, \Delta LINF_{t-i} + \sum_{i=0}^{p} \lambda_{3i}\, \Delta LRGDP_{t-i} + \sum_{i=0}^{q} \lambda_{4i}\, \Delta LUNEMP_{t-i} + \gamma_1 LTNTS_{t-1} + \gamma_2 LINF_{t-1} + \gamma_3 LRGDP_{t-1} + \gamma_4 LUNEMP_{t-1} + \gamma_5 \Delta d\_1994 + \gamma_6 \Delta d\_2001 + \gamma_7 \Delta d\_2009 + \varepsilon_t \quad (1.1)$$

$$\Delta PCAC_t = \alpha + \delta t + \sum_{i=1}^{m} \lambda_{1i}\, \Delta PCAC_{t-1} + \sum_{i=0}^{n} \lambda_{2i}\, \Delta INF_{t-i} + \sum_{i=0}^{p} \lambda_{3i}\, \Delta RGDP_{t-i} + \sum_{i=0}^{q} \lambda_{4i}\, \Delta UNEMP_{t-i} + \gamma_1 PCAC_{t-1} + \gamma_2 INF_{t-1} + \gamma_3 RGDP_{t-1} + \gamma_4 UNEMP_{t-1} + \gamma_5 d\_1994 + \gamma_6 d\_2001 + \gamma_7 d\_2009 + \varepsilon_t \quad (1.2)$$

$$\Delta LVEGFRC_t = \alpha + \sum_{i=1}^{m} \lambda_{1i}\, \Delta LVEGFRC_{t-i} + \sum_{i=0}^{n} \lambda_{2i}\, \Delta LINF_{t-i} + \sum_{i=0}^{p} \lambda_{3i}\, \Delta LRGDP_{t-i} + \sum_{i=0}^{q} \lambda_{4i}\, \Delta LUNEMP_{t-i} + \gamma_1 LFEGFRC_{t-1} + \gamma_2 LINF_{t-1} + \gamma_3 LRGDP_{t-1} + \gamma_4 LUNEMP_{t-1} + \gamma_5 \Delta d\_1994 + \gamma_6 \Delta d\_2001 + \gamma_7 \Delta d\_2009 + \varepsilon_t \quad (1.3)$$

$$\Delta LSUGARC_t = \sum_{i=1}^{m} \lambda_{1i}\, \Delta LSUGARC_{t-i} + \sum_{i=0}^{n} \lambda_{2i}\, \Delta LINF_{t-i} + \sum_{i=0}^{p} \lambda_{3i}\, \Delta LRGDP_{t-i} + \sum_{i=0}^{q} \lambda_{4i}\, \Delta LUNEMP_{t-i} + \gamma_1 LSUGARC_{t-1} + \gamma_2 LINF_{t-1} + \gamma_3 LRGDP_{t-1} + \gamma_4 LUNEMP_{t-1} + \gamma_5 \Delta d\_1994 + \gamma_6 \Delta d\_2001 + \gamma_7 \Delta d\_2009 + \varepsilon_t \quad (1.4)$$

In the above equations, "α" is the constant component of the model, "δt" is the trend component of the model, "Δ" is the first difference operator, "ε" is constant error term with the white noise, and "L" means logarithmic transformation. The models estimate an UECM model with maximum lag lengths (m, n, p, q). F test (wald test) is performed to determine the joint significance of the lagged level values of the UECM model according to the model types. Decisions for the cointegration of the above equations are made by comparing the F-test values obtained for the models with comparing with the lower and upper critical values in Pesaran, Shin & Smith's (2001) Table CI (ii) for ΔLTNTC and ΔLVEGFRC, Table CI(iv) for ΔPCAC, and Table CI(i) for ΔLSUGARC. The following Table 4 contains estimates of the Unrestricted Error Correction Models.

According to the results of the analysis in Table 4, it is understood that the obtained F test value for the model of cigarette sales to total domestic market exceeds all the upper limit critical values given in Table CI (ii) by Pesaran, Shin & Smith (2001), and for the other models, which are alcohol consumption, vegetable-fruit consumption and, sugar consumption, F test values are above the upper limit for the 95% confidence level in Table CI (ii) and Table CI(iv). Moreover, it is understood that there is no problem in terms of diagnostic statistics of the models. According to the CUSUM and CUSUM-SQ graphs below (Figure 1), it is understood that the long term coefficients of the models are stable.

Table 4: The Results of UECM Models

Estimated ARDL Model	**LTNTS [5, 5, 0, 0]**	
k*	**F**	**p**
3	4.89	0.007
Diagnostic Tests: R2: 0.75 A-R2: 0.42 SE: 0.034 SSE: 0.017; S.C.: 0.53, p: 0.742; J.-B.Nor.: 3.41, p: 0.1181; Het.: 0.16, p: 0.6883; F.Res: 1.98, p: 0.181		
Estimated ARDL Model	**LVEGFRC [3, 0, 1, 3]**	
k	**F**	**p**
3	3.95	0.011
Diagnostic Tests: R2: 0.67 A-R2: 0.39 SE: 0.029 SSE: 0.017; S.C.: 1.08, p: 0.383; J.-B.Nor.: 2.65, p: 0.264; Het.: 2.13, p: 0.152; F.Res: 0.20, p: 0.657		
**** Critical Values for Table CI (ii):** for %1– the lower limit 3.65. – the upper limit 4.66; for %2.5– the lower limit 3.15 and the upper limit 4.08; for %5– the lower limit 2.79 and the upper limit 3.67; for %10– the lower limit 2.37 and the upper limit 3.20.		
Estimated ARDL Model	**PCAC [2, 3, 2, 3]**	
k	**F**	**p**
3	4.29	0.010
Diagnostic Tests: R2: 0.71 A-R2: 0.34; SE: 0.125 SSE: 0.253; S.C.: 0.91, p: 0.461; J.-B.Nor.: 1.43, p: 0.488; Het.: 1.87, p: 0.179; F.Res: 1.80, p: 0.199		
**** Critical Values for Table CI (iv):** for %1– the lower limit 4.3. – the upper limit 5.23; for %2.5– the lower limit 3.8 and the upper limit 4.68; for %5– the lower limit 3.38 and the upper limit 4.23; for %10– the lower limit 2.97 and the upper limit 3.74.		
Estimated ARDL Model	**LSUGARC [1, 0, 0, 0]**	
k	**F**	**p**
3	3.86	0.012
Diagnostic Tests: R2: 0.44 A-R2: 0.25 SE: 0.057 SSE: 0.094; S.C.: 0.85, p: 0.362; J.-B.Nor.: 0.63, p: 0.941; Het.: 0.005, p: 0.941; F.Res: 0.24, p: 0.625		
*** Critical Values for Table CI (i):** for %1– the lower limit 3.42. – the upper limit 4.84; for %2.5– the lower limit 2.87 and the upper limit 4.16; for %5– the lower limit 2.45 and the upper limit 3.63; for %10– the lower limit 2.01 and the upper limit 3.10.		

* k indicates the number of independent variables in the model.

** Meaning of the abbreviations in diagnostic tests section; SE: Standar error, SSE: Sum of standart errors, S.C.: Breusch-Godfrey LM test for autocorrelation, J.-B.Nor.: Jarque-Berra normality test, Het.: ARCH test, F.Res.: Ramsey Reset test

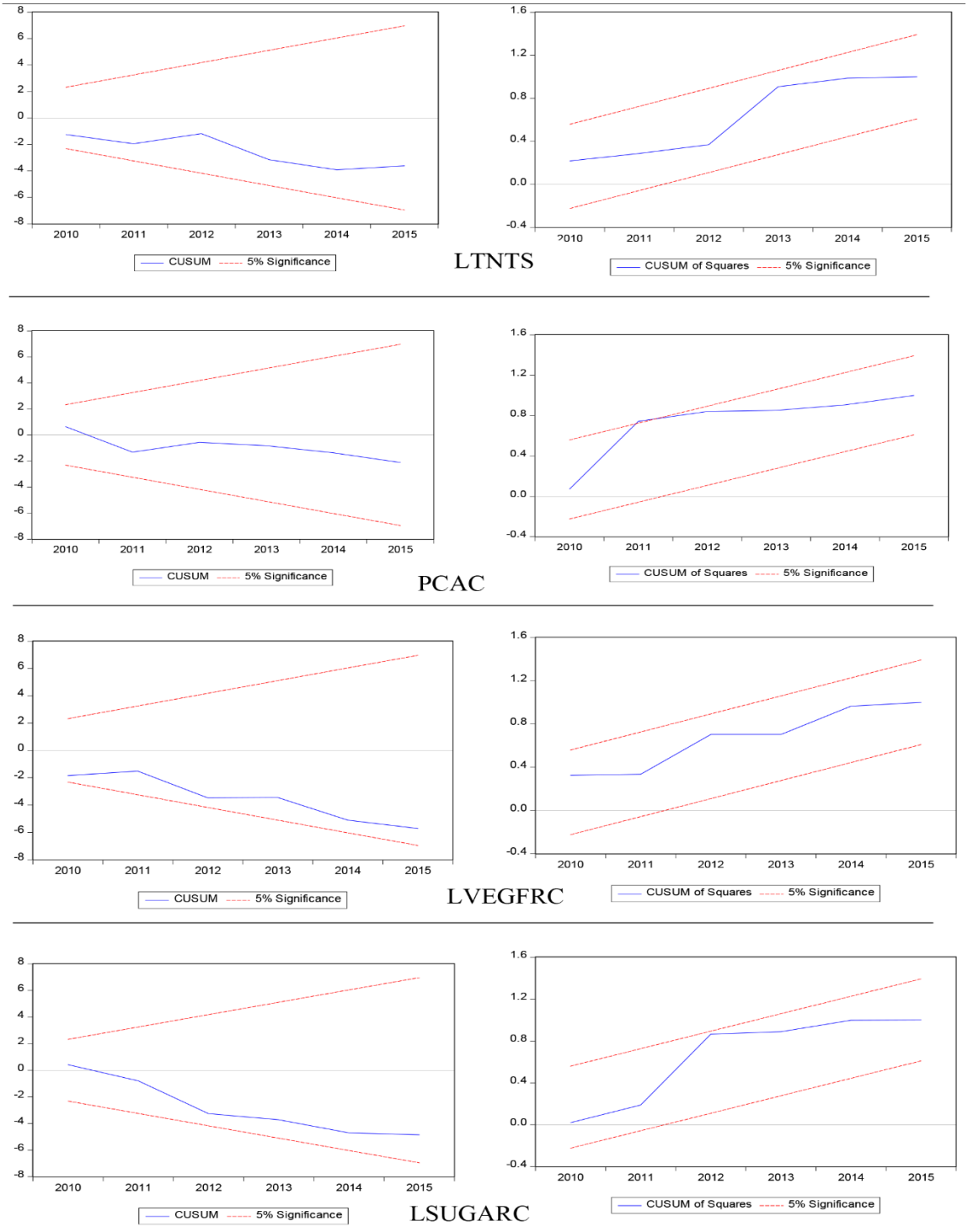

Figure 1: CUSUM and CUSUM-SQ Graphics of The UECM Models

3.3. The Results of ARDL Error Correction Models

At this stage, with the Eviews 9.5 package program, a general ARDL model is estimated by the OLS technique by choosing a maximum delay length of 5 for tobacco consumption, 3 for alcohol consumption, 3 for vegetable-fruit consumption and 3 for sugar consumption, and using Akaike Information Criteria for maximum lag lenght and then the most appropriate ARDL model was decided. The selection of the most appropriate ARLD model is made automatically by the Eviews 9.5 package program according to the selected information criterion and the maximum lag length. In Table 5, the results of ECM models are shown.

Table: 5 The Results of ARDL Error Correction Models

ARDL Model: [4, 4, 4, 0] Ind. Var.: ΔLTNTS	**Variables**	**ΔD_1994**	**ΔD_2001**	**ΔD_2009**	**ECM(-1)**	**C**
	Coefficient	-0.032	-0.028	0.03	-0.349	-11.94
	t	-1.275	-1.056	1.126	-5.058***	-8.963***
	p	0.218	0.304	0.273	0.000	0.000
ECM= LTNTS - (0.2150*LINF + 0.6261*LRGDP + 0.0354*LUNEMP -0.0039*D_1994 -0.1117*D_2001 -0.0010*D_2009 -11.9398)						
Diagnostic Tests: R2: 0.99 A-R2: 0.98 SE: 0.031 SSE: 0.018; S.C.: 1.01, p: 0.445; J.-B.Nor.: 4.06, p: 0.131; Het.: 0.01, p: 0.918; F.Res: 2.19, p: 0.155						
ARDL Model: [3, 4, 3, 4] Ind. Var.: ΔPCAC	**Variables**	**ΔD_1994**	**ΔD_2001**	**ΔD_2009**	**C**	**Trend**
	Coefficient	-0.074	-0.388	-0.364	0.869	-0.08
	t	-0.666	-3.129***	-2.635**	5.238***	-3.108***
	p	0.514	0.006	0.018	0.000	0.007
ECM= PCAC - (0.0054*INF + 0.0000*RGDP -0.0002*UNEMP -0.0305*D_1994 -0.4932*D_2001 -0.3619*D_2009 -0.0803*@TREND)						
Diagnostic Tests: R2: 0.80 A-R2: 0.54 SE: 0.126 SSE: 0.253; S.C.: 0.63, p: 0.647; J.-B.Nor.: 1.43, p: 0.488; Het.: 1.87, p: 0.180; F.Res: 0.34, p: 0.563						
ARDL Model: [3, 0, 1, 3] Ind. Var.: ΔLVEGFRC	**Variables**	**ΔD_1994**	**ΔD_2001**	**ΔD_2009**	**ECM(-1)**	**C**
	Coefficient	-0.099	-0.066	0.051	-0.2	1.468
	t	-4.077***	-2.411**	2.139**	-3.767***	0.684
	p	0.000	0.024	0.042	0.001	0.5
ECM= LVEGFRC - (0.1031*LINF + 0.1653*LRGDP -0.0028*LUNEMP -0.4117*D_1994 -0.2874*D_2001 + 0.1171*D_2009 +1.4677)						
Diagnostic Tests: R2: 0.83 A-R2: 0.74 SE: 0.029 SSE: 0.021; S.C.: 1.38, p: 0.274; J.-B.Nor.: 0.69, p: 0.706; Het.: 0.09 p: 0.758; F.Res: 0.40, p: 0.531						
ARDL Model: [1, 1, 2, 0] Ind. Var.: ΔLSUGAR	**Variables**	**ΔD_1994**	**ΔD_2001**	**ΔD_2009**	**ECM(-1)**	
	Coefficient	0.031	0.114	0.188	-0.711	
	t	0.696	2.511**	3.369***	-4.498***	
	p	0.492	0.018	0.002	0.000	
ECM= LSUGAR - (0.0503*LINF + 0.1344*LRGDP -0.0764*LUNEMP + 0.0043*D_1994 + 0.0820*D_2001 + 0.2913*D_2009)						
Diagnostic Tests: R2: 0.55 A-R2: 0.42 SE: 0.055 SSE: 0.089; S.C.: 0.66, p: 0.582; J.-B.Nor.: 0.55, p: 0.759; Het.: 0.21, p: 0.649; F.Res: 1.44, p: 0.238						

The results of CUSUM and CUSUM-SQ tests are shown in Figure 2.

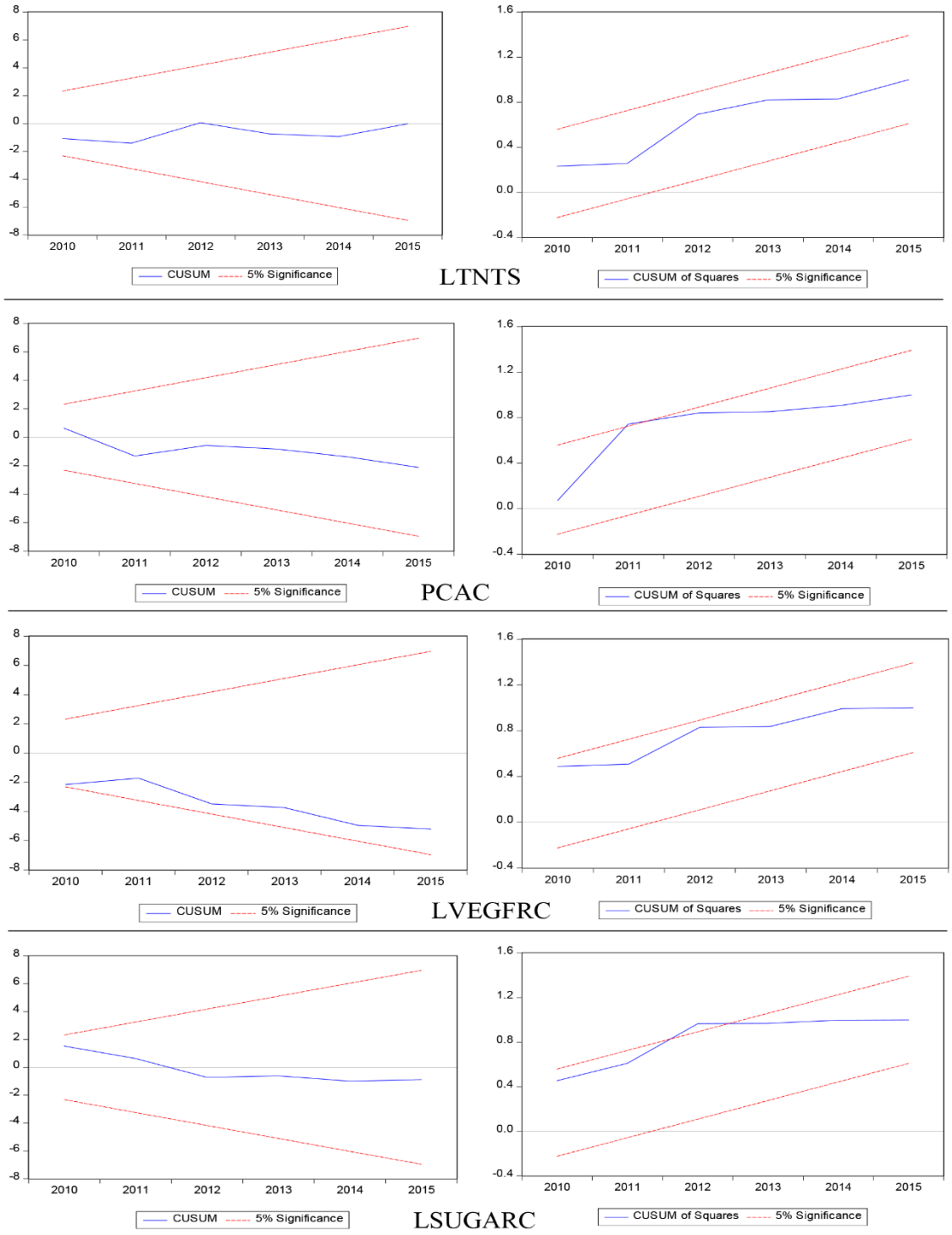

Figure 2: CUSUM and CUSUM-SQ Graphics of ARDL Error Correction Models

Diagnostic test results in Table 5 show that there are no diagnostic problems in the models, and also CUSUM and CUSUM-SQ graphics in Figure 2 shows that the models are stable. According to the error correction model results shown in Table 5, it is seen that all the coefficients of ECM(-1) are negative and statistically significant as expected. These coefficients are interpreted as follow example:

- For the TNTS model, according to the error correction model coefficient (-0.349), we can say that 35% of the deviations in the long term equilibrium of the system after the shocks that can occur in the short term period in the system will be eliminated in the next period.

When the impacts of economic crises on the number of tobacco sales to the total domestic market was examined, it was determined that the 1994 and 2001 and 2009 economic crises had no significant effect on cigarette consumption ($p>0.05$), according to the information on the short term coefficients table (Table 5). For the effects of the economic crises on per capita alcohol consumption, the impacts of the 1994 economic crisis was not significant, whereas it has been found that the impacts of the economic crisis of 2001 and 2009 were significantly ($p<0.05$) negative. When the impacts of economic crises on annual per capita vegetable-fruit consumption are examined, while it has been detected that the economic crisis of 1994 and 2001 significantly reduced the consumption of vegetables and fruits, on the contrary, 2009 economic crisis was found to have significant positive impact ($p<0.05$). Given the effects of economic crises on per capita sugar consumption, according to the results of short-term estimations (Table 5), the 1994 economic crisis had no significant impact ($p>0.05$) and the 2001 and 2009 economic crises had increased per capita sugar consumption significantly ($p<0.05$).

5. Discussions

This study shows that economic crises have had no significant impact on the tobacco consumption in Turkey. When considering that the smoking is an addiction, it is possible to say that the economic crises in Turkey have not affected the tobacco consumption to the extent that could lead to behavioral change. On the other hand, considering the positive coefficient of 2009 economic crisis and, the negative coefficient of 1994 and 2001 economic crisis, which are more severe than 2009 economic crisis, the severity of economic crisis may be an important factor in the impact of economic crisis on the tobacco consumption.

The significant reducing impacts of 2001 and 2009 economic crisis on alcohol consumption in Turkey in this study, can be argued that alcohol is a product that can be easily dispensable compared to the tobacco. Also we can explain this result from income effect, and it can be said that the price elasticity of tobacco consumption is more flexible during economic crises in Turkey. From the findings about excess intake of sugar during economic crisis in Turkey, it can be said that

in general the adverse health effects of the economic crises in terms of sugar consumption may occur.

There are many other factors that can affect the health-related behavior of the population, apart from the factors in this study. Demographic factors, socio-cultural characteristics and psychological factors are among these. For example, being perceived the smoking as a socio-cultural superiority might be a factor in the reason why tobacco consumption is not affected by the economic crisis in Turkey. Similarly, the fact that cigarette smoking is considered as a pleasure-giving consuming substance, and thus becoming a traditional consumption item, may be the reason for this result. This study shows the there is a decline trend in the alcohol consumption in Turkey during the economic crisis. Alcohol consumption is already low in Turkey. Because alcohol consumption is seen as a sin in religious terms, it may be easily abandoned. Therefore, these may be the important factors of decline trend in the alcohol consumption during the economic crisis beside higher price of alcohol than cigarette. Also, contrary to cigarette smoking, the frequency of alcohol consumption among individuals may not be at the level of addiction. In terms of sugar consumption, there is an important place of desserts in the food culture in Turkey, and desserts take the first place to serve to the quests. Thus, these features of the dessert may also be an important factor in the increase of sugar consumption

6. Conclusions and Suggestions

The aim of this study is to reveal the impacts of economic crises on health behaviors in Turkey. In this context, the impacts of the 1994, 2001 and 2009 economic crisis on 4 indicators related to health behaviors in Turkey between 1974-2015 were investigated by ARDL bounds testing approach. According to the results, the economic crisis of 1994, 2001 and 2009 have not significantly affected the tobacco consumption in Turkey. In the alcohol consumption, it was found that the 1994 economic crisis had no significant effect, whereas the 2001 and 2009 economic crises had significant positive effects ($p<0.05$). In the consumption of vegetables and fruits, the impacts economic crises of 1994 and 2001 were negative and significant, contrary to positive and significant impacts of 2009 economic crisis. In sugar consumption, only the impacts of 2001 and 2009 economic crises were significantly negative.

From the results of study, it can be stated that economic crises may effect health behaviors in both negative and positive way. Health behaviors are among the important determinants of health. Therefore, negative behavioral impacts of economic crises will impact health in a negative way. For policy-makers to prevent negative health effects, it is recommended to increase public spending in mental health services, or at least not to cut it. Furthermore, it is noteworthy that, in spite of the significant decreases in alcohol consumption during the crisis periods, smoking consumption is not affected by crises. In this result, the high

price of alcohol may have played an important role. For this reason, it may be deterrent to raise cigarette prices to prevent negative health effects. Additionally, this study shows that positive behavioral changes is an opportunity for policy-makers to make these behavioral changes permanent. Therefore, it is recommended to increase training activities, for example increasing public service advertisings during crises, to make these changes permanent.

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