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On the nexus between exchange rate and income distribution in Turkey: ARDL bound testing analysis

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Abstract

If we talk about the importance of variables in economic development, income distribution is not the second to economic growth, especially in emerging countries. These emerging countries are generally characterized by the volatility of exchange rates, especially after most of the countries adopted floating exchange rates system. This paper investigates the impact of an increases in dollar value on income distribution using annual data in the period 1990-2016 for Turkey via an ARDL model and bound testing analysis. In constructing the empirical model, it also considers the impact of GDP per capita on the dependent variable. **Findings/Originality**: The paper finds that an increase in dollar value leads to a more unequal income distribution in Turkey. The dollar holds an important place in Turkey's foreign trade. Therefore, the changes in the value of dollar results in significant welfare effects.

Introduction

Exchange rates affect many macroeconomic variables worldwide. The volatility of exchange rates, which is caused by institutional or economic factors, has important welfare effects. These effects vary in both country status and periodic differences. In addition, a fair distribution of income is an important indicator of the welfare of the poor.

One of the approaches to explain equilibrium exchange rate is the structural approach. The equilibrium exchange rate refers to the exchange rate, which provides an acceptable internal income distribution. In this approach, the volatility in the exchange rate reverts income distribution through prices and wages. Exchange rate is an important pricing instrument. The depreciation in domestic currency increases prices of imports and decreases prices of exports. An increase in demand on exports results in rising price level (Mishkin, 2000). The depreciation in domestic currency also causes rising prices of imported intermediate goods and energy which result in cost inflation. (Alexander, 1952) claims that increases in exchange rate primarily effect prices but there would be a long lag on the adjustment of wages to this inflationary effect. Therefore, the transfer of income from fixed-income group to capital owners will occur. According to Lim (2014), income distribution corrupts labor in export-led growth economies. The bargaining power of the labor side is weak in developing countries. In spite of high labor productivity, wage increases drop behind this productivity and this may cause a redistribution of income from labor-side to profit earners.

Agénor (2002) presents two ways from real exchange rate to welfare of the poor. First, a depreciation in real exchange rate decreases prices of non-tradable goods and it increases welfare of the urban poor who consume such goods. Second, depreciation incentives for the allocation of

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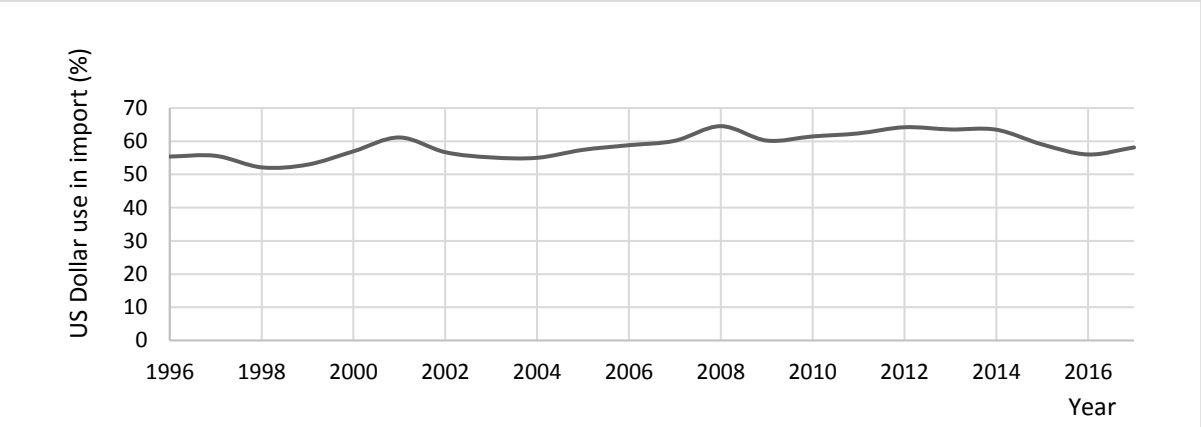
resources to agricultural export activities and that rises income and increases welfare of the poor who stands in rural area.

In Turkey, a significant part of imports is made with US dollar. According to Turkish Statistical Institute Foreign Trade Statistics in 2018, percentage share of imports made with dollars in total imports is 58.66% on average over the last 22 years.



Source: Turkish Statistical Institute, 2018.

Figure 1: US Dollar Use in Turkey's Total Import (1996-2017)

Figure 1 shows percentage share of US dollar use in import over the last 22 years. The dollar is holding an important place in Turkey's foreign trade and its welfare effects should be taken into account. Because of using US dollar on importing intermediate goods and energy, positive changes on dollar value directly effects prices through cost of production. These inflationary effects are expected to have negative impact on the equal distribution of income in Turkey.

There are only a few empirical studies investigating that relationship. Bahmani-Oskooee (1997) found an unequalizing effect of devaluation on income distribution using a cross-sectional model includes 24 countries. In a similar study for 28 countries Bahmani-Oskooee, Goswami, & Mebratu (2006) analyzed the relationship between black market premium on foreign exchange and income distribution. Their results show that countries with higher black market premium have more unequal income distribution. From a theoretical point of view, it is expected that the high level of the black market premium in the foreign exchange market will make the same impact as the exchange rate increases. Shahbaz, Islam, & Butt (2011) have come to the conclusion that devaluation worsened income distribution in Pakistan with their time series analysis including the period 1973-2006 using ARDL model and bound testing analysis. Another empirical work for the USA has been conducted by Bahmani-Oskooee & Motavallizadeh-Ardakani (2017) using an ARDL model. They present a nonlinear long-term relationship between the value of dollar and income inequality in their studies using both linear and nonlinear ARDL co-integration analyses. The data used in their study includes 51 states of the USA. Finally, Bahmani-Oskooee & Motavallizadeh-Ardakani (2018) found a short-run asymmetric relationship in 34 countries and long-run in 22 countries using non-linear cointegration analysis with the dataset of 41 countries. In that case, devaluation worsens income equality but a revaluation does not lead to an opposite effect.

The results obtained from empirical works generally shows that in linear models an increase in real exchange rate leads to inequality and decreases welfare of the poor. However, nonlinear empirical results show rising exchange rate worsens equality but depreciations do not lead to a more equal income distribution and the relationship is asymmetric. Recent literature lacks time series analysis to present country-specific evidences. In this study, we empirically investigated the relationship between changes in the value of dollar and income distribution in Turkey.

Research Method

The Gini data which shows income distribution in Turkey has been taken from Standardized World Income Inequality Database (Solt, 2016). Effective dollar value data has been received from Central Bank of the Republic of Turkey. Real GDP per capita from the World Bank (World Development Indicators) also used as control variable (World Bank, 2017). The dataset is annual and include the period 1990-2016 for Turkey. The model used in this work is as follows.

$$Gini_t = \beta_0 + \beta_1 GDP_t + \beta_2 DV_t + \varepsilon_t \quad (1)$$

In equation (1), Gini refers to Gini coefficient, GDP refers to real GDP per capita, and DV is percentage change in dollar value and all variables are in logarithmic form.

In the co-integration analysis of Engle & Granger (1987) and Johansen & Juselius (1990), series should be integrated in the first order (I_1). However, when series are integrated in different orders, these analyses can not be used. In this situation, we can analyze a co-integrated relationship using the bound testing approach by Pesaran & Shin (1998) and Pesaran, Shin, & Smith (2001). The established ARDL model is as follows.

$$\Delta \mathrm{Gini}_t = \psi + \eta_0 \mathrm{Gini}_{t-1} + \eta_1 \mathrm{DV}_{t-1} + \eta_2 \mathrm{GDP}_{t-1} \sum_{j=1}^{p} \beta_{1j} \Delta \mathrm{Gini}_{t-j} + \sum_{j=0}^{q} \beta_{2j} \Delta \mathrm{DV}_{t-j} + \sum_{j=0}^{q} \beta_{3j} \Delta \mathrm{GDP}_{t-j} + \varepsilon_t \quad (2)$$

The ARDL bound testing method has a few comparative advantages over methods proposed by Engle & Granger (1987) and Johansen & Juselius (1990). First, the ARDL method can be used to determine co-integration in a small sample size, whereas Johansen's method needs a large sample size. Second, all regressors in Johansen's method must be integrated in the same order for testing co-integration, whereas the ARDL method can be used regardless of the level of explanatory variables. They can be I(0), I(1), or a combination of both (Pesaran et al., 2001). Third, the ARDL method allows wide choices while selecting exogenous variables.

ARDL model allows to create an error correction model to see in how many periods the variables will come to equilibrium. The error correction equation is given in equation 4.

$$ECT_t = Gini_t - \beta_0 - \beta_1 GDP_t - \beta_2 DV_t \quad (3)$$

$$\Delta Gini_t = \gamma_0 + \sum_{i=1}^{n} \gamma_{1i} \Delta Gini_{t-i} + \sum_{i=0}^{q} \gamma_{2i} \Delta GDP_{t-i} + \sum_{i=0}^{r} \gamma_{3i} \Delta DV_{t-i} + \delta ECT_{t-1} + \varepsilon_t \quad (4)$$

Results and Discussion

The stationarity levels of the variables used in our model is investigated with Kwiatkowski, Phillips, Schmidt, & Shin (1992) unit root test. This method gives better results in small sample time series (T<100) compared to other traditional unit root tests (Shin & Schmidt, 1992). The results of unit root tests are as in Table 1.

Table 1. Unit Root Test Results

Model	Variable	LM statistic	%5 Critical value
c+t	Gini	0.178**	0.146
C	Δ(Gini)	0.405	0.463
c+t	DV	0.144	0.146
c+t	GDP	0.151**	0.146
C	Δ(GDP)	0.138	0.463

** indicates rejection of null hypothesis at 5% significance level.

The unit root test results are shown in table 1. A *c+t* refers to the model with constant and trend. A *c* refers to model with constant only. The null hypothesis of stationarity results shows that Gini coefficient, GDP per capita and percentage changes in dollar value are I_1, I_1 and I_0, respectively.

In our model, we have only 27 annual observations and the variables are integrated in different orders. Therefore, an ARDL model is appropriate for our analysis. The results of the ARDL model are as follows;

Table 2. ARDL (1,0,4) Estimation Results

Variable	Coefficient	t statistic
Gini (-1)	0.675	10.322***
GDP	-0.051	-3.588***
DV	-0.003	-0.620
DV(-1)	0.002	0.366
DV(-2)	0.013	3.166***
DV(-3)	0.011	2.460**
DV(-4)	0.008	1.865*
C	0.177	2.101*
	Statistic	p value
J-B normality test	0.705	0.703
Serial correlation LM test	0.197	0.896
Heteroscedasticity test	0.628	0.726

***, **, and * indicate rejection of null hypothesis at 1%, 5% and 10% significance levels, respectively.

The results of the ARDL model are shown in Table 2. The optimum lag levels are determined with Schwarz Information Criterion. The model specification tests are also reported. Model specification results show that autocorrelation and heteroscedasticity problems are absent using this lag structure with residuals normally distributed. Bound testing results to investigate long run relationship are shown in Table 3.

Table 3. Results of Bound Test

Number of regressors	F statistic	5% lower bound	5% upper bound
2	8.146	3.790	4.850

According to Table 3, F statistic is exceeding the 5% upper bound and the null hypothesis "no long run relationship" is rejected. That means there is a long run relationship between those variables.

Table 4. Estimated Long Run Coefficients

Variable	Coefficient	t statistic
GDP	-0.155	-7.575***
DV	0.095	5.046***
C	0.543	2.790**

***, **, and * indicate rejection of null hypothesis at 1%, 5% and 10% significance levels respectively.

Table 4 shows long run coefficients obtained from ARDL model. Real GDP per capita affects Gini Index negatively and the value of dollar affects Gini Index positively. With reference

to results it can be said that positive changes in the value of dollar leads to more unequal income distribution in the long run.

Table 5: Error Correction Model Results

Variable	Coefficient	t statistic
D(GDP)	-0.050	-3.588***
D(DV)	-0.003	-0.619
D(DV(-1))	0.013	3.166***
D(DV(-2))	0.010	2.460**
D(DV(-3))	0.008	1.865*
ECT(-1)	-0.325	-4.977***

***, **, and * indicate rejection of null hypothesis at 1%, 5% and 10% significance levels, respectively.

According to the error correction model estimation results shown in Table 5, the coefficient of error correction term (ECT) is negative and statistically significant at 1% level, implying that 32% of the errors are correcting in a single time period.

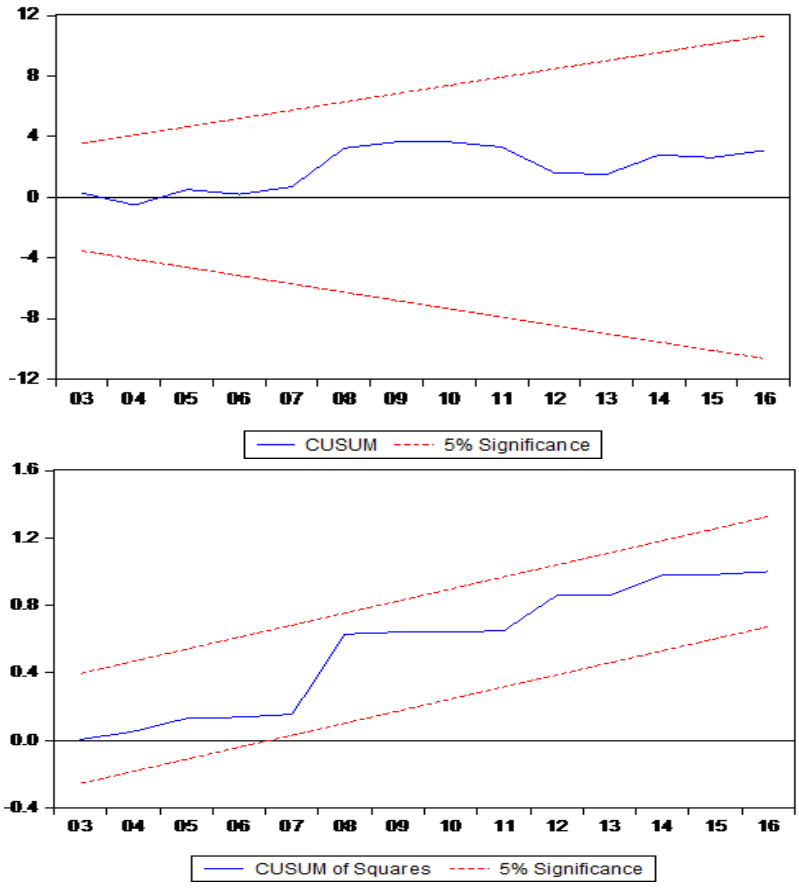


Figure 2: Cusum and Cusum of Squares

CUSUM and CUSUM of Squares tests proposed by Brown et al. (1975) show consistency of parameters over time. Figure 2 shows Cusum and Cusum of Squares results indicating that the long run coefficients are stable at 5% significance level.

The results obtained from this empirical work can be summarized as follows; (i) Series are integrated in different orders according to Kwiatkowski et al. (1992)) unit root test. Therefore, ARDL model and bound testing analysis proposed by Pesaran & Shin (1998) and Pesaran et al. (2001) are appropriate for our study. (ii) Long run coefficients show a significant relationship between real GDP per capita, percentage changes on the value of dollar and Gini coefficient. In the long run, rising real GDP per capita leads to more equal income distribution and positive changes in the value of dollar worsen equality. A 1% increase in the value of dollar leads to 0,09% more unequal income distribution. (iii) According to error correction results, 32% of errors are correcting in a single time period and CUSUM and CUSUM of squares tests show consistency in coefficients at 5% significance level.

Results obtained from the analysis support the idea that previously proposed by Alexander (1952) and Bahmani-Oskooee (1997). According to their studies, the inflationary effects of exchange rate increases redistribute income from workers to producers. In Turkey, wages are determined by collective agreements. Exchange rate increases directly cause a cost inflation but because of the agreements nominal wages cannot be immediately adjusted to the price increases. Results obtained from our work also support previous empirical works done by Shahbaz et al. (2011) and Bahmani-Oskooee & Motavallizadeh-Ardakani (2018). Similar to the results we obtained, previous studies have concluded that the increase in exchange rate leads to more unequal income distribution.

Conclusion

Previous researches investigating the relationship between exchange rate and income inequality are lack of time series analysis and country-specific results. The consequences of the exchange rate changes will differ according to foreign trade structures of the countries. Turkey is a country dependent on foreign intermediate goods and energy. For this reason, it is inevitable that exchange rate changes will affect productivity and welfare.

In this study we investigated the nexus between changes in the value of dollar and income distribution using annual data in the period 1990-2016 for Turkey via ARDL cointegration analysis. The results show that increases in exchange rate results a more unequal income distribution in Turkey.

Imports with US dollar holds an important place in Turkey's total imports. More than half of the total imports are made with dollars in Turkey. Therefore, changes in the value of dollar directly effects price stability. Rising dollar value results with a redistribution of income from fixed-income group to the rest of the economy, hence a more stable exchange rate policy is important to improve the welfare of the poor and middle-income groups.

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