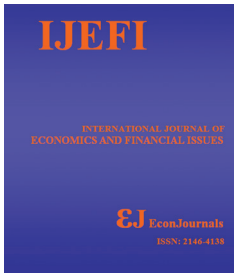


International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2016, 6(2), 442-449.

Exchange Rate Movements and its Local Effects: Turkey Case

Hasan Engin Duran*

Izmir Institute of Technology, City and Regional Planning Department, Turkey. *Email: enginduran@iyte.edu.tr

ABSTRACT

Aim of the current study is to investigate the impact of exchange rate movements on regional growth and inequalities across 26 NUTS-2 level regions in Turkey over a period 2004-2011. In terms of methodology, spatial-panel methods such as fixed and random effect estimators alligned with spatial autoregressive and error models were adopted. As an outcome, it has been shown that depreciation of Turkish lira creates an increasing effect on aggregate growth while its impact on regions are quite mixed. The industrialized Western regions are worsely affected. In these regions, depreciations create an increase in the cost items of companies, discouraging the production and output growth. Controversially, relatively less developed regions in Eastern parts are positively affected from depreciations, probably due to their improved export performances, following a depreciation, driven by a decrease in exported-good prices and increased competitiveness in foreign markets. This leads consequently to an improvement of convergence process.

Keywords: Exchange Rate, Regional Growth, Spatial-Panel Models
JEL Classifications: F31, F32, R11, R12

1. INTRODUCTION

In the literature on regional convergence, a number of studies had an attempt to analyze the evolution of income inequalities across regions (Barro and Sala-i Martin, 1991; 1992; Rey and Montouri, 1999) The vast majority of these studies rely on the neo-classical foundation of growth as it implies a monotone saddle path along which each regional economy manifest a tendency to converge towards a unique steady state and long-run equilibrium (Solow, 1956; Duran, 2014; Duran, 2015a).

In order to achieve the convergence and territorial cohesion, different types of policies have been adopted by governments. Among others, fiscal policy is used as the main instrument which aims at stimulating the economic growth in backward regions by both diverting the direct and indirect income transfers to the less developed areas (via taxation or subsidies) and by improving the physical and social infrastructure in these regions (Munnell and Cook, 1990; Romans and Subrahmanyam, 1979).

However, the macroeconomic policies are not limited to fiscal policy. Likewise, monetary policy and interest rate decisions are also argued to have varying effects on regional economies (Carlino and DeFina, 1999; Owyang and Wall, 2009).

In a similar manner, the exchange rate movements and related policies may have contradicting effects on growth, both at the aggregate or disaggregate levels (Rodrik, 2008; Carlino et al., 1990; Eichengreen, 2008). For the aggregate level, there are two opposing views.

First, the traditional school argues that depreciation of domestic currency is beneficial for growth (Easterly, 2005; Vieira and MacDonald, 2012). The rational behind this claim is based on the idea that an undervaluation of domestic currency decreases the price of exported goods, it, therefore, helps improving the competitiveness of domestic firms; attracting the external demand and, hence, upgrade the volume of exported goods (Kandil et al., 2007). It consequently stimulates the economic growth by ameliorating the balance of trade. Moreover, the success of such a channel depends also on the capacity of domestic economy to accomodate the additional external demand (Guitian, 1976; Dornbusch, 1988). In contrast, the countries that experience overvalued currencies are expected to have foreign currency shortages, rent seeking, current account and balance of payment crisis (Rodrik, 2008).

Not all scholars, however, equally agree with the above mentioned optimistic views. In contrast, the stream of structuralists adopt

a counterview (from a supply-side look) (Meade, 1951). Their main argument is that, in unindustrialized countries, inputs for manufacturing goods can hardly be produced domestically, which are rather imported from developed states (Bruno, 1979; Van Wijnbergen, 1986). In such a case, the depreciation of the domestic currency is expected to raise the prices of imported inputs automatically which leads to an increase in the costs of raw materials, energy and intermediate goods of the firms (Bruno, 1979; Van Wijnbergen, 1986). Therefore, it creates a decline in competitiveness of the companies, which is detrimental to growth stimulus. The harmfull effects of devaluation can also be triggered by demand-side factors. Such that an unexpected depreciation is likely to force the policy makers to raise the interest rates for two reasons; first, in order to attract the short-term foreign capital inflows and, second, to cope with the pressures on domestic inflation (Kandil et al., 2007). Such an increase in interest rates will naturally lower the domestic demand on goods and will also cut the investments of the firms. Consequently, this will create a reductive effect on economic growth.

At the regional level, the issue is even more complicated. For some regions, the first channel can be dominant, depending on the productive capacity, industrial and employment structure as well as the degree of outward orientation of the region, while, for the remaining regions, the second channel might work out. In other words, the depreciation is likely to have quite distinguished and varying effects on different regions.

Anyhow, depending on these circumstances, the depreciation of the currency might favor either the already developed regions or the relatively poorer ones. Thus, it might create an increase or decrease in income inequalities across regions.

Indeed, this is an issue almost completely unstudied in the literature (see for rare examples, Branson and Love, 1987; Cox and Hill, 1988; Carlino et al., 1990) although the problem is quite relevant for developing countries since they experience highly volatility exchange rate fluctuations from the past to today, sharp devaluations and appreciations. In that context, Turkey is one of those developing countries which fits quite well to the purpose of this study as it includes large socio-economic and territorial economic imbalances as well as rapidly changing exchange rates (Yildirim et al., 2009; Gezici and Hewings, 2007; Berument and Dincer, 2004).

Hence, aim of the current study is to investigate the impact of exchange rate movements on the regional growth and inequalities (for 26 NUTS-2 level regions) in Turkey over a period 2004-2011.

In Section 2, we provide a brief account of the existing literature on this issue. In Section 3, the empirical part takes place. In terms of methodology, we, first, design a spatial-panel model and estimate the impact of depreciation on regional growth using fixed effect and random effect estimators and also by adopting the combination of spatial autoregressive (SAR) and spatial error models (SEM) (Anselin, 1988; Baltagi et al., 2007; Millo and Piras, 2012). Then, the estimated effects of depreciation are evaluated using explaratory tools (like maps) and conditional income distributions and kernel regressions (Bashtannyk and Hyndman, 2001; Hyndman et al., 1996; Hyndman and Yao, 2002). Finally, Section 3 is devoted to concluding remarks.

2. LITERATURE REVIEW

The link between economic growth and currency devaluation has been heatedly debated in the literature both theoretically and empirically (some examlples; Dollar, 1992; Sachs and Warner, 1995). The theoretical linkages are explained in the introductory part, however, the discussion on the empirical findings is yet to be covered.

At the country-level, majority of the studies point to the relevance of the optimistic channel. This holds particularly true for developing countries. Some examples of these studies are Rodrik (2008) who has investiagated the relationship between currency depreciation and economic growth in a set of 188 countries and over a period 1950-2004. He found evidence in favor a causal positive impact of undervaluation on output growth, especially for developing countries. In support of this finding, he acknowledges that in China, gross domestic product (GDP) growth during 1970s is coupled with an increase in undervaluation of yuan. Likewise, in India, the acceleration of GDP growth during the recent decades is parallel to the undervaluation of Indian rupee.

Similar studies have been carried out for Turkey as well. One important example is Kandil et al. (2007)'s study who have analyzed the relationship between depreciation of Turkish liras and aggregate economic performance over a period 1980-2004 and found evidence of the fact that both anticipated and unanticipated appreciation of lira is detrimental to economic growth. There are other studies who found evidence of detrimental effects of depreciations. One of these examples is Çatik (2007) who has analzed this issue for Turkish economy over a period 1992-2005.

In contrast, Domaç (1997), who has analzed the issue for Turkish economy for a period 1960-1990, has found a positive impact of unanticipated devaluations on the real economic activity.

In line with the latter study, some other country examples has come up with a similar finding of positive impact. For instance, Kamin (1988), Edwards (1989), Kamin and Rogers (1997) and Morley (1992) are among the papers that belong to this stream.

At the regional level, however, far little number of studies exist. Indeed, almost all of them focus on U.S. States. In particular, Carlino et al. (1990) has analyzed the output responses of 48 states to the appreciation of real exchange rate over a period 1972-1986. They distinguished the short-run impact from the long-run one. As an outcome, they found that, in the short-run, the impact is significant for 11 states (negative for 5 states and positive for 6 states). In the long-run, the effect is significant for 17 states (negative for 13 states and positive for 4 states). Hence, although, in general, appreciation has created a deceleration for the economic growth, the impact is quite mixed among states. Similarly, Branson and Love (1987) have found quite differential effect of currency appreciation on the employment growth of manufacturing sectors

across U.S states. It has been argued that industry mixes of states (particularly the intensity of manufacturing sector) is critical to the magnitude of the effect (Cox and Hill, 1988).

As for the Turkish economy, the issue of regional growth patterns and convergence are debated by a strand of scholars but never in the context of its relation to exchange rate movements. Commonly accepted finding is the presence of a significant East/West dualism in the development levels of regions (Yildirim et al., 2009; Gezici and Hewings, 2007; Filiztekin, 1999). The persistence of large inequalities and non-convergent pattern is mostly related to the liberal policies that aim at favoring the already developed Western regions; to the inadequacy of 5 year-development plans which is adopted since the 1960s; to the out migration of productive labor force from rural to the developed areas and to the other structural problems such as lack of physical and social infrastructure, etc. (Kirdar and Saracoglu, 2008; Yildirim et al., 2009; Gezici and Hewings, 2007; Filiztekin, 1999). The empirical part is pursued in the next sub-section.

3. EMPIRICAL MODEL AND RESULTS

The initial step in our analyses is to define our empirical model, which is based on the following longitudional - spatial regression equation[1]:

$$\ln\left(y_{i,t}\right)-\ln\left(y_{i,t-1}\right)=\Delta y_{i,t}=\gamma_0+\gamma_1\ln(y_{t-1})+\gamma_2 W\Delta y_{i,t}+\gamma_3 ms_t+\gamma_4 humancap_{i,t}+\gamma_5 labour_{i,t}+\gamma_6 d\_crisis_t+\gamma_7 indus_{i,t}+\sum_{i=1}^{26}\beta_i D_i\, x\, ln\Delta RER_t+\sum_{i=1}^{26}\delta_i D_i\, x ln\Delta RER_{t-1}+\in_{i,t}$$

$$\in_{i,t}=\varphi W\in_{j,t} \qquad t=2004,\ldots,2011 \qquad i=1,\ldots,26 \qquad (1)$$

To begin with the dependent variable, $\Delta y_{i,t}$ represents the annual regional economic growth and measured by the first differenced real gross value added (GVA) per capita (in natural logarithms) of region *i* at year *t*. The GVA data is first deflated by using regional consumer price index data, assuming the 2004 as a base year.

In terms of the right hand-side variables, the first independent variable is the per capita real GVA (in ln) in region i and year $t-1$. It represents the initial income of regions and critical to understand the convergence process. Specifically, a negative and significant γ_1 would indicate the presence of catch-up process along which initially poorer regions growth faster than the richer ones. The GVA data has been obtained from Turkish Statistical Institute (TURKSTAT) and Regional Consumer Price Index data has been obtained from Central Bank of Turkey.

$W\Delta y_{i,t}$, denotes the SAR component of the dependent variable (to be used in SAR model). *W* is the spatial weight matrix which is in the form of raw standardized inverse distance matrix. In particular, each cell in the matrix takes a value on the basis of $1/dij$ where *d* is the distance in kilometers between the biggest province of two regions (*i* and *j*). The distance data has been obtained from General Directorate of Highways of Turkey. A positive and significant γ_2 would indicate the evidence of spatial spillover of growth from one region to the neighbouring ones. Similarly, φ captures the geographical dependence and spillover among errors (unexpected growth) of the neighbouring regions (to be used in SEM).

Another indendent variable, *ms,* represents the nominal money supply of Central Bank and measured by the logged and first differenced sum of yearly reserve money. It is used to capture the effect of monetary expansion and money in circulation on regional economic growth. The related data has been obtained from the website of Ministry of Development.

$Humancap_{i,t}$ variable captures the effect of human capital stock of the region on economic growth. It is measured (in logs) by the percentage of university graduates within the labor force of the region. The related data has been obtained from TURKSTAT.

Next, *labour* variable measures the market size of the region using the number of people in labour force (in logs). *d_crisis* is a dummy variable that captures the effect of global financial crisis on regional growth. It takes value 1 for 2008 and 2009 years and 0 for other years. *indus* is the percentage share of industry in regional GVA. It is in the form of logs and the related data has been obatined from TURKSTAT.

Finally, perhaps the most important part is the remaining two variables which capture the impact of real exchange rate movements of regional economic growth. lnΔRER is the first differenced and logged change in the index of real effective exchange rate (*RER*) of Turkish Liras againts a basket consist of the currencies of major trading partner countries of Turkey *(RER* is calculated on the basis of CPI and assuming 2003=100). The formulation of *RER* is specified in a following way[2]:

$$RER=\prod_{c=1}^{N}\left[\frac{Price_{Turkey}}{Price_c\times exch_{c,Turkey}}\right]^{w_c} \qquad (2)$$

Where, *c* denotes the index of countries with which Turkey has trade ties. N is the total number of trade partners. $Price_{Turkey}$ and $Price_c$ represents respectively the price level of Turkey and the trading partners. For Turkey, the price index is calcuated on the basis of consumer price index. $exch_{c,Turkey}$ is the exchange rate of Turkish liras against the trading parner's currency, expressed in Turkish liras. w_c represents the weights of each country in the formula. Overall, the weighted geometric average of relative price movements and exchange rate constitute the *RER*. An increase

1 The empirical analyses in this paper is performed using "R" program and SPLM (Millo and Piras, 2012) and HDRCDE packages.

2 This formualtion has been obtained from official website of Central bank of Turkey: http://www.tcmb.gov.tr/wps/wcm/connect/d63eb7a3-63e3-47f8-985d-0770eba69a11/YontemselAciklama.pdf?MOD=AJPERES&CACHEID=d63eb7a3-63e3-47f8-985d-0770eba69a11.

(decrease) in *RER* means an appreciation (depreciation) of Turkish liras against foreign currencies. The calculated *RER* values are obtained from the website of Central Bank of Turkey.

Since *RER* is an aggregate variable, we interact this variable with the 26 regional dummies (D_i) in order to capture its impact on individual regions. β_i,then, is estimated for each region and it captures the short-run impact of appreciation on the growth rate of regions. In a similar vein, δ_i, captures not immediate but 1-year lagged impact of appreciation. This seems plausible as it is natural to assume that macroeconomic variables can have 1 or few years memory. However, we are not able to incorporate more than 1 time lags as it makes us loose many observations.

Both β_i and δ_i can be interpreted as the elasticity of regional growth with respect to 1-unit appreciation of lira as the variables are in the form of logged and first differenced. Finally, the total effect of $\ln\Delta RER$ on regional growth is summarized by $\beta_i + \delta_i \beta_i + \delta_i$

Before proceeding with the estimation of the model, few words on the recent changes in exchange rates and policies in Turkey should be mentioned.

As such historial perspective is documented in Kandil et al. (2007), the 1980 is recognized as a real milestone for Turkish economy, both from a macroeconomic performance viewpoint and also with regard to the related fiscal, monetary and exchange rate policies. After the military revolution in 1980, a current account liberalization era has been launched along with a period of tight fiscal regime and supressed wages. Integration to world commodity markets was achieved via increased volumes of exports and imports. The strategy of government was to keep the exchange rate unappreciated in order to improve the balance of trade and enhance export-led growth. Between 1980 and 1989, this strategy was partially successful as the exchange rate policy has promoted real depreciations, the tariffs and quotas were decreased and share of trade has increased in GDP. From 1989 onwards, Turkish liras has become fully convertible and capital account has been liberalized. The appreciations have taken place periodically which attracts the short-term capital inflows but creating boom-bost cycles and economic volatility. As a consequence, several economic crises have occured in 1991 (during Gulf War-crisis), in 1994 (due to political and fiscal detoriation), in 1998 (during Russian-Asian crisis) and in 1999 (due to earthquake and fiscal detoriation) along with the devaluations, high inflation and negative growth, after which each of crisis, new stabilization programs (in accordance with International Monetary Fund [IMF's] policies) were launced to bring-back the macro-stability. In 1996, Turkey has signed the Custom's Union agreement which has reinforced the economic liberalization and integration process. After the crisis in 1999, a disinflation program of IMF and crawling-peg regime of exchange rate were adopted. A new economic crisis emerged in 2001 due to political instability. Following this, crawling-peg regime was demolished and Turkish liras has been devaluated about 94% in nominal terms, output has dropped 9.4% annually and starting from early-2001, a floating exchange rate policy has been adopted along with structural reforms and fiscal discipline which has brought about economic stability and growth in these years (Kandil et al., 2007).

In order to observe better the exchange rate movements during the period we analyze, we chart in Figure 1 the yearly changes in *RER* against all trading partner-countries and also against the developed and developing ones separately.

From 2004 to 2008, an appreaciation with respect to developed countries' currencies and depreciation againts the developing countries' are observed. The exchange rate was allowed to float however managed in the meanwhile, by several instruments of Central Bank (i.e. via supply of foreign currency reserves when necessary). During the global financial crisis (2009), Lira has depreciated about 10% with respect to developed countries' currencies and about 20% with respect to developing countries' currencies. After the crisis, recurrent app- and depreciations are observed till 2011.

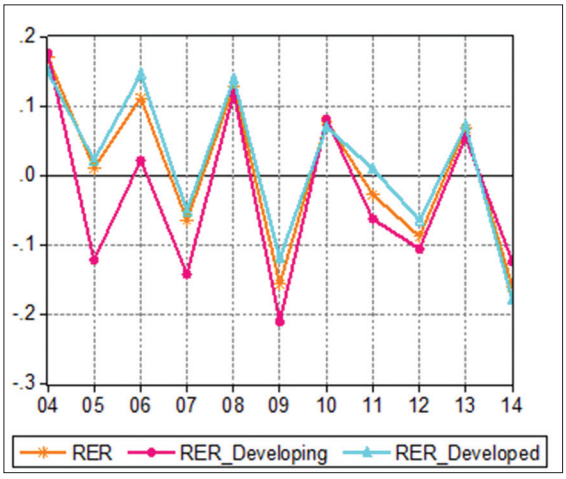
The highly volatile exchange rate pattern of Turkey makes our study more interesting *per se* as its impact may be magnificant and heterogenous on regional economies.

With respect to the method of estimation, we use two types of panel models; random and fixed effect (within) models. These models are known to be useful in handling the possible bias driven by neglected endogeneity and unobserved heterogeneity (Baltagi, 2013; Duran, 2015b). Random effect model is often used to capture the region specific effects by assuming randomly occurring unobserved heterogeneity across observations (Baltagi, 2013; Duran, 2015b). Alternatively, we adopt within (fixed) effect model that controls the individual (region-specific) effects by de-meaning each observation with respect to time (For detailed description of both models, Baltagi, 2013).

Our models incorporate a spatial component as well. In that manner, two types of spatial models are used; SAR model and SEM each of which incorporates the spillover of economic growth in the growth rate of neighboring regions respectively via dependent variable or random regional disturbances.

Overall, four types of models are estimated using maximum likelihood method. The first model is random effect estimator with

Figure 1: Evolution of real exchange rate in Turkey, 2004-2014



Source: Central Bank of Turkey

Table 1: Regression results

Variables	Random effect-SAR	Random effect-SEM	Fixed effect-SAR	Fixed effect-SEM
γ_0	0.196426***	0.25105***	-	-
$\ln(y_{t-1})$	−0.02674***	−0.0306***	−4.18E-01***	−0.58507***
$W\Delta y_{i,t}$	0.73262***	-	5.34E-01***	-
$W\epsilon_{i,t}$	-	0.73965621***	-	0.755918***
ms	0.045788**	0.172769**	5.69E-02**	0.214387***
humancap	−0.00089	−0.0017	3.06E-02	−0.00798
labour	0.001341	0.000317	9.77E-02**	0.028658
d_crisis	−0.0095	−0.03913	−4.06E-03	−0.02304
indus	0.009108	0.006712	1.10E-01*	0.054175
Wald test (Chi-square test statistics)				
$\sum_{i=1}^{26}\beta_i D_i \times RER_t$	45**	44.6**	41**	48.8***
$\sum_{i=1}^{26}\delta_i D_i \times RER_{t-1}$	38.3*	37.9*	35.1	46.8***
N=182				

***Significance at 1%, **at 5%, *at 10%. SAR: Spatial autoregressive, SEM: Spatial error models, RER: Real effective exchange rate

SAR model, second one is the random effect estimator with SEM model, third one is the within effect estimator with SAR model and the fourth one is the within effect estimator with SEM model[3]. The error terms, $\in_{i,t}$, are assumed to follow a normal, identical and independent distribution with a constant variance. The results of regressions are summarized in Table 1.

At a glance, it is immediate to note several important findings from the estimations. Firstly, γ_1 has been found negative and significant at 1% in all regressions, regardless of which methodology adopted and of the type of spatial process assumed. This basically means that a regional convergence process is firmly evident in Turkey. In other words, it indicates a tendency which initially poorer regions grow faster than the richer ones, hence, narrowing the income gap.

Secondly, the estimated γ_1 (from SAR models) and φ (from SEM models) are positive and significant in all regressions at 1% level. Hence, a positive spatial spillover of output growth among neighbouring regions is shown to be evident. Thus, growth in one region, either the anticipated one or unexpected one affects positively the nearby regions' performance.

Third, money supply is positively associated with the periods of economic growth, rising during the loose monetary policy and contracting during the times of tight monetary base.

Fourth, perhaps most importantly, we test the significance of exchange rate movements on regional growth by using Wald tests (with Chi-square distributions) in the last two raws of Table 1. The test is based on the following null and alternative hypothesis, respectively, for the immediate and 1-year lagged joint impacts of appreciation on regions' growth rates. If null hypotheses are accepted, this would mean that the exchange rate movements do not have any significant impact on the regional growth rates, however, the rejection of null would indicate the opposite.

$Ho: \beta_1 = \beta_2 = \ldots \beta_{26} = 0$

$Ha: \beta_1 \neq \beta_2 \neq \ldots \beta_{26} \neq 0$ and,

$Ho: \delta_1 = \delta_2 = \ldots \delta_{26} = 0$

$Ha: \delta_1 \neq \delta_2 \neq \delta \ldots \delta_{26} \neq 0$

In both tests, the results indicate the fact that exchange rate movements affect the regional growth rates significantly in almost all models (except fixed effect-SAR model) with least 10% significance level. In other words, 1-unit of depreciation (or appreciation) create significant changes in regions' growth rates. Surely, these effects, their magnitude and directions, are expected to vary significantly across regions. Therefore, to provide more detailed insights, we present the estimated $-(\beta_i + \delta_i)$ values for each region in Table 2 in order to document the elasticity of regional growth rates with respect to 1% Turkish Lira's depreciation.

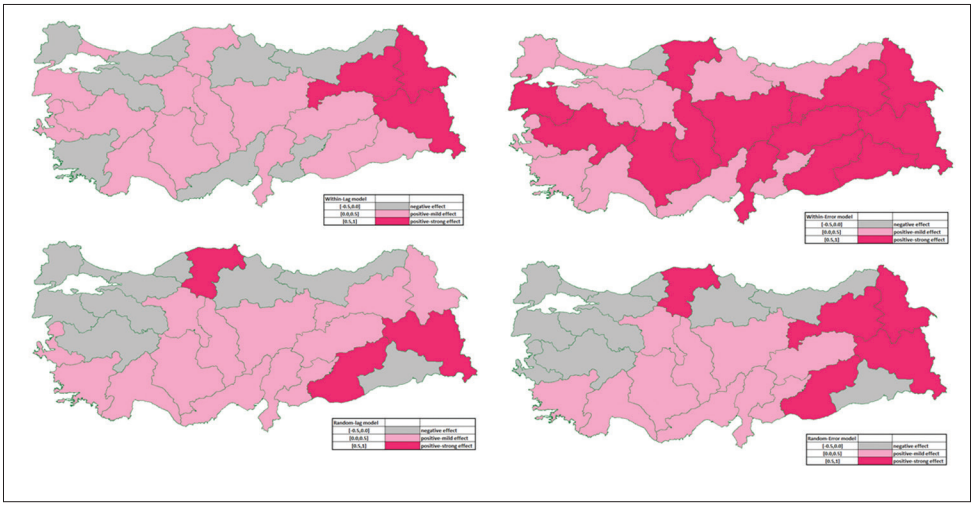
In the last two raws, cross-sectional mean and standard deviations of these elasticities are shown. So, on average, the elasticities range between 0.06 and 0.53 which means that 1-unit undervaluation of Turkish lira improve the growth rate of regions about 0.06-0.53%. This is consistent with the conventional view that depreciation enhances the decrease in exported-good prices, increase the competitiveness of domestic firms and the attraction of external demand.

However, in the last raw, standard deviation values range between 0.33 and 0.41. This indicates a great heterogeneity across regions' reaction to currency undervaluation. While many regions show a positive reaction to depreciation, many others exhibit a negative response.

To understand this visually better, we demonstrate the geographical distribution of the elasticities in maps (Figure 2).

3 The estimations are performed using "R" program and "splm" package

Figure 2: Geographical distribution of depreciation effect on regional growth: $-(\beta i + \delta i)$



There are four maps that show the elasticities obtained from four different models. The grey coloured regions are the ones that are negatively affected from 1-unit of depreciation. Light pink color represents the set of regions that are affected positively but mildly and dark pink color represents the class of regions that are affected positively and strongly[4].

The negatively affected regions are concentrated mostly around Istanbul and Marmara regions. These regions are known as the most developed, most open to foreign trade and most specialized in industrial activities and agglomerated regions. Therefore, the pessimistic channel seems to work out for these regions. The mechanism is likely to work in a following way; these regions import massively intermediate goods and inputs, raw materials and use intensively the imported energy sources in their production systems, hence, any depreciation increases the cost of these firms and discourage the output production as it makes the firms less competitive in foreign markets (Bruno, 1979; Van Wijnbergen, 1986). Another mechanism might work through monetary policy changes induced by depreciation. Once a depreciation occurs, policy makers are often willing to raise the interest rates in order to attract back the foreign capital inflows. But this not costless and at the expense of the slow down of regions' growth for those of which are specialized more in interest-rate sensitive industries such as durable goods, manufacturing and construction (like Marmara region) (Carlino and DeFina, 1999; Owyang and Wall, 2009).

The positively affected areas are accumulated more about Central, Eastern and South Eastern Anatolian regions which are relatively low income places and more concentrated on agricultural activities. However, in recent years, these regions have increased rapidly their export volumes and shares, a result that has also been similarly found in Erdem (2015). So one may argue that the optimistic channel works out for these regions as the depreciation is helpful for upgrading their export volumes.

4 The region TR81 in Figure 2 (within-lag model) has the value "0.65" bu exceptionally assumed within 0-0.5 interval.

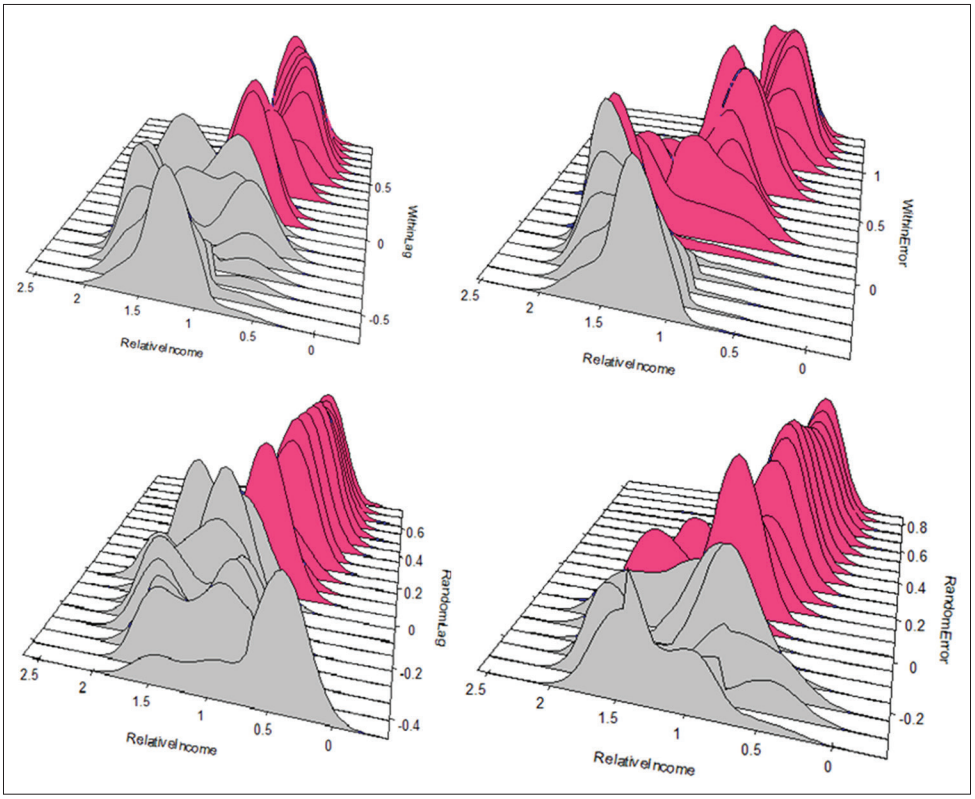
Table 2: Total effect of depreciation on regional growth $[-(\beta_i+\delta_i)]$

Regions	The model applied			
	Random-SAR	Random-SEM	Within-SAR	Within-SEM
TR10	−0.007	−0.045	0.147	0.339
TR21	−0.397	−0.356	−0.16	0.327
TR22	−0.061	−0.042	0.399	0.899
TR31	0.09	−0.001	0.124	0.308
TR32	0.168	0.187	−0.115	0.249
TR33	−0.408	−0.341	0.14	0.761
TR41	−0.257	−0.272	−0.33	0.046
TR42	−0.223	−0.218	−0.296	0.02
TR51	0.113	0.156	0.198	0.462
TR52	0.021	0.112	0.127	0.553
TR61	0.151	0.205	0.198	0.482
TR62	0.036	0.127	−0.101	0.25
TR63	0.062	0.174	0.068	0.634
TR71	0.036	0.138	0.284	0.596
TR72	0.183	0.271	0.135	0.583
TR81	−0.114	−0.046	−0.655	−0.462
TR82	0.678	0.743	0.393	0.617
TR83	−0.25	−0.153	−0.032	0.403
TR90	−0.286	−0.191	−0.204	0.318
TRA1	0.391	0.532	0.921	1.408
TRA2	0.473	0.651	0.601	1.096
TRB1	0.089	0.223	0.221	0.687
TRB2	0.618	0.754	0.678	1.141
TRC1	0.206	0.326	−0.237	0.253
TRC2	0.752	0.851	0.257	0.642
TRC3	−0.471	−0.236	0.495	1.292
Mean	0.06	0.14	0.13	0.53
SD	0.33	0.34	0.34	0.41

SD: Standard deviation, SAR: Spatial autoregressive, SEM: Spatial error models, RER: wReal effective exchange rate

Overall, depreciation of Turkish lira seems to promote the regional convergence process as the relatively poorer regions are better off during this process. To support this claim empirically, we illustrate in Figure 3 the relative income distribution (per capita GVA in 2004, assuming mean income = 1) conditioned on estimated regions' elasticity of growth with respect to 1-unit depreciation for 4 models.

Figure 3: Distribution of income conditional upon regional exchange rate response



All estimations in Figure 3 tell more or less the same story. In conditonal density estimations, the grey colored parts represent the income distributions of regions which are negatively affected from depreciation, and pink colored areas represent the income distributions of regions which are positively affected. We clearly see that the regions which are worsely affected from depreciation are the relatively wealthier regions as their relative income concentrates around the values above 1. Moreover, the regions that, instead, benefit from the depreciation are the relatively poorer regions which have relative income concentrated around the values below 1.

Putting all these together, the depreciation of currency is shown to foster the growth of poorer regions and promote the catch-up process. This seems plausible as the rural and less developed Eastern regions in Turkey has recently increased their export performance rapidly and process of depreciation helps this process.

4. CONCLUSIONS

This study has aimed at exploring a new factor, namely, exchange rate movements, in explaning the evolution of regional income inequalities. To do so, we have estimated the impact of currency depreciation on the regional growth patterns in Turkey, using a range of spatial-panel and explaratory methods. The analyses indicate two major conclusions.

First, it has been clearly shown that the depreciation of Turkish economy create an increasing effect on aggregate growth while its impact on regions are quite mixed and varying heterogenously among regions. The industrialized regions in Western parts are negatively affected in general. This most probably due to the fact that these regions' production system rely mostly on imported materials, capital goods and energy. Thus, depreciations automatically create an increase in cost items of companies, discouraging the production and output growth. Controversially, the relatively less developed regions in the Eastern parts are positively affected, probably due to their improved export performances, following a depreciation, driven by a decrease in exported-good prices and increased competitiveness in foreign markets.

Second, there has been found a negative relationship between the relative income of regions and their reaction to depreciation. It follows that relatively wealther regions are affected worsely while, in contrast, poorer regions benefit the undervaluation of Turkish lira. This leads consequently to an improvement in convergence process across regions.

In the light of this findings, policy implications suggest that designing the exchange rate policy is a harder task than initially understood as it does not have only an aggregate effect but disaggregate effects should also be considered. Free floating regime of exchange rate, with periods of depreciations and alternating appreciations, seem to foster both aggregate growth and the regional convergence process, hence, it seems like a better option compared to peg-crawl system.

REFERENCES

Anselin, L. (1988), Spatial Econometrics: Methods and Models. Studies in Operational Regional Science. Dordrecht: Kluwer Academic Publishers.

Baltagi, B.H., Song, S.H., Jung, B., Koh, W. (2007), Testing panel data regression models with spatial and serial error correlation. Journal of Econometrics, 140, 5-51.
Baltagi, H. (2013), Econometric Analysis of Panel Data. 5th ed. Chichester: Wiley Blackwell.
Barro, R.J., Sala-i-Martin, X. (1991), Convergence across states and regions. Brookings Papers on Economic Activity, 221, 107-182.
Barro, R.J., Sala-i-Martin, X. (1992), Convergence. Journal of Political Economy, 1002, 223-251.
Bashtannyk, D.M., Hyndman, R.J. (2001), Bandwidth selection for kernel conditional density estimation. Computational Statistics and Data Analysis, 363, 279-298.
Berument, H., Dincer, N.N. (2004), The effects of exchange rate risk on economic performance: the Turkish experience. Applied Economics, 36(21), 2429-2441.
Branson, W.H., Love, J.P. (1987), The real exchange rate and employment in U.S. manufacturing: State and regional results. NBER Working Paper No. 2435.
Bruno, M. (1979), Stabilization and stagflation in a semi-industrialized economy. In: Dornbusch, R., Frankel, J., editors. International Economic Policy. Baltimore, MD: Johns Hopkins University Press.
Carlino, G., DeFina, R. (1999), The differential regional effects of monetary policy: Evidence from the U.S. States. Journal of Regional Science, 392, 339-358.
Carlino, G., Cody, B., Voith, R. (1990), Regional impacts of exchange rate movements. The Journal of Regional Analysis and Policy, 201, 89-102.
Çatik, N.A. (2007), Daraltıcı devalüasyon hipotezi: Türkiye üzerine bir uygulama. Ekonomik Yaklaşım, 18(62), 18-62.
Cox, M.W., Hill J.K. (1988), Effects of the Lower Dollar on U.S. Manufacturing: Industry and state comparisons. Economic Review, March, 1-9.
Dollar, D. (1992), Outward-oriented developing economies really do grow more rapidly: Evidence from 95 LDCs, 1976-1985. Economic Development and Cultural Change, 403, 523-544.
Domaç, İ. (1997), Are devaluations contractionary? Evidence from Turkey. Journal of Economic Development, 22(2), 145-163.
Dornbusch, R. (1988), Open Economy Macroeconomics. 2nd ed. New York: MIT Press.
Duran, H.E. (2014), Short-run dynamics of income disparities and regional cycle synchronization in the U.S. Growth and Change, 452, 292-332.
Duran, H.E. (2015a), Non-linear regional income divergence and policies: Turkey case. Regional Science Inquiry, 7(2), 107-114.
Duran, H.E. (2015b), Regional employment volatility in Turkey: Causes and consequences. Turkish Economic Association, Discussion Paper. p6.
Easterly, W. (2005), National policies and economic growth: A reappraisal. In: Aghion, P., Durlauf, S., editors. Handbook of Economic Growth. Vol. 1. Part A. Amsterdam: Elsevier. p1015-1059.
Edwards, S. (1989), Real Exchange Rates, Devaluation, and Adjustment. Cambridge, MA: MIT Press.
Eichengreen, B. (2008), The Real Exchange Rate and Economic Growth. Commission on Growth and Development Working Paper. No. 4, The World Bank, 2008.
Erdem, U. (2015), Spatial Effects of Trade Openness: Regional Inequality, Trade Openness and Liberal Trade Policies in Turkey", Master Thesis, Izmir Institute of Technology, City and Regional Planning Department.
Filiztekin, A. (1999), Convergence across Turkish Provinces and Sectoral Dynamics. Mimeo: Koc University.
Gezici, F., Hewings, G.J.D. (2007), Spatial analysis of regional ınequalities in Turkey. European Planning Studies, 153, 383-403.
Guitian, M. (1976), The effects of changes in the exchange rate on output, prices and the balance of payments. Journal of International Economics, 61, 65-74.
Hyndman, R.J., Bashtannyk, D.M., Grunwald, G.K. (1996), Estimating and visualizing conditional densities. Journal of Computational and Graphical Statistics, 5, 315-336.
Hyndman, R.J., Yao, Q. (2002), Nonparametric estimation and symmetry tests for conditional density functions. Journal of Nonparametric Statistics, 143, 259-278.
Kamin, S.B. (1988), Devaluation, External Balance, and Macroeconomic Performance in Developing Countries: A Look at the Numbers. Princeton: Princeton University, Department of Economics, International Finance Section, Princeton Essays in International Finance. p62.
Kamin, S.B., Rogers, J.H. (1997), Output and the Real Exchange Rate in Developing Countries: An Application to Mexico. International Finance Discussion Paper, No. 580. Washington, D.C.: Federal Reserve Board.
Kandil, M., Berument, H., Dincer, N.N. (2007), The effects of exchange rate fluctuations on economic activity in Turkey. Journal of Asian Economics, 18, 466-489.
Kirdar, M.G., Saracoğlu, Ş. (2008), Migration and regional convergence: An empirical investigation for Turkey. Papers in Regional Science, 874, 545-566.
Meade, J.E. (1951), The Theory of International Economic Policy, I: The Balance of Payment. Oxford: Oxford University Press.
Millo, G., Piras, G. (2012), Splm: Spatial panel data models in R. Journal of Statistical Software, 471, 1-38.
Morley, S.A. (1992), On the effect of devaluation during stabilization programs in LDCs. Review of Economics and Statistics, 74(1), 21-27.
Munnell, A.H., Cook, L.M. (1990), How does public infrastructure affect regional economic performance? New England Economic Review, 5, 12-33.
Owyang, M.T., Wall, H.J. (2009), Regional VARs and the channels of monetary policy. Applied Economics Letters, 1612, 1191-1194.
Rey, S.J., Montouri, B.D. (1999), US regional income convergence: A spatial econometric perspective. Regional Studies, 332, 143-156.
Rodrik, D. (2008), The real exchange rate and economic growth. Brookings Papers on Economic Activity, 2, 365-412.
Romans, T., Subrahmanyam, G. (1979), State and local taxes, transfers and regional economic growth. Southern Economic Journal, 462, 435-444.
Sachs, J.D., Warner, A. (1995), Economic reform and the process of global ıntegration. Brookings Paper on Economic Activity, 1, 1-118.
Solow, R.M. (1956), A contribution to the theory of economic growth. The Quarterly Journal of Economics, 701, 65-94.
Van Wijnbergen, S. (1986), Exchange rate management and stabilization policies in developing countries. Journal of Development Economics, 232, 227-247.
Vieira, F.V., MacDonald, R. (2012), A panel data ınvestigation of real exchange rate misalignment and growth. Estudos Economicos, 42(3), 433-456.
Yildirim, J., Öcal, N., Özyildirim, S. (2009), Income ınequality and economic convergence in Turkey: A spatial effect analysis. International Regional Science Review, 32, 221-254.