

Regional inequality and international trade in Turkey: A dynamic spatial panel approach

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Abstract

Aim of the present article¹ is to investigate the impact of trade liberalization on the evolution of regional income inequalities in Turkey between 2004-2011. Despite the large body of literature on this subject, there exists several directions which needs to be further explored. i. so far in the literature, the concept of trade openness is too broadly defined. However, it is not only 'trade' per se that can affect the regional economies but the composition of trade is also of great importance (Rodriquez-Pose and Gill, 2006). Indeed, it can be partitioned into two components, such as exports and imports. We analyze separately the impact of each component on the evolution of regional inequalities. ii. in most of the empirical studies dealing with this issue, neighboring regions are assumed to have no spatial economic interconnection between each other. We, therefore, incorporate spatial spillovers of trade and growth into our analysis. Our results are summarized in two groups: First, regional inequalities in Turkey are quite sizable but tend to decline over the period of analyses. Second, initially poorer regions that experience an export-based liberalization tend to grow faster than richer ones. Imports, on the other hand, have an opposite effect.

Keywords

Regional inequality, Trade liberalization.



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1. Introduction

Since the 1960s, international free trade has widely been recognized as promoting the economic growth in a variety of theoretical and empirical models (Dollar and Kraay, 2004; Frankel and Romer, 1999). Most influential, Heckscher-Ohlin-Samuelson theory suggests that trade liberalization is likely to bring about substantial productivity gains by pushing countries to specialize according to their comparative advantage and relocating the production factors between tradable and non-tradable sectors (Daumal and Özyurt, 2011; Özyurt and Daumal 2011). In a similar vein, it is expected to induce the productivity by easing the transmission of know-how and technology spillovers among trading partners (Coe and Helpman, 1995; Grossman and Helpman, 1991). Opening up the markets may also increase the internal competition that, possibly, forces local firms to improve their operational and managerial efficiency and upgrade their production systems (Daumal and Özyurt, 2011; Fu, 2004).

Although merits of trade are well known at the country level, its varying impact on regional economies remain largely ambiguous (Rodríguez-Pose, 2012). In other words, not all regions within a country can equally benefit the trade liberalization. In contrast, some of them are likely to generate greater benefits that contributes to the widening or reduction of interregional disparities (Elveren, 2010).

Despite its importance, the debate on the link between trade openness and regional inequality has not yet been conclusive in the literature (Brühlhart, 2011).

On the one hand, a class of NEG (New Economic Geography) models argue that trade liberalization is likely to contribute to the reduction of disparities (Krugman and Elizondo, 1996). According to this claim, as a country opens its markets to trade, core regions tend to become less attractive for firms (Özyurt and Daumal, 2011). Since land costs, internal competition, congestion and labor costs are high in large metropolitan areas, advantages created by locational concentration can not exceed these costs (Özyurt and Daumal,

2011). Hence, firms prefer to relocate and move towards peripheral regions in search of a higher profit margin and finer economic climate (Fan and Casetti, 1994; Rodríguez-Pose and Gill, 2006). Such a diffusion process is likely to foster the economic growth in backward regions and contribute to the reduction of income disparities.

On the other hand, a group of scholars adopt a counter view by arguing that trade liberalization provides additional benefits to developed regions (Crozet and Koenig, 2004; Myrdal 1957; Rivas, 2007). The rationale behind this claim is attributed to the advantages of agglomeration and centripetal effects of trade openness (in accordance with Myrdal (1957)). Such that, developed regions which have low cost access to foreign markets, competitive advantages and highly mobile work force benefits the increasing returns to scale created by agglomeration. Indeed, during the liberalization process firms tend to move towards metropolitan areas that promotes cumulative growth process. In contrast, peripheral places can hardly benefit this ever-growing process. Thus, inequalities between rich and poor regions tend to widen over time (Aghion, Burgess, Redding and Zilibotti, 2004; Henderson and Kuncoro, 1996).

On empirical grounds, the findings are also far from a clear cut. A class of scholars including Brühlhart, Carre and Trionfetti (2010) and Daumal (2013) focus on regional disparities respectively within Austria and Brasil and report evidence in favor of reductive effect of trade on regional inequalities. Controversially, several others, including Daumal and Özyurt (2011), Daumal (2013), Rivas (2007), Oktay and Gözgör (2013), Kanbur and Zhang (2005), Pernia and Quising (2003) are the authors who find a positive impact of trade liberalization on spatial disparities respectively for Brasil, India, Mexico, Turkey, China and Philipines.

Despite the large body of literature on this subject, there exists several directions which needs to be further explored.

First, although researchers mainly focused on emerging economies like Brasil, India and Mexico, the literature

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focusing on Turkey is rather scarce. In fact, Turkey is a country that includes large socio-economic and territorial imbalances as well as diverse economic structure and labor force across regions (Erkut and Baypinar, 2011; Baypinar and Erkut, 2009; Gezici and Hewings, 2007; Yildirim, Öcal and Özyıldırım, 2009). Hence, tackling the spatial disparities and maintaining the economic and social cohesion is one of the major political concerns.

In addition, Turkey has experienced a period of rapid liberalization over the last few decades. From 1970s to 2000s, policies favouring the economic liberalization have been implemented. Such that the main growth strategy has switched from an import substitution approach to an export-led growth. Hence, we think it is crucial to identify the winners and losers of this process to be able to provide relevant insights to policy makers which is one of the major targets of the present study.

Second, so far in the literature, the concept of trade openness is too broadly defined. In reality, trade can be partitioned into several components, such as exports and imports. In fact, each component can have far different effect on regional economies. In support of this argument, Rodriquez-Pose and Gill (2006) suggests that it is not only 'trade' per se that affect the regional inequality but the composition of trade is also of great importance. As trade shifts from exports to imports (or manufacturing to agriculture) or vice versa, the implications on regional growth patterns can significantly change (Leichenko and Silvia, 2004). For these reasons, we intend to analyze separately the impact of each component on the evolution of regional inequalities.

Third, in most of the empirical studies dealing with this issue, regions are assumed to have no economic interconnection between each other. In contrast, the importance of spatial spillovers of trade and income among the economic systems are well documented in the literature (Ertur and Koch, 2007). Thus, we find it useful to incorporate spatial factors into our analysis. Failing to do so, might in fact lead to distorted results due to a neglected spatial dependence.

Overall, the aim of the present article is to investigate the impact of trade liberalization on the evolution of regional inequalities in Turkey by adopting the perspectives above. In terms of spatial units, we focus on the NUTS-2 (Nomenclature of territorial units for statistics) level regions for a period between 2004 and 2011. Data used in this paper is mostly obtained from TUIK (Turkish Statistical Institute).

The organization of the paper is as follows: In section 2, we provide an overview of the related literature. Section 3 is devoted to the empirical analysis which is implemented in three steps. In section 3.1 and 3.2, we respectively explore the evolution of regional inequalities and trade liberalization in Turkey. In section 3, we set out our econometric model and estimate the impact of trade openness on regional disparities and, finally, we conclude our study in section 4.

2. Literature review

As anticipated, there has been a clear distinction between studies' empirical findings and theoretical argumentations. To be able to provide a brief account of the debate, we partition the studies into two groups; i. those of which report negative impact of trade openness and ii. those of which find, instead, a positive relationship.

2.1. Literature supporting the negative impact

Some examples of the empirical studies in this class are Brülhart et al. (2010) who find that poorer border regions in Austria experience higher liberalization and greater employment growth between 1975 and 2002, Daumal (2013) who reports that trade openness reduces the regional income inequalities in Brazil between 1985-2004, Paluzie, Pons and Tirado (2004) who show that from 1960s onwards regional imbalances and industrial concentration has decreased in Spain, and, lastly, Rodriquez-Pose (2012) who analyses the intra-national disparities within various countries between 1975-2005 and reports a negative association between liberalization process and income disparities for relatively wealthier states i.e. US, France,

Belgium, Sweden, Japan, Netherlands, Austria, Canada and Finland.

From a theoretical point of view, the interpretations of authors mostly refer to the explanations of Krugman and Elizondo (1996) according to who trade liberalization is likely to favour the underdeveloped regions. The mechanism is likely to work in a following way; as the regions opens up their markets to trade, firms choose to re-locate and move from core regions, where land, labour and congestions costs are high, to the peripheral locations where the costs are lower and, thus, greater incentives for profits are available (Fan and Casetti, 1994; Özyurt and Daumal, 2011; Rodriquez-Pose and Gill, 2006). If this happens to be the case, it would actually mean that the advantages of metropolitan areas, such as agglomeration and positive externalities created by lower information costs and highly productive labour force, do not offset the costs of production factors. Therefore, it becomes an appropriate choice for firms to search for new places with lower cost base. Consequently, this mechanism is likely to foster the economic growth in lagging regions and contribute to the reduction of inter-regional disparities. In support of this argument, Rodriquez-Pose and Gill (2006) provides similar explanations. Such that if capital and investment look for the places with lowest costs, spread of firms towards backward regions becomes more likely that, in turn, stimulates the economic growth in underdeveloped regions and enhance the convergence process (Rodriquez-Pose and Gill, 2006).

2.2. Literature supporting the positive impact

Not all scholars, however, agree with the literature above. Some examples of controversial studies are Jian Sachs and Warner (1996), Kanbur and Zhang (2005) and Fu (2004) who conclude that trade openness in China has led to the widening of spatial disparities as investment and human capital drain from underdeveloped inland areas to coastal regions, Loayza, Fajnzylber and Calderon (2004) who find a positive impact of trade on the evolution of regional disparities in a panel of 78 coun-

tries. Similarly, Daumal and Ozyurt (2011) investigate the same issue for Brazilian states between 1989-2002 and conclude that trade openness is likely to encourage the developed regions with higher stock of human capital. For the case of Mexico, Rivas (2007), Chiquiar (2005), Rodriquez-Pose and Sanchez-Reaza (2005) reach similar results which indicate the fact that disparities across Mexican states tend to increase during the process of trade liberalization. Henderson and Kuncoro (1996) find that Indonesian trade openness is associated with the concentration of firms around metropolitan regions that intensifies the regional polarization of income. Similarly, Perinia and Quising (2003) conclude that foreign trade benefits, primarily, the metropolitan Manila area in Philipines. Lastly, Oktay and Gözgor (2013) analyse the regional development differentials across 81 Turkish between 2002 and 2008 and conclude that foreign trade widens the economic gap between the provinces.

In theoretical terms, several arguments have been put forward in the literature. For instance, Rivas (2007) interpret the positive relationship by referring to the views of Myrdal (1957) according to whom trade liberalization primarily benefits the developed regions as these places provide several advantages to firms. For instance, increasing returns to scale created by agglomeration, low cost access to foreign markets, availability of highly qualified labour force, low information costs and better infrastructure attract firms to metropolitan areas. Indeed, liberalization process reinforces the relocation of firms and intensifies the centrifugal effects. Thus, it leads to an increase in the income gap between poor and rich regions.

Another interpretation is provided by Daumal and Özyurt (2011) and Young (1991) who claim that trade openness promotes the specialization of developed regions in knowledge intensive high-tech activities and push, on the other hand, other regions to specialize more in non-dynamic traditional sectors such as agriculture and mining. Naturally, the income gap widens between technology base regions and agricultural zones.

Lastly, Ben-David (1999) and Daumal and Özyurt (2011) argue that only regions with large stock of human capital can benefit the trade liberalization. Hence, underdeveloped regions that lack a substantial stock of human capital can hardly adopt the technological advancements which have detrimental effects on economic growth.

Having reviewed the existing literature, next, we start our empirical investigation.

3. Empirical analysis

3.1. Regional inequalities and convergence in Turkey

An initial step in our empirical analysis is to understand the extent of the spatial disparities within Turkey and its evolution over time. In terms of methodology, two main types of techniques have been used to measure the level of inequalities and speed of convergence in the literature. The first one is sigma-convergence that calculates for each year a time series index (i.e. Coefficient of Variation) that summarizes the level of spatial inequalities within a country (Barro and Sala-i Martin 1991;1992). It specifically uses the cross-sectional variance of regional incomes from mean and compares the calculated index in different years. The second approach is the cross-sectional regression approach (beta-convergence) that estimates the relationship between initial income of regions and their growth rates over time (Barro and Sala-i Martin 1991;1992). This approach is divided into two sub-techniques; *absolute* and *conditional convergence*. In absolute convergence, the speed of convergence to steady state is not conditioned on structural factors hence, it directly estimates whether poorer regions are growing faster than the richer ones. In conditional convergence, by contrast, regional convergence process is conditioned upon several control variables (such as human capital, public investments). Throughout the paper, we use both sigma and beta convergence methods in our empirical analyses.

A number of studies has investigated this issue for Turkey and obtained mixed results.

On the one hand, a group of re-

searchers conclude that regional inequalities tend to persist over time and no evidence of convergence is reported. Some examples of these studies are Şenesen (2002) who examines interregional income disparities in Turkey and reports that polarization process rather than a convergence trend is present, Doğruel F. and Doğruel S. (2003) who conclude that convergence is achieved only across developed regions between 1987-1999 and Filiztekin (1999) who reports an increase in disparities across provinces between 1975-1995.

On the other hand, fewer authors report evidence in favour of income convergence. Some examples are Yıldırım, Öcal and Özyıldırım (2009) who analyse the evolution of income inequalities across Turkish provinces and regions between 1987 and 2001 and report that disparities tend to decline over time. In the same vein, Geziçi and Hewings (2007) investigate the evolution of income disparities across provinces between 1980 and 1997 and find evidence of declining disparities, Kılıçaslan and Özatağan (2007) report income convergence across 64 Turkish provinces between 1987 and 2000. Finally, Baypinar and Erkut (2011) analyse the convergence of productivity among Turkish provinces over a period 1990-2000 and report conditional convergence. They emphasize the importance of human capital in productivity formation (Erdem, 2016; Kerimoğlu and Karahasan, 2012).

It seems that obtained results vary according to the time period analysed. That's why we find it valuable to concentrate on the most recently available dataset.

We calculate three types of inequality indices for the period between 2004 and 2011. In terms of income data, we use regional per capita real GVA (Gross Value Added) (at 2003 prices)². The first inequality index that we consider is the Coefficient of Variation (CV):

$$CV = \frac{\sqrt{\sum_{i=1}^n \frac{(y_{i,t} - \bar{y}_t)^2}{n-1}}}{\bar{y}_t}$$

where $y_{i,t}$ is the per capita GVA in region i at time t and \bar{y}_t is its cross sectional mean. n is the number of

²The GVA data has been obtained from TUIK (Turkish Statistical Institute), where regional price indices used for deflating the GVA have been obtained from Central Bank of Turkey.

regions. Greater values of CV indicate larger inequalities and more dispersed distribution of income across regions.

Although CV is commonly accepted in the literature, it has been criticized by researchers since it does not take into account the differences in population sizes of regions. In other words, it treats all observations equally. (Duran, 2014; Petrakos and Artelaris, 2009; Petrakos, Rodriquez-Pose, A. and Rovolis, 2005). This creates a caveat also for our study since the population of regions is greatly heterogeneous. Such that population of Istanbul region (TR10), which is about 13 million, is 18 times bigger than the population of TR82 (Kastamonu, Çankırı, Sinop) region which has population about 740.000 inhabitants. For these reasons, we find it useful to calculate also a population weighted coefficient of variation (WCV):

$$WCV = \frac{\sqrt{\sum_{i=1}^n (y_{i,t} - \bar{y}_t)^2 * (p_{i,t})}}{\bar{y}_t}$$

where $p_{i,t}$ represents the population share of region i in national population at time t .

Lastly, we calculate an inequality index developed by Theil (1967) which is used by Yildirim, Öcal and Özyıldırım (2009) in their application to Turkish regions:

$$Theil = \sum_{i=1}^n \log(s_{i,t} / p_{i,t}) * (s_{i,t})$$

where $s_{i,t}$ denotes region i 's share in national income (GVA) and n is the number of regions. We present the calculated indices in Figure 1.

At a glance, two important results appear to emerge: First, a clear pattern of declining inequalities is present from 2004 to 2011. In other words, visual inspection of indices suggests a convergence pattern among regions and, therefore, homogenization of economic prosperity. Second, although the inequalities tend to decline, its level is still quite high. The economic reasons behind the observed inequalities should be interpreted together with all results. So, we will pursue such a detailed interpretation in the further parts of the paper. However, it is also worth spending few words from now

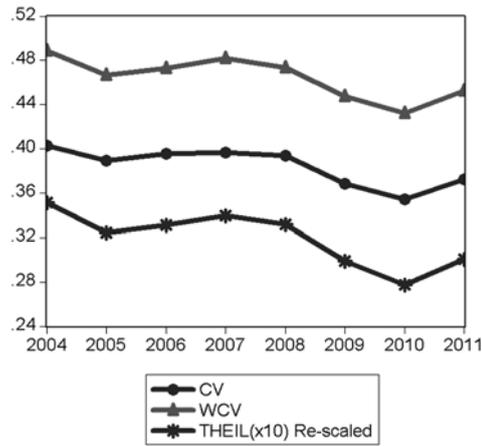


Figure 1. Evolution of regional inequality indices, Source: Authors' own analyses.

on. The economic reasons behind the observed inequalities are mostly attributed in the literature to the social, geographical and demographic characteristics of regions. For instance, the most prosperous regions are the places (around Marmara and Aegean Sea) in which geographically concentrated and dynamic industries are present. Moreover, relatively high level of human capital and educated workforce in these regions is the most important factor that contributes to the productivity.

To support these arguments with the official figures, first, we provide in the map (Figure 2) the distribution of human capital of within the regions which shows the number of people who are university graduates divided into population (Erdem, 2015).

It is clearly seen in the map that high human capital and educated population concentrate in/around high income places such as Marmara and Aegean regions.

Second, to support our interpretation with another official figure, we provide in the map (Figure 3) the distribution of industrial density of regions (in terms of industrial electricity consumption per capita. (Erdem, 2015)).

It is clearly seen in the map that industrialization and electricity consumption is mostly located in/around high income places such as Marmara and Aegean regions.

With regard to the geographical pattern of inequalities, Figure 4 presents a map illustrating the distribution of

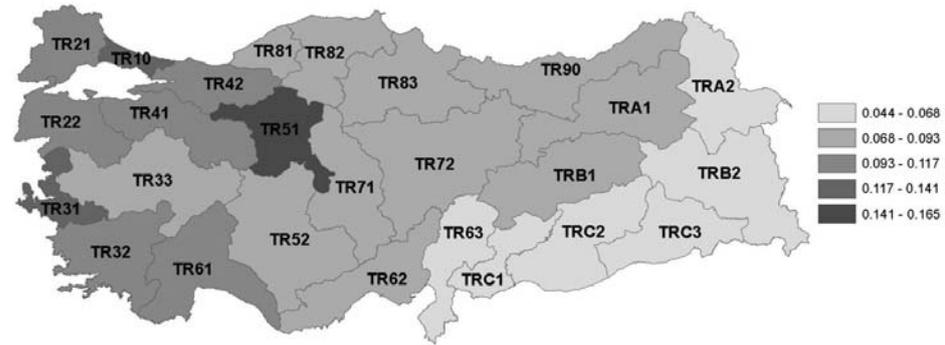


Figure 2. Geographical distribution of human capital (number of university graduates/population), Source: Authors'own analyses.

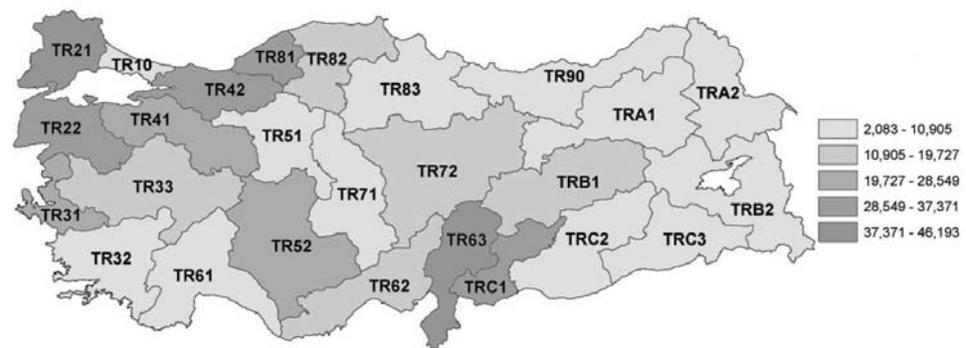


Figure 3. Geographical distribution of electricity consumption in industry (per capita) Source: Authors'own analyses.

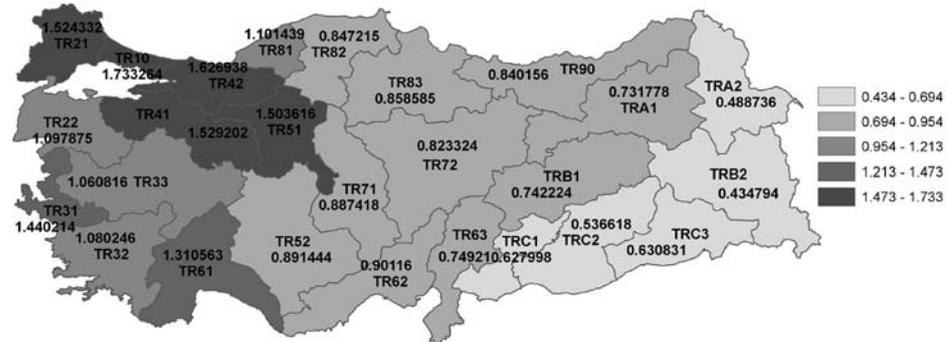


Figure 4. Relative per capita GVA of NUTS-2 regions, Average=1, Source: Authors'own analyses.

relative income in 2011. The relative per capita GVA ranges between 0.43 (the least prosperous region (TRC3)) and 1.73 (the richest region (TR42)). Hence, the income gap seems quite high as the richest region has about 4 times more real income than the poorest region. It can be observed that regions around Marmara Sea, Western Black Sea coast and the coastal regions along the Aegean Sea (Izmir) are the

most developed places, while middle Anatolian regions are the second and Eastern regions appear to be the least prosperous ones.

Moreover, from the maps we can observe that income seems to follow a spatially correlated pattern where low income and high income places are geographically clustered. Indeed, this should be taken into account in further empirical analyses.

3.2. Trade liberalization process in Turkey

From 1970s to 2000s, Turkey has experienced several milestones in the liberalization process. First, deregulation policies and economic program following the crisis in 1980 was designed to promote export-led growth and trade openness. Import-substitution approach, which took place until that time, was instead abandoned (Boratav, Yeldan and Köse, 1999). Hence, integration to global commodity markets was achieved via trade liberalization. Exports were particularly important as the main strategy for economic growth and stability.

In 1989, Turkish lira became convertible in foreign markets which contributed to the acceleration of liberalization. 1990s is also known as a remarkable period of transition during which several international agreements were signed. In 1996, Turkey has joined the Customs Union, World Trade Organization and Multilateral Agreement on Investment. Finally, in 2005 negotiations for European Union membership was initiated.

As a consequence of these developments, volume of external trade has significantly risen. To illustrate this, we depict the evolution of export, import and total trade volumes (in dollars) in Figure 5. The related data has been obtained from Turkish Statistical Institute.

The trade volumes seem to follow an exponential evolution that increased sharply during 1990s and, particularly, after 2000. While in 2000, the total external trade was around 82 Billion Dollars, in 2013 it has risen to 400 Billion dollars. It can also be observed that imports were always greater than exports, creating a current account deficit which has grown over time.

From a regional perspective, trade volumes have recently been increasing as well. The evolution of regional export and import volumes over time are depicted in Figure 6. It is clearly seen that trade deficit problem is even more acute at the regional level. Such that in all regions, export volumes have been increasing but the import volumes have been rising more rapidly.

Overall, liberal policies and de-reg-

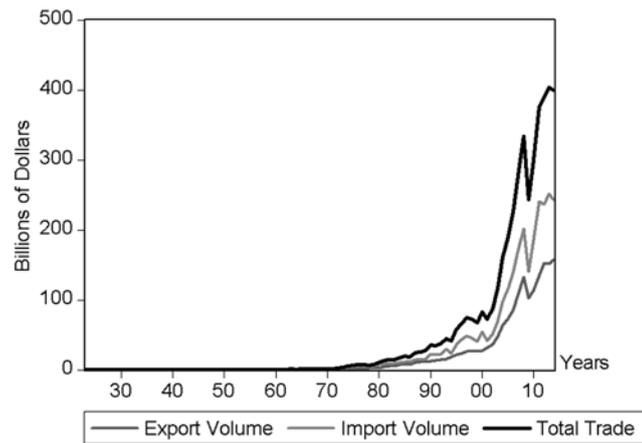


Figure 5. Trade liberalization of Turkish economy, Source: Authors' own analyses.

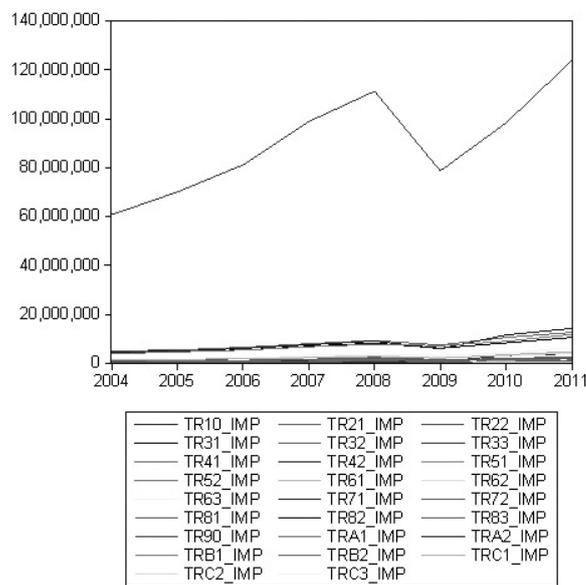


Figure 6(a). Evolution of regional import volumes, Source: Authors' own analyses.

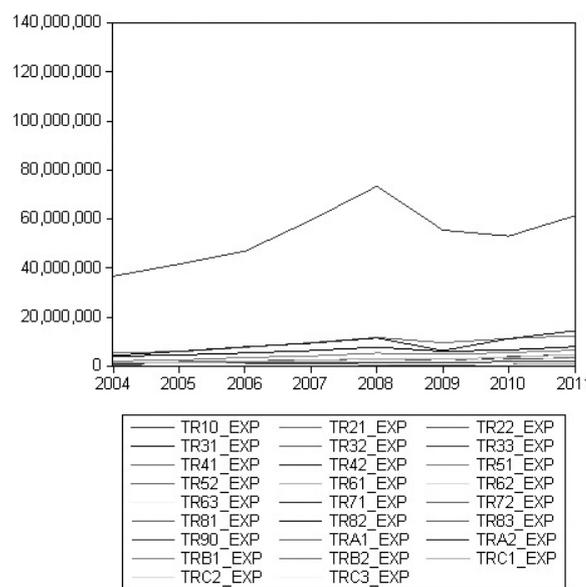


Figure 6(b). Evolution of regional export volumes, Source: Authors' own analyses.

ulation process in Turkey has resulted in rapidly increasing trade openness which might have large and heterogeneous impact on regional economies which is an issue to be investigated in the next section.

3.3. Impact of trade openness on regional inequalities

In this section, we construct our empirical model by employing a range of trade, spatial and control variables. Regional data on foreign trade and GVA is, however, available only for the period of 2004-2011. That's why we are bound to analyse only this period.

3.3.1. Empirical Model and Data

Our econometric model is based on the following spatial panel convergence regression which consists of 182 observations (26regions x7years).

Table 1 documents the definition of variables. The dependent variable is the annual growth rate of real GVA per capita in region i at year t . The first independent variable is the initial real GVA per capita, $y_{i,t}$. δ_1 captures the convergence/divergence trend. Such that a negative and significant δ_1 would indicate an evidence of convergence pattern along which poorer regions grow faster than the richer ones. (Barro and Sala-i Martin, 1991).

In trade variable represent the shares of foreign trade in total GVA of region i at year t . There are two more sub-versions of the trade variable; *In export* and *In import* which indicate respectively the share of regional ex-

port and import in regional total GVA. The impact of each variable is expected to be different. As indicated by, Rodriquerz-Pose and Gill (2006), export firms can largely contribute to employment growth and wage patterns, which is likely to promote the local development. Similarly, enlargement of market size due to an export orientation enhances economies of scale, internal competition and productivity growth (Daumal and Ozyurt, 2011; Fu, 2004; Krueger 1978;). Imports, on the other hand, are expected to have a controversial impact on growth. This may also depend on the type of goods imported. If they are mostly intermediate capital goods, especially inputs for high-tech commodities, it might well stimulate the domestic production by creating supply-chain and knowledge transfers. (Grossman and Helpman, 1991). Otherwise, imports are likely to have a detrimental impact on regional growth.

The interaction term between initial income and foreign trade has been added so to understand the impact of trade on regional inequalities. Such that if $\delta_3 < 0$ and significant, it means that as poorer regions opens up their markets to trade, they will grow faster than the richer ones. Or, if $\delta_3 > 0$, for instance, poorer regions that experience an import-based liberalization, will tend to grow slower than the richer regions. The other two variables are referred to as control variables which are commonly used in the literature.

$$\ln\left(\frac{y_{i,t}}{y_{i,t-1}}\right) = \gamma + \delta_1 \ln y_{i,t-1} + \delta_2 \ln trade_{i,t} + \delta_3 \ln trade_{i,t} * \ln y_{i,t-1} + \delta_4 \ln bachelor_{i,t} + \delta_5 \ln pop_{i,t} + \rho W \ln\left(\frac{y_{i,t}}{y_{i,t-1}}\right) + \mu_{i,t}$$

$$\mu_{i,t} = \lambda W \mu_{j,t} \quad i=1,\dots,26 \quad t=2005,\dots,2011$$

Table 1. Definition of variables in regression equation.

Variable	Definition
$\ln\left(\frac{y_{i,t}}{y_{i,t-1}}\right)$	Growth rate of per capita GVA of region i at year t (in natural logarithms). Data Source: Turkish Statistical Institute
$\ln y_{i,t-1}$	Initial income (GVA per capita) of region i at year t . (in natural logarithms). Data Source: Turkish Statistical Institute
$\ln trade_{i,t}$	It is the share of regional export and import in total regional GVA. It is used in two forms: <i>ln export</i> and <i>ln import</i> that represent respectively share of region i 's exports and imports in regional total GVA. (in natural logarithms). Data Source: Turkish Statistical Institute
$\ln bachelor_{i,t}$	number of university graduates in total regional population at year t region i . (in natural logarithms). Data Source: Turkish Statistical Institute
$\ln pop_{i,t}$	Population of region i at year t . (in natural logarithms). Data Source: Turkish Statistical Institute

Bachelor represents the education level and human capital stock of the regions which is measured by the number of university graduates in total regional population. *ln_pop* is the population of regions used to capture the impact of different economic sizes of regions. Finally, $\mu_{i,t}$ is the error term which is assumed to follow, $iid(0,\sigma)$, an identical and independent normal distribution with zero mean and constant variance.

With regard to the estimation method, one of the most important shortcomings of simple OLS is the problem of neglected endogeneity and spatial dependence. Indeed, in our case, these problems might be even more acute since each region is likely to have a specific fixed effect and well-interconnected with each other in a spatial sense. This is likely to create an unobserved heterogeneity across regions and bias in estimations. To be able to cope with this, we prefer to estimate the regression equation with random effects estimator and also capture the regional fixed effects by adding dummies for each region (Baltagi, 2014). (except only one of them (TRC3) to avoid the dummy trap).

Moreover, spatial parameters are included so to capture the geographical spillover across regions in dependent variable (ρ) and error terms (λ). From a technical point of view, OLS estimation might have a severe defect that spatial economic interactions among the regions are ignored. Among the variety of spatial models introduced in the literature (Anselin, 1988) the most comprehensive ones seem to be the ones that incorporate both spatial dependence in the dependent variable and in error terms. Therefore, we prefer to estimate the model in this way. Hence, ρ captures the externality created by neighbouring regions on the growth rates of region *i* (Ertur and Koch, 2007) and λ captures, instead, the spatial dependence in the error terms of regions *i* and *j*. *W* is the spatial weight matrix which is in the form of inverse-distance and raw standardized.³

The regression results are summarized in Table 2. Column 1 includes only initial income and control variables (*bachelor* and *pop*). In models 2-4, we add separately the trade variables one-by-one. At a glance, three important results appear to be evident from the analysis.

Table 2. Panel regression results, source: authors' own analyses.

Variables	Model 1	Model 2	Model 3	Model 4
<i>constant</i>	2,7390819***	2,69E+00***	3,1013228***	2,7126747***
<i>ln_y-1</i>	-0,4416001***	-4,97E-01***	-0,5627929***	-0,4143721***
<i>ln_trade</i>	-	1,03E-01	-	-
<i>ln_exports</i>	-	-	0,1654772**	-
<i>ln_imports</i>	-	-	-	-0,0313497
<i>ln_y-1*ln_trade</i>	-	-2,24E-02	-	-
<i>ln_y-1*ln_export</i>	-	-	-0,0429939**	-
<i>ln_y-1*ln_import</i>	-	-	-	0,009801
<i>ln_bachelor</i>	0,0039147	6,35E-05	0,0028327	0,0031956
<i>ln_pop</i>	-0,1479131	-1,10E-01	-0,1355936	-0,1554278
<i>lambda</i>	0,807547***	0,780684***	0,798173***	0,806185***
<i>rho</i>	0,21522	0,27373	0,26837	0,20291
N	182	182	182	182

*** denotes significance at 1%, ** at 5 %, * at 10 %.

³The distance data between the main cities of NUTS-2 regions have been obtained from General Directorate of Highways of Turkey. The data for *bachelor*, *population*, and *GVA* variables, and for regional and national trade data are obtained from TUIK. The exchange rate data used to convert the currency values of trade was obtained from USDA (United States Department of Agriculture). The analyses are implemented using Eviews and R SPLM packages.

First, initial income has a negative and significant coefficient at 1 % in all regressions. In other words, declining inequalities across regions are found to be present since δ_1 is negative and significant. This indicates a strong set of evidence for regional income convergence.

Second, as for the spatial components, spatial dependence among the error terms is found significant and positive ($\lambda > 0$) while spatial correlation in dependent variable is insignificant (ρ). It therefore suggests that unanticipated growth (shocks) of the neighbouring regions are correlated in a sense that unexpected growth in one of them spill over to the nearby places.

Third, in model 2, *ln_trade* variable has an insignificant coefficient. This actually means that aggregate trade openness has an ambiguous effect on regional growth patterns. Components of trade, however, are investigated in models 3 and 4; the impact of export and import intensity has been examined separately. In model 3, *ln_export* has a positive and significant coefficient. Thus, it indicates the fact that the regions which are more export oriented tend to grow more.

More importantly, the interaction term between *ln_export* and initial income has a negative and significant coefficient. Thus, it means that initially poorer regions that experience an export-based liberalization tend to grow faster than the richer ones. Thus, ex-

port-oriented liberalization is found to be helpful in stimulating the economic convergence and narrowing the income gap.

The impact of import-led liberalization is, however, controversial. Such that it has an insignificant effect on the growth rate of regions (in model 4). With regard to the importance of control variables, their impacts are found to be insignificant.

The economic interpretation of all our analysis results is important (Figure 1 and Table 2) First of all, in the first (Figure 1) and second analysis, we have found a declining pattern of regional income inequalities which means that income gap between regions tend to decrease. Second, we have found that export base economic development strategy help the underdeveloped regions grow faster and exhibit a convergence pattern to other regions. Indeed, in Figure 7 we have shown that less developed areas show a greater performance increase in export volume.

To support this argument, we document in Figure 7 (7a and 7b) the annual growth rate of regional export volumes over the 2011-2004 period.

The figures look totally supportive of our argument. The low-income Eastern regions exhibit a much better export performance compared to Western and high-income places. The map in Figure 7 shows the export growth of regions. Pink-coloured places are the ones which have export growth above

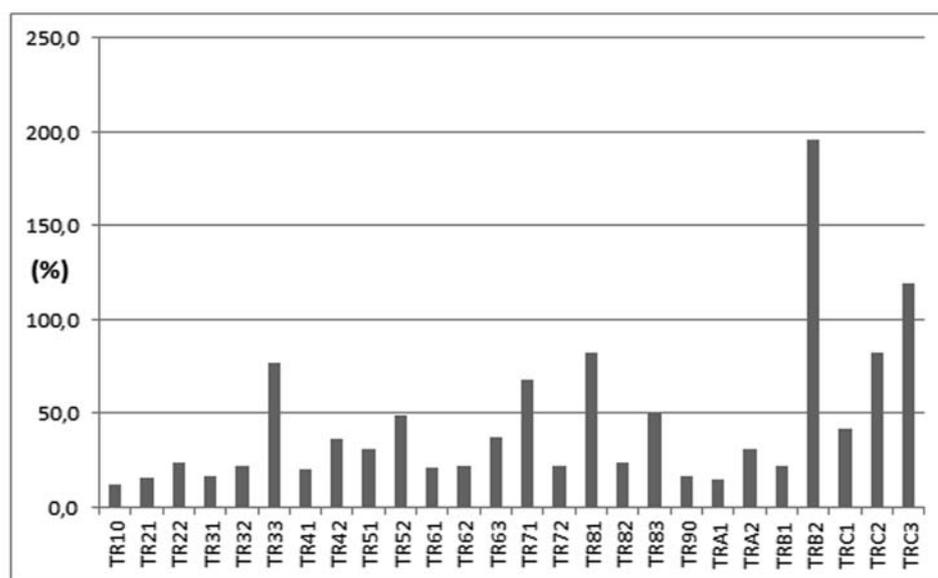


Figure 7(a). Regional export growth rates (bar chart).

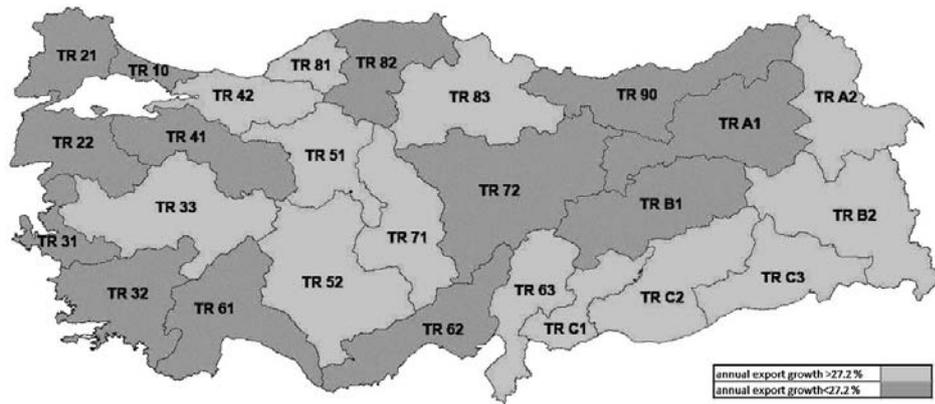


Figure 7(b). Regional export growth rates (geographical distribution).

the cross sectional median (27 %) and grey areas represent the places which have below-median export growth. So, one may easily observe that Eastern and South Eastern Anatolian regions and Middle Anatolian Regions, which are known to be relatively poorer, show a superior export performance that, in turn, contribute to the narrowing process of income gap.

To interpret further our regression results, we should refer to Turkey's dynamics. Export orientation of underdeveloped regions enhances economic growth and convergence process. This sounds plausible as firms around Marmara and Aegean regions exhibit recently a tendency to move inner Anatolia, East and Southern regions. Firms prefer these regions as the labour and land cost is less in South and Eastern regions. So, as firms invest more in export based production in these regions, employment and production will increase which will promote the local development in Eastern/Southern regions and reduction of regional inequalities will occur.

All the results that we have so far obtained provide several implications to policy makers. In Turkey, South and Eastern regions have a big potential for manufacturing production since land and labour costs are relatively lower. So, policy makers should be active in diverting the investments to these areas. Specifically, they can subsidize export based companies in these regions through direct subsidies or tax exemptions. They should develop well the infrastructure and logistic routes. They can develop more free international trade zones in South/Eastern regions.

Not only manufacturing but also agriculture is important. Hence, agricultural exports should be very well supported in these regions. Because there are valuable local products (agricultural products and food) in these places, these products should be very well marketed.

4. Conclusion

This paper has investigated the consequences of trade liberalization on the evolution of regional inequalities within Turkey. Having implemented various econometric and spatial analyses, we obtained several remarkable conclusions.

First, over the period of analysis, 2004-2011, spatial inequalities, although quite sizable, tend to decline which is associated with economic and trade liberalization process. Second, aggregate trade per se fall short from explaining the evolution of inequalities but the composition of trade provides relevant insights. Such that initially poorer regions which opens up their markets with an export orientation tend to catch up the richer regions and reduce the income gap. Import liberalization has, in contrast, a controversial impact. Third, spatial proximity is found to matter in regional growth pattern in a way that unexpected growth in one region is spilled over to the neighbouring ones.

To sum up, trade liberalization seems to have favoured the regional convergence in Turkey. Export-orientation and diffusion of manufacturing activities from developed to underdeveloped regions is likely to have reinforced this process. Overall, from a political point

of view, this mechanism should be supported more to maintain fully the territorial and social cohesion. To be able to achieve this, the export orientation should be subsidized more in less developed regions either via direct or indirect instruments. The direct support can be provided through tax exemption, direct financial assistance and/or rental aid to exporter firms whereas indirect support can be given by establishing physical infrastructure, such as airports, roads, or by enhancing social infrastructure and human capital stock by promoting education and establishing universities. Finally, another important policy suggestion drawn from our analyses is to promote the bilateral trade agreements and eliminating the barriers against the free international trade, especially with those countries to which the country can export well the goods and services.

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