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Trade and Regional Inequality

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Abstract

This paper examines the relationship between openness and within-country regional inequality across 28 countries over the period 1975–2005, paying special attention to whether increases in global trade affect the developed and developing world differently. Using a combination of static and dynamic panel data analysis, we find that while increases in trade per se do not lead to greater territorial polarization, in combination with certain country-specific conditions, trade has a positive and significant association with regional inequality. In particular, states with higher inter-regional differences in sector endowments, a lower share of government expenditure, and a combination of high internal transaction costs with a higher degree of coincidence between the regional income distribution and regional foreign market access positions have experienced the greatest rise in territorial inequality when exposed to greater trade flows. This means that changes in trade regimes have had a more polarizing effect in low and middle-income countries, whose structural features tend to potentiate the trade effect and whose levels of internal spatial inequality are, on average, significantly higher than in high-income countries.

This paper—a product of the International Trade Department, Poverty Reduction and Economic Management Network—is part of a larger effort in the department to understand the implications of trade on growth, employment, and poverty reduction and, specifically, the differential impacts trade may have on "core" and "peripheral" regions *within* countries. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at a.rodriguez-pose@lse.ac.uk or via tfarole@worldbank.org.

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Trade and regional inequality*

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1. Introduction

The World Bank 2009 World Development Report *Reshaping Economic Geography* put trade at the heart of the holy trinity of factors promoting growth. “Cities, migration, and trade have been the main catalysts of progress in the developed world over the past two centuries [and] these stories are now being repeated in the developing world’s most dynamic economies” (World Bank, 2009: 20). Although promoting trade is acknowledged to lead to greater territorial disparities (World Bank, 2009: 6 and 12), this may not matter in the medium- and long-term as “evidence from today’s industrial countries suggests that development has largely eliminated rural-urban disparities” (World Bank, 2009:62). Hence, from this perspective, the best way to deal with territorial inequality is not through ‘spatially balanced growth’, which has been a “mantra of policy makers in many developing countries” (ibid: 73), but through the promotion of growth resulting from increases in trade and economic integration.

This approach to promoting economic development rests, however, on three assumptions for which existing scholarly literature provides no firm answer. Namely that a) increases in trade lead to rising territorial inequalities; b) these inequalities subsequently recede as a country develops; and c) the emergence of spatial disparities does not represent a threat to future development, implying that developing countries should be more concerned about the promotion of growth rather than worry about inequalities (ibid: 12). However and despite the surge of attention on the relationship between globalization, the rise of trade, and inequality whether these assumptions hold remains very much unanswered.

Most of the work conducted so far on the link between trade and inequality has been concerned with the impact of increasing global market integration on inter-personal income inequality, both in the developed and the developing worlds (e.g. Wood, 1994; Ravallion, 2001; Alderson and Nielsen, 2002; Williamson, 2005). The spatial dimension of inequality has attracted far less attention. This means that, as Kanbur and Venables (2005) underline, both the theoretical and empirical relationship between greater openness and spatial inequality remains ambiguous (see also

Brülhart, 2009). There are almost as many studies which point towards a link between trade and spatial convergence as those pointing towards spatial divergence (Brülhart, 2009) and the direction and dimension of this relationship is far from uniform and varies from one country to another and according to the data and methods used.

Although the number of single-country case studies which have delved into this question has grown significantly in recent years, very scant cross-country evidence exists unveiling a general causal linkage between greater trade openness and market integration, on the one hand, and intra-national spatial inequality, on the other[2]. This may be because the literature on the evolution of within-country spatial inequalities has tended – following the path opened by Williamson (1965) in his account of the relationship between spatial disparities and the stage of economic development – to focus on the internal and not the external forces of agglomeration and dispersion. From this perspective economic development matters for the evolution of spatial inequalities, which tend to wane as a country develops. Hence, the factors that make a difference in explaining the evolution of regional inequality are considered to be internal to the country itself, while external factors are, at best, regarded as playing a supporting role in this process. And when they are taken into consideration, the outcome is rather inconclusive. As Milanovic puts it (2005: 428) "country experiences differ and […] openness as such may not have the same discernable effects on countries regardless of their level of development, type of economic institutions, and other macroeconomic policies". Moreover, a large percentage of the literature dealing with the relationship between trade and spatial inequality has concentrated on developed countries – and in particular with the spatial effects of EU integration (e.g. Niebuhr, 2006; Barrios and Strobl, 2009) – meaning that the findings, as inconclusive as they are, may be irrelevant in middle and lower income country environments.

Finally, it is far from certain that the temporality and benign implications of any potential growth in within country regional disparities resulting from changes in trade patterns will materialize. In particular, in cases where increasing polarization takes

[2] Brülhart (2009) limits the number of cross-country analyses to 11, virtually all using urban primacy data, rather than regional data (e.g. Ades and Glaeser, 1995; Nitsch, 2006; Brülhart and Sbergami, 2008).

place during periods of low growth – meaning that not all regions within a country end up better off than before changes in trade patterns took place – in cases when trade widens an already wide gap between rich and poor regions, and in cases when new territorial inequalities resulting from trade reinforce pre-existing social, political, cultural, or ethnic divides, the rise in inequalities may not just be a temporary stage, but one that becomes entrenched. Under these circumstances, increasing regional inequality may lead to a fragmentation of internal markets and to social, political, and/or ethnic tensions which may threaten the very growth and prosperity that greater trade is supposed to bring about.

This paper delves into the assumptions about the link between trade and regional inequality present in the WDR 2009 and for which existing literature offers no conclusive indications. More specifically, the paper focuses on the first two assumptions highlighted earlier: a) whether changes in trade matter for the evolution of spatial inequalities and whether openness to trade affects developed and developing countries differently and b) whether there is a dynamic element to this association. The analysis covers the evolution of regional inequality across 28 countries – including 15 high income and 13 low and medium income countries – over the period 1975-2005[3].

In order to achieve this, the paper combines the analysis of internal factors – in the tradition of Williamson – with that of change in real trade as a potential external factor which may affect the evolution of within-country regional inequality. Internal factors considered include both Williamson's (1965) level of real economic growth and development, as well as a series of other factors, used as structural conditioning variables following the new economic geography theory (NEG), which aims to account for apparent differences in the relationship between trade openness and spatial inequality. The analysis is conducted by running unbalanced static panels with country and time fixed effects, in order to address whether changes in trade patterns are connected with changes in spatial inequalities, followed by dynamic panel

[3] The analysis of the evolution of regional disparities requires good subnational data series, which imply a degree of sophistication by national statistical offices. Thus, using the most recent World Bank classification, no country included in the sample can be considered as low income, sensu strictu, while only China, India, Indonesia, and Thailand are classified as lower middle income countries.

estimation, differentiating between short-term and long-term effects, as a way to assess whether this relationship changes with time.

The paper is structured into five additional sections. Section 2 introduces a necessarily brief overview of the existing theoretical and empirical literature. This is followed in Section 3 by a presentation of the data and its main trends. Section 4 outlines the theoretical framework and presents the variables included in the analysis, while Section 5 reports the results of the static and dynamic analysis, distinguishing between the differential effect of trade on regional inequality in developed and developing countries, and presents a series of robustness checks. The conclusions are condensed in Section 6.

2. Trade and regional inequality in the literature

As mentioned in the introduction, the link between changes in trade and the evolution of regional disparities has hardly captured the imagination of geographers and economists. In contrast with the spawning literature on trade and interpersonal inequality, until recently there was a dearth of studies focusing on the within-country spatial consequences of changes in trade patterns. The emergence of the NEG theory has somewhat contributed to alleviate this gap in the literature, especially from a theoretical perspective. A string of NEG models concerned with the spatial implications of economic openness and trade (e.g. Krugman and Livas-Elizondo, 1996; Monfort and Nicolini, 2000; Paluzie, 2001; Crozet and Koenig-Soubeyran, 2004; Brülhart *et al.*, 2004) have appeared in recent years. In this literature the causal effect of globalization on the national geography of production and income is conceptualized in terms of changes in cross-border market access that affect the interplay between agglomeration and dispersion forces which, in turn, determine industrial location dynamics across domestic regions.

Because most of these models have a two-sector nature (agriculture/manufacturing), the central question has been whether increasing cross-border integration leads to a greater intra-national concentration of manufacturing activity, and thereby growing regional inequality. However, due to the use of different sets of assumptions and of the particular nature of the agglomeration and dispersion forces included in the models (Brülhart *et al*., 2004), contradictory and/or ambiguous conclusions have been derived from this type of analysis (e.g. Krugman and Livas-Elizondo, 1996 vs. Paluzie, 2001).

Empirical studies have not been better at resolving this conundrum. Most of the empirical analyses have tended to concentrate – in part as a result of the scarcity and lack of reliability of sub-national comparable datasets across countries – on single country case studies. Two countries feature prominently in empirical approaches. First and foremost is post-reform (post-1978) China, where an expanding number of studies have focused, *inter alia*, on the trade-to-GDP ratio and/or FDI inflows in order to explain either overall regional inequality or the growing coast-inland divide (Jian *et al.*, 1996; Yang, 2002; Zhang and Zhang, 2003; Kanbur and Zhang, 2005). Many of these studies have run time-series OLS regressions with the measure of provincial inequality on the left hand side and openness to trade and/or investment among a list of variables on the right. Most of these studies have found a significant positive effect of the rise in trade experienced by the country on regional inequality. Mexico has also featured prominently among those interested on the impact of trade on the location of economic activity. Using a number of measures which range from changes in trade ratios (Sánchez-Reaza and Rodríguez-Pose, 2002; Rodríguez-Pose and Sánchez-Reaza, 2005), sometimes controlling for location and sector (Faber, 2007), to FDI (Jordaan, 2008a and 2008b), retail sales (Adkisson and Zimmerman, 2004), or retail trade (Ford et al., 2009), these studies tend to find that increases in trade and greater economic integration in NAFTA have resulted in important differences in the location of economic activity between border regions and the rest of Mexico, thus affecting the evolution of regional inequality.

Cross-country panel data analyses examining the link between changes in trade patterns and the evolution of regional disparities have been significantly fewer. A large number of these studies have concentrated on the impact of European integration on trade patterns and how these, in turn, influence regional inequality. Among these studies, the work of Petrakos *et al.* (2005) and of Barrios and Strobl (2009) can be highlighted. Petrakos *et al.* (2005) resort to a measure of relative intra-European integration for a sample of 8 EU member countries, measured as national exports plus imports to and from other EU countries divided by total trade, rather than the overall trade-to-GDP ratios. Running a system of seemingly unrelated equations, they find mixed explanatory results for this variable and conclude that European integration affects countries differently. Barrios and Strobl (2009) run fixed effects OLS analyses for the EU15 over the period 1975-2000. Their aim is to explain how a measure of regional inequalities within each country is influenced by the trade-to-GDP ratio, as well as by trade over GDP in PPP terms. For the latter, they find a significant positive effect on regional inequalities among EU15 countries over 1975-2000.

The studies which have focused on this topic covering a more diverse sample of countries – involving both developed and developing ones – are rarer. Two such studies are Milanovic (2005) and Rodríguez-Pose and Gill (2006). Milanovic (2005) addresses the evolution of regional inequalities across the five most populous countries of the world: China, India, the US, Indonesia, and Brazil over varying time spans during the period 1980-2000. The results of his static fixed effects and dynamic Arellano-Bover panel analyses point to an absence of a significant causal relationship between openness and regional inequalities. Rodríguez-Pose and Gill (2006) map two sets of binary relationships – first between nominal trade openness and regional inequality, and second between a trade composition index and regional inequality – for eight countries, including Brazil, China, Germany, India, Italy, Mexico, Spain, and the US, over varying time spans between 1970-2000. They conclude that it is not trade openness *per se* which has any bearing on the evolution of regional inequality, but its combination with the evolution of the manufacturing-to-agriculture share of exports which influences which regions gain and which lose from greater economic integration over time. As trade shifts from the primary sector to manufacturing, by virtue of manufacturing being more geographically concentrated – especially in emerging countries – than agriculture or mining, within country regional disparities tend to increase and they do so at a faster pace in the developing than in the developed world. They find indicative support for this hypothesis based on the coincidence between changes in the evolution of their trade composition index and changes in regional inequalities across countries.

Given the diversity of results in both theoretical and empirical analyses, one would be hard pressed to generalize from the existing literature. The relationship between trade and regional inequalities thus remains wide open, both from a theoretical and empirical perspective.

3. Overall trade and regional inequality: Empirical evidence

This paper revisits the question of the link between trade and regional inequality, using an unbalanced panel dataset comprising 28 countries over the period 1975-2005. The 28 countries included in the analysis are presented in Table 1, which groups them according to whether they have experienced increasing, stable, or decreasing spatial disparities, using the evolution of the population-weighted coefficient of variation, over the time span covered by the data.

Insert Table 1 around here

As can be seen, the majority of the countries included in the sample have experienced a rise in regional disparities over the period of analysis. In 18 out of the 28 countries spatial inequalities have increased, while seven countries witnessed relative stability[4], and only three – Belgium, Brazil, and South Africa – saw a reduction in disparities. The rate of change varies enormously across countries (Figure 1). Countries such as Bulgaria, China, Hungary, India, Poland, Romania or the Slovak Republic have witnessed a very rapid rise in disparities, while the rate of increase has been more moderate in places such as Australia, Spain, the UK, or the US. Rates of decline in inequalities have also varied hugely, with Belgium and Brazil experiencing the strongest decline in territorial inequalities. There is also no apparent difference between the trajectories of developed and of emerging countries. Some of the low and medium income countries included in the sample have seen spatial disparities increase – e.g. Bulgaria, China, India, Indonesia, Mexico, and Thailand – while this has not been the case in Brazil and South Africa (Figure 1). However, it is worth noting that the level of territorial inequalities differs widely among countries and especially

[4] It is often the case that overall stability trends during the period of analysis hide significant variations in the evolution of regional inequality. Two such cases are Canada and China. In both countries, albeit for very different reasons, regional disparities decreased during the 1980s, but have tended to grow – and in the case of China, particularly rapidly – since the early 1990s.

between countries in the developed and developing worlds. Regional disparities in Thailand are eight times higher than those found in Australia or the US (Figure 1). The order of magnitude is four to one between China and Mexico and the former two high income countries, and three to one in the case of Brazil and India.

Insert Figure 1 around here

The primary question which is asked is whether any general relationship between the evolution of trade openness and spatial inequalities across countries can be detected. In order to assess whether this is the case, a simple binary association between annual measures of real trade openness and regional inequality for each country separately is performed. Figure 2 maps the regression coefficient of the log Gini index of regional GDP per capita on the log of the share of exports plus imports in GDP adjusted to purchasing power parities (PPP) by country. In Figure 3 the same regression coefficients are presented, having replaced the annual measures by three-year averages, as multi-annual averages may be better than annual data at picking up any potential lagged effects, thus correcting for yearly fluctuations.

Insert Figures 2 and 3 around here

Figures 2 and 3 show no dominating pattern. There is a huge diversity in both the sign and the dimension of the coefficient, with some countries sporting a positive relationship between trade and the evolution of regional disparities and others a negative one. There consequently seems to be, as indicated by Milanovic (2005) and Rodríguez-Pose and Gill (2006), no evidence of the presence of a simple linear relationship between the two variables that holds across different types of countries. A more subtle observation concerns the sequence of countries from left to right. On the whole, wealthier countries (Finland, Sweden, Canada, Netherlands, Japan) tend to be located on the left-hand side of both figures, displaying a negative association between increases in trade and regional disparities, while poorer countries tend to be found towards the right-hand side of Figures 2 and 3 (India, Romania, Poland). This relationship is, however, far from linear, with some high and middle income countries (Spain, Italy, South Korea, UK, and Greece) displaying a positive binary association between trade and spatial inequality.

4. Model and data

There are limitations, however, in what can be inferred from simple binary associations, as they only offer very limited information about the mechanisms at play and many other factors may be affecting the evolution of within-country regional disparities. In order to address this issue, in the following paragraphs a formal econometric specification with additional controls and conditioning variables is formulated aimed at testing whether there is a significant association between openness and spatial inequality and whether this association – if it exists – affects developed and developing countries in a different way.

4.1. The basic model

With very few exceptions (e.g. Milanovic, 2005), the bulk of studies on the determinants of regional inequalities are based on static one-yearly specifications. However, regional inequality is bound to be a time-persistent phenomenon with a high degree of inertia. This makes overlooking time considerations problematic. Theory, however, provides no clear (if any) insights concerning the temporal dimension of internal spatial adjustments to changes in external market access. Hence, rather than guessing an appropriate adjustment timeframe, the paper tackles potential inertia is by formulating a dynamic model with past levels of spatial inequality on the dependent variable side. The use of dynamic panels – complementing static panels – has the advantage of introducing the distinction between short term and long term effects.

Taking this into consideration, the following general model is formulated:

$$\text{Inequality}^{*}_{it} = \alpha + \sum\beta x_{it} + \varepsilon_{it} \qquad (1)$$

Where $Inequality^{*}_{it}$ is the level of inequality in country i at time t corresponding to the spatial configuration that would arise if there was no inertia in the system and x_{it} is a vector of independent variables conditioning the spatial distribution of income in any given country *i* at time *t*. Using Brown's (1952) classical habit persistence model, equation (1) is transformed into equation (2):

$$\text{Inequality}_{it} - \text{Inequality}_{it-1} = \lambda\ (\text{Inequality}^{*}_{it} - \text{Inequality}_{it-1}),\ 0<\lambda<1 \qquad (2)$$

where the actual observed change of the spatial configuration ($Inequality_{it}$ - $Inequality_{t-1}$) is a fraction λ of the adjustment that would have taken place under instantaneous adjustment.

Parameter λ ranges between 0 and 1 and represents the speed of adjustment. If λ is close to 1, then the adjustment is almost instantaneous and the relationship between the theoretical determinants x_{it} and the actual observed spatial outcomes $Inequality_{it}$ is static. If λ is below 1 then the difference between the observed spatial outcomes and their inertia-free theoretical counterpart $Inequality^{*}_{it}$ becomes significant, creating the need to control for partial adjustment in a dynamic model. Rearranging and substituting for $Inequality^{*}_{it}$, we obtain:

$$\text{Inequality}_{it} = \lambda\ (\alpha + \sum\beta x_{it} + \varepsilon_{it}) + (1-\lambda)\ \text{Inequality}_{it-1},\ 0<\lambda<1 \qquad (3)$$

Equation 3 presents the basic specification followed in the dynamic panel regressions. On the left hand side of the equation is the dependent variable, representing the observed inequality. On the right, we find the theoretical determinants of the inertia-free spatial configuration plus the previous period's value of the dependent variable can be found. The latter effectively controls for potential inertia and partial adjustment. By fixing the previous spatial outcome $Inequality_{it-1}$, the short-term effect of any independent variable x_{it} is given by its revealed regression coefficient when running equation (3). Conceptually, this coefficient represents the product λβ. The assumption for the long run is that a country's spatial configuration reaches a stable equilibrium, making the current and the previous year's inequality levels close to identical. Setting $Inequality_{it-1}$ equal to $Inequality_{it}$ in equation 3, the long-term effect of any independent variable on the spatial configuration can thus be derived by dividing the observed regression coefficient λβ by the speed of adjustment parameter λ. The long-term effects can be derived by dividing the coefficients of the independent variables by 1 minus the coefficient of the lagged dependent variable.

4.2. The conditioning variables

Having set the basic model, the task now is to identify an appropriate set of conditioning variables capturing the relationship between trade openness and internal spatial inequality in the form of equation 1. This is done in two stages: the first one drawing on recent NEG models and the second reaching beyond the purely market access driven framework.

In an NEG core-periphery framework and as a consequence of NEG's basic two sector assumption and of the absence of intra-industry linkages, distinguishing whether or not greater accessibility to foreign markets promotes economic growth is tricky. The introduction of cross-border intra-industry linkages and of a multi-sector industrial scenario in the analysis gives rise to an additional pull factor towards highly accessible regions once trade is liberalized and allows export market potential, intra-industry supply potential, and import competition to affect domestic sectors differently, depending on the comparative advantages revealed by market integration (Faber, 2007). Sectors characterized by a revealed comparative advantage and/or cross-border intra-industry linkages will thus grow faster in regions with good foreign market access, whereas import competing sectors gain in relative terms in regions with higher 'natural protection' related to poor market access. Faber (2007) finds empirical support for this trade-location linkage across 43 industrial sectors in post-NAFTA Mexico over the period 1993-2003.

The implications of this possible divergence of sector location patterns under cross-border market integration are important in order to understand whether and how market accessibility affects regional performance. Regions with high relative foreign market access which attract the winners of integration will also tend to shed declining sectors, resulting in higher medium to long-term regional growth rates than in regions with limited and/or constrained foreign market access.

In conditions of increasing trade and economic integration two additional country-specific factors may play a conditioning role in determining the evolution of regional inequalities. First is the degree of variation of foreign market accessibility among regions within any given country. If, given the discussion above, we assume that relative foreign market access drives regional attractiveness for expanding sectors, the locational pull will be strongest in countries characterized by high regional differences in cross-border market accessibility. The strength of this factor is further conditioned by the degree of coincidence between the existing regional income distribution and the distribution of relative foreign market access. When relatively wealthy regions are also those with a greater degree of accessibility, increases in trade are likely to exacerbate previously existing inequalities. In contrast, when poorer regions have a market accessibility advantage relative to better off regions, the net outcome of increases in trade is likely to be a reduction in regional disparities and within-country territorial convergence. Hence, it can be safely assumed that *greater trade openness will have a more polarizing effect in countries characterized by a) higher differences in foreign market accessibility among its regions and b) where there is also a high degree of coincidence between the regional income distribution and accessibility to foreign markets.* The presence of a strong coincidence between regional income distribution and accessibility to foreign markets is a sufficient, rather than a necessary condition in order to generate greater inequality, as trade openness may also exacerbate previously existing inequality even in cases when wealthier regions have less foreign market accessibility than poorer regions. This may be a consequence that differences in endowments or in adaptive capacity between rich and poor regions more than compensate for differences in accessibility.

Stepping outside the NEG framework, other factors may come into play in determining the link between trade and regional inequality. Among these factors differences in the distribution of human capital and skills and infrastructure affect trade patterns as well as economic growth. It can therefore be envisaged that *the greater the regional differences in endowments and sector specialization, the greater the spatial impact of trade openness.*

The role of government policies may also enhance or attenuate the spatial effects of changes in trade patterns. Governments with a greater social and territorial redistributive capacity through public policies will be in a better position to counter any potential tendency of increases in trade patterns leading to greater geographical polarization. Budgetary or regional policy transfers from prosperous to lagging regions will thus offset rises in regional inequality, making *the effect of trade openness on spatial inequality likely to be more severe in countries with a weaker redistributive capacity by the central government and/or with fewer provisions for interregional transfers.*

A fourth conditioning factor concerns the degree of labor mobility, especially within-country mobility. Depending of the conditions of any particular country, inter-regional worker mobility may either contribute to greater agglomeration, as workers concentrate in core areas offering higher salaries or greater job opportunities, or to greater territorial cohesion, if workers follow firms seeking lower costs in peripheral areas (Puga, 1999). Hence, *the effect of trade on regional inequality will depend on the degree of inter-regional labor mobility and the specific conditions of the country.*

A final factor is the quality of institutions, which will vary significantly from one region to another. Poorer and/or lagging regions are likely to suffer the most from this situation. Problems of institutional sclerosis, clientelism, corruption, and pervasive rent seeking by durable local elites, which beset many lagging areas, are likely to contribute to trade bypassing these regions in favor of those with more 'appropriate' institutions. "Informal institutions in these places are often similarly dysfunctional, resulting in low levels of trust and declining associative capacity, and restricting the potential for effective collective action" (Farole et al., 2009: 11). *'Inappropriate' institutions will thus represent an important barrier for trade, leading to a spatial effect of trade more severe in countries with a significant gap in institutional capacity among its regions*.

Unfortunately, due to lack of comparable and reliable data on inter-regional labor mobility and institutions across the 28 countries covered in the analysis, the latter two hypotheses cannot be tested. We therefore have to assume that labor mobility and institutions are not systematically correlated with any of the other regressors, implying that there is no omitted variable problem in leaving out this conditioning interaction.

There is also a need to control for other factors which may affect the relationship between trade and spatial inequality. The key element in this realm relates to

Williamson's (1965) classical account of the linkage between spatial disparities and the stage of economic development. In Williamson's account, the level of within-country spatial inequalities is fundamentally the result of the level of national economic development (proxied in this case by real GDP per capita and its growth). As countries prosper inequalities tend to diminish, making economic growth a primary driver of changes in spatial inequalities. Williamson's theory is built-in into the WDR 2009. There it is stated that not only has "development […] largely eliminated rural-urban disparities" (World Bank, 2009: 62), but also that "high urban shares and concentrated economic density go hand in hand with small differences in rural-urban well-being on a range of indicators" (ibid.: 62). As economic growth is also likely to be correlated with changes in trade (Sachs and Warner, 1995), a control for real GDP per capita and its interaction with the country's development stage is included in the analysis.

4.3. The empirical model, data and method

The above discussion leads to the transformation of equation (1) into the following empirical specification (4). Table A1 in the appendix presents the actual values of the structural conditions across the 28 countries.

$$\ln \text{Inequality}^{*}_{it} = \alpha + \beta 1\ [\ln(\text{GDPcap}_{it}) * \text{Development}_{i}] + \beta 2\ [\ln(\text{Trade}_{it}) * \ln(\text{MarketAccess}_{i}) * \ln(\text{Coincidence}_{i})] + \beta 3\ [\ln(\text{Trade}_{it}) * \ln(\text{Sectors}_{i})] + \beta 4\ [\ln(\text{Trade}_{it}) * \ln(\text{Government}_{i})] + \varepsilon_{it} \quad (4)$$

where:

Inequality$_{it}$ represents the level of within-country regional inequality in country i in year t, measured using the Gini index of regional GDP per capita.

GDPcap$_{it}$ denotes real GDP per capita in PPP in constant US$ (2000) for country i in year t.

Development$_{i}$ is a dummy variable which takes the value of 1 if country i is a developing or transition economy and 0 otherwise. The categories were assigned on the basis of historical World Bank classifications. Each country was assigned to its most frequent classification over the time period covered in the dataset. This variable is, in turn, subdivided into three components:

a) *High income*$_i$ is another dummy variable which takes the value of 1 if country i has been most frequently classified as high income country and 0 otherwise.
b) *Middle income*$_i$ is a dummy variable which takes the value 1 of if country i has been most frequently classified as middle income country and 0 otherwise.
c) *Low income*$_i$ is a dummy variable which takes the value of 1 if country i has been most frequently classified as low income country and 0 otherwise.

Trade$_{it}$ represents the total imports and exports in current US$ divided by GDP in PPP current US$ for country i in year t.

Sectors$_i$ is a variable aimed at capturing the degree of inter-regional sectoral differences that exist across countries, proxied by the standard deviation of the share of agriculture in regional GDP, averaged across the time periods under study for country i[5].

Government$_i$ denotes the size of government in country i, proxied by the share of non-military government expenditure in total GDP averaged across time periods under study. It is assumed that inter-regional transfer programs and social expenditures are linearly related to the level of government expenditure in total GDP and that, in most countries, there will be a certain progressiveness in-built in the territorial distribution of investment.

MarketAccess$_i$ denotes the degree of inter-regional differences in foreign market access across countries. Taking into account existing data constraints in the countries covered in the sample, two alternative measures of market access are used. The first variable (*Surface*$_i$) is each country's surface area in square kilometers. However, the surface area of a country is a rather crude measure of market access, especially in view of the huge diversity in population density among countries. Hence an alternative composite measure of internal market access polarization

[5] Ideally a finer sectoral disaggregation in order to capture in a more precise way the variation of modern sector endowments between domestic regions should have been used, perhaps including the sub-sectors of the service sector for the developed world. But given the diversity of countries included in the panel, the share of agriculture in regional GDPs over time was the best comparable indicator available.

(*$MAPolaristaion_i$*) is constructed. In this measure the surface area in square kilometers of a country is transformed into an index ranging between 0 and 100 and introduced as the first element. The second element is the population density adjusted ratio of paved road and railway kilometers over the square root of the land area. The adjustment for population density is intended to account for the fact that some countries have vast unpopulated areas while others are much more densely populated. The infrastructure-to-land area ratio is weighted by transforming each country's land area to the panel's mean population density. This adjustment implies that in the case of Australia this greatly reduces its adjusted land area, whereas in the case of the Netherlands it increases it. The paved road and railroad line kilometers relative to the square root of the adjusted land area is used as a population-density adjusted indicator of infrastructure quantity and quality across countries. As with the surface area, this composite measure is transformed into an index ranging between 0 and 100 where 100 represents the score for the country with the lowest endowment in infrastructure (in our panel Thailand, see table A1). The two 0-100 scores are then combined into an aggregate score of possible values between 0-200, where increasing scores suggest increasing internal differences of foreign market access.

The main logic behind the use of the $MAPolaristaion_i$ variable is that both the level of absolute internal distances (element 1) and the population density adjusted infrastructural endowments (element 2) determine the degree of inter-regional variation in access to foreign markets. The first concerns the internal transport distances, the second proxies for the average transportation costs of a country. A one-to-one weighting was chosen under the assumption that the proxy for quality and quantity of transport infrastructure will not only reflect average transport costs per km of landmass, but also the number and availability of international transshipment and customs facilities along a country's coasts and borders.

$Coincidence_i$ reflects the degree of coincidence between relative regional market access positions and regional income per capita levels across countries. Once again, two alternative measures of coincidence between both factors are used. The first ($Coincidence25_i$) is the ratio of the average GDP per capita levels of the regions in the top 25 percent in terms of foreign market access over average regional GDP per capita. The second ($Coincidence50_i$) calculates the same ratio on the basis of the regions in the top 50 percent in terms of relative foreign market access. In order to insure consistency with the dependent measure of regional inequality which treats each region as one observation, the coincidence ratios are also computed disregarding regional population sizes.

The question is of course how to determine relative market access positions. In the absence of adequate and comparable datasets of regional transport costs to an equivalent selection of international trade points in each country, the method used consists in first identifying the trade entry points accountable for at least 70% of the country's total trade, as well as the top quarter or half of the regions in terms of border or coast location in closest proximity to the main trade routes. In the cases where two regions were close in terms of border/coast accessibility to the main trade routes, the region with the higher number of international ports or border crossings was chosen.

Beyond a mere response to limited data availability, this geography based construction of the coincidence measures also addresses a potential endogeneity issue. Assuming that perfect data about each region's foreign market access in terms of actual transport cost weighted market potential is available, it is highly likely that high degrees of regional inequality are associated to higher degrees of coincidence, because regional prosperity tends to be a driver of market access when measured in terms of human-built infrastructure. Relying on physical proximity and border or coast location instead is not subject to this potential endogeneity issue. As in the case of the previous structural conditioning variables, the coincidence measures are averaged across periods for each country.

The data sources for each of the variables are presented in Table A2 in the Appendix.

Finally ε represents the error term.

In order to assess the original questions of whether trade and the remaining variables included under equation (4) affect regional inequalities and whether this relationship changes over time, both static OLS with country and time fixed effects, as well as dynamic panels are run. The static analysis aims at discovering the association (or lack of it) between trade and the evolution of regional disparities. In the case of the dynamic regressions, general method of moments (GMM) estimation following Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998) are applied in order to distinguish between short- and long-term effects. The problem with running OLS on panels that include the lagged dependent variable is that it will be correlated with the error term even after getting rid of the unobserved country heterogeneity therein. To adjust for this bias, Arellano and Bond have proposed a first difference GMM estimator that uses lagged values of the dependent and predetermined variables and differences of the strictly exogenous ones as instruments. Arellano and Bover and Blundell and Bond have proposed a system GMM estimator in which variables in levels are instrumented with lags of their own first differences to exploit additional moment conditions.

5. The impact of trade on regional inequality

5.1. Static analysis

In this section the results of running the different specifications of equation (4) are presented. Table 2 introduces the results for the static OLS with country and time fixed effects. Given that all unobserved invariant country and time heterogeneity has been eliminated from the model, the coefficients can be interpreted as the partial effects that annual variations of independent variables around the country mean have had on annual variations of spatial inequality around the country mean.

Insert Table 2 around here.

When trade is considered as a free-standing variable (Table 2, Regression 1), no association whatsoever between changes in trade patterns and the evolution of regional disparities is found. This coincides with the results of other studies which have looked at the simple association between trade and regional inequality (e.g. Rodríguez-Pose and Gill, 2006). This lack of association changes when, as specified in the diverse hypotheses, trade is considered in interaction with a series of country-specific factors. Here, the results of the static panel highlight, in contrast to most previous studies operating with international panels, the presence of a weak, but positive and highly significant effect of the dimension of real trade on spatial inequality when pooling across all countries. Having controlled for the internal growth effect and its different slope across developed and developing countries, a one percent increase in real trade openness is on average associated with a 0.17 percent increase of the Gini index of regional inequality (Table 2, Regression 2). The results also indicate that this effect is significantly stronger in developing countries than in developed ones (Table 2, Regression 3), although the binary *Development* dummy interaction is only significant at the 10 percent level.

Regressions 4 to 9 take us beyond the simple binary relationship between trade and inequality and introduce the conditioning structural variables identified in the previous section. All the coefficients have the expected sign – rises in trade are associated with lower regional inequalities in countries with large government size and with higher inequalities in cases of strong inter-regional sector differences, when there are important differences in market access and when these coincide with geographical disparities in income per capita – and, with the exception of one particular combination of the spatial structure conditions in regression 6, all are significant at the one percent level. Poorer countries with lower government expenditure, higher variations in regional sector structures, and a spatial structure dominated by high internal transaction costs coupled with a higher degree of coincidence between prosperous regions and foreign market access are thus bound to experience greater rises in regional inequality when opening to foreign trade.

Interestingly, when all conditioning interactions are added together (Table 2, Regression 10), the binary *Development* dummy interaction effect becomes insignificant. The same is the case for the *Government* expenditure interaction. These changes could simply be the result of collinearity between the *Development* dummy and the *Government* variable. But this is not the case. The *Government* variable remains significant once the *Sectors* interaction is dropped, meaning that the problem of collinearity arises between the *Government* and *Sectors* interactions, but not between *Development* and *Government*. This suggests that the proposed structural variables account to a great extent for the apparent differences in the association between trade and within-country spatial inequalities across developed and developing countries.

In order to test whether the weak binary *Development* dummy interaction of the trade impact also holds at a less aggregate categorical level, the panel is divided into high middle and low income countries, according to the World Bank's classification, using the high income group as the reference category. Table 3 reports the results of this type of analysis.

Adding greater nuances to the developed/developing country division leads to an increase in the significance of development dummy interactions (Regression 2, Table 3), in comparison to those reported in Regression 3 (Table 2). The results suggest that variations in levels of trade openness have a significantly higher association with average variations in spatial inequality in middle and low income countries than in high income ones in the short term. There is, in contrast, no significant difference between the impact of changes in trade on spatial inequality between low and middle income countries (Regression 2, Table 3).

Insert Table 3 around here

When instead of testing for different slopes of the trade effect on spatial inequality across groups, we examine whether the effect of trade has changed as countries progress in terms of economic development – by interacting trade openness with the countries' real GDP per capita (Regression 3, Table 3) – the resulting coefficient points towards a weakening of the positive association between increases in trade and within-country spatial inequalities as countries become wealthier. Overall, Table 3 once again suggests that trade has had a higher impact on spatial inequality in developing countries, and that this effect tends to be diminishing with economic development at a slower pace than in developed countries.

An important final point concerns the striking difference between the coefficient results for the internal determinant of spatial inequality in the tradition of Williamson, and the external trade induced factor. Particularly surprising is the negative and frequently significant coefficient of the interaction term. This suggests that, after controlling for real trade openness, variations of real income per capita have on average had a less positive association to variations in spatial inequality in developing countries as opposed to developed ones. In other words, economic growth has on average been less polarizing in developing countries than in developed ones.

These findings indicate that the external effect of real trade openness on internal spatial inequality appears to have had a more polarizing effect in developing countries than economic growth. The important question in this context is, of course, what are the underlying structural factors behind the observed differences in the trade effect. As noted in Regression 9 in Table 2 above, the diminishing size and lack of significance of the development dummy interaction after controlling for spatial structure, government intervention, and sector differences point to these structural factors as part of the reason. This line of reasoning is confirmed in Table 4 in which the variable averages are collapsed across different country groups.

Insert Table 4 around here

In Table 4 all the identified conditioning country characteristics appear to be working against developing countries. This is especially pronounced after disaggregating countries into high middle and low income clusters, especially when taking into account current existing degrees of global integration, on one side, and levels of spatial inequality, on the other. This implies that, as highlighted by Rodríguez-Pose and Gill (2006), the room for growth in spatial inequalities is much greater in the developing than in the developed world as a) developing countries tend to be characterized by structural features that potentiate the polarizing effect of trade openness, b) they already have much higher existing levels of spatial inequality, and c) their level of trade openness is, on average, still only a fraction of the one among developed countries.

5.2. Dynamic analysis

Table 5 presents the results of the dynamic panel regressions. The results were computed using the xtabond2 command in STATA (Roodman, 2006). Reported results correspond to the 1st difference Arellano-Bond GMM estimation. The reason for this is that the usually preferred Arellano-Bover system GMM was repeatedly rejected by the Sargan test of over-identification, indicating that its additional assumptions on the data generating process did not hold.

Insert Table 5 around here

As could be expected, when switching to dynamic panels with the lagged level of inequality included on the right hand side, most of the differences in current within-country spatial inequality levels are explained by previous levels of within-country inequality, meaning also that the effect of trade openness on regional inequality ceases to matter (Table 5, Regression 1). The same is the case for the binary *Development* dummy interaction term in Regression 2 (Table 5).

Regressions 3 to 9 introduce the structural conditions in the dynamic model. Here, the partial effects of the static fixed effect model are confirmed in the cases of sector differences and government expenditure, which also render the *Trade* variable significant at the five percent level (Regressions 3 and 4, Table 5). The introduction of the spatial variables, in contrast, while keeping the same coefficient signs of the static analysis, display insignificant coefficients with the exception of Regression 9 which substitutes the *Development* dummy by a relatively crude binary proxy of internal market access polarization.

The high degree of inertia inferred from the coefficient of the lagged level of regional inequality comes as no surprise, with the speed of adjustment parameter lying around 0.3. This coefficient suggests the presence of a strong difference between short term and long term effects of all included independent factors (Table 5).

5.3. Robustness tests

In order to check whether these results are robust to differences in specifications, the Gini index of regional inequality is replaced by alternative inequality measures. The specifications in Tables 2 to 4 are thus run replacing Gini coefficient of within-country regional inequality as the dependent variable with two alternative measures:

the Theil index and the population-weighted coefficient of variation. The results are robust to the change in specification and can be provided upon request.

Another robustness check, given the limited number of observations in a panel including 28 countries relative to the time of the analysis, is to use a bias-corrected least squares dummy variable (LSDV) estimator (Kiviet, 1995; Bun and Kiviet, 2003), instead of a instrumental variable GMM estimation. This approach also allows accommodating for unbalanced panels (Bruno, 2005). By resorting to this method, the aim is to check whether the results from the Arellano-Bond GMM estimation in Table 3 prove robust to an alternative estimator. The results are displayed in Table 6. Standard errors have been derived by setting the number of bootstrap repetitions to 200.

Insert Table 6 around here

Table 6 reveals that the size and sign of the coefficients of interest remain similar to those presented in Table 5. The speed of adjustment parameter slightly decreases to below 0.25 as indicated by the higher coefficient of the lagged level of regional inequality. However, none of the previously found significance levels is confirmed. This makes it difficult to draw any firm conclusions on the dynamic adjustment process between openness and regional inequality from our data. Beyond the highly significant static associations that we found, the data do not support any robust partial relationship in the dynamic setting that introduces short term and long term effects.

6. Conclusion

The aim of this paper has been to improve our understanding of the relationship between changes in trade patterns linked to global market integration, on the one hand, and within-country spatial inequalities, on the other, both from a theoretical and an empirical perspective. This is particularly relevant given the recent emphasis of the WDR 2009 that increases in trade may lead to greater growth at the expense of increases in territorial disparities, but that this is a temporary condition as greater development would eventually weaken within-country spatial inequality.

The paper is based on a model which combines regional spatial characteristics with a series of country features. The spatial characteristics include the degree of inter-regional variation in access to foreign markets and whether these differences in foreign markets coincide with differences in income. The conditioning country features include the degree of inter-regional sector variation, the level of government expenditure, the degree of labor mobility and institutions. Lack of data on the two latter categories allows testing for the former two conditions only. In the theoretical tradition of Williamson (1965) and in order to test whether development weakens spatial inequalities, the paper also controls for the internal growth effect and its interaction with the country's development stage. The influence of these variables on the evolution of within-country regional inequality is then tested using both static fixed effects, as well as dynamic panels.

The results show that trade – when considered in combination with country-specific factors – matters for the evolution of regional inequalities. There is a weak association between both factors in static panel analyses, which improves significantly as the conditioning variables are included in the analysis. This implies that, while changes in trade make a difference for the evolution of spatial disparities, the impact of changes in trade is more polarizing in countries with higher inter-regional sector differences, lower shares of government expenditure, and a combination of higher internal transaction costs with higher degrees of coincidence between wealthier regions and foreign market access. However, the spatial country variables cease to be significant once controlling for lagged levels of inequality in dynamic panels, meaning that no firm conclusions can be extracted regarding the dynamic timeframe of spatial adjustments and the distinction between short term and long term effects of trade openness.

The key result is that changes in trade patterns seem to affect the evolution of regional inequality in developing countries to a much greater extent than in developed ones. The spatially polarizing effect of trade also decreases at a significantly slower pace in developing countries than in developed ones. And trade, in contrast to what was suggested by Williamson (1965), seems to have a greater sway on the evolution of regional inequality than economic growth. This means that economic growth –

whether directly provoked by changes in trade or not – cannot offset the potentially negative effects for territorial equality of increases in trade in the developing world.

By and large, countries in the developing world are characterized by a series of features that are likely to potentiate the spatially polarizing effects of greater openness to trade. Their higher existing levels of regional inequality, their greater degree of sector polarization, the fact that their wealthier regions often coincide with the key entry points to trade, and their weaker state all contribute to exacerbate regional disparities as trade with the external world increases. And countries in the developing world have a much greater scope for increases in spatial polarization, as their level of international market integration, while growing rapidly, is still a fraction of that of developed countries.

Policy-makers in the developing world – as well as international organizations – may thus need to tread carefully when thinking about the potential implications of greater market openness for their countries. While greater openness to trade is likely to yield rewards in terms of growth and the absolute welfare of local citizens, it may also bring the unwelcome consequence of greater territorial polarization. While, as pointed out in the WDR 2009, this may not necessarily be bad in the short term, enhancing territorial inequality in countries with already high levels of spatial polarization and where territorial differences may pile on top of pre-existent social, cultural, ethnic, and/or religious grievances, can contribute flare up tensions which could ultimately undermine the very economic benefits that trade is suppose to bring about. Hence, it is convenient to bring the territorial implications of trade into the trade policy equation. This may imply trade policies aimed at promoting growth not just focused on generating greater agglomeration, as these can have unintended effects that may ultimately limit their influence on development. A return to 'spatially balanced growth' policies may not be in the cards (World Bank, 2009: 5), but many growth policies based on trade may benefit from including a 'spatially-sensitive' dimension, if the potential economic benefits of greater openness to trade for countries in the developing world are to be maximized.

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Figure 1: Evolution of regional inequality in a selected sample of countries (measured by the population-weighted coefficient of variation).

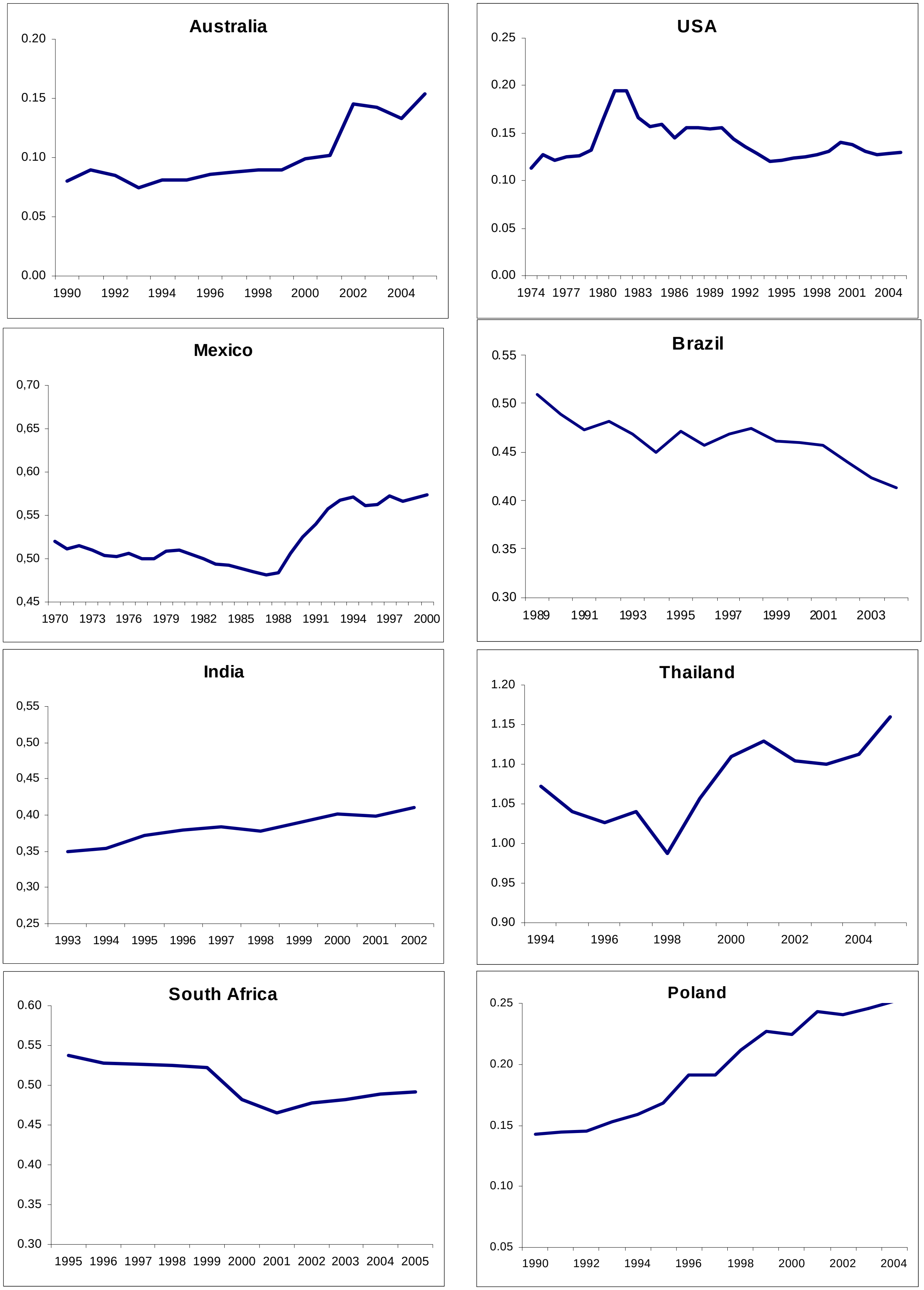

Figure 2: Regression Coefficients of Regional Inequality on Real Trade Openness

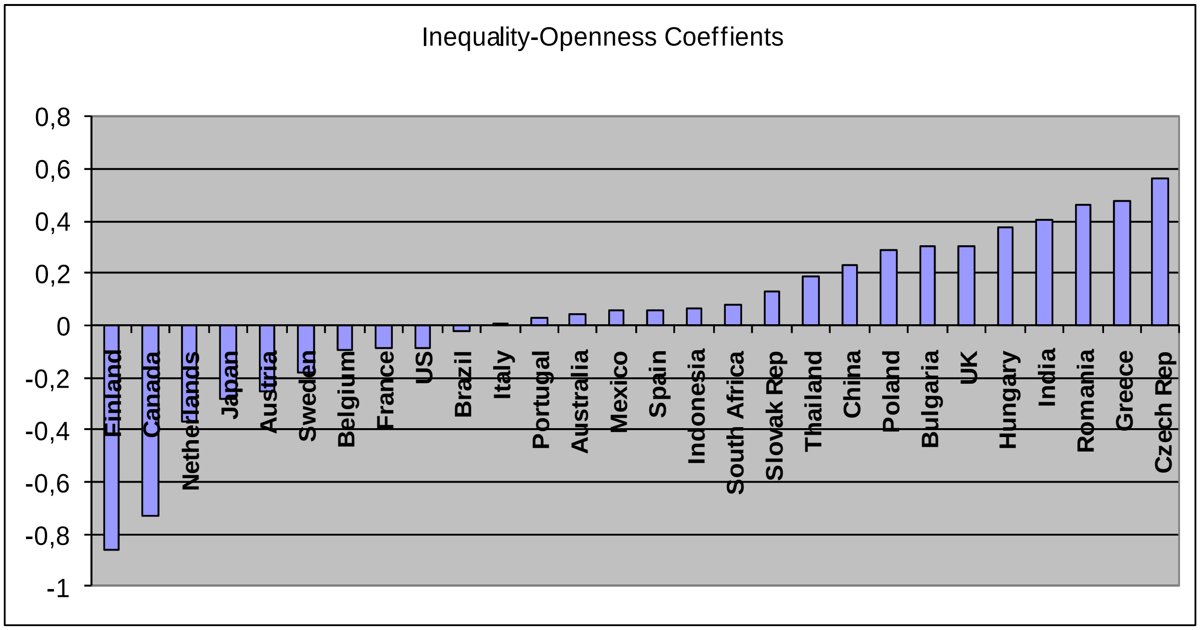

Figure 3: Regression Coefficients of Regional Inequality on Openness for 3-year average

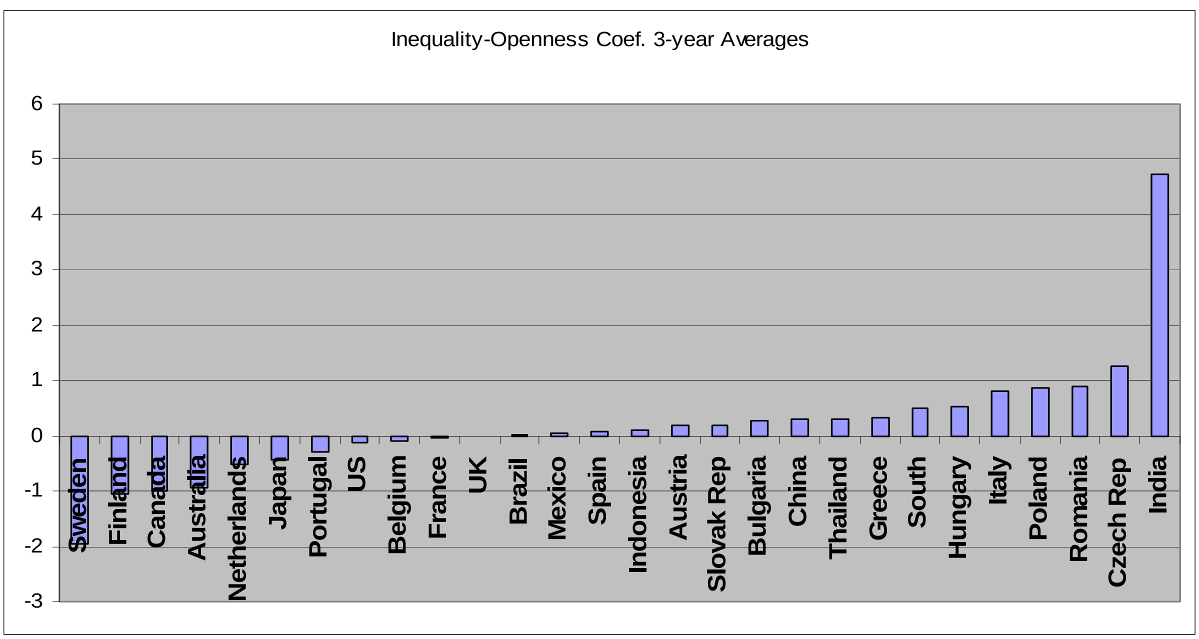

Table 1: Increasing versus Decreasing Regional Inequality

Increasing Regional Inequality	Stable Regional Inequality	Decreasing Regional Inequality
Australia (1990-2005)	Austria (1988-2004)	Belgium (1977-1996)
Bulgaria (1995-2004)	Canada (1981-2005)	Brazil (1989-2004)
Czech Republic (1995-2004)	China (1978-2004)	South Africa (1995-2005)
Finland (1995-2004)	Italy (1995-2004)	
France (1982-2004)	Japan (1975-2004)	
Greece (1979-2004)	Netherlands (1986-2004)	
Hungary (1995-2004)	USA (1975-2005)	
India (1993-2002)		
Indonesia (2000-2005)		
Mexico (1993-2004)		
Poland (1995-2004)		
Portugal (1995-2004)		
Romania (1998-2004)		
Slovakia (1995-2004)		
Spain (1980-2004)		
Sweden (1994-2004)		
Thailand (1994-2005)		
UK (1994-2004)		

Table 2: Static Panel with Country and Time Fixed Effects

	1	2	3	4	5	6	7	8	9	10
GDPcap	.1680	.2433**	.2766**	.2657**	.3049***	.1799	.1791	.2251**	.2418**	.3607***
GDPcap*Development		-.1223	-.1721	-.1523*	-.1992**	-.0540	-.0404	-.1025	-.0998	-.2363***
Trade	.0725	.1728***	.1042*	-.4840***	.8620***	1.7055***	1.770***	1.1955**	1.2968***	2.1162***
Trade*Development			.1237*							.1160
Trade*Government				-.3337***						-.0932
Trade*Sectors					.2081***					.2358***
Trade*Coincidence50*MAPolarisation						.7888				
Trade*Coincidence25*MAPolarisation							.8889***			
Trade*Coincidence50*Surface								.1544***		
Trade*Coincidence25*Surface									.1351***	.1272**
Constant	-1.510	-3.631	-3.811	-3.729	-3.968	-3.297	-3.317	-3.699	-3.841	-4.592
R^2 (within)	0.003	0.227	0.2327	0.2527	0.2577	0.2503	0.2622	0.2775	0.2885	0.359
Observations	435	435	435	435	435	435	435	435	435	435
F-test for country dummies	Prob>F =0.640	Prob>F =0.000	Prob>F =0.000	Prob>F =0.000	Prob>F =0.000	Prob>F =0.000	Prob>F =0.000	Prob>F =0.000	Prob>F =0.000	Prob>F =0.000

*, **, *** correspond to 10, 5, and 1% significance levels respectively computed with heteroskedasticity adjusted standard errors;
Time and country fixed effects included.

Table 3: Trade Effect in Developed and Developing Countries

	1	2	3	4
GDPcap	.2766**	.4628***	.1427	-.0954
GDPcap*Development	-.1721*	-.3489***	-.2438**	.3507*
Trade	.1042*	-.0587	.9534**	2.8924***
Trade*Development	.1237*			-3.2878***
Trade*GDPcap			-.0814**	-.2888***
Trade*GDPcap*Development				.3508***
Trade*Middle Income		.3963***		
Trade*Low Income		.3523***		
Constant	-3.811	-5.027	-2.262	-1.951
R^2 (within)	0.2327	0.2968	0.2347	0.2681
Observations	435	435	435	435
F-test for country dummies	Prob>F =0.000	Prob>F =0.000	Prob>F =0.000	Prob>F =0.000

*, **, *** correspond to 10, 5, and 1% significance levels respectively computed with heteroskedasticity adjusted standard errors; Time and country fixed effects included.

Table 4: Structural Factors Across Groups of Countries

	Developed	Developing	Ding/Ded Ratio	High Income	Middle Income	Low Income	Low/High Ratio
Inequality	.11	.25	2.27	0.11	0.18	0.28	2.57
Real Trade Openness	.44	.22	0.51	0.46	0.26	0.16	0.35
Government	.17	.13	0.79	0.18	0.15	0.11	0.61
Sectors	.03	.06	2.30	0.02	0.05	0.09	3.62
MAPolarisation	95.97	125.63	1.31	96.55	110.16	135.42	1.40
Coincidence50	1.03	1.09	1.06	1.03	0.97	1.23	1.19
Coincidence25	1.04	1.28	1.23	1.05	1.06	1.48	1.41

Table 5: Dynamic Panel with 1st Difference Arellano-Bond GMM

	1	2	3	4	5	6	7	8	9	10
Lagged Inequality	.7132***	.7188***	.6917***	.6917***	.7126***	.7154***	.7112***	.7090***	.7099***	.6917***
GDPcap	-.0102	.0002	.006	.0216	-.0165	-.0106	-.0168	-.0137	.0040	.0037
GDPcap*Development	.0303	.0243	.0141	-.0038	.0289	.0261	.0338	.0311	.0166	.0133
Trade	.0158	.0200	-.2429**	.2631**	-.1196	-.0803	.0862	.1187	.0232	.1172
Trade*Development		-.0116								-.0486
Trade*Government			-.1384**							-.0636
Trade*Sectors				.0726**						.0596
Trade*Coincidence50*MAPolarisation					-.0110					
Trade*Coincidence25*MAPolarisation						.0694				
Trade*Coincidence50*Surface							.0009			
Trade*Coincidence25*Surface								.0174		
Trade*Coincidence25*Development									.7210**	.5898*
Observations	379	379	379	379	379	379	379	379	379	379
Sargan Test	Prob>chi2	Prob > chi2	Prob>chi2	Prob>chi2	Prob>chi2	Prob>chi2	Prob>chi2	Prob>chi2	Prob>chi2	Prob>chi2
	=0.9355	=0.9407	=0.8894	=0.9147	=0.9493	=0.9484	=0.9541	=0.9461	=0.9530	=0.9395
2nd Order Autocorrelation	Pr>z=	Pr > z=	Pr>z=	Pr>z=	Pr>z=	Pr>z=	Pr>z=	Pr>z=	Pr>z=	Pr>z=
	0.5032	0.4920	0.5262	0.5343	0.5011	0.4886	0.5333	0.5252	0.4877	0.4958

*, **, *** correspond to 10, 5, and 1% significance levels respectively computed with heteroskedasticity adjusted standard errors;
Trade, sectors, government, and spatial variables entered the instrument matrix as strictly exogenous.
Time fixed effects included.

Table 6: Dynamic Panel with Bias Corrected LSDV (Arellano-Bond as initiating estimator)

	1	2	3	4	5	6	7	8	9	10
Lagged Inequality	.7695***	.7732***	.7625***	.7562***	.7717***	.7712***	.7658***	.7637***	.7688***	.7601***
GDPcap	-.0042542	-.0114254	-.0057356	.0018603	-.0016792	-.0032934	-.0006512	.0003451	-.010194	-.0076126
GDPcap*Devevelopment	.0447277	.0553157	.0543923	.0366075	.0393897	.0413365	.0422675	.0414348	.0539687	.0507196
Trade	.0072552	.0171614	-.0514281	.1724832	-.1523919	-.094782	.0582092	.1016657	.0197978	.3415041
Trade*Development		-.0231123								-.0508706
Trade*Government			-.030624							.0416388
Trade*Sectors				.0488378						.0697132
Trade*Coincidence50*MAPolarisation					-.0674853					
Trade*Coincidence25*MAPolarisation						.1046937				
Trade*Coincidence50*Surface							-.0081276			
Trade*Coincidence25*Surface								.0143537		
Trade*Coincidence25*DevDum									.5699036	.5615131
Observations	379	379	379	379	379	379	379	379	379	379

*, **, *** correspond to 10, 5, and 1% significance levels respectively, computed with 200 bootstrap repetitions;
Trade, sectors, government, and spatial variables entered the instrument matrix as strictly exogenous.
Time fixed effects included.

Table A1: Structural Conditions by Country

Country	DevDum	DevDumHigh	DevDumMid	DevDumLow	Government	Sectors	MAPol	Coin25	Coin50
Australia	0	1	0	0	0.16	0.02	145.09	1.00	1.05
Austria	0	1	0	0	0.18	0.02	83.72	1.06	1.07
Belgium	0	1	0	0	0.20	0.01	87.77	0.95	1.10
Brazil	1	0	1	0	0.17	0.07	182.44	0.59	0.65
Bulgaria	1	0	0	1	0.14	0.06	98.83	1.15	1.12
Canada	0	1	0	0	0.20	0.03	174.58	1.00	0.91
China	1	0	0	1	0.13	0.07	182.86	1.73	1.32
Czech Rep	1	0	1	0	0.20	0.03	95.42	0.88	1.15
Finland	0	1	0	0	0.21	0.02	96.04	1.18	1.13
France	0	1	0	0	0.20	0.02	57.36	0.97	0.99
Greece	0	0	1	0	0.11	0.06	90.30	0.93	1.00
Hungary	1	0	1	0	0.09	0.04	93.96	1.10	0.76
India	1	0	0	1	0.09	0.11	118.73	1.17	0.97
Indonesia	1	0	0	1	0.06	0.11	116.06	1.18	1.29
Italy	0	1	0	0	0.17	0.02	87.69	1.25	1.22
Japan	0	1	0	0	0.15	0.02	74.53	1.02	1.03
Mexico	1	0	1	0	0.10	0.05	117.73	1.41	1.04
Netherlands	0	1	0	0	0.21	0.02	91.47	1.07	1.00
Poland	1	0	1	0	0.18	0.04	88.10	1.06	1.01
Portugal	0	1	0	0	0.16	0.07	96.02	1.41	1.13
Romania	1	0	0	1	0.08	0.07	97.60	0.97	0.95
Slovak Rep	1	0	1	0	0.19	0.02	96.40	1.85	1.33
South Africa	1	0	1	0	0.17	0.02	104.42	1.03	1.00
Spain	0	1	0	0	0.16	0.03	84.48	1.02	1.07
Sweden	0	1	0	0	0.25	0.02	83.10	0.97	0.95
Thailand	1	0	0	1	0.08	0.13	104.80	1.92	1.46
UK	0	1	0	0	0.17	0.03	83.34	1.10	1.05
US	0	1	0	0	0.12	0.02	96.43	1.05	0.98

Table A2: Variables and sources of data

Variable	Source of data
Inequality	National statistical offices, and Eurostat Regio database
GDPcap	Word Development Indicators
Development	Historical Series of World Bank classifications
High income	Historical Series of World Bank classifications
Middle income	Historical Series of World Bank classifications
Low income	Historical Series of World Bank classifications
Trade	UN Comtrade and World Development Indicators
Government	World Development Indicators
Coincidence	UN Comtrade, World Port Database, own calculations