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DOES ECONOMIC GLOBALIZATION AFFECT REGIONAL INEQUALITY? A CROSS-COUNTRY ANALYSIS

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ABSTRACT

Does economic globalization affect regional inequality? A cross-country analysis*

This paper investigates the relationship between economic globalization and regional inequality in a panel of 47 countries over the period 1990-2007, using a measure of globalization that distinguishes the different dimensions of economic integration. The results show that there is a positive and statistically significant association between economic globalization and the magnitude of regional disparities. Countries with a greater degree of economic integration with the rest of the world tend to register higher levels of regional inequality. This finding is robust to the inclusion of additional explanatory variables and to the choice of the specific measure used to quantify the relevance of spatial inequality within the sample countries. Our analysis also reveals that the spatial impact of economic globalization is greater in low- and middle-income countries, whose levels of regional disparities are on average significantly higher than in high-income countries.

JEL Classification: F15, F60, R11 and R12
Keywords: economic globalization and regional inequality

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1 Introduction

The territorial impact of globalization remains a hotly debated topic (e.g. Stiglitz, 2002; Bhagwati, 2004). The unprecedented levels of integration have surpassed the previous peak reached before the First World War (Findlay and O'Rourke, 2007) and are leaving a profound imprint on economic growth (Frankel and Romer, 1999; Alcalá and Ciccone, 2004), income inequality and poverty (Wade, 2004; Milanovic, 2005a), labour markets (Dreher and Gaston, 2007; Tomohara and Takii, 2011), environmental quality (Antweiler et al., 2001; Frankel and Rose, 2005), democracy and human rights (Rudra, 2005; Dreher et al., 2012), or the quality of government (Al-Marhubi, 2004; Ezcurra, 2012).

Globalization also has an important impact on regional inequality (i.e. inequality across the various regions within a country) worldwide (e.g. Rodríguez-Pose and Gill, 2006; Rodríguez-Pose, 2012). However, our understanding of the link between globalization and regional inequality is still highly partial. Previous contributions to this field have tended to measure the incidence of economic globalization using mostly different indicators of the degree of trade openness of the countries considered. While from a policy perspective, the relationship between trade openness and regional inequality is undoubtedly relevant (World Bank, 2008), the degree of trade openness is not an adequate measure to capture the incidence of other aspects of economic globalization, such as the extent of capital controls or the amount of foreign direct investment (FDI). This is potentially important as it is not evident that the various dimensions of economic globalization affect regional inequality in the same way. Thus, the impact observed for one aspect may be caused by the omission from the analysis of other important aspects of economic integration. Overlooking capital controls or

FDI, while focusing exclusively on levels of trade, can seriously affect our perception of the relationship between globalization and spatial inequality (Dreher, 2006).

This paper aims to overcome this omission in the literature and to provide a comprehensive analysis of the relationship between economic globalization and regional inequality. In order to achieve this aim, we use the KOF index of globalization constructed by Dreher (2006) and updated by Dreher et al. (2008). This aggregate index distinguishes between the different aspects of economic integration, which allows us to adopt a broader perspective than existing studies. We are thus capable of approaching the analysis of the effects of economic globalization on regional disparities taking into account the challenges posed by integration in a more comprehensive way than hitherto and to identify who wins and who loses, not only within each country, but also across countries.

The remainder of the paper is organized as follows. After this introduction, section 2 provides a necessarily brief review of the theoretical and empirical literature on the link between globalization and spatial inequality. Section 3 describes the different measures used in our study to quantify the incidence of globalization and regional inequality in the sample countries. Section 4 presents the empirical analysis carried out in the paper to examine the relationship between economic globalization and regional inequality. The final section offers the main conclusions from our work.

2 Economic globalization and spatial inequality in the literature

Although globalization and spatial inequalities on their own have attracted considerable attention in recent years, their relationship has, somewhat surprisingly, been overlooked by the scholarly literature (Brülhart, 2011; Rodríguez-Pose, 2012). This contrasts with the large interest accorded over the last two decades to the impact of economic integration on growth (e.g. Frankel and Romer, 1999; Alesina et al., 2000; Alcalá and Ciccone, 2004), and interpersonal inequality and poverty (e.g. Dollar and Kraay, 2004; Wade, 2004; Milanovic, 2005a; Dreher and Gaston, 2008). The situation, however, has begun to change recently, coinciding with the resurgence of interest in economic geography and with the improvements in the availability and quality of regional data.

From a theoretical perspective, the development of the so-called "new economic geography" (NEG) has played a crucial role in pushing forward the early interest of some neoclassical studies (e.g. Henderson, 1982; Rauch, 1991) on the analysis of the consequences of rising trade –as trade with the rest of the world became less costly– on the spatial distribution of economic activity within a country. While early urban systems models were based on the assumption of perfectly competitive markets with exogenous scale economies at the regional level, and lacked a welfare-relevant dimension of spatial inequality (Brülhart, 2011), the emergence of the NEG school has allowed for monopolistically competitive markets and endogenous regional scale economies.[1] Within this framework, the NEG has conceptualized the effect of economic integration on the spatial distribution of income in terms of changes in cross-border access

to markets that affect the interactions between agglomeration and dispersion forces.

The NEG has provided a framework for determining the dynamics of the location of economic activity across regions within a country, which has led to the publication – beginning with the seminal paper by Krugman (1991)– of numerous theoretical models concerned with the spatial implications of trade integration over the last twenty years. These models tend to employ different sets of assumptions and functional forms, which has resulted, however, in contradictory and ambiguous conclusions. While some of the proposed models (e.g. Krugman and Livas Elizondo, 1996; Alonso-Villar, 2001; Behrens et al., 2007) suggest that trade liberalization increases the internal dispersion of economic activity, thus reducing the level of spatial inequality, others (e.g. Paluzie, 2001; Monfort and Nicolini, 2000; Monfort and van Ypersele, 2003) point towards a link between trade integration and internal agglomeration, which gives rise to greater regional disparities. It is difficult to determine a priori which type of model provides a better representation of reality (Brülhart, 2011). Empirical research is therefore key to shedding light on the spatial implications of economic integration. Yet, the number of empirical analyses on the topic so far is relatively limited.

Most existing empirical analyses on this issue tend to be based on single-country case studies, reflecting the scarcity and limited reliability of regional comparable data sets across countries. In particular, the literature has paid special attention to the experience of two emerging countries: China and Mexico. The results of analyses dealing with China (e.g. Jian et al., 1996; Zhang and Zhang, 2003; Kanbur and Zhang, 2005) are far from conclusive, but tend to suggest that the process of trade liberalization has played a relevant role in explaining the important increase in the level of regional inequality registered over the last two decades. In China openness to

international trade and capital flows have benefited mostly to the developed coastal regions, often at the expense of the less accessible and poorer inland provinces (World Bank, 2008). Studies dealing with Mexico (e.g. Sánchez-Reaza and Rodríguez-Pose, 2002; Faber, 2007; Jordaan, 2008) also tend to highlight a positive association between the evolution of regional inequality and the rise in the degree of trade openness. The integration of Mexico in the General Agreement on Tariff and Trade (GATT) and the North American Free Trade Agreement (NAFTA) contributed to the development of states bordering the US and to further industrialization in and around the former economic hubs of the Centre of the country, while the more impoverished South languished behind.

In stark contrast to the number of single-country case studies, there are few cross-country analyses to date addressing the spatial implications of a greater degree of economic integration. In a recent review of this literature, Brülhart (2011) only identifies 11 cross-country studies exploring this issue. The majority of these papers use an indicator of urban primacy as dependent variable, which does not allow to properly discern the extent to which changes in trade patterns influence regional convergence or divergence trends. Research by Rodríguez-Pose and Gill (2006) and Rodríguez-Pose (2012), by contrast, tackle the spatial consequences of trade openness head on. These analyses use different measures of spatial inequality in order to quantify the relevance of regional disparities within the sample countries. Rodríguez-Pose and Gill (2006) focus their attention on eight countries –Brazil, China, Germany, India, Italy, Mexico, Spain, and the United States– over various time spans between 1970 and 2000. The authors conclude that there is no clear-cut connection between changes in the degree of trade openness and regional inequality, although the association seems to be stronger when sectoral shifts in trade composition are considered. Rodríguez-Pose (2012), us-

ing a range of panel data techniques, examines this issue in a sample of 15 developed and 13 emerging countries throughout the period 1970-2005. His results show that trade openness has a positive and statistically significant association with regional inequality in combination with certain country-specific conditions. Rodríguez-Pose (2012) also finds that the spatial impact of international trade is greater in low- and middle-income countries than in high-income countries.

A limited number of additional studies not dealing specifically with the spatial implications of trade liberalizations include a measure of the degree of trade openness as a control variable in cross-country regressions whose dependent variable is an indicator of within-country spatial inequality. The results obtained by these studies are not conclusive. Some papers report that greater trade openness leads to higher levels of regional disparities (Rodríguez-Pose and Ezcurra, 2010), while others find that the relationship is not statistically significant (Milanovic, 2005b), or depends ultimately on the countries included in the sample (Petrakos et al., 2005).

One important characteristic of all the above-mentioned cross-country analyses is that they use different measures of trade openness to examine the spatial consequences of economic globalization. While this approach is undoubtedly useful in order to investigate the impact on regional disparities of changes in trade patterns, it neglects the role played by other potentially important dimensions of economic integration. Trade is not the only factor driving economic globalisation. As has been noted by the literature on the death of distance, in a more integrated world firms and companies are becoming much more mobile and pursuing integration strategies through FDI and/or mergers and acquisitions (Kang and Johansson, 2000; Zademach and Rodríguez-Pose, 2009). The rise in FDI has been particularly strong in recent

decades. Whereas, according to World Bank data, in the 1970s FDI represented a mere 2% of exports, in 2007 –the peak of FDI to date– FDI was 15% of worldwide exports. Even in 2011, in the middle of the crisis, FDI still stood at more than 8% of exports. The growth of portfolio investment flows –especially until the burst of the dot-com bubble in 2000– has also been spectacular. Both FDI and portfolio investment flows provide key sources of external finance and liquidity. The drivers of FDI and mergers and acquisitions do not necessarily coincide with those of trade. Factors such as access to markets and geographical proximity still determine, to a large extent, cross-country flows of FDI (Zademach and Rodríguez-Pose, 2009). Access to technology and labour skills are also particularly important in this respect. With few exceptions –such as a strong sensitivity to changes in GDP per capita– the drivers of portfolio investments are very similar to those governing FDI (Guerin, 2006). In addition, the rise in regulation in recent years has been exponential. Bilateral trade agreements and other sorts of preferential relationships have proliferated in the last two decades. As noted by Hufbauer and Schott (2009), the number of preferential trade agreements signed between 2000 and 2007 alone (185) was just under half the total number of agreements signed during the entire 20th century (374). This proliferation has had important implications in terms of import barriers, mean tariff rates, taxes and trade and on capital account restrictions, which has affected significantly trade and FDI and portfolio investment flows (Sally and Sen, 2011). It has also put to the fore the implications for third countries of preferential trade agreements and may have significant effects in the locational decisions of multinationals (Desai et al., 2004).

This omission has been partly addressed by Lessmann (2013), who examines in a recent study the effect of FDI on regional inequality in 55 countries between 1980

and 2009. His results show that the spatial impact of FDI is contingent on the level of economic development of the various countries. Nevertheless, as far as we are aware, none of the existing cross-country analyses has considered so far the potential link between regional inequality and the extent of capital controls or changes in the amount of portfolio investment. Accordingly, the effect of economic integration on regional inequality observed in the literature may be affected by the omission from the analysis of these other aspects of economic globalization (Dreher, 2006). Bearing this in mind, in this paper we adopt a broader perspective than in previous research and use a more extensive notion of economic globalization, which takes into account the multidimensional nature of the processes of economic integration.

3 Data and preliminary evidence

In order to assess whether economic globalization affects regional inequality, we first need to quantify the relevance of regional disparities within each country. To that end, we follow Theil (1967) in proposing the ensuing measure of inequality:

$$T(0)_i = \sum_{j=1}^{J} p_j \log\left(\frac{\mu}{y_j}\right) \tag{1}$$

where y and p are respectively the GDP per capita and the population share of region j in country i, and $\mu = \sum_{j=1}^{J} p_j y_j$.[2] T(0) is known in the literature as the Theil's second measure of inequality or mean logarithmic deviation. The advantage of this measure vis-à-vis other potential alternative indices of inequality is that it is independent of scale and population size, and satisfies the Pigou-Dalton transfer principle (Cowell,

1995). Additionally, as demonstrated by Bourguignon (1979) and Shorrocks (1980), this measure is additively decomposable by population subgroups, which explains its popularity in the literature. From a spatial perspective, it is worth noting that T(0) takes into account the differences in population size across the various territorial units considered. This aspect has traditionally been overlooked by the literature on economic convergence that has flourished since the contributions of Barro and Sala-i-Martin (1991, 1992), despite the fact that, as noted by Petrakos et al. (2005), omitting population size may greatly distort our perceptions of regional inequality.

In order to calculate T(0) a good availability of regional data on GDP and population is required. This is not an easy task if, as in our case, one aims to carry out a cross-country analysis. Although the OECD, Eurostat or Cambridge Econometrics provide regional data for the majority of developed countries, the situation is different in the case of developing countries. In these countries regional data often tend to be scarce and must be obtained directly from national statistical offices and central banks. The sample used in our analysis includes a total of 47 developed and developing countries over the period 1990-2007 (see Table A1 in the Appendix for further details).[3] Data availability, however, is not the same for all countries included in the sample. Specifically, the average number of observations for each country is 15.3 years, from a possible maximum of 18.

In order to measure the relevance of economic globalization in the different countries, we resort to a more comprehensive measure of globalization than in previous studies. Earlier analyses of the topic have used mostly various measures of trade openness as proxies for the importance of economic integration (Rodríguez-Pose and Gill, 2006; Rodríguez-Pose, 2012). Although, as mentioned in the introduction, this

approach is useful to investigate the effect of changes in trade on regional disparities, it provides no information about the spatial implications of other aspects of economic integration such as the amount of FDI or the extent of capital controls. This derives in a partial view of globalization. However, it is the overall effect of economic globalization that is decisive for the evaluation of its potential benefits. Accordingly, only an aggregate measure of economic globalization can be employed to study its overall effect. Bearing this in mind, in this paper we use the KOF index of economic globalization constructed by Dreher (2006) and updated by Dreher et al. (2008).[4]

The KOF index of economic globalization is based on eight variables associated with different dimensions of economic integration (Table 1). These variables are used in order to obtain two indicators on the incidence of economic globalization by means of principal component analysis. The first indicator measures the relevance of actual flows of trade, FDI and portfolio investment across countries, expressed in all cases as a percentage of national GDP. This indicator also includes income payments to foreign nationals and capital employed in order to capture the extent to which countries use foreign labour and capital in their production processes. The second indicator of economic globalization identified by Dreher (2006) and Dreher et al. (2008) has to do with the importance of existing restrictions on trade and capital flows. This dimension of economic integration is captured in the KOF index by hidden import barriers, mean tariff rates, taxes on international trade and a measure of capital controls constructed by Gwartney and Lawson (2002) (Table 1). The data on actual flows and restrictions are aggregated by Dreher (2006) and Dreher et al. (2008) into an overall index of economic globalization, which is our main proxy for the degree of economic integration of the sample countries with the rest of the world. Table 1 also includes information on the weights attached to each individual variable to calculate the various indices.

[INSERT TABLE 1 AROUND HERE]

Tables 2 and 3 show the countries with the highest and the lowest average values of T(0) and the KOF index of economic globalization over the study period. Regional inequality ranges from 0.002 (Australia) to 0.184 (Indonesia), whereas the index of economic integration ranges from 29.17 (India) to 93.22 (Ireland). A first observation from the rankings in Tables 2 and 3 is that T(0) and the KOF index appear to be associated with the level of economic development. The correlation coefficients between both variables and GDP per capita are respectively -0.636 (p-value = 0.000) and 0.771 (p-value = 0.000), which indicates that high-income countries are likely to have lower levels of regional inequality and to participate more in globalization than low- and middle-income countries.

[INSERT TABLE 2 AROUND HERE]

[INSERT TABLE 3 AROUND HERE]

A first, descriptive, look at the potential link between economic globalization and regional inequality, represented by the partial regression plot of T(0) on the KOF index of economic integration, conditional on the level of GDP per capita of the various countries, suggests the existence of a positive association between both factors. More globalized countries tend on average to register relatively higher levels of regional inequality. Conversely, countries less affected by economic globalization are

characterized by lower regional disparities as a whole. However, when interpreting the information provided by Figure 1, it should be noted that it is very likely that regional inequality does not depend exclusively on the incidence of economic globalization or the level of GDP per capita. This implies that the empirical evidence shown in Figure 1 should be interpreted with some caution, as omitted variables could ultimately affect the perception of the connection between economic integration and regional disparities. In view of these potential problem, in the next section we present a more appropriate statistical analysis on the link between economic globalization and regional inequality.

4 Econometric analysis

4.1 The model

We estimate different versions of the following model in order to address the issue of omitted variables in the relationship between globalization and regional disparities:

$$INEQ_{it} = \alpha + \beta GLOB_{it} + \gamma^{'}\mathbf{X}_{it} + \varepsilon_{it} \tag{2}$$

where INEQ is our measure of regional inequality in country i and year t, GLOB is the KOF index of economic globalization, $\mathbf{X}$ denotes a set of variables that control for additional factors considered to have an influence on regional disparities, and ε is the corresponding disturbance term. The coefficient of interest throughout the paper is β, which measures the effect of economic globalization on regional inequality.

Model (2) exploits both the cross-sectional and time-series characteristics of the data, therefore maximizing the number of observations available. Similar models tend to include country-specific effects. However, controlling for country fixed effects is not useful in our case, as most of the variation registered by the dependent variable is between countries, rather than over time. The information provided by an ANOVA model (Li et al., 1998) shows that in our sample 90% of the variation in the regional inequality data is due to variations across countries, while the time dimension only explains around 1% of total variability in T(0). As pointed out by Breen and García-Penalosa (2005), in this case fixed effects models leave what is most important in the data unexplained and may, as a consequence, produce inaccurate results (Quah, 2003). The potential alternative, the estimation of a random effects model, assumes that the individual unobserved effects and the observed explanatory variables are uncorrelated, which is unlikely to be satisfied in our context. Hence, given the characteristics of our data set, pooled OLS provides the most appropriate econometric framework for the estimation of the relationship between globalization and regional inequality.[5]

The control variables in vector $\mathbf{X}$ have been selected on the basis of existing studies on the determinants of regional disparities, and include the number and size of the regions used in each country to compute the degree of spatial inequality, the level of economic development of the country, country size, a dummy distinguishing between federal and unitary states, a proxy for the redistributive capacity of public sector, and the degree of ethnolinguistic fractionalization. The definitions of all the control variables used in the paper and their sources are included in the Appendix.

When estimating model (2) it is important to note that the level of regional disparities in each country may be affected by the heterogeneity of the spatial units used

to compute the index of regional inequality (Portnov and Felsenstein, 2005). This is particularly relevant in our analysis, as our sample countries differ considerably in the number of territorial units used to calculate T(0) and in their size. Hence and although the values of the dependent variable have already been calculated taking into account the differences in population size across the various regions, we also control for the number of subnational units and their average size in terms of population as a way to minimize any potential bias emerging from the heterogeneity of the different territorial levels.

Taking into account the preliminary evidence provided in the previous section, we also consider the spatial impact of national GDP per capita. Past empirical literature on spatial inequality has tended to pay particular attention to the role of the level of economic development in explaining regional disparities (Petrakos et al., 2005; Barrios and Strobl, 2009). This interest goes back to the publication of the seminal work by Williamson (1965), who adopted the Kuznets' (1955) approach to a spatial framework. According to Williamson (1965), as progress in economic development takes place, spatial inequality first increases, before systematically decreasing in the ensuing stages of development. The result of this process is an inverted U-shape trend in spatial inequality. This is also the position endorsed by the World Bank in its 2009 World Development Report (World Bank, 2008). We take this into account and test for the possible existence of a non-linear relationship between regional inequality and the degree of economic development in our case countries, by including in the list of regressors of model (2) one-year lagged values of the national GDP per capita and its square.[6]

Regional inequality may also be related to country size (Williamson, 1965). Larger countries are often more heterogeneous than smaller countries. We use the population of the country as our measure of country size.

Likewise, federal and unitary countries may differ in their levels of regional inequality (Shankar and Shah, 2003). In comparison with a unitary system, federalism will, at least in theory, to undermine the capacity of the central government to play equalizing role. This may give rise to a more uneven distribution of resources across space, thus increasing territorial imbalances (Prud'homme, 1995). Consequently, the transfer of powers and resources to subnational tiers of government will primarily benefit the most prosperous regions, which are characterized, in general, by better socio-economic endowments and better institutions. In view of these arguments the literature has tended to emphasize the spatial regressive effects of federalism (Rodríguez-Pose and Ezcurra, 2010). There are, however, various reasons to suppose that federalism may operate in an opposite direction and contribute to reduce regional inequality. Second generation models of fiscal federalism (e.g. Weingast,1995; Qian and Weingast, 1997) underline the role played in this context by the incentive effects of regional competition following fiscal devolution. Given that the ability of regional governments to stay in power depends decisively on their performance in attaining a level of development and economic growth similar to that registered by the rest of the country, policy-makers in poorer regions will attempt to reduce their development gaps by offering more flexible labour markets and/or less generous welfare provisions than richer regions. Likewise, as pointed out by Shankar and Shah (2003), federal states may do better in reducing spatial inequality, because of the greater political risk that regional disparities pose for such countries. We therefore add a dummy variable in model (2) in order to differentiate in our sample between federal and unitary countries.

We also control for the size of the public sector, measured by the share of government final consumption expenditure in national GDP. This variable can be interpreted as a proxy for the capacity of governments to redistribute financial resources across regions and to fund infrastructure development (Rodríguez-Pose and Ezcurra, 2010), which may affect the level and evolution of territorial disparities within any given country.

Finally, many of the countries included in our study are inhabited by different ethnolinguistic groups (e.g. Belgium, India). Nevertheless, the degree of ethnolinguistic diversity is frequently not the same in all regions of the country. This may imply the existence of differences in terms of development across its different areas (Easterly and Levine, 1997). Furthermore, a high degree of ethnolinguistic fractionalization increases the risks of internal conflicts (Horowitz, 1985), promoting spatial divergence. Our final control variable in model (2) is thus a measure of the degree of ethnolinguistic fractionalization of the sample countries based on Alesina et al. (2003).

4.2 Results

Table 4 presents the results obtained when various versions of model (2) are estimated by OLS with heteroskedasticity consistent standard errors, using the KOF index as our measure of economic globalization. As can be observed, the different specifications appear to work reasonably well in explaining cross-country variation in the level of regional inequality, with relatively good values in terms of goodness-of-fit. Focusing on our key variable of interest, the main finding is that the coefficient of the index of economic globalization is in all cases positive and statistically significant at the 1% level. Accordingly, our analysis reveals that those countries more integrated with the

rest of the world tend to register higher levels of regional inequality, which is consistent with the preliminary evidence provided by Figure 1. This result is not affected by the inclusion of additional explanatory variables in the analysis, confirming its robustness and showing that the effect of economic integration on regional disparities is not a spurious correlation as a consequence of the omission of relevant variables. In particular, it should be noted that the globalization index remains significantly associated with regional inequality when we control for the level of GDP per capita of the various countries. This is especially important, given that several studies have highlighted the role played by globalization in promoting growth and economic development (e.g. Frankel and Romer, 1999; Alcalá and Ciccone, 2004; Dreher, 2006). Our results show that the index of economic globalization makes a relevant contribution in explaining the cross-country variations in regional disparities, and is not simply capturing the effect of the level of economic development.

[INSERT TABLE 4 AROUND HERE]

To get an idea of the magnitude of the effect of economic globalization on regional inequality, let us consider the following example. In 2006 Bolivia had in relative terms an intermediate level of regional inequality (T(0) = 0.046), while the value of the KOF index of economic globalization in that country was below the sample mean (GLOB = 62.91). The regression coefficient from our preferred specification in Table 4 (column 6) indicates that, for instance, if Bolivia had had a globalization index similar to that of South Africa (GLOB = 67.66), then the value of T(0) registered by Bolivia would have increased around 10%. This example suggests that economic globalization exerts a quantitatively relevant impact on regional inequality, which should not be overlooked

by policy-makers and international organizations when considering the consequences derived from the process of integration currently underway.

With respect to the control variables included in vector **X**, the results in Table 4 are consistent with the findings of the existing literature on the determinants of spatial inequality. There is a positive association between the number and size of the territorial units and the level of spatial disparities registered by a country. Our estimates also reveal the existence of an inverted U-shaped relationship between national development and regional inequality, confirming the hypothesis put forward by Williamson (1965). This implies that, when the level of economic development is relatively low, the growth of national GDP per capita is associated with increasing regional disparities. However, beyond a certain threshold level, the relationship turns from positive to negative and richer countries are likely to have lower inequalities. Additionally, Table 4 shows that larger countries tend to register higher levels of regional inequality. The coefficient of the dummy variable for the federal states is negative in all cases, which would be in line with the idea that federal countries have a tendency to register lower levels of regional disparities (Shankar and Shah, 2003). This result, however, should be treated with caution, as the dummy variable for a federation is a rather crude measure of decentralization and is not statistically significant in all the specifications considered.[7] Furthermore, our estimates reveal that there is a negative correlation between our proxy for the public sector size and the dependent variable, which corroborates the positive effect of the redistributive capacity of government in the reduction of regional inequality. Finally, Table 4 also shows that the degree of ethnolinguistic fractionalization is positively associated with the magnitude of regional disparities.

So far we have investigated the overall impact of economic globalization on regional inequality. In order to complement the results in Table 4, we now use the information provided by the KOF index to examine the role played in this setting by actual flows and existing restrictions on trade and capital (see Table 1 for further details). This is particularly interesting in this context, as it is not clear a priori that these two dimensions of economic globalization necessarily affect regional disparities in the same way. In view of this, model (2) is estimated again using the indicators of actual flows and restrictions as regressors, instead of the overall index employed so far. The first two columns of Table 5 show the results obtained when these two indices are included separately in the model. As can be seen, the conclusions are very similar in both cases. Regardless of the specific indicator used, the coefficients of the two measures of economic globalization identified by Dreher (2006) and Dreher et al. (2008) are positive and statistically significant at the 1% level. This indicates that actual flows and restrictions are both positively correlated with regional inequality, which is in line with the information provided by Table 4. However, not accounting for all dimensions of economic integration may lead to an omitted variable bias. Consequently, we include the measures of actual flows and restrictions jointly, in the third column of Table 5. The results indicate that in this specification the index of restrictions is no longer statistically significant at conventional levels. In any case, this finding should be treated with some caution because of the possible existence of multicollinearity, which probably results in lower t-statistics.[8]

[INSERT TABLE 5 AROUND HERE]

4.3 Robustness checks

The analysis carried out so far suggests the existence of a positive relationship between the degree of economic integration and regional inequality. In particular, our estimates seem to indicate that actual flows and restrictions on trade and capital are positively correlated with the magnitude of regional disparities. In the rest of this section we investigate the robustness of these findings.

As a first robustness check, we examine the impact of influential observations on our estimates. To that end, we calculate the DFITS statistic of Welsch and Kuh (1977), which allows one to check whether individual observations exert unusual leverage on the coefficient estimates. According to the cut-off criterion proposed by Belsley et al. (1980), around 7% of the observations are influential in the full specifications of model (2).[9] Nevertheless, these influential observations have little effect on our main findings. Columns 1-4 of Table 6 indicate that, once these observations are dropped from the sample, the estimated coefficients of the economic globalization indices tend to increase while remaining statistically significant at the 1% level in all cases. Furthermore and in contrast with the results in Table 5, the coefficient of the index of restrictions is now statistically significant in the specification including also the index of actual flows. In order to confirm these findings, we use robust regression as an alternative in order to identify the influence of potential outliers in our sample. This technique is based on an iterative process where the observations with larger residuals receive smaller weights, reducing their impact on the estimates (Berk, 1990). Columns 5-8 of Table 6 show the results obtained when robust regression is used to estimate model (2). As can be observed the conclusions are very similar to those just discussed.

[INSERT TABLE 6 AROUND HERE]

When interpreting our previous results, it should be noted that the impact of economic globalization on regional inequality may differ across countries, depending on their level of development. According to this hypothesis, the positive correlation observed between the measures of economic integration and regional disparities may be caused by the inclusion in the sample of countries with different levels of economic development. In order to test whether this is the case, model (2) is estimated separately for two subsamples of countries: (i) the subsample of low- and middle-income countries (developing countries), and (ii) the subsample of high-income countries (developed countries).[10] Table 7 shows that the coefficients of the economic globalization indices are positive and statistically significant in the two subsamples, confirming the negative effect of the degree of economic integration with the rest of the world on territorial equity observed in Table 4. Nevertheless, the magnitude of the coefficients suggests that the spatial impact of economic globalization is greater in low-and middle-income countries, which is consistent with the empirical evidence provided by Rodríguez-Pose (2012). This is particularly important for policy-makers, since developing countries tend to register on average considerably higher levels of spatial disparities.

[INSERT TABLE 7 AROUND HERE]

Finally, we examine to what extent the results may be sensitive to the choice of the measure used to quantify the relevance of regional inequality within our case countries.

In this respect, it is well-known that various inequality measures may actually yield different orderings of the distributions one wishes to compare, since each index has a different way of aggregating the information contained in the distribution under study (Ezcurra and Rodríguez-Pose, 2009). For this reason, and in order to complement the information provided by T(0), we calculate three additional indices of inequality: Theil's first measure of inequality (T(1)), the coefficient of variation (c), and the standard deviation of the logarithm of regional GDP per capita (s).[11]

Table 8 summarizes the main results obtained when model (2) is estimated again using as dependent variables T(1), c and s in turn, instead of T(0). Using different measures of inequality does not alter the results. This implies that the observed correlation between economic globalization and spatial inequality does not depend on the specific measure used to quantify the degree of dispersion in the regional distribution of GDP per capita within the different countries included in our study.

[INSERT TABLE 8 AROUND HERE]

5 Conclusions

This paper has analysed the relationship between economic globalization and regional inequality in a panel of 47 countries over the period 1990-2007. We have resorted to a broader notion of economic globalization than in previous studies of the topic. This allows us to take into consideration the role played in this context by a number of different dimensions of economic integration.

Our results show a positive association between the degree of economic openness and the magnitude of within-country regional disparities. Countries with a greater degree of economic integration with the rest of the world, everything else being equal, have higher levels of regional inequality. This conclusion still holds when we examine the spatial impact of actual flows and existing restrictions on trade and capital. Our findings are robust to the inclusion in the analysis of additional explanatory variables that affect regional disparities, such as GDP per capita, country size, the redistributive capacity of the state, or the degree of ethnolinguistic fractionalization. Robustness checks further confirm that our results are not driven by a reduced number of influential observations. Furthermore, the positive link observed between economic globalization and regional disparities does not depend on the specific measure used to quantify the level of spatial inequality within the various countries.

The results of the analysis also indicate that the effect of economic globalization on regional disparities may be contingent on the level of economic development of the countries. Specifically, the territorial impact of economic integration is greater in low- and middle-income countries. This is potentially important, since the level of international market integration in many developing countries still has a large potential to grow. Accordingly, policy-makers and international organizations should pay particular attention to the spatial implications derived from a greater degree of economic integration with the rest of the world in emerging countries.

The results of this paper represent an additional contribution to the debate by emphasizing the spatial impact of economic integration. There is little question that globalization leads to the emergence of losing and winning regions within countries. But the distribution of winners and losers seems to be geographically uneven. Our

findings suggest that the group of losing (winning) regions tend to be made up of low-(high-)income regions. In any case, additional extensions to our work are not difficult to conceive. Some relate directly to the enlargement of the number of countries included in the sample. Lack of adequate regional data has prevented us from pursuing this issue, but addressing it may provide a more complete picture about the nature of the link between economic globalization and spatial inequality. Similarly, further scrutiny of the conditions under which globalization leads to greater regional disparities will be required. This implies that research will have to pay special attention to the need to identify and study the theoretical mechanisms which explain in the final instance the influence of the degree of economic integration with the rest of the world on regional inequality. Only by pursuing these strands we will be able to attain a more complete understanding about how economic globalization affects regional disparities.

Notes

[1]See Henderson (1986) for further details on the differences between the neoclassical urban systems models and the NEG approach.

[2]Note that equation (1) assumes that everyone in a region has the same income, ignoring intrarregional differences.

[3]With the only exception of Sub-Saharan Africa, the sample includes a representative number of countries in the different regions of the world. Nevertheless, the lack of adequate regional data means that we have been forced to exclude the least developed countries from the analysis. This potential selection bias should be taken into account when interpreting the results of the paper.

[4]This index has been widely employed in the recent literature to examine different aspects of the consequences of globalization. A comprehensive list of papers based on the KOF index of globalization can be found at http://globalization.kof.ethz.ch/.

[5]In any case, the main results of the paper still hold when fixed and random effects model are used instead of pooled OLS. Further details are available upon request.

[6]The level of economic development may affect regional disparities and, in turn, be affected by them (Brülhart and Sbergami, 2009), giving rise to a reverse causality problem. Given the difficulties in finding suitable instruments for national GDP per capita, we follow the strategy adopted by Barrios and Strobl (2009) and include one-year lagged values of GDP per capita and its square in our baseline specification in order to minimize any potential endogeneity problem. The results are very similar when longer time-lags are employed.

[7]In addition to the federal dummy, we also considered the role played in this context by other measures of decentralization used in the literature. In particular, we resorted to the subnational share in total government expenditures, and to a measure proposed by Treisman (2002) to capture decision-making decentralization and based on the degree of autonomy of subnational governments in certain areas. Unfortunately, these two indicators are not available for all the countries and years included in

our study. As a robustness test, we checked using a reduced sample that their inclusion in the list of regressors of model (2) does not affect the core results of the paper. Indeed, none of these measures of decentralization is significantly associated with regional inequality.

[8]The coefficient of correlation between the measures of actual flows and restrictions is 0.607 (p-value = 0.000).

[9]Belsley et al.(1980) suggest omitting those observations for which $|DFITS| > 2\sqrt{k/n}$, where k is the number of regressors and n is the sample size.

[10]The composition of the two subsamples is based on the level of GDP per capita of the various countries according to the World Bank classification.

[11]These measures of inequality can be expressed as follows:

$$T(1)_i = \sum_{j=1}^{J} p_j \left(\frac{y_j}{\mu}\right) \log\left(\frac{y_j}{\mu}\right)$$

$$c_i = \frac{\sqrt{\sum_{j=1}^{J} p_j \left(\log y_j - \mu\right)^2}}{\mu}$$

and

$$s_i = \sqrt{\sum_{j=1}^{J} p_j \left(\log y_j - \overline{\mu}\right)^2}$$

where $\overline{\mu} = \sum_{j=1}^{J} p_j \log y_j$. In their non-weighted versions, c and s have been widely used in the convergence literature to capture the concept of sigma convergence (Barro and Sala-i-Martin, 1995). As is the case of Theil's second measure of inequality employed so far, all the indices selected are independent of scale and population size and, except for the standard deviation of the logarithm, they all fulfil the Pigou-Dalton transfer principle for the whole definition domain of income (Ezcurra and Rodríguez-Pose, 2009).

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Appendix

Data description and sources

Economic globalization: Index constructed with principal components analysis comprising eight variables measuring economic globalization. The index is a weighted average of the indices of actual flows and restrictions. See Table 1 for further details. The index is expressed in natural logs in the regression analyses performed in the paper. Source: Dreher (2006) and Dreher et al. (2008).

Actual flows: Index based on various variables capturing the relevance of actual economic flows. See Table 1 for further details. The index is expressed in natural logs in the regression analyses performed in the paper. Source: Dreher (2006) and Dreher et al. (2008).

Restrictions: Index based on various variables capturing the relevance of existing restrictions on trade and capital. Higher values of the index indicate greater globalization. See Table 1 for further details. The index is expressed in natural logs in the regression analyses performed in the paper. Source: Dreher (2006) and Dreher et al. (2008).

GDP per capita: Natural log of GDP per capita in purchasing power parity (PPP) basis. Data are in constant 2005 international dollars. Source: World Development Indicators (World Bank).

Population: Natural log of total population. Source: World Development Indicators (World Bank).

Federal: Dummy variable that takes the value one if the country is federal, zero otherwise. Source: Treisman (2008).

Government size: Government consumption expenditures expressed as a share of GDP. Government consumption expenditures include all current spending for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defense and security, but excludes government military expenditures. Source: World Development Indicators (World Bank).

Fractionalization: Average of the measures of ethnic and linguistic fractionalization calculated by Alesina et al. (2003). Source: Alesina et al. (2003).

Regional data: Regional GDP per capita and population. Sources: OECD Territorial Statistics, Cambridge Econometrics, and various national statistics.

[INSERT TABLE A1 AROUND HERE]

Tables and Figures

Table 1: Components of the KOF index of economic globalization.

Indices and variables	Weights
Actual flows	[50%]
Trade (percent of GDP)	(22%)
Foreign direct investment, stocks (percent of GDP)	(29%)
Portfolio investment (percent of GDP)	(22%)
Income payments to foreign nationals (percent of GDP)	(27%)
Restrictions	[50%]
Hidden import barriers	(22%)
Mean tariff rate	(28%)
Taxes on international trade (percent of current revenue)	(27%)
Capital account restrictions	(23%)

Source: http://globalization.kof.ethz.ch/

Table 2: The most and the least unequal countries.

Most unequal countries		Least unequal countries	
Country	T(0)	Country	T(0)
Indonesia	0.184	Australia	0.002
Philippines	0.160	New Zealand	0.002
Ecuador	0.157	Japan	0.006
Peru	0.149	Netherlands	0.008
Mexico	0.136	Denmark	0.009

Table 3: The most and the least globalized countries.

Most globalized countries		Least globalized countries	
Country	KOF index	Country	KOF index
Ireland	93.22	India	29.17
Belgium	92.13	Romania	45.93
Netherlands	90.30	China	46.76
Sweden	84.89	Colombia	48.76
Switzerland	84.47	Ecuador	48.87

Table 4: Estimation results: Regional inequality and economic globalization.

	(1)	(2)	(3)	(4)	(5)	(6)
Economic globalization	0.072***	0.081***	0.058***	0.069***	0.060***	0.064***
	(0.006)	(0.007)	(0.006)	(0.006)	(0.007)	(0.006)
Number of spatial units	0.027***	0.019***	0.032***	0.020***	0.024***	0.022***
	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)
Size of spatial units	0.005***	0.003**	0.008***	0.005***	0.006***	0.006***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
GDP per capita	0.134***	0.150***	0.140***	0.196***	0.206***	0.193***
	(0.029)	(0.037)	(0.030)	(0.036)	(0.034)	(0.036)
GDP per capita squared	-0.010***	-0.011***	-0.010***	-0.013***	-0.013***	-0.012***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Population		0.003**		0.004***	0.005***	0.005***
		(0.002)		(0.002)	(0.001)	(0.001)
Federal		-0.003	-0.013***		-0.013***	-0.015***
		(0.003)	(0.003)		(0.003)	(0.003)
Government size		-0.001***	-0.001***	-0.001***		-0.001***
		(0.000)	(0.000)	(0.000)		(0.000)
Fractionalization			0.057***	0.046***	0.062***	0.062***
			(0.007)	(0.006)	(0.007)	(0.007)
Constant	-0.697***	-0.830***	-0.742***	-1.067***	-1.137***	-1.078***
	(0.137)	(0.190)	(0.140)	(0.189)	(0.179)	(0.186)
F-test	128.7***	95.36***	106.1***	99.40***	110.7***	106.3***
Adjusted R-squared	0.548	0.556	0.592	0.587	0.595	0.601
Observations	720	720	720	720	720	720

Notes: The dependent variable is in all cases the value of T(0) in the various countries. Robust standard errors in parentheses. * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 5: Estimation results: Regional inequality, actual flows and restrictions.

	(1)	(2)	(3)
Actual flows	0.043***		0.042***
	(0.003)		(0.004)
Restrictions		0.029***	0.009
		(0.009)	(0.008)
Number of spatial units	0.021***	0.026***	0.021***
	(0.003)	(0.004)	(0.003)
Size of spatial units	0.005***	0.008***	0.005***
	(0.001)	(0.002)	(0.001)
GDP per capita	0.187***	0.186***	0.190***
	(0.034)	(0.037)	(0.035)
GDP per capita squared	-0.012***	-0.012***	-0.012***
	(0.002)	(0.002)	(0.002)
Population	0.006***	0.003*	0.006***
	(0.001)	(0.001)	(0.001)
Federal	-0.019***	-0.015***	-0.018***
	(0.003)	(0.003)	(0.003)
Government size	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)
Fractionalization	0.064***	0.073***	0.063***
	(0.007)	(0.007)	(0.007)
Constant	-1.000***	-0.918***	-1.031***
	(0.175)	(0.195)	(0.182)
F-test	105.1***	84.59***	96.64***
Adjusted R-squared	0.611	0.562	0.611
Observations	720	720	720

Notes: The dependent variable is in all cases the value of T(0) in the various countries. Robust standard errors in parentheses. * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 6: Estimation results: Robustness to influential observations.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Method	OLS	OLS	OLS	OLS	Rob. reg.	Rob. reg.	Rob. reg.	Rob. reg.
Economic globalization	0.076***				0.076***			
	(0.005)				(0.006)			
Actual flows		0.046***		0.040***		0.045***		0.039***
		(0.003)		(0.003)		(0.004)		(0.004)
Restrictions			0.052***	0.024***			0.054***	0.029***
			(0.007)	(0.006)			(0.007)	(0.006)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-test	144.2***	123.6***	103.4***	114.9***	135.5***	131.7***	102.3***	128.0***
Adjusted R-squared	0.663	0.676	0.611	0.668	0.627	0.621	0.559	0.639
Observations	669	666	670	668	720	720	720	720

Notes: The dependent variable is in all cases the value of T(0) in the various countries. All the regressions include the constant and the full set of control variables described in the text. Robust standard errors in parentheses. * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 7: Estimation results: Robustness to the level of economic development of the countries.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Economic globalization	0.079***	0.046***						
	(0.007)	(0.005)						
Actual flows			0.052***	0.020***			0.050***	0.026***
			(0.004)	(0.003)			(0.005)	(0.004)
Restrictions					0.038***	0.032***	0.009	0.014**
					(0.011)	(0.006)	(0.011)	(0.006)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-test	88.67***	40.60***	92.52***	24.45***	68.18***	21.37***	86.67***	44.26***
Adjusted R-squared	0.600	0.302	0.613	0.178	0.530	0.232	0.613	0.314
Sample	Low income	High income	Low income	High income	Low income	High income	Low income	High income
Observations	332	388	332	388	332	388	332	388

Notes: The dependent variable is in all cases the value of T(0) in the various countries. All the regressions include the constant and the full set of control variables described in the text. Robust standard errors in parentheses. * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 8: Estimation results: Robustness to alternative measures of inequality.

Dep. var.	Theil's first measure of inequality				Coefficient of variation				Standard deviation of the logarithm			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Econ. glob.	0.079***				0.311***				0.197***			
	(0.007)				(0.024)				(0.020)			
Actual flows		0.056***		0.056***		0.224***		0.226***		0.129***		0.121***
		(0.004)		(0.005)		(0.015)		(0.019)		(0.011)		(0.012)
Restrictions			0.027**	-0.000			0.095**	-0.016			0.105***	0.045*
			(0.012)	(0.012)			(0.045)	(0.045)			(0.025)	(0.024)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-test	68.50***	69.10***	55.97***	62.71***	82.45***	83.43***	60.59***	76.13***	137.3***	150.6***	129.6***	133.0***
Adj. R-sq.	0.551	0.569	0.501	0.568	0.534	0.561	0.467	0.561	0.602	0.610	0.564	0.612
Observ.	720	720	720	720	720	720	720	720	720	720	720	720

Notes: All the regressions include the constant and the full set of control variables described in the text. Robust standard errors in parentheses. * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table A1: Territorial classification.

Country	Number of spatial units	Average size (km^2)	Country	Number of spatial units	Average size (km^2)
Argentina	23	120,887	Japan	10	37,780
Australia	8	967,653	Korea, Rep.	7	14,180
Austria	9	9,319	Latvia	6	10,765
Belgium	11	2,775	Lithuania	10	6,530
Bolivia	9	122,064	Mexico	32	61,387
Brazil	27	315,366	Netherlands	12	3,461
Bulgaria	6	18,498	New Zealand	2	133,855
Canada	12	832,056	Norway	7	46,257
Chile	13	58,161	Peru	24	53,551
China	31	309,677	Philippines	16	17,572
Colombia	33	34,598	Poland	16	19,543
Czech Republic	8	9,859	Portugal	5	17,803
Denmark	3	14,363	Romania	8	29,799
Ecuador	21	12,208	Slovak Republic	4	12,258
Estonia	5	9,046	Slovenia	12	1,689
Finland	5	67,630	South Africa	9	135,454
France	22	24,726	Spain	17	29,704
Germany	41	8,708	Sweden	8	56,288
Greece	13	10,151	Switzerland	7	5,897
Hungary	7	13,290	Turkey	26	30,137
India	32	102,707	United Kingdom	37	6,584
Indonesia	30	57,046	United States	50	192,637
Ireland	2	35,140	Venezuela	23	39,654
Italy	21	14,350			

Figure 1: Partial regression plot: Regional inequality and economic globalization.