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Roberto Ezcurra and Andrés Rodríguez-Pose

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Roberto Ezcurra, Universidad Pública de Navarra
Andrés Rodríguez-Pose, London School of Economics and CEPR

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Centre for Economic Policy Research
77 Bastwick Street, London EC1V 3PZ, UK
Tel: (44 20) 7183 8801, Fax: (44 20) 7183 8820
Email: cepr@cepr.org, Website: www.cepr.org

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ABSTRACT

Government quality and spatial inequality: A cross-country analysis*

This paper examines the relationship between government quality and spatial inequality across 46 countries over the period 1996-2006. The results of the analysis point to the existence of a negative and significant association between government quality and the magnitude of regional disparities. Countries with better quality of government register lower levels of spatial inequality. This finding is robust to the inclusion in the analysis of additional explanatory variables that may affect both regional disparities and governance outcomes. The observed link between government quality and spatial inequality is confirmed by various robustness tests.

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Roberto Ezcurra
Departamento de Economia
Univeridad Publica de Navarra
Campus de Arrosadia s/n
31006 Pamplona
SPAIN

Email: roberto.ezcurra@unavarra.es

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Andrés Rodríguez-Pose
Department of Geography and Environment
London School of Economics
Houghton Street
London WC2A 2AE

Email: a.rodriguez-pose@lse.ac.uk

For further Discussion Papers by this author see:
www.cepr.org/pubs/new-dps/dplist.asp?authorid=158972

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1 Introduction

Spatial inequality has received considerable attention from both scholars and politicians in the last two decades, coinciding with advances in the process of globalization. The growing interest surrounding this issue has to do with the fact that spatial inequality –defined as income inequality across geographical or administrative units within a territorial entity (e.g. country, region)– is one component of overall inequality across individuals (Milanovic, 2005). This means that when spatial inequality increases within any given country, other things being equal, so does national inequality. Spatial inequality is also important because a high degree of regional disparities may lead to internal conflicts about the territorial distribution of resources, undermining economic, social and/or political stability (Østby et al., 2009).

Various studies have examined the impact of different factors on spatial inequality, including the level of economic development (Petrakos et al., 2005; Lessmann, 2011), the degree of trade openness (Rodríguez-Pose, 2012; Ezcurra and Rodríguez-Pose, 2013), or the processes of fiscal and political decentralization (Shankar and Shah, 2003; Rodríguez-Pose and Ezcurra, 2010). However, the potential influence of the quality of government on regional disparities has hardly received any attention in this literature. In fact, to the best of our knowledge, the only exceptions are Kyriacou and Roca-Sagalés (2012) and Kyriacou et al. (2013). Kyriacou and Roca-Sagalés (2012) include an indicator of the quality of government as an additional control to examine the effects of Structural Funds on regional disparities within the EU countries, whereas Kyriacou et al. (2013) show how governance affects the impact of fiscal decentralization on spatial inequality in a sample of OECD countries. This scant interest is particularly disconcerting, as the way in which authority is exercised by governments plays a key role in shaping the spatial distribution of economic activity and in fostering regional development (Acemoglu and Robinson, 2012; Rodríguez-Pose, 2013). In order to fill this gap, we assess the effect of government quality on spatial inequality. To that end, we use data for 46 countries with different levels of economic development over the period 1996-2006. The results of the analysis provide strong support for the hypothesis that government quality contributes to the reduction of spatial disparities, which underlines the importance of institutional factors in the processes of regional growth.

The remainder of the paper is organized as follows. After this introduction, section 2 discusses from a theoretical perspective why the quality of government may affect spatial inequality. Section 3 describes the measures of governance and spatial inequality used in the paper. In turn, section 4 presents the main results of the empirical analysis carried out to investigate the link between the quality of government and spatial inequality. The robustness of our findings is examined in section 5. The final section offers the main conclusions from the paper.

2 The spatial implications of government quality

During the last fifteen years the influence of institutions in general, and of government quality in particular, on economic development has been the object of greater scrutiny (e.g. Acemoglu et al., 2001; Kaufmann and Kraay, 2002; Tabellini, 2010). This literature generally shows that income levels, on the one hand, and institutional quality and good government, on the other, are strongly and positively correlated across countries. Indeed, it has been claimed that the quality of institutions is even more relevant than traditional development factors, such as geography or trade (Rodrik et al., 2004). These findings are potentially important in our context, as the literature on the determinants of spatial inequality has emphasized repeatedly the relevance of the level of economic development in explaining regional disparities (e.g. Williamson, 1965; Rodríguez-Pose and Ezcurra, 2010; Kyriacou et al., 2013).

An alternative explanation of the potential link between government quality and spatial disparities is related to the impact of government outcomes on the success of regional development strategies (Rodríguez-Pose and Garcilazo, 2013). The last decades have witnessed a significant increase in the quantitative importance of the public interventions designed to reduce the magnitude of regional inequality in many parts of the world (Pike et al., 2006). This has been the consequence of a growing concern from a policy point of view on the possible effects of high levels of spatial inequality. In any case, when assessing the returns of these policies, it needs to be taken into account that the degree of effectiveness of regional development strategies is closely related to the quality of institutions and the way in which authority is exercised by governments (European Commission, 2010; Rodríguez-Pose, 2013). Countries with weak institutions and low quality of government are characterized by the presence of persistent corruption, pervasive rent-seeking, self-serving decision-makers, and low quality of bureaucracy. This set of problems often gives rise to imperfectly functioning markets and institutional and government failure, which in turn reduces the capacity of the public sector to design and implement effective policies that contribute to promote regional convergence.

Government quality also plays a essential role in establishing the adequate conditions for economic interactions and reducing the risks of social unrest and internal conflict (Jütting, 2003). By decreasing the degree of uncertainty and transaction costs, governments can facilitate the processes of technology and knowledge transfer across regions, improving the conditions for the development of economic activity in lagging regions (North, 1990; Acemoglu and Robinson, 2012). As Putnam (2000, p. 325) argues, "institutional factors are the key enablers of innovation, mutual learning and productivity growth".

High levels of corruption, insecure property rights, bureaucratic obstacles, or political instability in any given country wield a negative impact on the business climate,

which directly affects the probability of receiving foreign direct investment (FDI). Indeed, numerous studies have established empirically the positive relationship between FDI and quality of government (e.g. Gani, 2007; Fazio and Talamo, 2008). Countries with better governments and governance attract greater FDI, which in turn has consequences for the spatial distribution of income. It is however difficult to determine a priori the final effect of FDI on regional inequality. According to the standard neoclassical growth model, FDI flows will be channelled mainly to poorer regions, where the marginal productivity of capital is greater than in richer ones, thus contributing to reduce spatial disparities. The experience of numerous developing and transition countries suggests, by contrast, that FDI tends to concentrate largely in the most dynamic areas, which enjoy the advantages of being better endowed in terms of infrastructure and human capital for international business activities (Ezcurra and Pascual, 2007). In such a situation, a potential increase in the volume of FDI caused by an improvement in the quality of government would be associated with greater spatial inequality (Zhang and Zhang, 2003).

The arguments laid down above provide different reasons to believe that the quality of government may affect spatial inequality through its impact on the level of economic development, regional development strategies and FDI. The previous discussion shows, however, that this is a complex relationship: explaining how government quality affects spatial inequality implies taking into consideration multiple factors and mechanisms. In these circumstances, empirical research is key to shed light on this issue. For this reason, the rest of the paper is devoted to investigating the potential effect of government quality on spatial inequality in a large cross-section of countries.

3 Measuring the quality of government and spatial inequality

Government quality varies enormously across countries, but measuring these differences is not an easy task. A raft of different indicators have been proposed, amongst which the Worldwide Governance Indicators constructed by Kaufmann et al. (1999, 2008) in the context of a long-standing World Bank research programme have become the most comprehensive and commonly used. These indicators capture six key dimensions of institutional quality, including the process by which governments are selected and replaced, the capacity of governments to formulate and develop sound policies, and the respect of citizens and the state for the institutional framework. The six indicators are calculated using an unobserved components model that aggregates the information provided by hundreds of individual underlying variables obtained from different data sources, including surveys of firms and households, commercial information providers, public sector organizations and non-governmental organizations. The six dimensions of governance identified by Kaufmann et al. (2008) are defined as

follows (Kaufmann et al., 2008, pp. 7-8):

- *Voice and accountability:* Measuring perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.
- *Political stability and absence of violence:* Measuring perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.
- *Government effectiveness:* Measuring perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
- *Regulatory quality:* Measuring perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
- *Rule of law:* Measuring perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
- *Control of corruption:* Measuring perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

The method used to calculate these six measures gives them a unit normal distribution ranging approximately from -2.5 to 2.5, with greater values always meaning better governance outcomes. The Worldwide Governance Indicators are available for a high number of countries since 1996, and have been employed over the last decade in numerous studies in order to measure cross-country differences in governance and the quality of institutions (e.g. Dollar and Kraay, 2003; Easterly and Levine, 2003; Rodrik et al., 2004; Alesina and Zhuravskaya, 2011).[1] We resort to the same indicators as a means to make our study comparable to previous work in the field.[2].

Using data for 204 countries in 2006, Table 1 shows that the six indicators calculated by Kaufmann et al. (2008) are characterized by very high bivariate correlations. Specifically, the lowest correlation is between *Voice and accountability* and *Political*

[1]The data vary yearly, although there is no information for 1997, 1999 and 2001.

[2]Although the Worldwide Governance Indicators are the most commonly used measures of government quality, they are not free of criticism. For further details, see Langbein and Knack (2010) or Thomas (2010).

stability and absence of violence ($r = 0.68$), while the highest is between *Government effectiveness* and *Regulatory quality* ($r = 0.95$). This is consistent with the empirical evidence provided by Langbein and Knack (2010), who point out that the six indicators of Kaufmann et al. (2008) appear to be measuring the same broad concept rather than successfully distinguishing different dimensions of governance. In view of this, we follow the strategy adopted by various researchers (e.g. Easterly and Levine, 2003; Seldadyo et al., 2010), and calculate an aggregate index of government quality equal to the average of the six indicators constructed by Kaufmann et al. (2008). This is coherent with the approach used in the paper, given that we are interested in the relationship between spatial inequality and overall government quality. Furthermore, using an aggregate measure seems particularly appropriate taking into account the possibility that each individual indicator may be affected by measurement errors (Mauro, 1995).[3]

[INSERT TABLE 1 AROUND HERE]

We also need to quantify the relevance of regional disparities within each country. To that end, we use the following measure of inequality proposed by Theil (1967):

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

where y and p are respectively the GDP per capita and the population share of region j in country i, and $\mu = \sum_{j=1}^{J} p_j y_j$. T(0) is known in the literature as Theil's second measure of inequality or mean logarithmic deviation. Greater values of $T(0)$ imply greater inequality.[4] The advantage of this measure vis-à-vis other potential alternative indexes of inequality is that it is independent of scale and population size, and satisfies the Pigou-Dalton transfer principle (Cowell, 1995). Additionally, as shown 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

[3] In order to examine the robustness of our findings, we checked that the results of the paper hold for each of the six indicators of governance identified by Kaufmann et al. (2008). This suggests that resorting to the aggregate index does not imply a relevant loss of information in this context.

[4] As can be checked from (1), $T(0) = 0$ when all regions have the same GDP per capita.

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 spatial inequality.

To calculate T(0) we require regional data on GDP and population. 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. Despite these difficulties, the sample used in our analysis includes a total of 46 developed and developing countries over the period 1996-2006. Although data availability is not the same for all countries included in the sample, the coverage is comprehensive: out of a possible maximum of 11 years, the average number of observations for each country is 10.2. The full list of countries is included in the Appendix.

[INSERT TABLE 2 AROUND HERE]

[INSERT TABLE 3 AROUND HERE]

Tables 2 and 3 show the countries with the highest and the lowest average values of the measure of governance and T(0) over the study period. The quality of government ranges from -0.694 (Indonesia) to 1.862 (Finland), whereas the index of spatial inequality ranges from 0.002 (Australia) to 0.187 (Indonesia). A first observation from the rankings in Tables 2 and 3 is that both variables appear to be associated with the level of economic development, which suggests that high-income countries are likely to have better governance outcomes and lower levels of spatial inequality than low- and middle-income countries (La Porta et al., 1999; Rodríguez-Pose, 2012).

4 Is there a link between government quality and spatial inequality?

4.1 Preliminary evidence

This paper addresses the potential link between government quality and spatial inequality. As a first insight on this relationship, the sample countries are divided into

two and three groups according to the average value of the measure of governance over the study period. The definitions of the different groups are based on the median (classification into two groups) and the first and third quartiles (classification into three groups) of the distribution of the index of government quality. As can be seen in Table 4, the countries with better quality of government tend on average to register lower levels of spatial inequality. In contrast, those countries with worse governance outcomes are characterized as a whole by greater regional disparities. This is corroborated by the corresponding F-tests, which show that the differences between the groups in the average value of T(0) are statistically significant at the 1% level.

[INSERT TABLE 4 AROUND HERE]

When interpreting the information provided by Table 4, it needs to be taken into consideration that the results discussed above may be ultimately sensitive to the specific number of groups used to classify the sample countries. Bearing this in mind, we plot in Figure 1 the relationship between our index of spatial inequality and quality of government. The scatter plot indicates the existence of a strong negative link between the quality of government and the level of regional disparities. The relationship is statistically significant (t-value is -21.04), and the measure of governance alone explains around 56% of the whole variation in spatial inequality.

[INSERT FIGURE 1 AROUND HERE]

4.2 The model

In order to examine in greater detail the relationship between government quality and spatial inequality, we now estimate different versions of the following model:

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

where I is the measure of spatial inequality in country i and year t, GQ is the indicator of government quality, $\mathbf{X}$ denotes a set of variables that control for additional factors that are assumed 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 the quality of government on spatial 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 96% of the variation in spatial inequality is between countries, rather than over time. 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. 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 the quality of government and spatial inequality.

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 average size of the regions used in each country to compute the degree of spatial inequality, the stage of economic development of the country, the degree of trade openness, country size, the level of ethnolinguistic fractionalization, and two dummy variables for federal states and transition countries. 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 take into account that the level of regional disparities in each country may be affected by the average size of the spatial units used to compute the index of regional inequality. This is particularly relevant in our analysis, as the average size of the territorial units used to calculate T(0) differs considerably from one country to another. In addition, the size of a country's regions may have a direct effect on the quality of government (Alesina and Zhuravskaya, 2011). 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 average size of regions in any given country as a way to minimize any potential bias emerging from the heterogeneity of the different territorial levels. Furthermore, the information provided by Tables 2 and 3 suggests that we should consider the spatial impact of national GDP per capita. Indeed, as mentioned in section 2, the empirical literature on spatial inequality has tended to pay particular attention to the role of the level of economic development in explaining regional disparities (e.g. Petrakos et al., 2005; Lessmann, 2011). This interest goes back to the publication of the seminal work by Williamson (1965), who adapted Kuznets (1955) work to a spatial framework. According to Williamson (1965), progress in the economic development process, leads to an initial increase in spatial inequality, followed by a decline in the ensuing stages of development. Consequently, the trend in spatial inequality conforms to an inverted U-shape. We therefore test for the possible existence of a non-linear

relationship between spatial inequality and the degree of economic development in our case countries, by including in the list of regressors of model (2) the national GDP per capita and its square.

The recent rise in trade has also attracted attention as a potential factor behind of changes in regional disparities (Rodríguez-Pose, 2012; Ezcurra and Rodríguez-Pose, 2013). This interest is closely related to the development of the 'new economic geography' strand. Different new economic geography models tend, however, to apply different sets of assumptions and functional forms, resulting in contradictory and ambiguous conclusions on the link between trade and spatial inequality (Brülhart, 2011). As a consequence, in our estimations we control for the possible impact of the degree of international trade openness of the countries considered in the analysis on regional inequality. Spatial inequality may also be related to country size (Williamson, 1965). Larger countries are often characterized by greater spatial heterogeneity than smaller countries, which are in general more homogeneous and compact. Likewise, country size may also affect the quality of government (Olsson and Hansson, 2011). We use the country's area as our measure of country size. Many of the countries included in our study are further inhabited by different ethnolinguistic groups (e.g. Belgium, China, India, Indonesia), which may potentially increase the risks of internal conflicts and spatial divergence (Horowitz, 1985). Bearing this in mind, we include in model (2) a measure of the degree of ethnolinguistic fractionalization of the sample countries based on Alesina et al. (2003).

Federal and unitary countries may also differ in their levels of spatial inequality (Shankar and Shah, 2003). In comparison with a unitary system, federalism may in theory undermine the power of the central government to play an equalizing role. This may give rise to a more uneven distribution of resources across space, contributing to increase territorial imbalances (Prud'homme, 1995). It can therefore be argued that the transfer of powers and resources to subnational tiers of government mainly benefits the most prosperous regions, which generally enjoy better socio-economic endowments and better institutions. In view of these arguments the literature has tended to emphasize the spatially regressive effects of federalism (Rodríguez-Pose and Ezcurra, 2010). There are, however, various reasons to suppose that federalism may not exacerbate spatial inequality, but may also contribute to reduce it. 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 might attempt to reduce their development gaps by offering more flexible labour markets and/or less generous welfare provisions than richer regions.[5]

[5]Conversely, rather than a 'run to the bottom', decentralization may trigger a 'run to the top', whereby regions rather than reduce welfare provisions increase them, as well as boost education and

Likewise, federal states may do better in reducing spatial inequality, because of the greater political risk that regional disparities pose for such countries (Shankar and Shah; 2003). Bearing in mind these considerations, we include a dummy variable in model (2), allowing us to differentiate in our sample between federal and unitary countries.

Transition from real socialism to capitalism is also bound to have affected the location of economic activities and thus territorial disparities. Throughout the 1990s, a number of countries around the world –and especially in Central and Eastern Europe (CEE)– underwent profound changes of a political and economic nature as a consequence of the processes of restructuring, privatization, and liberalization that ensued the fall of communism. These changes have had a significant impact on the spatial distribution of economic activity, frequently leading to an important increase in the magnitude of regional disparities (Ezcurra and Pascual, 2007). Consequently, we include in vector **X** a dummy variable for the transition countries of our sample.

4.3 Results

Table 5 presents the results obtained when various versions of model (2) are estimated by OLS with heteroskedasticity and autocorrelation robust standard errors. The different specifications work reasonably well in explaining cross-country variations in regional disparities, with relatively good values in terms of goodness-of-fit. Focusing on our key variable of interest, the coefficient of government quality is in all cases negative and statistically significant at the 1% level. This shows that lower government quality is associated with higher spatial inequalities, which is consistent with the information provided previously in Table 4 and Figure 1.[6] The sign and statistical significance of the coefficient is not affected by the inclusion in the analysis of additional controls, confirming its robustness and showing that the effect of government quality on regional disparities is not a spurious correlation resulting from the omission of relevant variables. In particular, the quality of government remains significantly associated with spatial inequality even when we control for the level of GDP per capita. This is especially important given the positive association identified in the literature between the level of economic development and the quality of the institutional environment (e.g. La Porta et al., 1999; Kaufmann and Kraay, 2002; Rodrik et al., 2004). Nevertheless, although the spatial impact of the government quality decreases somewhat when GDP per capita is included in the specification of model (2), the corresponding coefficient remains negative and statistically significant.

health policies, so as not to be outdone by neighbouring regions (Béland and Lecours, 2010; Costa-Font, 2010).

[6] We also investigated the possibility that the effect of governance on regional disparities may be non-linear. To that end, we considered an alternative specification of model (2) including the square of the index of government quality as an additional regressor. Nevertheless, the results did not support the hypothesis of a non-linear link between governance outcomes and spatial inequality in our sample.

This shows that government quality makes a relevant contribution in explaining cross-country variation in spatial inequality and does not simply capture the effect of the level of economic development.

[INSERT TABLE 5 AROUND HERE]

The coefficients of the control variables included in vector **X** are mostly statistically significant, and the results in Table 5 tend to be consistent with the findings of the existing literature on the determinants of spatial inequality. There is thus a negative association between the average size of territorial units and the level of spatial disparities in a country. Our estimates also reveal the existence of an inverted U-shaped relationship between national development and spatial inequality, confirming the hypothesis put forward by Williamson (1965): at low levels of economic development, national GDP per capita growth is associated with increasing regional disparities. However, this relationship does not continue indefinitely. Beyond a certain threshold, our results show the presence of a negative correlation between the two variables (Lessmann, 2011). Furthermore, the degree of trade openness is positively associated with the level of spatial inequality (Rodríguez-Pose and Ezcurra, 2010, Ezcurra and Rodríguez-Pose, 2013). Additionally, Table 5 shows that larger and more ethnically diverse countries tend to register greater regional disparities. In contrast, federal states and transition countries are characterized on average by lower levels of spatial inequality, once other factors which may affect regional disparities are controlled for. Nevertheless, the coefficient of the federal dummy is not statistically significant when the level of economic development is included in the list of regressors.[7]

Overall, the results in Table 5 show a strong negative correlation between government quality and spatial inequality. This relationship can, however, not be interpreted as causal. The existence of high income differences across the regions of a country tends to increase the importance of interregional redistribution mechanisms, which may crowd out policies aiming to improve the government quality (Kyriacou and Roca-Sagalés, 2013). Consequently, government quality may affect regional disparities and, in turn, be affected by them, giving rise to a reverse causality problem. In addition, the Worldwide Governance Indicators used to construct our aggregate index of government quality may contain measurement errors. These problems are potentially important from an econometric perspective, but they could be solved if

[7] In addition to the federal dummy, we also considered the role played in this context by the measures of fiscal and political decentralization calculated by Schneider (2003). 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. None of these measures of decentralization is significantly associated with spatial inequality in our sample.

we had an instrument for the quality of government. Such an instrument must not be correlated with the disturbance process in model (2), but must be an important factor in accounting for the variation in government quality that we observe in our sample. We consider that the degree of press freedom in the various countries considered represents a suitable instrument in this context. Free and pluralistic media provide the relevant information needed to keep the necessary checks and balances and alert public opinion about wrongdoers and corrupt public officials. Press freedom also plays a key role in the processes of political change and institutional reform that strengthens civil society and improves the quality of government (Acemoglu and Robinson, 2012). There is indeed abundant empirical evidence supporting the positive effect of the free press on government outcomes (e.g. Brunetti and Weder, 2003; Chowdhury, 2004; Enikolopov et al., 2011). We therefore instrument the measure of government quality with the index of press freedom provided by Freedom House.[8]

At this point we investigate to what extent this instrument is correlated with government performance in our sample. To that end we present in Table 6 the results of the first stage regressions of the form:

$$GQ_{it} = \delta + \zeta PF_{it} + \theta^{'}\mathbf{X}_{it} + \upsilon_{it} \tag{3}$$

where PF is the index of press freedom and υ is the corresponding error term. The table is organized in the same way as Table 5. As can be observed, in all the regressions the instrument has a positive and statistically significant effect on government quality. Furthermore, the F-statistics for these regressions are well above the threshold of 10 suggested by Staiger and Stock (1997) when there is one endogenous regressor. The relevance of the index of press freedom in this context is confirmed by the partial R-squared statistic, which measures the correlation between the governance measure and the instrument after partialling out the effect of the remaining regressors.

[INSERT TABLE 6 AROUND HERE]

The information provided by the first stage regressions in Table 6 indicates that the index of press freedom is significantly associated with government quality in our sample countries. To be a valid instrument, however, the index of press freedom should not

[8]The original index ranges from 0 (total freedom of the press) to 100 (highest violation of press freedom). We have rescaled the index in such a way that higher values indicate a greater degree of press freedom.

affect spatial inequality, beyond its impact through the quality of government. This condition cannot be tested formally in the absence of other instruments. Nevertheless, it seems reasonable to assume that the degree of press freedom does not exert a direct effect on the level of spatial inequality in a particular country. This is consistent with the information provided by the partial regression plot of spatial inequality on the instrument conditional on the full set of control variables shown in Figure 2, which suggests that the index of press freedom is a plausible instrument in this context.[9]

[INSERT FIGURE 2 AROUND HERE]

Table 7 presents the results of the second stage regressions. As in the OLS regressions shown in Table 5, the coefficient of our measure of government quality is in all cases negative and statistically significant, and its size is larger than in the previous estimates. This confirms that improvements in the quality of government contribute to reduce the level of spatial inequality, which constitutes the main empirical finding of the paper.

[INSERT TABLE 7 AROUND HERE]

5 Robustness checks

The analysis carried out so far reveals the existence of a negative association between government quality and the level of spatial inequality. In this section we investigate the robustness of this finding.

[9] As mentioned in section 3, the Worldwide Governance Indicators are constructed using an unobserved components model that aggregates the information provided by hundreds of individual underlying variables. The index of press freedom calculated by Freedom House is one of these variables, which in principle may cast doubts on its validity as instrument in this context. In particular, this index has been used by Kaufmann et al. (2008) to estimate the indicator of *Voice and accountability*. In order to investigate the relevance of this potential problem, we calculate a different aggregate measure of governance equal to the average of the remaining five indicators estimated by Kaufmann et al. (2008) (*Political stability and absence of violence*, *Government effectiveness*, *Regulatory quality*, *Rule of law*, and *Control of corruption*). The employment of this alternative indicator of government quality does not affect the results of the paper. Furthermore, in Section 5.2 we examine whether our findings still hold when we use other measures of government quality which are not based on the Worldwide Governance Indicators.

5.1 Influential observations

As a first robustness check, we examine the impact of influential observations on our estimates. To do so, we calculate each observation's DFBETA for the index of the quality of government, which is a measure of the difference in the estimated coefficient for this variable (scaled by the standard error) when the observation in question is included and when it is excluded from the sample. Following Belsley et al. (1980), we omit all observations for which $|DFBETA| > 2/\sqrt{N}$, where N is the sample size. When this cut-off criterion is applied, around 5% of the observations are influential in the full specification of model (2). The first column of Table 8 indicates that, once these observations are dropped from the sample, the estimated coefficient of the governance index continues to be negative and statistically significant.

[INSERT TABLE 8 AROUND HERE]

As an additional sensitivity check, we also assess to what extent our results are determined by the inclusion of specific countries in the sample. It may be the case that the negative association detected between government quality and spatial inequality is driven by a particular group of countries. If this hypothesis holds, eliminating that group of countries from the sample would make the coefficient of the governance index non-significant. In order to test whether this is the case, we estimate our baseline specification again excluding different groups of countries. In particular, we examine the influence on the results of countries in Asia, Western Europe, Central and Eastern Europe, North America and South America. Columns 2-6 of Table 8 show that the coefficient of the index of government quality remains negative and statistically significant in all cases.

When interpreting our previous results, it should be noted that the impact of governance on spatial inequality may differ across countries, depending on their level of development. This implies that the negative association observed between the measure of government quality and regional disparities may be caused by the inclusion in the sample of countries with different levels of economic development. In order to investigate this hypothesis, 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] Columns 7 and 8 of Table 8 show that the coefficients of the index of governance are negative and statistically significant in the two subsamples, confirming our previous findings. Nevertheless, the magnitude of the coefficients seems to suggest that the spatial impact

[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.

of the quality of government is greater in low-and middle-income countries. This is particularly important for policy-makers, since developing countries tend to register on average considerably higher levels of spatial disparities (Rodríguez-Pose, 2012).

5.2 Alternative measures of spatial inequality and of the quality of government

Next we check whether the results depend on the choice of the measure used to quantify the relevance of spatial 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 additionally the 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 9 summarizes the main results obtained when model (2) is estimated again using T(1), c and s in turn, instead of T(0) as dependent variables. As can be seen, the sign and the significance of the estimated coefficient of government quality remains unchanged. This implies that the observed association between government quality and spatial inequality is not contingent on the specific measure used to quantify the

[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 with the 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 (Cowell, 1995; Ezcurra and Rodríguez-Pose, 2009).

degree of dispersion in the regional distribution of GDP per capita within the different countries included in our study.

[INSERT TABLE 9 AROUND HERE]

As discussed above, the measure of the quality of government used so far in the paper is an aggregate index equal to the average of the six indicators included in the Worldwide Governance Indicators (see Section 3 for further details). Next, we explore whether the results obtained hold for alternative measures of government quality. To that end, we resort to the International Country Risk Guide (ICRG) database developed by the Political Risk Services Group to assess the political, economic and financial risks across countries. As is usual in the literature we use in our analysis an aggregate indicator of governance equal to the mean value of the ICRG variables *Corruption*, *Law and order* and *Bureaucracy quality* (Teorell et al., 2012) We also employ the indices of economic freedom and property rights provided by the Heritage Foundation. Model 2 is reestimated for each of these other measures. Table 10 shows that the coefficients of these alternative measures of government quality continue to be negative and statistically significant in all cases, corroborating the observed association between governance and spatial inequality.

[INSERT TABLE 10 AROUND HERE]

5.3 Additional controls

As an additional robustness check, we now examine the possibility that our results are driven by an omitted variable. We address this issue by controlling for different covariates that could plausibly be correlated with spatial inequality and government quality, and checking whether the inclusion of these additional controls affects our estimates.

According to this strategy, we add to our baseline specification two geographical variables that may be important in this context: a measure of the extent to which a country's surface is covered by mountains, and the standard deviation of the elevation within country borders. The level of spatial inequality in a country may depend on the existence of physical constraints to mobility, whereas countries with rougher surface tend to have a greater geographical concentration of economic activity (Ramcharan, 2009). Furthermore, these geographical variables can also affect the diffusion

of government quality from the capital towards the rest of the country (Olsson and Hansson, 2011). Additionally, we control for the net flows of FDI received by a country as, according to several of the arguments laid down in Section 2, this variable may be associated with both spatial inequality and government quality. We also include in the list of regressors government size, which can be interpreted as a proxy for the capacity of the state to redistribute financial resources across regions to reduce existing spatial disparities (Rodríguez-Pose and Ezcurra, 2010). Indeed, there is empirical evidence supporting the existence of a significant relationship between government size and government quality (Hopkin and Rodríguez-Pose, 2007).

The index of fractionalization included in the baseline specification of model (2) does not take into the geographical distribution of ethnic groups within country borders, which may be particularly important in the relationship between ethnic cleavages and spatial inequality (Kyriacou et al., 2013). In turn, Alesina and Zhuravskaya (2011) show that more ethnically segregated countries have a lower quality of government. In view of this, we add to the list of covariates two measures of ethnic segregation calculated by Alesina and Zhuravskaya (2011). Furthermore, the important amount of funds devoted over the last two decades by the European regional policy to promoting economic and social cohesion and reducing disparities in the level of development of the various regions may have led to a more spatially balanced growth and, consequently, to a lower degree of spatial inequality within the EU member states (Kyriacou and Roca-Sagalés, 2012). For this reason, we include in the list of covariates a dummy variable for the EU countries. We also control for other potential determinants of the quality of government identified in the literature, such as latitude or English legal origin (La Porta et al., 1999). Finally, time-specific effects common to all countries are added.

[INSERT TABLE 11 AROUND HERE]

Table 11 presents the results obtained when model (2) is estimated again including these additional controls. As can be seen, none of these covariates is statistically significant and their inclusion in our baseline specification does not modify the main result of the paper. In particular, Table 11 shows that the additional controls considered do not affect the estimates of the impact of government quality on spatial inequality. The coefficient of the index of government quality remains negative and statistically significant in all cases, confirming the robustness of our findings.

6 Conclusions

With the goal of improving our understanding of the factors driving regional disparities, this paper has examined the relationship between government quality and spatial inequality in a panel of 46 countries over the period 1996-2006. The results show that there is a negative association between the quality of government and the magnitude of regional disparities. Accordingly, countries with good governance outcomes tend on the whole to register lower levels of spatial inequality. The existence of a causal effect is confirmed by the employment of an instrumental variable approach. The results are robust to the inclusion in the analysis of additional explanatory variables that may be correlated with regional disparities and government quality such as GDP per capita, the degree of trade openness, country and government size, or ethnolingusitic diversity. We have checked that our results are not driven by a specific group of countries or a reduced number of influential observations. Furthermore, the negative link observed between governance and regional disparities still holds when alternative measures are used to quantify the level of spatial inequality registered within the various countries.

Spatial inequality poses significant economic and political challenges for the governments of many countries, mainly in the developing world where regional disparities are considerably higher than in the developed world. In relation to this, the results of the paper raise potentially important policy implications. In particular, our findings suggest that improving the quality of government may contribute to reduce regional disparities. This means that government quality is not only important per se or as a determinant of growth and economic development, but also as a way to guarantee greater territorial cohesion. Consequently, policy makers concerned with regional disparities should pay attention to the way in which authority is exercised, without overlooking the importance in this setting of institutional quality and government performance. Nevertheless, when considering the possibilities of public intervention in this context, it is important to recall that government quality also depends on geography and historical and cultural factors, which cannot be easily modified in the short run.

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 government quality and spatial inequality. Further research will also have to pay special attention to the need to identify and study the various theoretical mechanisms which explain ultimately the effect of government quality on regional disparities. Only by pursuing these strands, we will be able to have a fuller understanding about the way in which our governments act and behave affects spatial inequality.

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Appendix

List of countries

Argentina
Australia
Austria
Belgium
Bolivia
Brazil
Bulgaria
Canada
Chile
China
Colombia
Czech Republic
Denmark
Ecuador
Estonia
Finland
France
Germany
Greece
Hungary
India
Indonesia
Ireland
Italy
Japan
Korea, Rep.
Latvia
Lithuania
Mexico
Netherlands
New Zealand
Norway
Peru
Philippines
Poland
Portugal
Romania
Slovak Republic
Slovenia
South Africa
Spain
Sweden
Switzerland
Turkey
United Kingdom
United States

Description and sources of control variables

GDP per capita: Natural log of GDP per capita in purchasing power parity (PPP) basis. Data are in constant 2000 international dollars. Source: World Development Indicators (World Bank).

Trade openness: Sum of exports and imports of good and services expressed as a percentage of GDP. Source: World Development Indicators (World Bank).

Area: Natural log of land area in square kilometres. 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).

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

Transition: Dummy variable that takes the value one for transition countries, zero otherwise. Source: Ezcurra and Rodríguez-Pose (2010).

Mountains: Measure of the extent to which a country's surface is covered by mountains. Source: Alesina and Zhuravskaya (2011).

Roughness: Standard deviation of elevation of each country expressed in metres. Source: Alesina and Zhuravskaya (2011).

FDI: Net inflows of FDI expressed as a percentage of GDP. FDI measures the investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. Source: World Development Indicators (World Bank).

Government size: Government consumption expenditures expressed as a percentage 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).

Segregation: Measures of ethnic segregation calculated by Alesina and Zhuravskaya. Source: Alesina and Zhuravskaya.

Latitude: Absolute value of the latitude of the country, scaled to take values between zero and one. Source: La Porta et. al. (1999).

English legal origin: Dummy variable that takes the value one if the legal origin of the Company Law or Commercial Code of the country is English Common Law, zero otherwise. Source: La Porta et. al. (1999).

Press freedom: Index of press freedom based on experts opinions, findings of international human rights groups and press organizations, analysis of publications and news services and reports of governments on related subjects. The original index was rescaled in such a way that higher values indicate a greater degree of press freedom. Source: Freedom House.

Figures and Tables

Figure 1: Spatial inequality and government quality, 1996-2006.

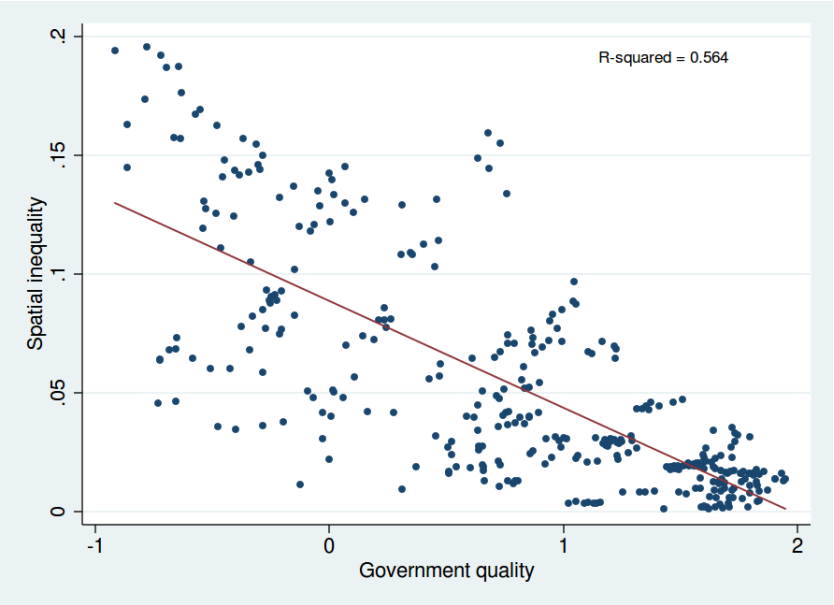

Figure 2: Partial regression plot: Spatial inequality and press freedom, 1996-2006.

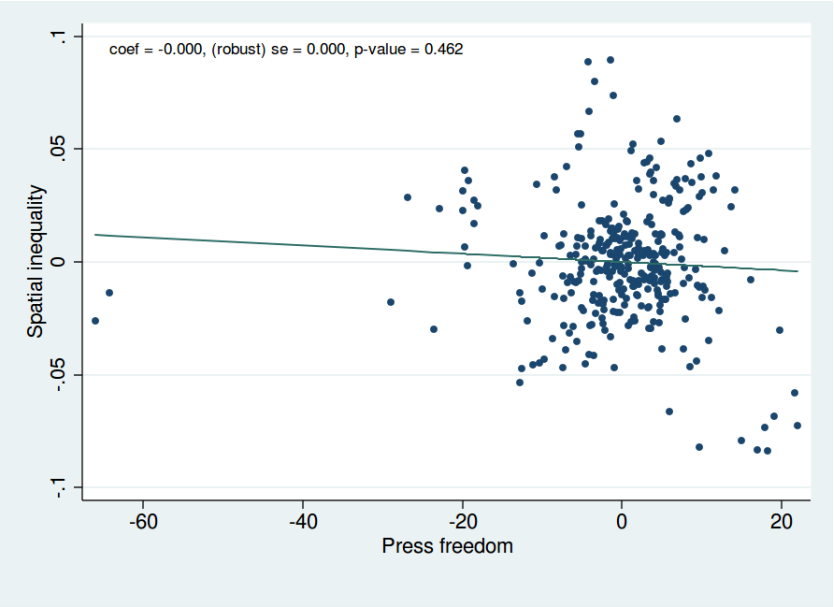

Table 1: Correlation coefficients between the various dimensions of government quality.

	Voice and accountability	Political stability	Government effectiveness	Regulatory quality	Rule of law	Control of corruption
Voice and accountability	1.000					
Political stability	0.683	1.000				
Government effectiveness	0.788	0.723	1.000			
Regulatory quality	0.811	0.687	0.949	1.000		
Rule of law	0.791	0.803	0.935	0.897	1.000	
Control of corruption	0.776	0.743	0.947	0.898	0.948	1.000

Note: Data for 204 countries in 2006. All the correlation coefficients are statistically significant at the 1% level.

Table 2: Countries with better and worse government quality.

Better government quality		Worse government quality	
Country	Gov. quality	Country	Gov. quality
Finland	1.862	Indonesia	-0.694
Switzerland	1.796	Ecuador	-0.651
Denmark	1.781	Colombia	-0.586
New Zealand	1.769	China	-0.483
Sweden	1.737	Bolivia	-0.356

Note: Average values over the period 1996-2006.

Table 3: Countries with higher and lower spatial inequality

Most unequal countries		Least unequal countries	
Country	Inequality	Country	Inequality
Indonesia	0.187	Australia	0.002
Ecudador	0.165	New Zealand	0.002
Philippines	0.160	Japan	0.004
Peru	0.146	Netherlands	0.005
Mexico	0.137	United States	0.009

Note: Average values over the period 1996-2006.

Table 4: Spatial inequality in various groups of countries.

	Two groups		Three groups		
	Low government quality	High government quality	Low government quality	Middle government quality	High government quality
Spatial inequality	0.085	0.025	0.115	0.045	0.014
# Countries	23	23	12	24	12
Equal means test (p-value)	26.79 (0.000)		29.67 (0.000)		

Notes: The classifications are based on the median (classification into two groups) and the first and third quartiles (classification into three groups) of the distribution of the average value of the index of goverment quality over the period 1996-2006.

Table 5: Spatial inequality and government quality. OLS regressions.

	(1)	(2)	(3)
Government quality	-0.045***	-0.040***	-0.024***
	(0.003)	(0.004)	(0.005)
Average size of regions		-0.002***	-0.003***
		(0.001)	(0.001)
GDP per capita			0.228***
			(0.056)
GDP per capita squared			-0.013***
			(0.003)
Trade openness		0.035***	0.039***
		(0.008)	(0.008)
Area		0.003**	0.004**
		(0.002)	(0.002)
Fractionalization		0.062***	0.060***
		(0.013)	(0.013)
Federal		-0.010**	-0.008
		(0.005)	(0.005)
Transition		-0.020***	-0.032***
		(0.008)	(0.007)
Constant	0.089***	0.022	-0.970***
	(0.004)	(0.025)	(0.259)
Adjusted R-squared	0.564	0.650	0.672
Observations	342	335	335

Notes: The dependent variable is in all cases the value of T(0) in the various countries over the period 1996-2006. Robust standard errors in parentheses. * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 6: First stage regressions: Government quality and press freedom.

	(1)	(2)	(3)
Press freedom	0.038***	0.033***	0.014***
	(0.004)	(0.004)	(0.003)
Average size of regions		0.013	0.028***
		(0.011)	(0.010)
GDP per capita			-3.092***
			(0.654)
GDP per capita squared			0.200***
			(0.036)
Trade openness		0.496***	0.085
		(0.098)	(0.086)
Area		0.004	0.005
		(0.031)	(0.016)
Fractionalization		-1.143***	-0.179
		(0.149)	(0.121)
Federal		0.225***	0.024
		(0.074)	(0.054)
Transition		-0.357***	0.067
		(0.094)	(0.085)
Constant	-1.981***	-1.840***	10.595***
	(0.300)	(0.649)	(3.015)
F-statistic	95.8***	76.2***	23.6***
Partial R-squared	0.635	0.612	0.223
Observations	339	335	335
Adjusted R-squared	0.634	0.761	0.888

Notes: The dependent variable is in all cases the value of the index of government quality in the various countries over the period 1996-2006. Robust standard errors in parentheses. * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 7: Spatial inequality and government quality. Second stage regressions.

	(1)	(2)	(3)
Government quality	-0.044***	-0.041***	-0.035**
	(0.003)	(0.004)	(0.014)
Average size of regions		-0.002***	-0.003***
		(0.001)	(0.001)
GDP per capita			0.191***
			(0.067)
GDP per capita squared			-0.011***
			(0.004)
Trade openness		0.035***	0.039***
		(0.008)	(0.008)
Area		0.003*	0.004**
		(0.002)	(0.002)
Fractionalization		0.060***	0.061***
		(0.013)	(0.013)
Federal		-0.010*	-0.008*
		(0.006)	(0.005)
Transition		-0.021***	-0.030***
		(0.007)	(0.008)
Constant	0.087***	0.026	-0.838***
	(0.004)	(0.024)	(0.281)
Adjusted R-squared	0.555	0.650	0.667
Observations	339	335	335

Notes: The dependent variable is in all cases the value of T(0) in the various countries over the period 1996-2006. Robust standard errors in parentheses. * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 8: Robustness analysis: Influential observations and particular groups of countries. Second stage regressions.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Government quality	-0.030**	-0.028***	-0.049**	-0.037**	-0.040***	-0.021*	-0.012**	-0.070***
	(0.013)	(0.009)	(0.021)	(0.016)	(0.014)	(0.011)	(0.005)	(0.020)
Adjusted R-squared	0.697	0.667	0.604	0.727	0.670	0.725	0.469	0.511
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Omitted observations	Influential observ.	Asia	Western Europe	Eastern Europe	North America	South America	Low income	High income
Observations	319	298	211	255	315	281	155	180

Notes: The dependent variable is in all cases the value of T(0) in the various countries over the period 1996-2006. All the regressions include 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 9: Robustness analysis: Alternative measures of inequality. Second stage regressions.

	(1)	(2)	(3)
Dependent variable	T(1)	c	s
Government quality	-0.045**	-0.133**	-0.070**
	(0.018)	(0.055)	(0.033)
Adjusted R-squared	0.614	0.634	0.698
Controls	Yes	Yes	Yes
Observations	335	335	335

Notes: The study period is 1996-2006. All the regressions include 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 10: Robustness analysis: Alternative measures of government quality. Second stage regressions.

	(1)	(2)	(3)
ICRG Government quality	-0.175**		
	(0.087)		
Economic freedom		-0.005**	
		(0.002)	
Property rights			-0.001**
			(0.001)
Adjusted R-squared	0.618	0.459	0.635
Controls	Yes	Yes	Yes
Observations	327	335	335

Notes: The dependent variable is in all cases the value of T(0) in the various countries over the period 1996-2006. All the regressions include 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 11: Robustness analysis: Additional controls. Second stage regressions.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Government quality	-0.034**	-0.035**	-0.035**	-0.032**	-0.033**	-0.030**	-0.034**	-0.035**	-0.034**	-0.035**
	(0.016)	(0.016)	(0.014)	(0.015)	(0.016)	(0.015)	(0.015)	(0.015)	(0.014)	(0.015)
Mountains	-0.002									
	(0.008)									
Roughness		-0.000								
		(0.000)								
FDI			0.000							
			(0.000)							
Government size				-0.056						
				(0.045)						
Segregation (measure 1)					-0.001					
					(0.042)					
Segregation (measure 2)						0.018				
						(0.035)				
EU countries							-0.004			
							(0.004)			
Latitude								0.006		
								(0.024)		
English legal origin									-0.010	
									(0.007)	
Adjusted R-squared	0.666	0.669	0.667	0.671	0.667	0.669	0.668	0.666	0.670	0.667
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	No	No	No	No	No	No	No	No	No	Yes
Observations	327	327	331	335	327	327	335	335	335	335

Notes: The dependent variable is in all cases the value of T(0) in the various countries over the period 1996-2006. All the regressions include 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.