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External influences on local institutions: spatial dependence and openness

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Abstract
There are both empirical and theoretical arguments for the thesis that external factors have an impact on domestic institutional quality. Consequently, external factors may have large effects on domestic income via local institutions. This paper investigates the role of external factors by estimating the impact of openness and the institutional environment of proximate countries on local institutions and local income. In a 107-country cross-section, we find that both openness (in trade, and especially FDI) and the institutional indicators of nearby countries have an independent impact on local institutional indicators. The effects on income levels are not symmetric, however. We estimate that trade openness plays a major role as a direct determinant of the income level, and a smaller role in determining local institutions. By contrast, institutions of nearby countries are a prime determinant of local institutions, but carry no direct effects on local income levels.

Keywords: Economic institutions, Spatial spillovers, Economic openness, Income differences

JEL classification: F43, H73, O11, O43

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1 Introduction

The conclusion that institutional quality determines economic outcomes (Rodrik et al. 2004) points to the high economic relevance of the determinants of institutions. The literature that produced this conclusion paints a gloomy picture, using historical or physical geographical explanations, and hence unchangeable factors as the origin of countries' fates. Furthermore, regardless of the exogenous setting, the ergodic process of institutional development seems difficult to manipulate. Acemoglu et al. (2004) explain institutions in a closed-economy setting in which political institutions have a tendency of persistence as powerful groups have the best opportunities to create and maintain those economic institutions that enable them to continue and to reinforce their political positions. While acknowledging these conclusions, this paper asks the question whether external factors have an impact on domestic institutional quality, and therefore on economic outcomes, specifically income. The presence of neighbouring countries may have wide implications for the development of domestic institutions. History provides many examples of states that tried to transplant their institutions to foreign nations, be it by peaceful or violent means. States may have incentives to change their institutions in order to better exploit foreign opportunities such as supplying foreign markets, attracting FDI or counteracting perceived external political threats. There are both theoretical and empirical arguments that integration in the world economy and the institutions of neighbouring countries have an impact on domestic institutional quality. This paper delves deeper into these relationships. Although the impact of trade integration on long term economic growth has been extensively researched, only a number of papers have been written on the impact of trade and openness on domestic institutions (Acemoglu and Robinson, 2006; Acemoglu et al., 2005; Dollar and Kraay, 2003; Rodrik et al., 2004; Wei, 2000; Islam and Montenegro, 2002). Observing that institutions and trade exert a mutual positive impact on each other (Rodrik et al., 2004: 143)[1], we take a closer look at the role of trade and geography in institutional and economic development. We will approach this question by distinguishing variations of trade and geography in their relevance to institutional and economic processes. Firstly, integration in the world economy may affect domestic structures, as, e.g., exporters put pressure on their governments to introduce institutions that support their competitiveness and foreign investors like adequate protection of their physical and intellectual property. The importance of openness per se implies that the relevance of the foreign country is simply in its presence, i.e. the partner country is viewed as generic. A second line of reasoning is the recent literature on the effect of second nature geography of institutions. Bosker and Garretsen (2008) find an independent role of neighbouring countries' institutions on domestic income levels. Does this relationship work

[1] The impact of institutions on trade is larger and statistically significant. The effect of trade on institutions is found for manufactures (Rodrik et al. 2004).

directly on growth or indirectly through domestic institutions? Spatial spillovers from neighbouring institutions are studied in a spatial panel data model by Kelejian et al. (2007). These authors find significant spillovers. Either way, this line of reasoning views the partner country as specific: the characteristics of this country matter for its effect on the domestic country. These arguments suggest a different role of location in domestic institutional change. In the first view, it is the presence of nearby and large economies or a natural propensity to trade, i.e. it is the market potential that affects the local institutions. The second view stresses the characteristics of nearby countries: local institutions would start to resemble the institutions of nearby countries. Institutional developments could be said to spill over between countries. In assessing these two views, we need to take a third role of location into account. Local historical and physical geographical features, such as quality of the land, climate, and consequent colonization strategies may have given rise to initial institutions that are still having an impact in the present time. The objective of this paper is to determine whether the arguments regarding openness and spillovers are two independent external factors that impact upon the quality of domestic institutions, and how these factors are related to differences in incomes.

The paper is composed as follows. The second section will discuss the literature with respect to the possible effects of openness and their potential relevance for institutional quality and the impact of the geography of institutions. The third section describes the empirical strategy of the paper and presents the empirical results. Conclusions are drawn in the fourth section.

2 External impacts on domestic institutions

There are several definitions of institutions. One definition is that institutions establish the "rules of the game" for a society. This is not far from North's definition of institutions as the formal and informal constraints on political, economic, and social interactions. At a more concrete level, institutions may be defined as particular organizational entities, procedural devices, and regulatory frameworks (IMF, 2003). These have an effect on economic performance by stimulating more or less productive and efficient behaviour of economic actors. Examples of institutions that promote economic performance include the protection of property rights, and the rule of law that stimulate investments in productive capacity and statutory provisions that establish the independence of a central bank which removes the manipulation of interest rates for political expediency.

While some of the hypothesized influences on institutions may apply over space, the bulk of theoretical work and nearly all empirical work examines the causes of institutional change on a domestic level. In this paper we focus on openness and regional spillovers as supplementary explanations. As for the first, Wei (2000) analyses the effect of openness on corruption. This author argues that the "natural openness" of a country – determined by its size and geographical position amongst other factors - affects its incentives to invest in a corruption-fighting public governance structure. In an open economy the trade-off between marginal cost and marginal benefits of better institutions will lead to an "equilibrium in which such economies may display less corruption and a higher quality of government than naturally less open economies" (Wei, 2000: 2). Islam and Montenegro (2002) have investigated and confirmed this relationship. They argue that there are at least four reasons why more open economies have better institutions. First, economic agents are more competitive internationally if their domestic environment is characterized by better institutions, and thus, countries will try to improve their institutions, in order to attract economic agents and ultimately increase overall economic welfare. Second, openness brings more competition among agents, which will make rent seeking and corruption more difficult. Third, better institutions are demanded to manage the risks that are associated with trading with unknown partners. Finally, there is a learning process based on the institutional conditions under which foreign agents work.[2] One of the conclusions they draw from their empirical research is that "... openness in trade is significantly and consistently correlated with measures of institutional quality that focus on economic features such as the rule of law, corruption and government effectiveness measures" (Islam and Montenegro 2002: 14). It is plausible that there is a dual causality between trade openness and institutions. Rodrik et al. find an effect of openness on institutional quality although the effect of institutional quality on trade openness is three times larger (Rodrik et al.: 143). Busse and Gröning (2007) use a dynamic GMM panel estimator to analyse the effect of trade openness on governance in developing countries. They find a relatively small effect that is close to zero for countries with low governance scores in the initial period and negative for resource intensive countries.

A second kind of reasoning with respect to external impacts upon domestic institutions starts from the assumption that institutions spill over between countries through various mechanisms. Jörgens (2003) distinguishes three mechanisms: harmonization, unilateral imposition and diffusion. *Harmonization* is the result of cooperative decision-making and may take place on different levels (global, regional, subregional). Generally, regional and subregional harmonization will result in agreements that have a more binding nature as the number

[2] This is a case of diffusion to which we return below when dealing with spatial spillovers.

of parties is lower compared to global harmonization, and the diversity of preferences is likely to be smaller and free riding is easier to monitor. There is *imposition* if institutions or policies are dictated upon countries by other states or international organizations. This may take the form of political or economic coercion, or may involve military threat or occupation. Examples of non-violent forms of imposition are conditionality attached to development aid or the Copenhagen criteria for countries in Eastern Europe that want to become full members of the European Union. It is plausible that imposition will be executed more effectively in regional settings where actors have higher stakes in exporting their institutions and the cost of imposition is lower. *Diffusion* may happen in different ways. Governments may imitate the institutions in other countries because of their proven attractiveness (learning, e.g. Easterly and Levine 1998) or reproduce other countries' institutions as a result of policy competition. Diffusion may also happen as a reaction to perceived threats from neighbouring countries. In case of regional political instability, a country may change its institutions to prevent itself from becoming instable as well. Voice and accountability and the rule of law may be curtailed to enable the incumbent government to quickly decide on military and police spending, on security measures (checking and restricting trade and the movement of people, investment) and on limiting civil liberties. An indication that this may happen is found by Bosker and Garretsen (2008) who compute correlations between neighbouring institutions and proxies for regional instability and found significant results for revolutions/coups, political instability, external war, the share of the government budget spent on military defence and the number of refugees. Not much research has been carried out with respect to institutional spillovers. Most authors try to answer the question whether the policies and institutions of neighbouring countries have an impact on the incomes of neighbouring countries, not on their institutions (e.g., Ades and Chua 1997; Murdoch and Sandler 2002). However, Easterly and Levine (1998) show in a cross-section estimation procedure that sub-Saharan African countries imitate each other's policies. They find "evidence consistent with the view that national economic policies are contagious" (Easterly and Levine, 1998: 122). Most close to the subject of this paper comes the study by Kelejian et al. (2007). These authors look into spatial spillovers between countries in the development of institutions. They explain the quality of economic institutions from a spatial lag of the dependent variable, constructed from the institutions in bordering countries. These authors control for the long-term determinants of institutions such as legal origin, resource base and ethnolinguistic fractionalization and the initial level of GDP per capita. They use a spatial panel data model. Their main finding is that spatial spillover effects are significant for the explanation of institutional quality.

Our arguments so far have essentially described three roles of the location of countries. In the closed economy model, the spatial patterns in institutional characteristics are explained from features intrinsic to the location, (especially distance to the equator). The local physical and historical environment is viewed as conducive to or harming the shaping of "good" institutions and consequent economic development. However, central to this paper are the two roles of relative location. First, higher openness to trade may affect domestic agents' interest in the nature of the local institutions, among others through increased competition and uncertainty. Proximity to other countries is therefore a potential explanation of the development of institutions. Secondly, it might also matter to *which* other countries are proximate. The relative location to other countries may hamper or boost local institutional and economic development, depending on the partner country's institutional situation. For instance, given a level of trade between two countries, institutional spillovers may be different if one country has policies that are worth imitating or induce a change of institutions to ward off a perceived threat.

The first point we will examine is, whether openness and spatial spillovers have a significant explanatory value for domestic institutions. In testing the strength of the two approaches we will define openness with respect to trade and to Foreign Direct Investment (FDI), in order to get a better understanding of the relevance of openness for institutions. We test the conditional explanatory power of the hypotheses regarding spillovers and openness in order to see if the one may render the other abundant. As the underlying mechanisms are different from each other, our central hypothesis is that openness and spatial spillovers both have an independent explanatory value with respect to the quality of institutions. The second point we examine is the relevance of external influences on institutions for the explanation of differences between countries in the level of income. We disentangle the effects of openness and spillovers on both income per capita and local institutions. While some researchers have argued for a role of foreign institutions in local growth, this analysis assesses an additional channel: one where external influences affect local institutions, which, in turn, affect local income.

3 Empirical evidence

In order to assess the empirical relevance of openness and spatial spillovers for domestic institutions, we take a closer look at the statistical determinants of institutions. Specifically, in this section we compare the proposed channels of external influences in a quantitative way. We model effects of openness (for trade and FDI) and specific spatial dependence among countries using different mechanisms. Then, we look at whether these effects hold up when they additionally explain income per capita directly.

For openness, we largely follow the established literature (such as Frankel and Romer, 1999) where the ratio of international trade to GDP explains growth. We do not follow Alcalá and Ciccone (2004) who use 'real openness' (exports and imports in current US$ over GDP in PPP US$) as we are primarily interested in the effect of openness on institutions, not on productivity. Due to a simultaneity bias, the explanatory variable has to be instrumented. The dependent variable is an indicator of the quality of institutions. The second hypothesis, on spillovers, claims that the institutions of countries in the vicinity are relevant for the quality of domestic institutions. In other words, it is not only important how open a country is, but it also matters who its neighbours are. This means that the nature of institutions of neighbouring countries matters. Modelling this mechanism introduces a strong cross-sectional dependence in the equation, because institutions in one country affect the other, and vice versa. To properly identify the spillover effects in the sample, we employ a spatial lag based on maximum likelihood, which explicitly takes this structure of dependence into account. Although the methodology is different, this paper compares on this point with Kelejian et al. (2007). The spatial lag is less straightforward than the specification using openness. Unlike trade or investments, we cannot observe a bilateral flow of institutional quality from one country to another. Therefore, we use a spatial lag employing standardized inverse distance[3]. This strategy imposes a structure of bilateral dependence between countries, after which we can estimate whether the structure matches observed spatial patterns.

There are thus two models we estimate and compare. The first incorporates a spatial lag of institutions and the second incorporates an indicator of openness:

$$\mathbf{Institution}_i = \rho \sum_j \mathbf{W}_{i,j}\mathbf{Institution}_j + \mathbf{X}_i\beta + \varepsilon_i \quad (1)$$

$$\mathbf{Institution}_i = \gamma\mathbf{Openness}_i + \mathbf{X}_i\beta + \varepsilon_i \quad (2)$$

[3] We have estimated a double spatial lag structure combining spatial lags. They are weights matrices of common borders (contiguity), inverse distance and standardized inverse distance multiplied with the dependent variable. We have added 0.001 to every observation of contiguity, to allow calculation of the eigenvalues. We follow the results in Rietveld and Wintershoven (1998). Basic t-tests suggest the lags based on standardized inverse distance and contiguity are significant when combined in a specification with two lags. A lag of standardized distance is not statistically significant when there is a lag using either standardized inverse distance or contiguity in the specification. We use a conditional test based on the Lagrange multiplier (see Anselin (2006), equation (26.130)). It tests the null-hypothesis that the relevant coefficient is zero, assuming the other coefficient is correctly estimated. In this case, the contiguity matrix is rejected as it contains no statistical significance conditional on the estimates of the coefficient of the standardized inverse distance lag. Vice versa, the coefficient of the lag using standardized inverse distance is significantly different from zero given the estimates for the contiguity-based lag. The joint LM-test (equation 26.128 in Anselin) rejects the coefficients of both lags being zero.

In the lag operator, $W_{i,j}$ denotes a weight of institutions in countries j in affecting institutions in country i. We use the row-standardized inverse distance as weights, i.e. $W_{i,i} = distance_{i,j}^{-1}$ and $\sum_j W_{i,j} = 1.$ Additionally, we test explanatory power of each model given the other model. To this end we use an artificial nesting model in which we use predicted values for the Rule of Law from the openness model in the lag model. In the nesting model we use a 2sls approach for the lag specification in order to make the two estimations comparable.

Next, we test the two channels in explaining income per capita differences between countries. We acknowledge that external factors may influence income levels directly, but also via their effect on local institutions. This setup is described by estimating the two equations of interest simultaneously:

$$\mathbf{Institution_i} = \rho \sum_j \mathbf{W_{i,j} Institution_j} + \gamma \mathbf{Openness_1} + \mathbf{X_1}\beta + \varepsilon_{1,1} \tag{3a}$$

$$\frac{\mathbf{GDP}}{\mathbf{capita_i}} = \alpha \mathbf{Institution_1} + \sigma \sum_j \mathbf{W_{i,j} Institution_j} + \delta \mathbf{Openness_1} + \mathbf{X_1}\varphi + \varepsilon_{2,1} \tag{3b}$$

The error terms are explicitly allowed to correlate. Further complications are the simultaneity bias and the reflection problem of the spatial lag in the right hand side variables. Therefore, the system exploits instrumental variables and is estimated by three stage least squares. We elaborate on the choice of instruments in a later section.

Local factors explaining institutions could also predict spatial patterns in institutions. Local circumstances may be similar in nearby countries, for instance through climate, resources or potential for exploitation by other countries.are important in this analysis. Therefore, we try to control for "local" explanations of institutions, especially focussing on the geographical explanations of first nature, such as disease and agricultural productivity and history. To control for the notion of geography, it is quite common to introduce absolute latitude as a (or the only) variable. We choose not to follow this strategy. Firstly, the interpretation of latitude is not clear as it plays a role in several explanations. Many first nature geography processes, such as disease environment, soil suitability, temperature and resources are subsumed in this variable. Secondly, we hypothesize that there is a spatial decay of dependence. When countries and thus observations have a strong impact on each other, the use of latitude produces a strong cross-sectional dependence. In that case, the role of relative location may also be present in the variable latitude.

3.1 Data

The above strategy is applied to a cross-section of countries in the year 2003. The motivation for a cross-section is twofold. First, information on institutional quality with a long time dimension is scarce. Second, since institutions are arguably endogenous and inert, the literature typically looks at historical factors, making many explanatory variables country-specific, not time-specific. The major drawback of a cross-section in this setting is that it does not inform us of the dynamics of institutional spillovers. It can shed light on whether institutional spillovers are present, but not on how quick we should expect changes in neighbouring countries or in trade to impact locally. As a dependent variable, we use the indicators on institutional quality as developed by Kaufmann et al. (2008) in the Worldwide Governance Indicators project. They are composed using various methods, and common factor analysis confirms their internal consistence. We are specifically interested in the Rule of Law variable as it describes the protection of property rights, judicial quality and independence, and the attitude to organized crime. To avoid non-linear interpretations in the spatial lag, we have added 2.5 points to the institutional variables in the Worldwide Governance Indicators: Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality and Control of Corruption.[4] For the weights matrices we depend on bilateral data. We have taken data on simple distance, joint language and joint colonial history from the distance databases at the CEPII. Bilateral export flows are from the World Bank (Nicita and Olarreaga, 2006). Table 1 contains descriptive statistics of the variables used.

[4] The source gives these indicators on a scale of -2.5 to +2.5.

Table 1 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Rule of Law	104	2.40	1.08	0.39	4.51
Voice & Accountability	104	2.43	0.97	0.65	4.01
Pol. Stability & Absence of Violence	104	2.16	1.02	0.14	4.15
Government Effectiveness	104	2.51	1.08	0.58	4.79
Regulatory Quality	104	2.49	0.99	0.30	4.40
Control of Corruption	104	2.48	1.10	0.79	4.96
Exports/GDP (perc.)	104	14.83	49.33	0	287.78
FDI/GDP (perc.)	78	7.99	10.41	0.01	48.68
British Legal Origin	104	0.33	0.47	0	1.00
Socialist Legal Origin	104	0.01	0.10	0	1.00
German Legal Origin	104	0.05	0.21	0	1.00
Scandinavian Legal Origin	104	0.04	0.19	0	1.00
Ethnolinguistic Fractionalization 1985	104	0.50	0.29	0	0.98
Soil Quality	104	33.69	10.28	5.23	64.55
Plague	104	0.08	0.15	0	0.62
Leprosy	104	0.62	0.42	0	1.05
Oil	104	0.10	0.30	0	1.00
Area (share) in (sub)tropic climate	104	0.44	0.43	0	1.00
Average Population Density	104	577.89	970.55	6.702	8,476.05
Land in 100km from coast/river	104	0.44	0.37	0	1.00
Area (share) in temperate zone	104	0.24	0.38	0	1.00
GDP/cap 2001	99	7,789.78	12,063.73	85.13	47,064.41
Fraction English as mother tongue	103	0.07	0.23	0	0.97

3.2 Results on Institutions

Table 2 presents the effects on the indicator Rule of Law. The maximum likelihood estimation of a spatial lag based on standardized inverse distance suggests that nearby countries' institutions have a significant and substantial positive effect on local institutions. The coefficient suggests that if all neighbours would increase their institutional indicator by 1 point, the country we look at would experience a growth of .56 points in its Rule of Law index. To assess robustness of this result, we have re-estimated this equation using the other institutional indicators. Table A1 in the appendix shows that similar conclusions can be drawn for other indicators of institutional quality. Moreover, we checked whether the lag was not simply picking up some other process through the use of distance. The last column of the appendix table shows a re-estimation of the spatial lag of the Rule of Law; for this we have replaced the distances with random distances. The spatial lag is rendered statistically insignificant through this operation. The set of legal origin dummies is jointly significant, and first-nature geography contains explanatory value by means of disease, climate and oil exports. Ethnolinguistic fractionalization has no significant impact given these controls.

In the second column we present the estimations of the effect of openness on the Rule of Law. Openness is defined as the share of exports in GDP. Because trade is likely to be determined by the institutional environment as well, we have instrumented openness using the methodology of Frankel and Romer. The instrument is a prediction of the sum of bilateral trade shares based on geographical features. We use a tobit-model predicting the ratio of bilateral export to GDP from variables describing inverse distance, area and landlockedness of the country of origin and destination, the interaction of these with a dummy for shared borders, and the dummy for shared border by itself. Aggregated by country, this variable (Pred. Export/GDP in table 2) is relevant to openness by exploiting physical geographical and hence exogenous variation. As an additional instrument, we use the average population density. We argue that the average population density is relevant to the share of exports in GDP, through increased options of production and specialization. At the same time, there is a less clear-cut relation between institutions and population density, and we assume population density to be exogenous. This assumption is tested in the Sargan statistic, which shows that we do not overidentify the equation using these two instruments. Moreover, in the first stage regression (lower part of table 2) both instruments are relevant to openness. The estimated coefficient for openness is significant and of considerable magnitude. An increase of one sample standard deviation in openness raises the Rule of Law indicator by 0.43 of its standard deviation.

Next, we test the independent explanatory power of the openness model and the lag model. We do this using an artificial nesting model, which involves introducing the predicted values for Rule of Law of the openness model into the lag specification. However, the estimation of the openness equation is based on two stage least squares while the estimation of the spatial lag equation uses the maximum likelihood technique. To make the two models comparable, we have re-estimated the lag specification using two stage least squares. We acknowledge and prefer the rigour of the maximum likelihood estimator used in the above, but instrumenting is another correct way to identify the coefficient on a spatial lag. Following Anselin (1988: 82), we first predict institutions using local controls only, and then weigh these predicted values according to standardized distance. This weighted prediction of institutions can serve as an instrument for the actual institutional lag. The estimates in the lag model obtained by the ML estimator differ from those obtained using instrumental variables. Therefore, we report the full sample estimates of the instrumental variable strategy in the third column of table 2. Qualitatively, the conclusions do not change. We introduce the predicted values of the equation that uses openness in the lag model and report the t-tests under "rival J-tests". Using this strategy, we confirm a strong role of a spatial lag structure in the openness model. Vice versa, we fit predictions of the openness model into the lag model. The value of the t-statistic is lower but significant at the 10 per cent level. Hence, this suggests that openness has additional explanatory value to a spatial lag structure.

The following columns repeat the exercise for FDI as a measure of openness. Again, we have instrumented FDI to disentangle its effect on institutions from its tendency to follow good institutions. We have taken two geographical variables to describe a country's potential for FDI, namely the area of land within 100 km from a coast or river, and the share of land in temperate climate zones. These instruments do not contain explanatory power for institutions themselves through first-nature geography. We control for a large part of first-nature geography; moreover, the Sargan test suggests we do not overidentify the equation. The result is a substantial role for the ratio of FDI to GDP. A standard deviation increase in FDI/GDP leads to an increase in Rule of Law of 0.76 of its standard deviation. Moreover, the model contains significant explanatory power when nested with the lag model. The artificial nesting test points out that the fitted values of the lag model have no explanatory power in the specification using FDI (the rival J-test). Predicted values of Rule of Law fitted into the spatial lag specification are statistically significant. In other words, the model using FDI seems to encompass the explanatory value of the model with a spatial lag.

Lastly, we follow the suggestion by Busse and Gröning (2007). They argue that trade will only have significant positive effects on growth once a minimum score on institutional quality has been achieved. We hypothesize that the same threshold applies for the effect of openness on institutions. In their assessment of the impact of institutions on growth, they allow for different intercepts in the bottom 20 per cent of the sample. Using our methodology, it is not useful to re-estimate the specification on 20 per cent of our dataset. Instead, we have rerun the estimations using a sample from which we excluded the institutionally weakest countries up to the 20th percentile. One would expect the effect of openness to increase, according to the logic of Busse and Gröning (2007). The results are presented in the last two columns of table 2. The coefficients of openness and the spatial lag are lower in this sample. This is not suggestive of a minimum threshold for institutions to be affected by trade or other countries' institutions. Moreover, after applying the nesting procedure for these 80 per cent of the countries, the openness equation has no explanatory power in addition to the spatial lag model: its J-test is insignificant. This is not a full-fledged test, but it may be deduced that the indicator for Rule of Law shows increased sensitivity to trade and external institutions when the indicator for Rule of Law is low.

Table 2 Effects on Rule of Law

	ML	2SLS	2SLS	2SLS	ML	2SLS
					Min 20th pctile. RoL	
Spatial Lag	0.561***		0.963***		0.499***	
	(0.186)		(0.227)		(0.192)	
FDI/GDP				0.0798***		
				(0.0174)		
Openness		0.00937**				0.00663*
		(0.00460)				(0.00349)
British L O	0.193	0.197	0.176	0.130	0.369***	0.376***
	(0.124)	(0.154)	(0.114)	(0.177)	(0.111)	(0.139)
Socialist L O	-0.466	0.0591	-0.538	0.0945	-0.499	-0.0806
	(0.581)	(0.747)	(0.531)	(0.694)	(0.453)	(0.587)
German L O	0.834***	0.647	0.622**	0.934***	0.746***	0.652**
	(0.293)	(0.417)	(0.279)	(0.331)	(0.235)	(0.322)
Scand. L O	0.655*	1.339***	0.447	-0.339	0.599**	1.135***
	(0.353)	(0.463)	(0.332)	(0.465)	(0.286)	(0.372)
Ethnoling. Fract.	-0.286	-0.361	-0.186	-0.358	-0.201	-0.225
	(0.235)	(0.287)	(0.218)	(0.332)	(0.213)	(0.266)
Soil Quality	-0.00841	-0.00858	-0.00920*	-0.00797	-0.0103**	-0.0116*
	(0.00605)	(0.00749)	(0.00552)	(0.00843)	(0.00505)	(0.00632)
Plague	0.643*	0.958*	0.605*	0.616	0.0326	0.234
	(0.382)	(0.489)	(0.349)	(0.521)	(0.317)	(0.410)
Leprosy	-0.801***	-0.813***	-0.622***	-0.243	-0.646***	-0.648***
	(0.172)	(0.220)	(0.170)	(0.233)	(0.141)	(0.179)
Oil	-0.516***	-0.388	-0.503***	0.0597	-0.465**	-0.343
	(0.198)	(0.255)	(0.181)	(0.330)	(0.188)	(0.246)
(Sub)Tropic Area	-0.438**	-0.481**	-0.271	-0.548**	-0.542***	-0.609***
	(0.176)	(0.216)	(0.172)	(0.248)	(0.167)	(0.196)
Constant	2.047***	3.260***	0.901	2.681***	2.215***	3.498***
	(0.594)	(0.383)	(0.692)	(0.468)	(0.645)	(0.322)
Observations	104	104	104	78	83	83
Rival J Test		6.594***	1.857*	1.496	1.584	6.271***
Reverse J Test				2.001**		
R-squared	.	0.584	0.774	0.604	.	0.669
Sargan		0.0572		2.416		0.0205
First Stage						
Pred. Export/GDP		0.585***				0.691***
		(0.204)				(0.247)
Population dens.		0.0107**				1.07e-05*
		(0.00475)				(5.39E-06)
Coast/River				2.103		
				(2.757)		
Land in temp. climate				15.80***		
				(2.373)		
Constant		43.75***		2.015		0.0525***
		(13.59)		(1.55)		(0.0162)
Joint F test		7.302***		28.46***		6.247***

*** p<0.01, ** p<0.05, * p<0.1, Standard errors in parentheses. Explanation of J-tests in the text.

3.3 Explaining income differences

So far, our focus was on external forces affecting local institutions. However, this does not assess the relevance of these factors for the explanation of cross-country income differences, as much of the literature does. Moreover, there are competing hypotheses on how the spatial structure of institutions affects income differences. Bosker and Garretsen (2008) argue that foreign institutions affect local incomes, as do local institutions. One could also argue that local institutions are influenced by foreign institutions, which in turn affect growth. It is also plausible that openness has a direct and an indirect impact upon growth through the effect on local institutions. To identify which of these channels are relevant, we estimate the equations simultaneously by applying 3SLS on equation (3), describing these channels. To identify the 3SLS estimates, we need instruments. An obvious choice as instrument for trade openness is the predicted openness we generated using the methodology of Frankel and Romer (1999). Furthermore, to exploit exogenous variation in institutions, we use the fraction of population with English as mother tongue, put forward by Hall and Jones (1999). We do not apply the often used indicator of settler mortality as this variable is quite restrictive to the sample. This restriction causes a bias in the coefficients in the presence of spatial interdependences (Anselin 1988). Lastly, for our spatial lag in institutions, the direction of causality is less of an issue. The term does need instrumenting to avoid the reflection problem. Here we applied the same IV strategy as we did to estimate the artificial nesting model, based on the weighted prediction of the institutional indicator of partner countries by the local variables of those countries (see section 3.2).

Table 3 presents the results of this specification. The estimations suggest that nearby institutions mainly explain differences in income via the local institutions, because the spatial lag in institutions is positive and significant in the institutional equation. Trade openness, however, shows a positive coefficient in *both* equations. In other words, openness has a positive effect on incomes both directly and through local institutional quality. However, since the sample standard deviation in openness is around 0.05, the effect of a standard-deviation increase on the institutional indicator is roughly three times higher for the spatial lag than for openness. The expected direct effect of an increase in openness on the value of income per capita is more than twice as large as the indirect effect via local institutions. One other result to note is that in the income equation, all our controls have statistically insignificant coefficients. There seems to be a small role for first nature geography, which, if anything, works via the local institutions.

Table 3 Income differences

	(1)	(2)	(3)	(4)	(5)
	3SLS			First Stage	
Dependent variable	Ln GDP/cap	Rule of law	Rule of Law	Lag RoL	Exports/GDP
Rule of Law	1.256*				
	(0.746)				
Lag Rule of Law	0.316	0.924***			
	(0.861)	(0.245)			
Openness	19.36**	6.699*			
	(9.450)	(3.818)			
British L O	-0.385	0.248**	-0.0556	-0.0767**	0.000166
	(0.306)	(0.116)	(0.153)	(0.0382)	(0.0110)
Socialist L O	0.0305	-0.212	-0.417	-0.0858	-0.0521
	(1.202)	(0.567)	(0.647)	(0.162)	(0.0466)
German L O	-0.740	0.289	0.669*	-0.0885	0.0509**
	(0.695)	(0.314)	(0.352)	(0.0880)	(0.0254)
Scand. L O	0.446	0.836**	0.556	-0.137	-0.0495
	(1.029)	(0.390)	(0.418)	(0.104)	(0.0301)
Ethnoling. Fract.	-0.575	-0.217	-0.0451	0.0320	-0.00349
	(0.507)	(0.229)	(0.267)	(0.0666)	(0.0192)
Soil Quality	0.00113	-0.00651	-0.00575	0.00143	0.000192
	(0.0125)	(0.00548)	(0.00651)	(0.00163)	(0.000468)
Plague	0.713	0.540	0.239	-0.149	-0.0418
	(0.888)	(0.377)	(0.421)	(0.105)	(0.0303)
Leprosy	0.116	-0.321*	-0.223	0.126**	-0.00500
	(0.447)	(0.180)	(0.228)	(0.0568)	(0.0164)
(Sub)Tropic Area	0.674	-0.286	-0.208	0.0803	-0.00538
	(0.445)	(0.186)	(0.224)	(0.0559)	(0.0161)
Weighted pred. Rule of Law			1.357***	1.354***	0.0295
			(0.366)	(0.0914)	(0.0263)
Fraction English			1.118***	0.249***	0.00887
			(0.327)	(0.0817)	(0.0235)
Pred. Openness			2.350	0.631	0.628***
			(2.949)	(0.736)	(0.212)
Constant	3.410**	0.604	-0.370	-0.946***	-0.0147
	(1.562)	(0.712)	(1.069)	(0.267)	(0.0769)
Observations	99	99	103	103	103
Joint F-test			18.20***	82.22***	3.11***
R-squared	0.618	0.763	0.708	0.916	0.293

Standard errors in parentheses, RoL= Rule of Law

*** p<0.01, ** p<0.05, * p<0.1

The estimated coefficient of the lag in institutions is much higher than in previous results, which may be partly due to the methodology. In fact, when estimating the institutional equation (3a) with 2SLS, the coefficient slightly falls to 0.87. The instruments are relevant, as witnessed from their statistical significance in the first stage regressions. Moreover, they contain some orthogonality, as not all instruments explain variety in one

instrumented variable. The spatially weighted prediction of rule of law based on local independent variables explains local and lagged rule of law. The same is true for the fraction of people speaking English, although its coefficient is far higher for the local Rule of Law. Openness is poorly predicted by either of these two variables, but is explained well by geographically predicted openness.

4 Conclusions

This paper tests two theories that explain external impacts on domestic institutional quality: openness and spillovers from proximate countries. The first explanation posits that openness for trade or FDI will have a positive relationship with institutional quality. The second explanation argues that the institutional quality of neighbouring countries will influence domestic institutions. We show that openness – either for trade or for FDI – has a significant impact on institutional quality. In the model using a spatial lag in order to test for the impact of institutional quality in neighbouring countries, we find a significant and positive impact on domestic institutions. From an artificial nesting model, we conclude openness provides explanatory power in addition to the average institutional quality of nearby countries when explaining local institutions. This result holds when using the share of FDI in GDP as a measure for openness. We also address the idea that the effect of openness on institutions is weak or absent for countries that have a very low institutional quality. When excluding the 20 per cent of countries that rank lowest in the institutional indicator, we find a decrease in the overall effect of openness on institutions, while the coefficient of the spatial lag is lower as well. The most plausible inference must be that the lowest ranking countries are somewhat more sensitive to external influences on their institutional quality - both through openness and institutional spillovers from neighbouring countries - than other countries. We therefore confirm both the results of Kelejian et al. (2007) on spillovers and of Rodrik et al. (2004) on the impact of openness- in trade and especially in FDI.

The impact of external factors on institutions is quite different when explaining income levels, however. In a simultaneous model controlling for trade openness, the institutional characteristics of nearby countries may affect local income per capita at most indirectly, via local institutions. This nuances the findings of Bosker and Garretsen (2008), who find a direct income effect of foreign institutions. Trade openness has both a significant direct effect on income levels and an indirect effect, by changing local institutions.

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Appendix

Table A1: Different indicators

Dependent variable	VA	PA	GE	RQ	CC	RL random lag
Spatial lag	0.704***	0.527**	0.696***	0.624***	0.556***	0.000186
	(0.174)	(0.221)	(0.160)	(0.185)	(0.184)	(0.00854)
British L O	0.105	-0.0923	0.184	0.101	0.154	0.216
	(0.132)	(0.154)	(0.119)	(0.125)	(0.120)	(0.145)
Socialist L O	0.435	0.136	-0.413	-0.411	-0.711	-0.365
	(0.619)	(0.720)	(0.557)	(0.585)	(0.564)	(0.678)
German L O	0.677**	0.656*	0.708**	0.609**	0.787***	1.130***
	(0.303)	(0.355)	(0.280)	(0.289)	(0.283)	(0.322)
Scand. L O	0.702*	0.717*	0.669**	0.463	0.754**	0.946**
	(0.371)	(0.435)	(0.337)	(0.351)	(0.345)	(0.397)
Ethnoling. Fract.	0.00363	-0.361	-0.103	-0.218	-0.202	-0.425
	(0.250)	(0.290)	(0.224)	(0.239)	(0.226)	(0.271)
Soil Quality	-0.00197	-0.00612	-0.00796	-0.00752	-0.0112*	-0.00728
	(0.00655)	(0.00755)	(0.00580)	(0.00612)	(0.00586)	(0.00717)
Plague	0.578	0.647	0.532	0.696*	0.484	0.696
	(0.407)	(0.473)	(0.366)	(0.385)	(0.370)	(0.445)
Leprosy	-0.496***	-0.516***	-0.705***	-0.795***	-0.846***	-1.051***
	(0.177)	(0.200)	(0.162)	(0.176)	(0.170)	(0.176)
Oil	-0.822***	-0.684***	-0.537***	-0.646***	-0.531***	-0.535**
	(0.214)	(0.246)	(0.190)	(0.200)	(0.192)	(0.231)
(Sub)Tropic Area	-0.140	-0.154	-0.451***	-0.181	-0.502***	-0.671***
	(0.170)	(0.201)	(0.164)	(0.164)	(0.173)	(0.187)
Constant	1.100**	1.778***	1.620***	1.810***	2.224***	3.620***
	(0.539)	(0.621)	(0.535)	(0.596)	(0.610)	(1.160)
Observations	104	104	104	104	104	104

*** p<0.01, ** p<0.05, * p<0.1, standard errors in parentheses
VA=Voice & Accountability, PA= Political Stability and Absence of Violence, GE=Government Effectiveness, RQ=Regulatory quality, CC=Control of Corruption, RL=Rule of Law