ABSTRACT

Title of Document: THREE ESSAYS ON INSTITUTIONS AND ECONOMIC DEVELOPMENT

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Institutions are humanly devised constraints that shape interactions between people. Changing those constraints affects people's incentives and, therefore, affects economic, political, and social outcomes. Studying institutional arrangements helps to shed some light on why there is a high variation of the level of economic development across countries. These theses address the questions of how institutions are formed, how institutional changes affect incentives, and how they influence economic development.

The first chapter studies the effect of change in the rule that assign points in soccer on optimal strategies of soccer teams playing in a tournament. It demonstrates that the change in the rule increases incentives of teams to collude in order to trade points. It also has heterogeneous effects on top and lesser teams.

Second chapter looks at impact of good regional governance infrastructure on inflows of foreign direct investment (FDI) in 24 transition countries from 1993 to

2003. The model takes into account spatial spillovers and spatially correlated error terms. It is estimated by a recently developed generalized method of moment (GMM) three-stage procedure. The results show that the regional quality of institutions is an important factor that explains variations in FDI inflows. The positive effect of good regional governance dominates the effect of better developed regional markets.

The third chapter investigates determinants of the quality of governance inside a country. The main finding is the importance of relative geographical location: good governance in the neighboring countries has a positive impact on quality of governance inside a particular country. Spatial links work mostly through long-term determinants of governance that include culture, legal system, and colonial history. At the same time, the closest neighbors have the strongest impact on quality of governance, while cultural and colonial " neighbors" that are not close geographically, have smaller impact on the local institutional development. According to our results, cross-country regressions that do not take into account spatial interdependence of countries produce biased estimation of the coefficients and incorrect inference of variance-covariance matrix.

THREE ESSAYS ON INSTITUTIONS AND ECONOMIC DEVELOPMENT

By

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Introduction

In the middle of the 1990s, the European soccer body UEFA recommended to the National Soccer Federations that they should reward three points for a win instead of two points as under the old regulations. Soon, this new system was universally adopted by all countries. The purpose of this change in the rules was to encourage a more attractive attacking style of play and reduce the number of scoreless games that were then widespread. However, the results of the new regulation have been mixed. For example, Guedes and Fernando (2002) showed that, even though the new rule reduced the number of draws and increased the average number of goals per game, the effects have not been uniformly distributed across all clubs. While the new system encouraged top clubs to play more aggressive soccer, lesser clubs have chosen to play defensively in reaction to the aggressive strategy of the top clubs.

More importantly, as will be shown in this paper, the new rules also created an incentive for explicit or implicit collusion among lesser clubs. This paper argues that the change in soccer regulations determining the number of points assigned for a win can potentially lead to collusion between teams. The teams can pursue the strategy of winning home games in exchange for losing away games. This strategy is consistent with the objective to maximize the total number of points in a season for a team that does not have the goal to win the championship. We look for evidence of collusion in the Ukrainian first division and compare the behavior of the clubs under the old and

new rules. Under the new rule, there is a pattern of results that is consistent with collusion. The Ukrainian and Italian leagues are compared under the three-point system to look for evidence of cross-sectional differences. The Italian league does not have a statistically significant relationship between the outcomes of the games between a pair of teams. As argued in this paper, this difference can be attributed to the higher probability of being caught and the higher potential monetary loses in the Italian Seria A.

Until recently, the study of corruption was primarily focused on measuring the overall level of corruption and its effect on the economic growth and income distribution in different countries. The most popular index that measures corruption levels and most frequently used by researchers is the Transparency International Corruption Perceptions Index (CPI), which ranks countries in terms of the degree to which corruption is perceived to exist among public officials and politicians. The CPI is a composite index currently derived from 18 different surveys and based on the opinions of regional experts, government officials, and businessmen.[1] It has been published by Transparency International on an annual basis since 1995. Some estimates of corruption earlier than 1995 are also available but only for a very limited group of countries.

The study of the effects of corruption on growth and inequality include Shleifer and Vishny (1993), Mauro (1995, 2004), and Baretto (2003). Most empirical studies found negative correlations between the level of corruption and economic growth (Mauro 1995). Shleifer and Vishny (1993), for example, argued that

[1]For more details please visit http://www.icgg.org/

corruption is costly to economic development because it requires secrecy. It distorts development by channeling funds into sectors where the monitoring of activities is difficult (e.g., construction or national defense). At the same time, it drains resources from more transparent sectors, such as education and health. The imperative of secrecy also gives political leaders an incentive to increase barriers to entry and reduce economic competition. Mauro (2004) analyzed a data set consisting of subjective indices of corruption, the amount of red tape, the efficiency of the judicial system, and various categories of political stability for a cross-section of countries. He found corruption lowers investment, thereby lowering economic growth. Mocan (2004) used survey data on bribes collected in different countries and suggested an index of corruption proportional to the actual number of bribes experienced by respondents in these countries. Mocan measured not only the number of bribes but also the perception of the level of corruption in the country and found that the perception of corruption is very strongly correlated with the quality of institutions in a given country.

An alternative theory suggests that corruption might be growth enhancing, especially in countries with highly regulated markets, because it loosens rigid economic ties and speeds up the processes of decision-making. As a result, it can reduce transaction costs and improve economic performance. This line of argument was first suggested by Leff (1964) and Huntington (1968).

While very important, these approaches are not very informative in terms of explaining the exact mechanisms of corruption and finding policies that will reduce it. These papers discuss the consequences of corruption without trying to explain why

some countries remain trapped in a high level of corruption and how others managed to escape. The key question to answer is: Are there features of culture, institutions, or political systems in a particular country that explain why this country is more corrupt than another? The general level of corruption is a vector to all social interactions within a country. These interactions are governed by social norms and legal regulations accepted by economic agents. By changing norms and regulations, agents can, to some extent, influence the level of corruption. To better understand how and why the quality of governance and the level of corruption influence the economy and society in general, a study of corruption on the micro level is necessary. This type of study can show the exact mechanisms and channels that connect markets, firms, and organizations on the one hand and the government and the bureaucracy on the other.

There are some obstacles that prevent applied microeconomic studies of corruption and its effects. Corruption is difficult to measure with the same means as GDP or the rate of growth. So, every time the researcher measures corruption by some index based on subjective expert opinions or some set of objective proxies the legitimate objection arises as to the selection of the experts or variables. Moreover, even if researchers can agree on some universal measure of corruption, the micro-level data on corruption is difficult to collect because of the illegal nature of these types of transactions. Unwillingness to reveal full and unbiased information also generates the problem of the quality of collected data.

To circumvent obstacles such as lack of objective measures and lack of good-quality data, researchers have proposed innovations that allow for the study corruption on a disaggregated level. One approach to the causes and effects of

corruption is based on the study of historical documents. Wallis (2004) showed how changes in state constitutions in the U.S. during the 1840s helped to increase the transparency of the government and to reduce corruption. These institutional innovations were American inventions, and today hard budget constraints and transparent corporate forms with secure stockholder rights are important institutional determinants of successful economies.

Duggan and Levitt (2002) suggested studying indirect evidence of corruption in sports. The evidence of corruption could be uncovered with some degree of certainty by finding patterns of events that indicate the existence of corruption and that are inconsistent with the alternative theory of honest behavior. They studied corruption in the highest echelon of sumo wrestling and showed that under the current system of sumo tournaments there is a room for illegal match rigging between wrestlers because of the nonlinearity of the payoffs for winning matches. They also showed that increased media scrutiny reduces match fixing confirming the idea that corruption likes secrecy and can be fought by promoting government policy transparency and an independent press. A similar approach is introduced in this paper to look for evidence of corruption in soccer. A game theoretical model that separates patterns consistent with corruption from patterns consistent with honest play is constructed and the model's predictions are empirically tested. By looking at soccer, this paper focuses on two topics: the effect of changes in the rules and regulations on the way the game is played and on the level of corruption in soccer.

The study of sport competitions seems like a very promising area to test theories of human behavior in general and of economics specifically. A sport

competition usually has a well-defined set of rules and regulations, the outcomes are observable, and statistical data are available. It can be considered as a well-defined social experiment to test theoretical predictions made by researchers. For example, Walker and Wooders (2001) tested game theoretic predictions on Nash equilibrium with mixed strategies by looking at tennis servings. They found that, in the contrast with the mixed-strategy equilibrium, professional tennis players switch serves from left to right too often. At the same time, serving strategies of better players were closer to the prediction of the model. Another example is Chiappori, Levitt, and Groseclose (2002) who studied if mixed strategy game theoretic predictions are in accord with the strategies of players who take soccer penalty kicks. They found that the theory performs quite well when tested against the actual data.

The current paper is organized as follows. In section 2, historical and factual background on the rules and regulations of soccer and explain the structure of a typical soccer tournament are given. Section 3 develops the model of collusion between teams. Section 4 tests the predictions of the model and elaborates on the arguments. Section 5 gives conclusions and plans for future research.

Historical background

The history of soccer begins in 1863 in England when rugby football and association football split into two different sports. This lead to the founding of the world's first football association. Soccer has evolved considerably during the last 140 years and has experienced many changes that have improved the game. The philosophy of soccer emphasizes the maintenance of balance between offense and

defense. The fact that teams score approximately 2.6 goals combined per game makes each goal very valuable and discourages teams from placing all their resources into offense. At the same time, there has been an overall trend of decline in the average number of goals per game throughout most of the 20th century. The trend become apparent in the 1960's when Italian teams applied catenaccio[2] tactics and dominated international club soccer competitions. Catenaccio is a command tactic that is built on protecting one's goal as a priority and attacking the opponent's goal as a secondary objective.

The success of catenaccio in Italy and internationally forced teams to play more defensive soccer and reduced the average number of goals between 1960 and 1980[3]. To promote more aggressive soccer, the European soccer body UEFA recommended awarding three points for a win instead of two points as under the old regulations. Soon, the new system was universally adopted by all countries under the guidance of the international soccer organization FIFA.

While there is some evidence that this change had its intended effect, the effect has not been as dramatic as expected. Brocas and Carrillo (2004) set up a dynamic game model to study the implications of the three-point win rule and the "golden goal" rule on the flow of soccer matches. They showed that in some

[2] "Catenaccio describes a tactical system in football with an emphasis on defense and tactical fouls. In Italian catenaccio means "door-bolt" and it effectively means a highly organized backline defense which is intended to prevent goals. It was made famous by Argentinean trainer Helenio Herrera of Inter Milan in the 1960s who used it to grind out 1-0 wins over opponents in their league games." (Wikipedia)

[3] There was a similar tendency in the NHL where defensive tactics proved to be more successful in winning the Stanley Cup during the late 90's. Also, the average number of goals scored per game has reduced dramatically over the last 15 years.

circumstances the incentive for teams to play offensively may be lower under the three-point rule than under the traditional two-point victory rule.

Guedes and Fernando (2002) studied the effects of the new rule on team strategies in the Portuguese first division league. Even though the average number of goals per game increased from 2.40 to 2.60, or by 8.5%, the favorites scored 13.4% more goals and losers scored only 1.3% more. Guedes and Fernando (2002) concluded that the new rule has a non-uniform impact on top teams versus lesser teams. It makes top teams play more aggressively and lesser teams more defensively. Our paper confirms that there are significant differences between the strategies of the top teams and the rest of the teams.

In addition to the small effect on the number of goals, the potential danger of the new rule is that it penalizes "quality" draws when teams make a considerable effort but cannot win because they are evenly matched. In this case, teams receive only two points combined. On the other hand, if one of the teams wins it gets three points.

Can teams collude to increase the expected number of points if they meet more than once? Suppose that two teams of the same quality meet twice per season and the probability of a draw is very high[4] and the situation is repeated for many years. Rational managers would prefer to agree on a home win for sure and to lose an away game in exchange, rather than to fight in each game with the high probability of a draw. Under collusion, each team would end up with three points and higher

[4] In a typical soccer tournament teams play twice per season. The unconditional probability of a draw is in a range 0.22- 0.32 in our sample (Table 1). The probability of a draw under a two point rule or in Italian Seria A is in a range 0.26-0.36 in a match between teams that finish the season below the third place

chances of avoiding relegation to the lower division. This type of collusion would be difficult to uncover, because it does not require cash transfers or any sort of written agreement between teams. The deal can be reached in an informal meeting between owners, managers, or even influential players of two teams. It even should not be in a form of agreement on a certain outcome. A low level of effort from an away team that substantially increases chances for a home team to win would be sufficient. As will be demonstrated in a theoretical model, win-at-home and loss-away is a self-enforcing strategy in a repeated game with a positive probability of meeting next season.

Empirically, if collusion is common event for at least some team-pairs, a loss in the away game will be a statistically significant predictor of a win in the home game. This problem is especially relevant if teams can strategically interact during long tournaments and can lead to corruption and point trading between teams. It is shown that under the current system of point-counting there is a possibility of corruption and point trading between teams who want to achieve a decent tournament position and avoid relegation to the lower division but who do not want to win the tournament. However, the result does not apply to the top teams who have incentives and abilities to win every game and the tournament as a whole. Also, it is important to point out that the results are valid only for the specific structure of the competition when many teams compete over a long period of time and when the interactions between teams are repeated across many seasons. For example, results will not apply to a tournament that has playoff games after the regular season and without the relegation rule.

It is important to emphasize the differences between the structure of North American and European sport leagues. First, the European soccer tournament not only rewards the champions but also severely punishes the losers. The exact mechanism of punishment consists of relegation to the lower division. A club that is relegated in principle may never make it back to the first division. Such a club suffers a loss of revenue from ticket sales, TV broadcasts, and sponsors. It may also lose its best players, since often players' contracts often have a relegation clause. This system leads to rotation, with the worst clubs from the higher divisions being replaced by the best clubs from the lower divisions.

Second, in contrast to North American sports, the probability of a draw is very high. In fact, it ranges around 20% to 30%, depending on the country and time span. For example, in the Soviet Union in the 1970s and 1980s, 30% of all games were tied and 34% of all ties were scoreless. In the early 1980's, the Soviet soccer federation introduced a clause to the rules that gave a team no points for a draw if the team reached a cap of ten draws per season.

Third, since there are no playoff games, competition in the middle of the table is not very intense. When the group of leaders is determined often the rest of the pack give up fighting for the championship and only try to maintain their distance from the relegation zone. This particular feature of a typical soccer competition in Europe creates a set of clubs - soccer clubs that do not have the ambition or the ability to win tournaments but merely try to stay in the middle to play in the tournament next season – we want to concentrate this study.

Model

This section develops a model of strategic interaction between two teams who seek to maximize utility over an infinite number of periods. First, we look at the optimal strategy of each team within a period, and then we extend our analysis over an infinite horizon.

Set up

The following notation is used:

1. There are two teams $i=\{h, a\}$ playing a game. *h* stands for the team that plays a home game and *a* for the team that plays an away game to distinguish between home and away games to model a home team advantage. The team which plays a game at home has a higher chance to win the game.
2. There are infinite number of periods $t=1,2,3,...$ each representing a regular season. The interactions between the teams continue over time and each team accumulates a history of previous interactions with the other team.
3. Within a period teams meet twice, and they switch roles between home and away teams. Matches are indexed by $j=1,2$
4. A team can pick one of the following strategies $S=\{fair\_play, collusion\}$

Definition 1 *The match is a lottery with* $L^i = \{p_1^i, p_2^i, p_3^i\}$, $p_k^i \geq 0$ *for all k, and* $\sum_{k=1}^{3} p_k^i$

where p_1^i *is probability of win,* p_2^i *is probability of draw, and* p_3^i *is probability of*

loss.

Outcomes of the lottery C={win, draw, lose}.

Definition 2 *R is a rule that transforms outcome C into points x.*

R: $C \rightarrow x$.

Timing within a period t

The schedule is decided. One of the teams plays the first match at home and the second match away. It is assumed that the probability to win at home is greater than the probability to win away: $p_1^h > p_1^a$

2. Teams can openly negotiate the strategies they are going to choose before match 1 starts. If they both choose to collude in a match *j*, then the outcome is known with certainty. If both teams play a fair play strategy, then $p_k^i > 0$ for all *k*. In other words, each outcome of the game is possible.
3. After teams decide on the strategies, the games are played and the points are assigned according to the rule *R*.
4. Game goes to the next period *t*+1 with probability φ. There is a small positive probability (1- φ) that one or both teams relegate to the lower division and the game ends.

Solving for equilibrium

Each team has an objective to maximize the expected life-time utility. The payoffs in a game are determined by the rule R:

C	**x**
win	*k*
draw	1
loss	0

A. Team chooses fair play

Expected utility of a fair play for a team that starts the first game at home in period *t*:

$$EU^{h}_{fpt}=kp^{h}_{1}+p^{h}_{2}+kp^{a}_{1}+p^{a}_{2} \qquad (1)$$

Expected utility of a fair play for a team that starts the first game away in period *t*:

$$EU^{a}_{fpt}=kp^{h}_{3}+p^{h}_{2}+kp^{a}_{3}+p^{a}_{2} \qquad (2)$$

B. Team chooses to cooperate

If both teams cooperate they can choose any outcome C they like. Consider the following collusion scheme: teams win at home and lose away. Another possible strategy is to lose at home and win away, but it is not plausible empirically. The scheme that involves a draw cannot be an equilibrium strategy under the three-point rule since it is inferior to the strategies mentioned above. The collusion strategy to win at home and lose away is a focal point that is both a Nash equilibrium under the condition specified below and that does not set off alarms for sport fans and officials. Expected utility of colluding in two games:

$$EU_{ct}^{i} = k - \mu D \text{ for } i = h, a.,$$

where μ is the probability of being caught, and D is the penalty of cheating measured in terms of lost points[5].

Teams will choose to cooperate over fair play if the following conditions hold:

$$k(p_1^h + p_1^a) + (p_2^h + p_2^a) < k - \mu D \quad (3)$$

$$k(p_1^h + p_1^a) + (k-1)(p_2^h + p_2^a) > k + \mu D \quad (4)$$

Necessary condition for inequalities to hold is

$$(p_2^h + p_2^a) > \frac{2\mu D}{k-2} \text{ if } k > 2 \quad (5)$$

$$\mu D = 0 \text{ if } k = 2$$

Assuming symmetry between home and away games,

$$p_2^h = p_2^a$$

$$p_1^h = p_3^a$$

$$p_3^h = p_1^a$$

then (5) becomes a necessary and sufficient condition and takes the following form:

$$p_2^h > \frac{\mu D}{k-2} \text{ if } k > 2 \quad (6)$$

$$\mu D = 0 \text{ if } k = 2$$

Under the two-point win rule even a small chance of being caught deters teams from trading home wins. When k>2, teams are more likely to collude if the probability of having a draw is high or the expected penalty of being caught is low. In addition, the higher the reward k for a win relative to the reward for a draw, the more likely collusion between teams becomes.

Parameter $D = L + f(M)$ is a function of the prestige and profitability of the tournament. Punishment could vary from a deduction of points, L, for both teams to relegation to the lower division if a team is found guilty of match-fixing. In the latter

[5] Officials can directly subtract certain number of points, L, from a team that was caught cheating. They can also impose economic sanctions, M. Total disutility for a team that was caught cheating is $D = L + f(M)$

case, M, represents the loss of all sources of profits specific to the higher division, such as TV money, opportunity to play in international competitions, and higher ticket prices. Parameter μ depends on the general attitude of sport officials and fans towards corruption and on how hard soccer authorities fight corruption. An incident of corruption is more likely to be exposed if the general level of corruption in a country is low. μ also depends on the ability of the media to find and expose the incidents of corruption in the country. In countries with a high level of corruption, μ tends to be close to 0 and examples of uncovering collusion between teams are extremely rare.

Ruling out deviations

The team that plays the first game at home has an incentive to deviate from the "win home-loss away" strategy and make an effort to win the second game of the season. To rule out this incentive consider the following punishment mechanism:

- At t+1 an away team colludes if the home team did not deviate at time t.
- The away team plays a fair game from time t+1 on otherwise.

Before proceeding further, the following parameters should be defined:

$\delta_1 \in (0,1)$	a discount factor between periods t and t+1
$\delta = \varphi\delta_1$	a discount factor adjusted for probability of relegation
$\mathbf{V_{fp}}$	life-time utility of playing fair play
$\mathbf{V_c}$	life-time utility of playing collusion
$\mathbf{v_{fp}}$	one period utility of playing fair play

$\mathbf{v_c}$ one period utility of playing collusion

$\mathbf{v_d}$ one period utility of deviation

A one period utility of collusion, deviation and fair-play strategies are:

$$v_c = k - \mu D$$

$$v_d = k - \mu D + kp_1^a + p_2^a$$

$$v_{fp} = kp_1^h + p_2^h + kp_1^a + p_2^a$$

Corresponding life-time utilities are expressed as:

$$V_c = v_c + \delta V_c$$

$$V_{fp} = v_{fp} + \delta V_{fp}$$

$$V_d = v_d + \delta V_{fp}$$

Then $V_c > V_d$ if

$$\delta > \frac{v_d - v_c}{v_d - v_{fp}}$$

or

$$\delta > \frac{kp_1^a + p_2^a}{k - \mu D - kp_1^h - p_2^h} \qquad (7)$$

Again, assuming symmetry

$$p_2^h = p_2^a$$

$$p_1^h = p_3^a$$

$$p_3^h = p_1^a$$

(7) can be simplified and rewritten as:

$$\delta > \delta^0 = \frac{k(1-p_1^h)-(k-1)p_2^h}{k(1-p_1^h)-\mu D-p_2^h} \qquad (8)$$

Under the old rule k=2. Assuming μD>0, the right hand side of (8) is greater than 1 and the collusion cannot be sustained in the multi-period game. On the other hand, under the new rule k=3. If probability of a draw is high and $p_2^h > \mu D$, which is more likely if penalty D is small or if the probability of being caught μ is low, the collusion equilibrium strategy can be supported if the discount factor δ in the range $(\delta^0,1)$.

Empirical part

This section discusses the empirical evidence that support the predictions of the model.

1. There is an opportunity for match-fixing between teams that increases their welfare in terms of maximizing the number of points in the tournament. The probability of collusion is higher if a draw is a likely outcome of a match and

teams do not compete for the championship. Therefore, teams of equal strength that do not compete for the top three spots in the tournament are more likely to trade points. On the other hand, teams of the highest quality are not likely to be engaged in point trading.

2. Collusion is more likely to occur in a country with a high level of corruption and less media exposure. Collusion is less likely to occur in a prestigious tournament with high monetary rewards.

Data description

Information on competition results is available over the Internet. The most complete and up-to-date source of various historical and contemporary soccer results is The Rec.Sport.Soccer Statistics Foundation that currently tracks results from more than a hundred soccer leagues. The website has a detailed description of the date of each game, outcome of the match, and number of goals scored and conceded.

The Ukrainian national tournament is played each year from August until June of the next year. A season is divided into two equal parts. The first part is played August through December and the second part February through June. The number of teams varied over the studied period in a range of 14-18 teams. Each team plays twice per season against all other teams. One match is played at home and one is played away. For each pair, the team that played the first round game at home was randomly determined by the officials according to the tournament schedule. A win is rewarded with 3 points, a draw with 1 point, and a loss with 0 points. At the end of the season, teams that took one of the first three places continued to play in the international

competitions (the European Champions League and the UEFA cup) with potentially high monetary bonuses as a reward. The worst two teams were transferred to the lower division.

An empirical model developed in the paper takes into account these features and divides all teams into two groups: top teams competing for the three highest spots and other teams whose goal is primarily to avoid relegation and play in the tournament next year. This division is natural because the pool of teams competing for the first three spots was limited and very stable. In fact, only two teams were competing for the first two spots during 1995-2003 because of their financial superiority and ability to buy more talented players, better training facilities, and better management staff.

We looked at the Ukrainian league tournaments in 1995-2003 and constructed a database of 1870 games. We also constructed tournament standings in the end of each season that have the following information: the final ranking of teams based on the total number of points; the total number of wins, draws, and losses for each team; and the total number of goals scored and conceded by each team.

To compare our results for the Ukrainian league over time and across countries, it is important to look at additional data. First, we looked at how the change in the point assignment changed the outcomes of games and teams' tactics. Since Ukraine did not exist as a separate state before 1991, we collected the data on the USSR soccer competitions in 1980-1991 to compare the results under the two- and three-point systems. We realize that the data is not perfect but believe that the comparison is still valid because Ukrainian soccer was on the leading positions in the

USSR soccer competitions. During the 70's and 80's, Ukrainian soccer was always represented by 5-6 teams, who constituted 30% of the first division. For the cross-section comparison, we looked at the Italian Serie A results in 1993-2003. The Italian Serie A was chosen as a reference point, since it is one of the most competitive soccer leagues in the world. It attracts a lot of attention from the mass media and the players are paid high salaries and bonuses. Therefore, the possibility of match-fixing is greatly reduced and opportunities for punishment are higher than in the Ukraine.

Table 1 presents some descriptive statistics for the dataset. It shows outcome frequencies of home losses, draws, and wins for the whole sample and for the two sub-samples in each country: the sub-sample of games where at least one of the teams ended a season in the top three spots and the sub-sample of the other games. We will also refer to the first sub-sample as competitive games. There was a decrease in the percentage of home game draws from 26% under the two-point rule to 22% under the three-point rule. Even though the percentage of the home game losses increased from 20% to 24%, the increase came in the competitive games: 24% against 32%. At the same time, we observe big deviations in the outcome frequencies of the Ukrainian league as compared with the Italian Serie A. Thirty-two percent of all games in Italy were draws—which is 50% higher than in the Ukraine. Also, the home team won only 46% of the games in Italy, while in the Ukraine the home team won 54% of the games. These differences are consistent with the model of collusion that predicts more honest games in more competitive leagues.

Table 1 Outcome frequencies and summary statistics of the second half of the tournaments

	Three points			Two points			Italy		
	Competitive games	Rest	All games	Competitive games	Rest	All games	Competitive games	Rest	All games
Outcome frequencies:									
Loss in a home game									
games	107[a]	118	225	125	188	313	134	222	356
share, %	*32*[b]	*20*	*24*	*24*	*18*	*20*	*27*	*19*	*21*
Draw in a home game									
games	63	141	204	139	281	420	124	422	546
share, %	*19*	*23*	*22*	*26*	*26*	*26*	*25*	*36*	*32*
Win in a home game									
games	160	346	506	267	603	870	246	536	782
share, %	*48*	*57*	*54*	*50*	*56*	*54*	*49*	*45*	*46*
Means and standard deviations:									
Average goals for home team	1.57[c]	1.55	1.55	1.69	1.59	1.62	1.57	1.62	1.60
	1.50[d]	1.25	1.34	1.41	1.27	1.32	1.40	1.24	1.29
Average goals against home team	1.16	0.83	0.95	1.08	0.86	0.93	1.08	1.05	1.06
	1.30	0.93	1.09	1.11	0.93	1.00	1.09	1.04	1.06
Sample size	330	605	935	531	1072	1603	504	1180	1684

Source: Authorth's calculations
Notes:
a Total number of occurencies for a subgroup
b Relative share in % for a subgroup
c mean
d standard deviation

The table also presents summary statistics of means and standard deviations of goals scored and conceded by the home team. Under the three-point rule, all teams scored 2.5 goals per game, while under the two-point rule they scored 2.55. This number is higher in Italy: 2.66 goals per game mostly because away teams score more than one goal per game.

Econometric model

Suppose that a home team *i* plays against an away team *j*. y_i^* and y_j^* are variables that characterize abilities of the teams. The ability of team *i* to score in a particular game against team *j* can be written as:

$$G_{ij} = h + g(y_i^*, y_j^*) + \varepsilon_{ij} = g_{ij} + \varepsilon_{ij}$$

where h>0 represents home field advantage

Analogously,

$$G_{ji} = g(y_j^*, y_i^*) + \nu_{ji} = g_{ji} + \nu_{ji}$$

where $\varepsilon_{ij} \sim (0, \sigma_\varepsilon^2)$ and $\nu_{ji} \sim (0, \sigma_\nu^2)$

The probability of a win for the team i is:

$$P(win) = P(G_{ij} > G_{ji}) = P(\varpi < h + g_{ij} - g_{ji}) = F(h + g_{ij} - g_{ji})$$

where $\varpi = \nu_{ji} - \varepsilon_{ij}$

Suppose that g_{ij} and g_{ji} have linear form,

$$g_{ij} = \alpha_0 + \alpha_1 y_i^* + \alpha_2 y_j^*$$

$$g_{ji} = \beta_0 + \beta_1 y_i^* + \beta_2 y_j^*$$

then we can apply the following logit model:

$$P(win) = P(G_{ij} > G_{ji}) = P(\omega < \lambda_0 + \lambda_1 y_i^* + \lambda_2 y_j^*)$$

$$= Logit(\lambda_0 + \lambda_1 y_i^* + \lambda_2 y_j^*)$$

where λ_0=h+ α_0-β_0 and λ_m= α_m- β_m, m=1,2

We estimate the logit regression where the probability of winning the home game is defined as:

$$P(win\,\text{hom}\,e) = \frac{\exp(\lambda_0 + lossaway * \gamma + \lambda_1 y_i^* + \lambda_2 y_j^*)}{1 + \exp(\lambda_0 + lossaway * \gamma + + \lambda_1 y_i^* + \lambda_2 y_j^*)} \qquad (*)$$

Only the games in the second part of each season were considered. We looked at the outcome of the match for the home team. The dependent variable is a dummy variable that takes value of 1 if a home team i won the game (***win at home***). The explanatory variable of the interest is ***loss away***. ***Loss away*** is a dummy variable that takes value of 1 if a home team i lost the game against j in the first round. To control for the strength of the teams, we use the following variables:

- ***avg home for*** average number of goals per game scored by the home team in a season;

- ***avg home against*** average number of goals per game conceded by the home team in a season;
- ***avg away for*** average number of goals per game scored by the away team in a season; a
- ***avg away against*** average number of goals per game conceded by the away team in a season.

Since the outcome of the current game is directly determined by the goals scored in the game, independent variables are not completely exogenous. The total number of goals scored and conceded in a season includes the goals in the current game. To deal with the endogeneity problem, we adjusted the control variables by factoring out goals scored and conceded in the current game, subtracting them from the totals when calculating averages. Moreover, we allowed error terms to be pair specific. Therefore, we estimated regressions using robust errors corrected for heteroskedastisity and clustering effects for each pair of teams.

Given the control for the strengths of the teams, a loss in the first game should have no effect on the probability of the win in the second game under the null hypothesis of no collusion. In fact, we expect the sign of the coefficient of the ***loss away*** variable to be negative if the control variables do not capture all the relevant information that helps to predict the outcome of the game. The fact that a team was beaten in a game against a particular opponent in the first round might indicate that the style of the team is ineffective to beat the opponent. Therefore, we expect that the team is less likely to win the current game if it lost a game against the opponent in the

past. Under the alternative hypothesis that collusion took place and teams agreed to trade points, the sign of the coefficient of the ***loss away*** should be positive.

In addition, we want to make a distinction between competitive games and the rest of the games. The model developed in the previous section predicts that honest play is more likely if at least one of the teams has the ambition to win the tournament. We do not expect collusion in games where one or both teams finished the tournament in the top three spots. On the other hand, collusion is likely between teams of comparable abilities who do not have the goal to win the tournament. Therefore, in addition to the whole sample we ran separate regressions for two subsamples of games: a competitive game subsample where at least one of the teams ended the season in the top three spots and a subsample of other games.

Results

First, we conduct a cross-sectional analysis. Table 2 shows the results of a logit regression **(*)** for the Ukrainian and Italian leagues. The outcome of the home game does not depend on the outcome of the away game in the Italian league. This result holds for the whole sample, as well as for the two subsamples of competitive and non-competitive games. The results are different in the Ukrainian competitions. While the coefficient of ***loss away*** is -0.948 for the subsample of competitive games, it is positive and significant 0.40 for the rest of the sample. Both coefficients are significant at 5% level and statistically different from each other at 1% level.

Table 2 Logit regressions. 3 points for win. Italy and Ukraine comparison

Dependent variable is the win in the home game. 1="Yes" 2="No"

	1		2		3	
	Whole sample		Home or away team ended at top 3		Other teams	
	Ukraine	Italy	Ukraine	Italy	Ukraine	Italy
Loss in away game	0.114	0.008	-0.948***	0.259	0.400**	-0.072
1="Yes" 0="No"	[0.71]	[0.07]	[2.84]	[1.27]	[2.27]	[0.54]
Home team						
Average goals for per game	1.026***	0.924***	0.387	1.046***	1.278***	0.806***
	[4.52]	[5.38]	[1.05]	[3.03]	[3.53]	[3.76]
Average goals against per game	-0.993***	-0.996***	-2.588***	-1.302***	-0.758***	-0.819***
	[4.44]	[5.18]	[4.32]	[3.25]	[2.80]	[3.47]
Away team						
Average goals for per game	-1.293***	-0.657***	-0.945***	-0.986***	-0.934**	-0.526**
	[5.77]	[4.17]	[2.65]	[3.17]	[2.53]	[2.49]
Average goals against per game	1.158***	1.543***	1.284**	1.468***	0.956***	1.571***
	[4.51]	[7.92]	[2.13]	[4.01]	[3.49]	[6.46]
Constant	0.317	-1.054**	2.515	-0.423	-0.497	-1.321**
	[0.44]	[2.14]	[1.64]	[0.43]	[0.55]	[2.32]
Observations	935	1610	330	502	605	1108

Robust z statistics in brackets

** significant at 10%; ** significant at 5%; *** significant at 1%*

This difference was tested by running a regression with the following specification:

$$P(win\ \text{hom}\, e) = \frac{\exp(\lambda_0 + \gamma_1 * lossaway * strength + \gamma_2 * lossaway * (1 - strength) + \lambda_1 y_i^* + \lambda_2 y_j^*)}{1 + \exp(\lambda_0 + \gamma_1 * lossaway * strength + \gamma_2 * lossaway * (1 - strength) + \lambda_1 y_i^* + \lambda_2 y_j^*)}$$

(**)

where ***strength*** is a dummy variable that takes value of 1 if at least one of the teams in the current game ended the season in the top three and takes 0 otherwise (see Table 3).

We ran the Wald test to check for the equality of coefficient in the competitive games and the rest of the games that was rejected at 1% level for the Ukrainian sample and could not be rejected for the Italian one. The results show that there is a clear distinction between competitive games and other games in the Ukrainian national tournament. In addition, this points to the possibility of collusion between lesser teams in the Ukraine. The difference between Italian and Ukrainian competitions according to the model developed in the previous section can be attributed to the prohibitively high risk of collusion and lower overall level of corruption in Italy.

Table 3 Logit regressions. Italy and Ukraine comparison

Dependent variable is the win in the home game. 1="Yes" 0="No"

	Ukraine	Italy
Loss in away game*strength	-0.885***	0.106
	[3.44]	[0.63]
Loss in away game*(1-strength)	0.405**	-0.026
	[2.40]	[0.21]
Home team		
Average goals for per game	1.138***	0.910***
	[4.84]	[5.30]
Average goals against per game	-1.170***	-0.985***
	[5.07]	[5.10]
Away team		
Average goals for per game	-0.940***	-0.684***
	[3.81]	[4.23]
Average goals against per game	1.009***	1.576***
	[4.02]	[7.83]
Constant	0.176	-1.061**
	[0.24]	[2.15]
Observations	935	1610

Robust z statistics in brackets

** significant at 10%; ** significant at 5%; *** significant at 1%*

All control variables are significant and have expected signs. A team that on average scores more goals is more likely to win. Therefore, the probability of winning in a home game increases if the home team on average scores more goals and decreases if an away team scores more goals. A team that on average concedes more

goals is less likely to win. The probability of winning a home game decreases if a home team concedes more goals and increases if an away team concedes more goals.

According to the results of the cross-country regressions, we make the following conclusions. First, the outcome of a game between two teams in the Ukraine depends on how the teams played in the past. The relationship is quantitatively and qualitatively different for the competitive sub-sample and the rest of the games. It is positive and significant at 0.40 for the latter and negative and significant at -0.948 for the former. Second, there is no statistically significant connection between the current and previous games in our benchmark example. In the Italian league, the result of the current game cannot be explained by the way teams played in the past.

Next, we compare the results under the two- and three-point rules. As the model developed in previous section demonstrated, clubs have no incentive to trade home wins under the two-point system if the possibility of being caught is positive. According to Table 4, the result of the current game between two teams does not depend on the result of the previous game between the same teams under the two-point rule. The coefficient of ***loss away*** is positive but not significantly different from zero for the whole sample and for both subsamples. For the competitive games the coefficient is 0.044 and for the rest of the games it is 0.195; which is two times smaller than under the three-point system. We also run a Wald test for a difference of coefficients under two and three point rules and reject it for three point rule (Table 5). These findings confirm our intuition that the new rule created more incentives for point trading and therefore produced a statistically significant relationship between

the outcomes of the home and away games for teams in the lower part of the tournament table.

We also run regressions on the average number of points gained by a team in the current season as an additional control variable. Here, we found a high degree of collinearity with the other control variables. Moreover, this did not affect the results of the paper, so we have not included those results in the paper.

Table 4 Logit regressions. 3 points for win and 2 points for win comparison

Dependent variable is the win in the home game. 1="Yes" 0="No"

	1		**2**		**3**	
	Whole sample		Home or away team ended at top 3		Other teams	
	3 points	2 points	3 points	2 points	3 points	2 points
Loss in away game	0.114	0.148	-0.948***	0.044	0.400**	0.195
1="Yes" 0="No"	[0.71]	[1.37]	[2.84]	[0.22]	[2.27]	[1.48]
Home team						
Average goals for per game	1.026***	0.558***	0.387	0.528	1.278***	0.213
	[4.52]	[2.65]	[1.05]	[1.48]	[3.53]	[0.62]
Average goals against per game	-0.993***	-0.499**	-2.588***	-1.056**	-0.758***	-0.242
	[4.44]	[2.19]	[4.32]	[2.07]	[2.80]	[0.91]
Away team						
Average goals for per game	-1.293***	-0.928***	-0.945***	-1.095***	-0.934**	-0.505
	[5.77]	[4.84]	[2.65]	[3.07]	[2.53]	[1.56]
Average goals against per game	1.158***	1.380***	1.284**	1.375***	0.956***	1.317***
	[4.51]	[5.80]	[2.13]	[2.93]	[3.49]	[4.76]
Constant	0.317	-0.463	2.515	0.446	-0.497	-0.827
	[0.44]	[0.90]	[1.64]	[0.41]	[0.55]	[1.37]
Observations	935	1518	330	498	605	1020

Robust z statistics in brackets

** significant at 10%; ** significant at 5%; *** significant at 1%*

Table 5 Logit regressions. 3 points for win and 2 points for win comparison

Dependent variable is the win in the home game. 1="Yes" 0="No"

	3 points	2 points
Loss in away game*strength	-0.885***	0.004
	[3.44]	[0.02]
Loss in away game*(1-strength)	0.405**	0.206
	[2.40]	[1.61]
Home team		
Average goals for per game	1.138***	0.593***
	[4.84]	[2.75]
Average goals against per game	-1.170***	-0.530**
	[5.07]	[2.32]
Away team		
Average goals for per game	-0.940***	-0.834***
	[3.81]	[4.05]
Average goals against per game	1.009***	1.346***
	[4.02]	[5.59]
Constant	0.176	-0.534
	[0.24]	[1.03]
Observations	935	1518

Robust z statistics in brackets

** significant at 10%; ** significant at 5%; *** significant at 1%*

Conclusions

The new system of points assigned for the outcomes of soccer games has produced mixed results. It was beneficial for competitive tournaments such as the Italian Serie A, as it promoted a more attacking style of play and increased the number of goals. However, in less competitive environments it had a negligible effect on the scoring and produced more corruption and manipulation of the outcomes of games. The evidence presented in this paper shows that there is a statistically significant connection between the outcome of the home game and the outcome of the away game between the pair of teams during the season that was not statistically significant under the old system of point counting. The results also indicate a striking difference in the incentives produced by the new system for top teams versus lesser teams. While top teams are now playing attacking soccer and put an extra effort to win in a game if they lost the previous one, lesser teams have an incentive to trade points and employ an even more defensive style than under the old system.

The results, however, do not point conclusively to evidence of corruption because the statistically significant correlation between results of the first and second games is also consistent with an equilibrium strategy of exerting more efforts in a home game and less effort in an away game. Further investigation is required to find evidence in favor of one of the hypothesis or the other.

Chapter 2: Regional Governance Infrastructure: The Positive Externality on the Inflow of Foreign Direct Investment

Introduction

In the 18th century, Adam Smith raised an important question about the causes of the wealth of the nations. Economic theory has made a considerable progress over the last 200 years but economists repeatedly come back to this question in hopes to find a satisfactory answer. One of the predictions of a simple neoclassical model is the convergence of per capita incomes across countries and geographical regions. According to this theory, capital should flow from rich to poor countries until the rates of return to investment are equalized across all countries. Lucas (1990), who raised the question why capital does not flow from the rich to the poor countries, made the following observation: a simple neoclassical model with the constant return-to-scale technology and perfect capital markets estimates that the marginal product of capital in India is 58 times higher than the marginal product of capital in the US. Therefore, all new investments should go to India rather than US. As a result, low-income countries should grow faster; wage rates and amount of capital per worker should equalize; and income inequality across countries should decrease over time.

In reality, however, income inequality across countries has been increasing for the last thirty years and, by some estimates, reached the highest level since the 18th century. In the time of Adam Smith, the differences in GDP per capita between rich

and poor countries were barely 2-3 fold. Currently, OECD countries have a GDP per capita based on purchasing power parity (PPP) that is 35 times higher than that of Sub-Saharan Africa region.[6] Table 6 shows the recent trends in PPP based GDP per capita. Despite the fact that the average GDP per capita for all countries grew over the last 30 years, the average GDP per capita for the poorest 5% of the countries declined from $800 to $783. The ratio of the GDP per capita of the richest 5% countries to the GDP per capita of the poorest 5% countries has increased from 25 to 37.

Table 6 GDP per capita in 1975-2004

Period	Mean GDP per capita in all countries	Standard Deviation	GDP per capita in the poorest 5%	GDP per capita in the richest 5%	Ratio of GDP per capita of the richest 5% to the poorest 5%
1975-1979	7257	7326	800	19982	25
1980-1989	7491	7334	814	21979	27
1990-1999	8050	8296	781	24443	31
2000-2004	9009	9875	783	28781	37

Note: GDP per capita, PPP based, in constant US dollars of 2000. Sample consists from all available observations.
Data source: World Bank, GDF and WDI central, August 2005

High volumes of capital flows to the poor countries are simply not observed in the data. In fact, over the last 30 years, almost 80% of cumulative FDI inflows went to the high-income countries and only 1.6% of FDI inflows went to the low-income countries, as shown in Figure 1. The expected negative relationship between the income level and capital flows is observed only for the middle-income countries: 12% of total FDI went to the lower middle-income countries and 8% of FDI went to the upper middle-income countries.

[6] Numbers are taken from the presentation by D. Acemoglu at the World Bank, January 19, 2006

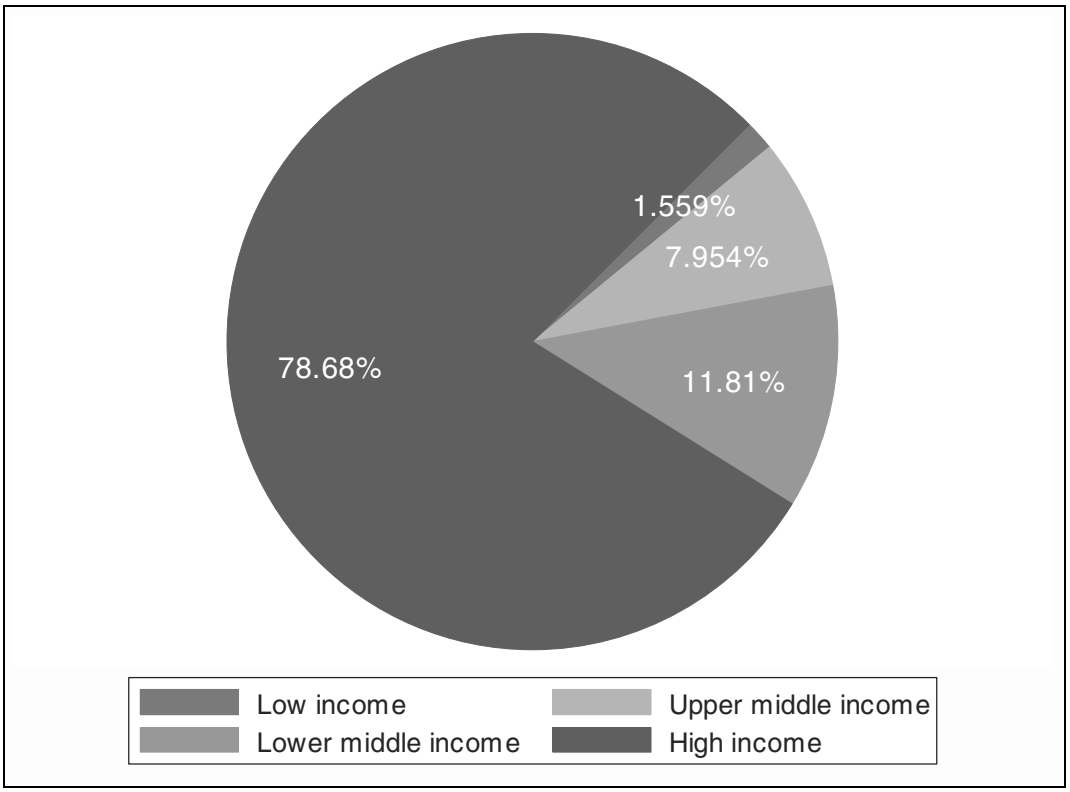


Figure 1 Distribution of cumulative FDI inflow in 1975-2003 by income groups

Data source: World Bank, GDF and WDI central, August 2005

It is also interesting to look at the geographical locations of the major recipients of FDI and compare them with geographical location of countries with different income levels. The majority of countries that received considerable FDI inflow in 2003 were located in North America, European Union, and South East Asia as shown in Figure 2. These regions also tended to have higher than average levels of GDP per capita according to Figure 3. The poorest countries, primarily located in Africa and Central Asia, received just a small fraction of FDI. These observations suggest that countries cluster geographically by income levels and by the amount of FDI they receive thus requiring an explanation on the underling economic forces that lead to such an even distribution of wealth and capital flows.

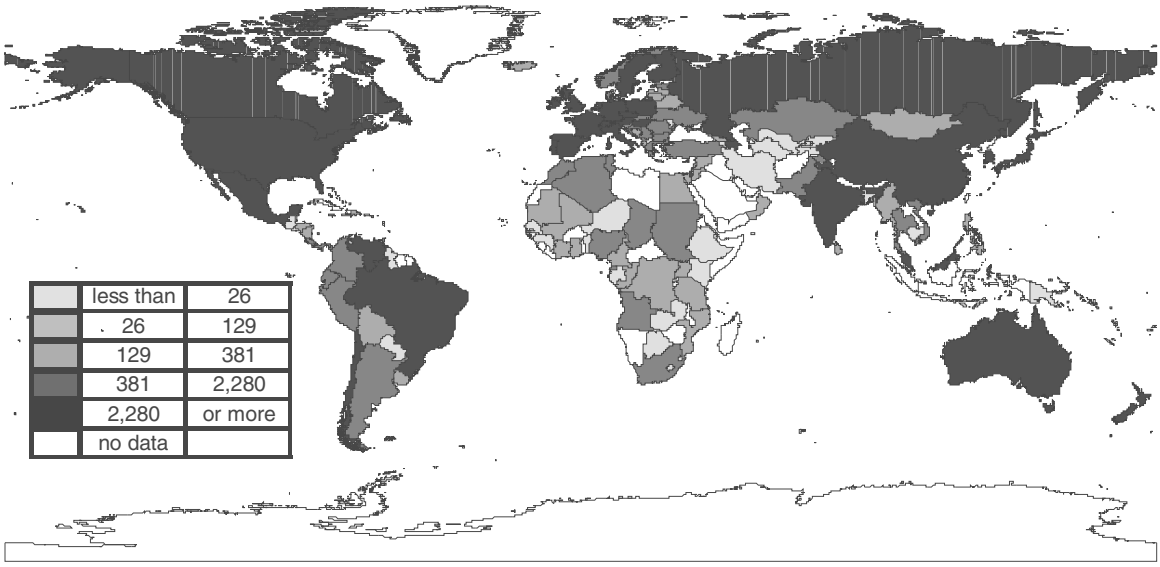


Figure 2 FDI inflow in 2003

Note: FDI inflow in million current US dollars. Data source is World Bank, GDF and WDI central, August 2005

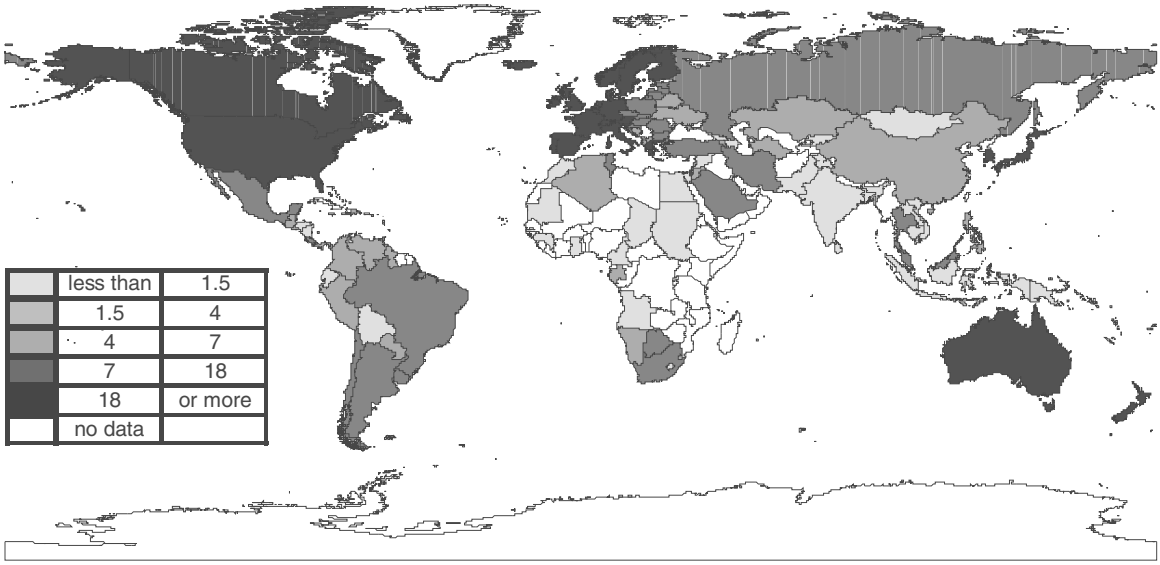


Figure 3 GDP per capita in 2003

Note: GDP per capita, PPP based, in thousand of constant US dollars of 2000. Data source is World Bank, GDF and WDI central, August 2005

In his article, Lucas (1990) suggested three possible explanations to reconcile the empirical regularities with economic theory: differences in human capital, differences in technologies, and capital market imperfections. He argued that the differences in the marginal product of capital vanish if the differences in human capital and technologies across countries are taken into account. In addition, he indicated that capital market imperfections and political risks can prevent capital from flowing to countries with higher return on investment. These explanations, however, do not answer the fundamental question: why some countries are successful in accumulating human capital, generating new technologies, and lowering investment risks while others trapped in poverty.

Currently, there are two competing - but not mutually exclusive theories - that address this question. These theories can be broadly defined as a new economic geography and institutional theory of development. The first theory emphasizes that a good geographical location, abundance of natural resources, arable land, and water are key components for economic development. As the centers of economic activities are formed in places that have favorable geographical locations and natural resources, they start growing by attracting additional labor and capital from less favorable places. Assuming the increasing return-to-scale technology, the growing economic centers start benefiting from an agglomeration as well as bigger local markets and become even more attractive places for migration and capital investment. Therefore, a self-reinforcing agglomeration process can produce the clustered picture of the world that is observed today.[7]

[7] See, for example, Baldwin at al (2001)

The economic geography theory, however, cannot explain historical processes that led to destruction of old economic powers and subsequent creation of the new centers of development. An institutional theory of development, on the other hand, underlines organization of societies and creation of the right incentives as major factors for economic development. Acemoglu, Johnson, and Robinson (AJR 2002), for example, argued that among countries colonized by Europeans, countries that were rich in 1500 are relatively poor now while countries that were poor 500 years ago are relatively rich. This reversal of fortunes cannot be explained by geographical factors since they have remained unchanged. The institutional theory, on the other hand, explains the economic reversal by institutional changes because Europeans deeply influenced institutions and political systems of colonized societies. Moreover, AJR (2001, 2002) argued that Europeans were more likely to create good institutions that favored growth and protected property rights in the regions that were less urbanized at the time of colonization. As a result, the reversal of institutions caused the reversal of income levels that occurred in the late 18th century. There is a growing empirical literature that supports the idea that institutions are important determinants of economic development.[8] In particular, many researchers tried to resolve "Lucas Paradox" since FDI and other capital flows are one of the important driving forces that generate economic growth and produce technological spillovers in developing countries.[9] As an example of recent empirical papers, Alfaro, Kalemli-Ozcan, and

[8] See, for example, Knack and Keefer (1995), Mauro (1995), Barro (1999), Hall and Jones (1999)
[9] The positive effects of FDIs mentioned in the literature include the following: promotion of economic growth and economic competition (Campos and Kinoshita 2002, Beck and Laeven 2005), transfer of knowledge and technologies (Javorcik 2004b), positive spillover effects on domestic firms (Globerman and Shapiro 2003)

Volosovych (2005) identified the low quality of institutions as the leading factor that explained why capital does not flow to poor countries.

It is important to integrate a spatial dimension into the study of the effects of institutions on the economic development. The fact that consistently different geographical patterns of FDI inflow are observed across regions suggests the existence of broader regional factors that determine the choice of FDI location. This paper studies country and region-specific factors that encourage multinational companies to invest in a developing country. To answer this question, in addition to the usual suspects such as a country-specific quality of institutions, GDP, and factor endowments; broader set of regional characteristics such as a regional GDP and regional quality of institutions is considered. As argued in this paper, variations in regional quality of institutions explain a significant part of variations in FDI inflows. Good economic and political institutions have a positive external effect on the economic development in the region. This can produce a positive spillover of better governance from one country to another as a result of better investment climate and broader market access at the firm's level. Thus, better regional institutions improve the regional investment climate and increase FDI inflow into each country of the region.

To investigate the impact of regional factors, this paper looks at the experience of 24 transition countries located in Eastern Europe and Central Asia (ECA) region. Transition provides a researcher with a unique policy experiment to study how rapid exogenous changes in the organization of societies influence economic development. The pace and direction of changes were largely determined

by the previous experience in these countries under Communist rule. Beck and Laeven (2005), for example, showed that dependence on natural resources and historical experience of these countries under socialism were major determinants of institution building in transition by the way these factors influenced the political structure during the initial years of reforms.

The ECA region became an important destination of FDI inflows. FDI in this region has increased from US$7.8 billion in 1993 to US$35.6 billion in 2003. At the same time, FDI flows within the ECA region are distributed very unevenly matching the worldwide pattern: more developed, relatively rich and well-governed countries located in Central and Eastern Europe (CEE) receiving a major share of FDI while relatively poor and less-reformed countries located in Central Asia receiving only a small fraction of FDI. As an illustration of the importance of the regional factors, two countries from Central Europe and Central Asia regions can be compared. Albania from the Central Europe and Kyrgyz Republic from the Central Asia are about the same size in terms of population. They both mostly consist of mountainous terrain and are not rich with natural resources. Main sectors in both countries are agriculture and tourism (Adriatic Sea in Albania and Issyk Kul Lake in Kyrgyz Republic). In 1993, Albania had $388 GDP per capita, $18 FDI per person, and 1.8 index of governance infrastructure. During the same period, Kyrgyz Republic had $452 GDP per capita, $2.2 FDI per person, and 1.7 index of governance. By 2003, indices of governance in Albania and Kyrgyzstan had reached 2.7 and 2.8 consequently, which indicates marginally better progress of reforms in Kyrgyzstan. At the same time, FDI

per capita in Albania and Kyrgyzstan, in 2003, had reached $56 and $9 consequently[10].

In addition to the importance of studying location choice of FDI, our analysis implements the spatial econometric modeling technique that is developed to estimate the models with distinct regional patterns of economic variables. In the case of spatial spillovers and spatial correlations, a simple OLS or panel data estimation will produce incorrectly identified confidence intervals. Obviously, this will lead to incorrect conclusions about the level of significance of the regression coefficients. The spatial econometric technique (Cliff and Ord 1981, Anselin 1988, Kelejian and Prucha 1999, 2004) augments the model by accounting for spatial spillovers. A panel data analysis with spatial lags of independent variables and spatially correlated error components is applied in this paper. To our best knowledge, this is the first attempt to estimate the impact of institutions on countries in transition in the context of a spatial panel data regression.

The structure of the rest of the paper is as follows. First, theoretical links between regional governance and local economic development are considered. Second, importance of FDI for transition economies is analyzed. Third, an econometric model that includes regional spatial spillover and takes into account spatial correlations is developed. Fourth, results and main findings are presented. Finally, the robustness check is presented and possible extensions of the model are discussed.

[10] Another pair of countries that made similar progress in terms of reforming governance but differences in economic development are Romania and Armenia. At the same time, in 2003, Romania received $85 FDI per capita while Armenia received only $40 FDI per capita.

Impact of better governance on economic performance in transition

Similar to the worldwide patterns, transition countries are geographically clustered with respect to their economic development (see De Melo et al, 1997; Berglof, 2003). Central and Eastern European countries (CEE) enjoyed a relatively smooth transition, with steady economic growth from 1993 to 2003, while Commonwealth of Independent States (CIS) countries struggled with a steep economic decline that did not stop until 1999. Eastern European countries also had better economic performance for a wide range of economic indicators. For example, Eastern European countries were able to attract $1,250 of FDI per capita per year during the period, while former Soviet Union countries managed to receive only $380[11]. Table 7 presents cumulative FDI into transition countries for the period 1993-2003.

[11] A big part of FDI in CIS countries went to the oil and gas sectors. If we compare FDI in manufacturing industries, the differences in FDI per capita are even greater.

Table 7 Cumulative FDI in transition countries in 1993-2003

Country	Cumulative FDI in 1993-2003, million of US$	Share of Total FDI, %
Albania	1,070	0.4
Armenia	852	0.3
Azerbaijan	8,660	3.5
Belarus	1,780	0.7
Bulgaria	6,340	2.6
Croatia	9,560	3.9
Czech Republic	38,500	15.7
Estonia	3,990	1.6
Georgia	1,390	0.6
Hungary	26,700	10.9
Kazakhstan	16,900	6.9
Kyrgyz Republic	512	0.2
Latvia	3,170	1.3
Lithuania	3,770	1.5
Moldova	671	0.3
Poland	53,600	21.9
Romania	10,600	4.3
Russian Federation	33,900	13.8
Slovak Republic	10,300	4.2
Slovenia	3,870	1.6
Tajikistan	214	0.1
Turkmenistan	1,260	0.5
Ukraine	6,510	2.7
Uzbekistan	908	0.4
Total	245,027	100

Note: FDI inflow in million current US$. Data source: World Bank, GDF and WDI central, August 2005

The variance in economic performance cannot be explained solely by the differences in macroeconomic policies carried out by the countries because most former Soviet Union and Eastern European countries took similar macroeconomic approaches in their transitions to market economies (De Melo et al., 1997; Falcetti, Raiser and Sanfey, 2002). The recipe prescribed by leading economists and economic organizations of that period included rapid privatization, price liberalization, and further macroeconomic stabilization. Mass privatization or voucher programs were implemented in most CEE and CIS countries (Brada, 1996). The price liberalization and monetary stabilization programs developed and monitored by the International

Monetary Fund (IMF) were considered key elements of transition. Gelb et al. (1999) discussed macroeconomic policies and found "strong common patterns for countries at similar stages of reforms."

The diversity can be explained, at least partially, by differences in institutional structure and the pace of building new economic institutions across countries. As pointed out by Murrell (2003), "reforming countries ended the 1980s with a set of formal institutions far different from those of market capitalism." The destruction of old institutions produced a vacuum of institutional infrastructures that led to a drop in output and productivity in the short run. Recent empirical studies (Beck and Laeven, 2005; Bevan and Estrin, 2004; Campos and Kinoshita, 2003; Havrylyshyn and van Rooden, 2003; Smarzynska Javorcik, 2004a) confirmed that the quality of institutions, government policies, and legal environment played an important role in the economic development and largely explained the differences in economic performance of countries in transition. These policies and institutions are referred to as "local governance infrastructure" throughout the following discussion.

Governance infrastructure is defined as a combination of institutions and economic policies that regulate relationship between economic agents[12]. Governance infrastructure is evaluated as "good" or "bad" with respect to the effects it has for economic development. Good governance infrastructure includes the following functions:

[12] Globerman and Shapiro (2003) suggested this term as a combination of institutions and government polices. Similar to social and human capital, governance infrastructure increases the productivity of capital and reduces the transaction costs of doing business.

- Create and enforce transparent laws and protect property rights.
- Promote market competition and economic stability
- Solve market externality problems

As an illustration of the positive effect of transparent privatization procedure on inward FDI, it is important to mention the privatization of Krivorozhstal, the major Ukrainian state-owned mining and metallurgical works. It was sold to the son–in-law of the former president Kuchma for $800 million in an "open" tender with only one local bidder, in June 2004. At least five overseas bidders that included companies from Russia, EU, United States, and India were not admitted to the auction. The exclusion was made possible due to the technical change in regulations just a couple of weeks before the auction. The transaction was revoked as rigged after the November 2004 presidential elections and Krivorozhstal was sold again in October 2005 to a foreign investor for 4.8 $US billion in an open tender that was televised nationally.

Promotion of competition and contract law enforcement are other functions of well-developed market institutions. Better corporate governance and contract laws reduce transaction costs for firms and organization, hence, increase productivity (Williamson, 1979). Lack of competition due to high barriers to trade in product and service sectors reduce social welfare and depress economic growth (Rutherford, Tarr, and Shepotylo, 2005). Market institutions are important for the successful enterprise restructuring and at least partially explain differences in enterprise restructuring across regions (Djankov and Murrell, 2002). Development of market institutions attracts more capital from abroad and produces a positive spillover effect on

performance of domestic firms (Globerman and Shapiro, 2003). Better governance and economic reforms contribute to the restored economic growth in transition countries (Havrylyshyn and van Rooden, 2003). Weak intellectual property rights protection deters foreign investors in technology-intensive sectors that rely heavily on intellectual property rights. Moreover, a weak intellectual property regime encourages investors to undertake projects focusing on distribution rather than on local production (Javorcik, 2004).

Regional patterns of FDI location: market potential, supplier access, and regional governance

The new economic geography emphasizes the importance of market potential for the choice of FDI location. The analytical framework for the new economic geography models was developed in the recent works by Krugman and Venables (1995), Venables (1996), Markusen and Venables (1999). Assuming an increasing return-to-scale technology, a multinational enterprise (MNE) reduces costs by concentrating production in one location. The choice of location is subject to minimization of transportation and input costs. To minimize transportation costs, the MNE chooses an area with the largest market potential to locate production facilities and serves smaller markets through inter-regional and international trade. The choice of location that minimizes input costs is ambiguous because there are two effects working in opposite directions. On the one hand, labor costs are positively correlated with the size of the economy, which reduces probability of investment in a large market. On the other hand, larger markets reduce input costs by offering wider choice of suppliers (*supplier access*) and more competitive market structure, therefore increasing

probability of investment in a large market. Overall, the theory predicts a positive link between the market size and the choice of FDI location.

Recent empirical works (Head and Mayer, 2004; Amiti and Javorcik, 2005) support the prediction of the new economic geography and demonstrate that market potential and supplier access play an important role in the decision to enter a foreign market. The first study looks at the market potential motive. It shows that Japanese firms are more likely to invest in a European region with higher market access measured as aggregated demand of all EU regions weighted by the distance from the region itself. The second study looks at both market potential and supplier access motives. It empirically demonstrates that these motives are the most important determinants affecting foreign entry of multinational companies into Chinese provinces.

Figure 4 Worldwide distribution of Volkswagen production facilities
Source: The Volkswagen Group

There are also anecdotal evidences that support the idea that firms tend to concentrate production activities close to the large markets. The Volkswagen Group, the biggest European car maker, operates 47 out of 54 production plants in eleven European countries, including six Eastern European countries (Figure 4), and sells its vehicles in more than 150 countries. Volkswagen started its Eastern European expansion by acquiring Skoda, the largest automaker in the Czech Republic. Over the last decade, Volkswagen built production facilities in other Eastern European countries, as well. Currently, it also plans to extend its Eastern European presence eastward by building a new plant in Russia. Another recent example that illustrates the importance of market access for the auto industry is Hyundai Motor Co., South Korea's largest automaker. On January 18th 2006, Reuters News Service reported that "the Czech government is likely to sign a memorandum with South Korea's Hyundai Motors in February on the carmaker's investment in a new automotive plant…Hyundai has said the Czech Republic was the ideal candidate to host its planned 1 billion euro ($1.21 billion) factory to get the company closer to customers in Europe."

To capitalize on benefits of a large regional market, however, it is very important that existing political and economic institutions in the region facilitate economic activities, promote free trade across countries, and encourage competition between local and foreign producers. As shown in the literature, bad governance inside the country is the major factor influencing FDI inflows and preventing foreigners from entering the market (Alfaro, Kalemli-Ozcan, and Volosovych, 2005). In addition, bad governance in the neighboring countries substantially reduces market access. An extreme illustration of this influence are the policies of "Iron Curtain" in Eastern Europe and the "Bamboo Curtain" in South East Asia. These policies prevented

countries from those regions from wider economic cooperation with their neighbors in the second part of the 20th century.[13]

Softer version of protectionist policies and institutions that prevent competition, increase barriers to entry, and create an unfair advantage for local producers would also considerably reduce any benefits of the market access mentioned in the literature. Better regional governance, on the other hand, improves market and supplier access and leads to an increase in the extent and efficiency of interactions between firms within the region. Therefore, a positive link between the quality of governance in the region and FDI inflows in a particular country is expected.

Governance diffusion and FDI: spatial dynamics

Good regional governance infrastructure can also have a direct positive effect on local governance of each country in the region. Similar to diffusion of knowledge and technologies, good governance practices and successful reforms implemented in leading transition countries have a powerful appeal to nearby countries. For rulers of a badly governed country, it is hard to ignore progress made by successfully developing countries, especially if they are located in the same region and share a similar historical and cultural background.

Depending on the political structure, the instrument of influence of population on inefficient or corrupt rulers range from a voting mechanism to immigration to the threat of the civil unrest. In a democracy, people would not re-elect an inefficient government that is unable to provide a decent level of rule and order that has been

[13] The ***Iron Curtain*** is a term referring to the boundary which economically and politically divided Europe into two separate areas from the end of World War II until the end of the Cold War, roughly 1945 to 1990. The ***Bamboo Curtain***, the South East Asian version of the Iron Curtain, separated communist countries of South East Asia from their neighbors.

achieved in similar countries. In an authoritarian state, there is a possibility of civil unrest and immigration that force the ruler to maintain some level of governance comparable with the levels of governance in neighboring countries.[14] Therefore, progress of institutional reforms in a region can force a local government to improve. That - in turn - increases efficiency of the local economy as well as increases FDI inflow in the country.

Political transition of Eastern European and Central Asia countries is a good example of the spatial dynamic process. The initial shock, which started with the fall of the Berlin Wall, spread in time and space to the neighboring countries and had a big impact on the governance structure for all countries of the region. Another example directly related to the political development of transition countries was the outcome of the 2004 presidential elections in Ukraine in.[15] which were greatly determined by the role played by its neighbors (the European Union and Poland, in particular).

Spatial Econometrics

The development of empirical spatial models would be impossible without recent progress in spatial econometrics. Cliff and Ord (1981) suggested the basic spatial model back in the 1970s, but the model did not receive important theoretical extensions until the middle of the 1990s, when mainstream economics started to systematically analyze the spatial dimension. Anselin (2003) and Florax and Vlist

[14] For example, Fleck and Hanssen (2005) mentioned that opportunity of residents to relocate to other countries nearby would constrain the ruler in an attempt to implement bad policies. Acemoglu and Robinson (2001) consider a threat of the civil unrest as an instrument that forces rulers to maintain a certain level of governance.

[15] For a detailed discussion of elections, see for example http://en.wikipedia.org/wiki/2004_Ukrainian_presidential_election

(2003) summarized the classifications and empirical implementation of models that incorporated spatial externalities and error structures. Estimation of spatial models requires the inversion of matrices of high dimension and can be unfeasible computationally when a data set has many observations. Kelejian and Prucha (1999, 2004) suggested a generalized method of moment estimation of spatial models for estimation of spatial autoregressive parameters and disturbances that is computationally feasible even for big data sets. Kapoor, Kelejian, and Prucha (2004) and Elhorst (2003) suggested econometric strategies to estimate panel data models with spatially correlated error components.

Empirical strategy

Data sources

Transition Report

Transition Report published by European Bank of Reconstruction and Development (EBRD) provides a broad and comprehensive description of the progress of reforms in 27 transition countries, starting from 1993. EBDR indices of reforms annually track progress in the following categories: privatization, prices and trade liberalization; infrastructure reform, competitiveness, and restructuring of enterprises; and financial sector reform and legal reform. All indices are measured on a scale of 1 to 4.3. Higher numbers represent greater progress.

GDF and WDI central

The GDF and WDI central database is the primary World Bank database for development data from officially-recognized international sources. It contains an expanded set of the economic, social, environmental, and other time series indicators published in World Development Indicators and Global Development Finance. The database is updated quarterly. WDI defines FDI inflows as "inflows of 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. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments"[16]

Definitions of variables and data sources are presented in Table 8. Summary statistics for the variables that are used in our empirical analysis are shown in Table 9. Average net FDI inflow in transition countries is 930 million $US per year. The most progress of reforms was achieved in small-scale privatization: 3.5. Infrastructure reform and competition policy are the most problematic scoring 1.9 and 2.1 consequently. A correlation matrix of EBRD indices and derived index of governance infrastructure, presented in Table 10, shows a strong correlation between various aspects of market-oriented reforms suggesting high degree of complementarity of reforms in various dimensions.

[16] In rare cases when FDI inflows are not available in the WDI dataset we use Transition Report 2004 to update the data.

Table 8 Variable definitions and sources

Variable	Definition	Source
EBRD indices:		
bank_ref	Banking reform and interest rate liberalization	EBRD Transition Report
competition	Competition policy	EBRD Transition Report
enterp_reform	Governance and enterprise restructuring	EBRD Transition Report
trade_lib	Trade and foreign exchange system	EBRD Transition Report
infrstruct	Infrastructure reform	EBRD Transition Report
ls_priv	Large-scale privatization	EBRD Transition Report
fin_reform	Securities markets and non-bank financial institutions	EBRD Transition Report
price_lib	Price liberalization	EBRD Transition Report
ss_priv	Small-scale privatization	EBRD Transition Report
Macroeconomic indicators:		
FDI	Foreign direct investment, inflows, balance of payment, current $US	World development indicators
GDP	Gross domestic product, balance of payment, current $US	World development indicators
Ex	Exports of goods, services and income, balance of payment, current $US	World development indicators*
Im	Imports of goods, services and income, balance of payment, current $US	World development indicators*
pop	Population	EBRD Transition Report
tariff	Collected import tariff rate, % of value of total import	EBRD Transition Report
hhexp	Household expenditures, current $US	World development indicators
Derived variables:		
index	Simple average of all EBRD indecies	Author's calculations
windex	Index of regional governance infrastructure	Author's calculations
lnfdi	ln(FDI)**	Author's calculations
lnfdipc	ln(FDI/pop)	Author's calculations
lngdp	ln(GDP)	Author's calculations
lngdppc	ln(GDP/pop)	Author's calculations
trade share	(Ex+Im)/GDP	Author's calculations
lnpop	ln(pop)	Author's calculations
lninitgdp	ln(GDP(1991))	Author's calculations
lninitgdppc	ln(GDP(1993)/pop(1993))	Author's calculations
lnhhexp	ln(hhexp)	Author's calculations
avg_tariff	Collected import tariff rates as % of total value of import, period average	Author's calculations
oil_gas	Substantial oil and gas resources	Author's calculations
EU	Countries that joined or scheduled to join EU	Author's calculations

Notes:

* There are 4 missing value in WDI dataset: Azerbaijan, Ukraine, Uzbekistan 1993 and Uzbekistan 1994. We used EBRD transition report to update the data..

** We have one negative value of FDI inflows in Uzbekistan in 1995. We used an average of net FDI in 1994 and 1995

Table 9 Summary Statistics

Variable	*Observations*	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
Population, million people	264	16.50	29.60	1.35	149.00
Net inward FDI, billion current $US	264	0.93	1.54	-0.02	9.34
GDP, billion current $US	264	36.00	74.90	0.92	435.00
Export, billion current $US	264	13.60	23.50	0.21	163.00
Import, billion current $US	264	12.80	18.70	0.45	103.00
Banking reform and interest rate liberalization	264	2.4	0.8	1.0	4.0
Competition policy	264	2.1	0.6	1.0	3.0
Governance and enterprise restructuring	264	2.2	0.7	1.0	3.3
Trade and foreign exchange system	264	3.4	1.1	1.0	4.3
Infrastructure reform	264	1.9	0.7	1.0	3.7
Large-scale privatization	264	2.7	0.9	1.0	4.0
Securities markets and non-bank financial institutions	264	2.0	0.7	1.0	3.7
Price liberalization	264	3.7	0.7	1.0	4.3
Small-scale privatization	264	3.5	0.9	1.0	4.3
Index of local governance infrastructure	264	2.6	0.7	1.0	3.8
Index of regional governance infrastructure	264	2.7	0.4	1.6	3.3
Household expenditures, billion of current $US	262	29.8	30.8	0.5	222.0
Average collected tariff, % of import	264	4.0	3.7	0.1	14.2

Table 10 Correlation matrix of EBRD indices and derived index of governance infrastructure

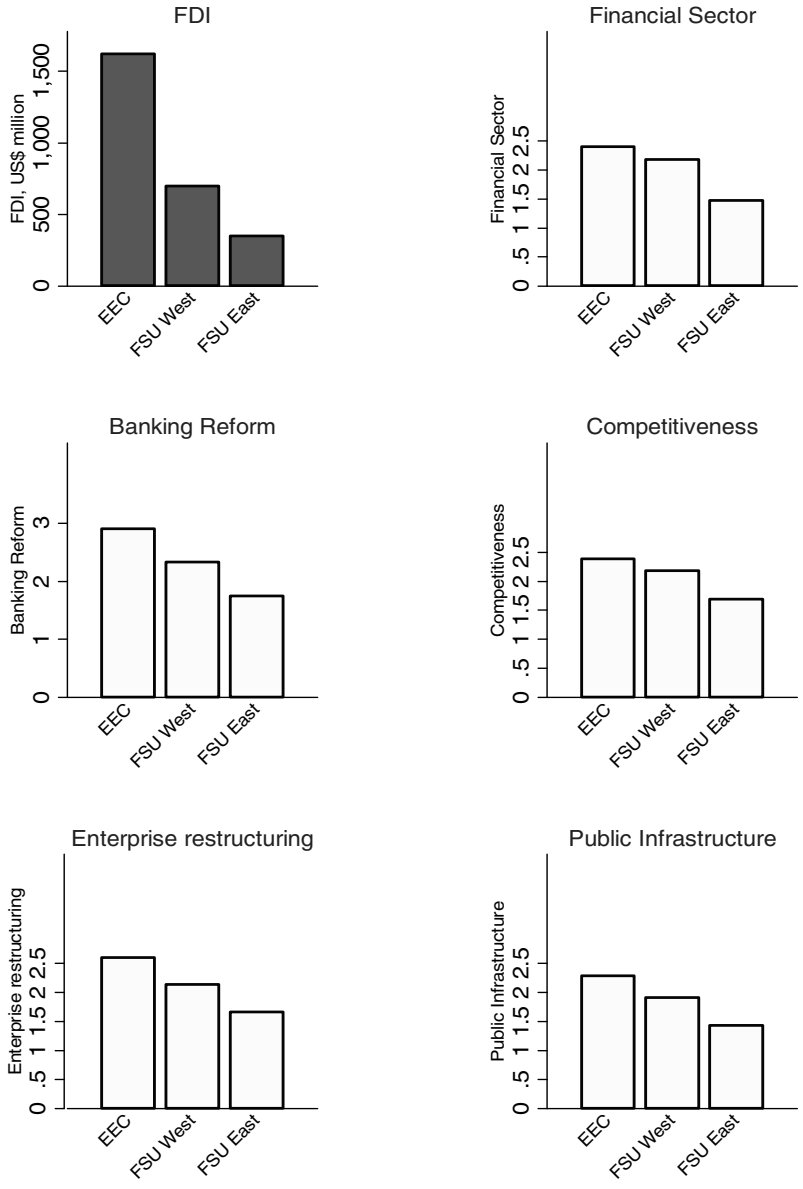
	Banking reform and interest rate liberalization	Competition policy	Governance and enterprise restructuring	Trade and foreign exchange system	Infrastructure reform	Large-scale privatization	Securities markets and non-bank financial institutions	Price liberalization	Small-scale privatization	Index of local governance infrastructure	Index of regional governance infrastructure
Banking reform and interest rate liberalization	1.00										
Competition policy	0.67	1.00									
Governance and enterprise restructuring	0.90	0.72	1.00								
Trade and foreign exchange system	0.81	0.51	0.76	1.00							
Infrastructure reform	0.84	0.67	0.77	0.67	1.00						
Large-scale privatization	0.77	0.67	0.80	0.73	0.75	1.00					
Securities markets and non-bank financial institutions	0.78	0.76	0.77	0.57	0.77	0.68	1.00				
Price liberalization	0.65	0.44	0.61	0.73	0.61	0.69	0.48	1.00			
Small-scale privatization	0.79	0.62	0.79	0.83	0.69	0.81	0.65	0.70	1.00		
Index of local governance infrastructure	0.93	0.76	0.92	0.87	0.87	0.89	0.82	0.77	0.90	1.00	
Index of regional governance infrastructure	0.58	0.53	0.55	0.53	0.63	0.54	0.61	0.62	0.58	0.66	1.00

It is worth looking at the regional patterns of economic variables and governance indicators because of systematic differences they have across the regions. Regions presented in Figure 5 are Central and Eastern European region (Albania, Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia, and Slovenia); European former Soviet Union region (Byelorussia, Estonia, Latvia,

Lithuania, Moldova, Russia, and Ukraine); and Central Asia and Caucus former Soviet Union region (Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan).[17] This classification naturally follows from geographical and historical background. Another consideration that led us to the suggested division is a roughly equal number of countries in each region. Figures 6 and 7 illustrate that FDI and various aspects of governance infrastructure are substantially different from region to region. The Eastern Europe region consistently had the highest values of governance infrastructure in every category, while the Central Asia and Caucus region had the smallest values. Eastern Europe, on average, received twice as many FDI per year as did European former Soviet Union countries and four times as many as did the Central Asia and Caucus region. A simple diagram that shows the relationship between the log of FDI per capita in a country and the index of regional governance shows strong correlation between two variables (Figure 8).

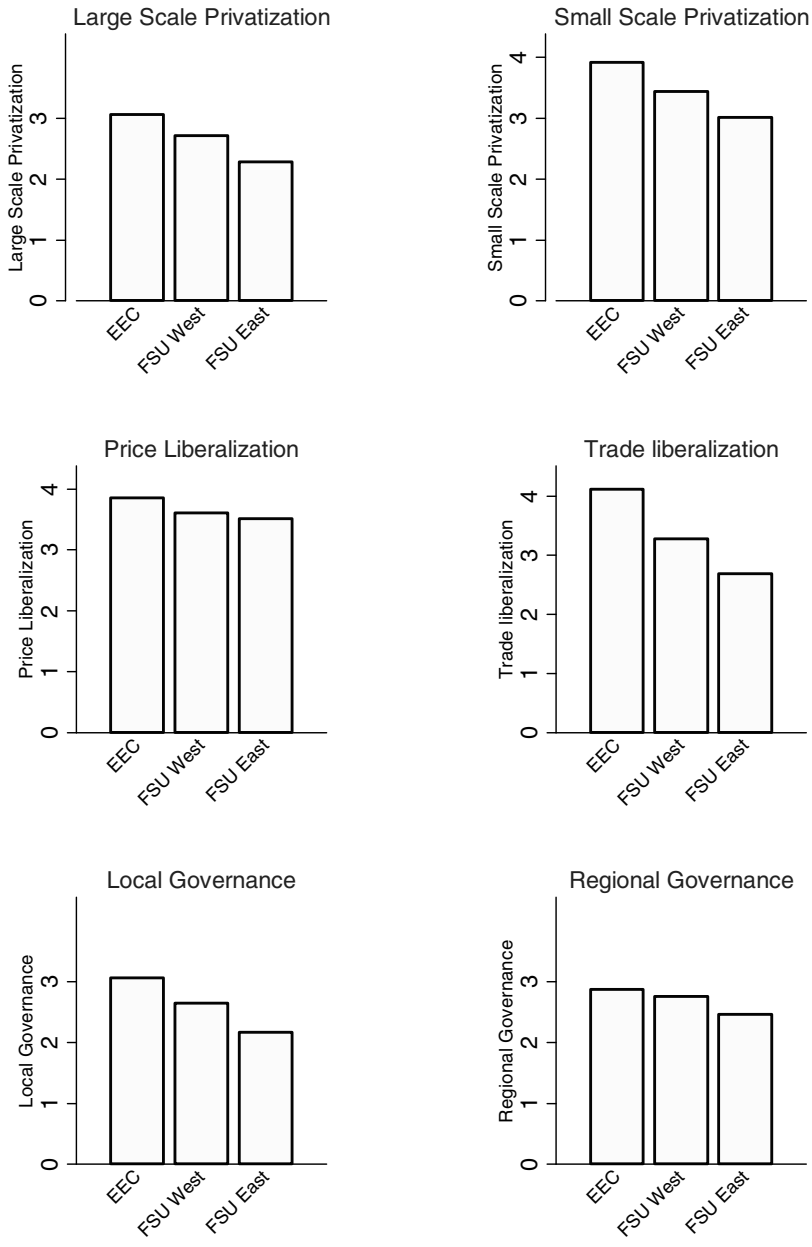
[17] We did not include Serbia , Bosnia and Herzegovina, and Republic of Macedonia in the analysis, so the data set is limited to 24 countries.

Figure 5 Map of the regions



EEC: Eastern European countries
FSU West: Western part of former Soviet Union
FSU East: Eastern part of former Soviet Union

Figure 6 FDIs and EBRD indices by regions. Average values over 1993-2003



EEC: Eastern European countries
FSU West: Western part of former Soviet Union
FSU East: Eastern part of former Soviet Union

Figure 7 FDIs and EBRD indices by regions. Average values over 1993-2003

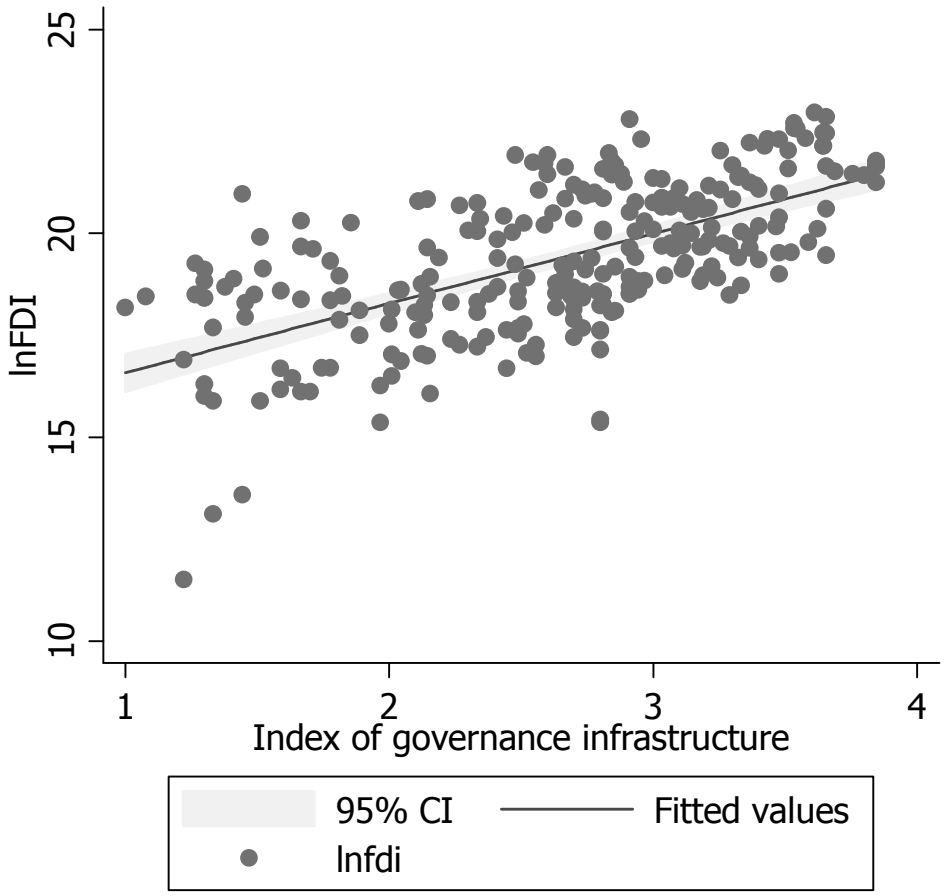


Figure 8 Correlation of FDI and index of governance

Model specification

The functional form of the estimated equation naturally follows from the gravity model of FDI flows. The gravity equation proved to be a successful analytical tool that explained bilateral trade flows. Recent theoretical models (Markusen et al, 1996) suggest that location and size of bilateral FDI flows depend on country characteristics such as a country size, population, factor endowments. Empirical papers (Brenton et al, 1999; Campos and Kinoshita, 2003; Egger and Pfaffermayr, 2004) showed that the gravity equation is useful in modeling bilateral FDI flows between countries. The panel consists from 24 transition countries, in 1993-2003. The model specification and estimation strategy is similar to Kapoor, Kelejian, and Prucha (2004).

The model in a scalar notation is presented by the following expression:

$$\ln FDI_{it} = \beta * index_{it} + \delta \sum_{j=1}^{N} w_{ij} * index_{jt} + \sum_{k=1}^{K} \gamma_k * z_{itk} + u_{it}, \quad \textbf{(1)}$$

where i,j=1,2,…,N and t=1,2,…,T

(1) $\ln FDI_{it}$ is the logarithm of FDI inflow into country *i* in year *t*.

(2) $index_{it}$ is an index of local governance infrastructure in a country i in a period t.

(3) w_{ij} is a weight which, along with the parameter δ describes how the $index_{jt}$ in country *j* influences the log of FDI in country *i* at time *t*. These weights are specified in more details below. Note that weights have the following properties:

$$w_{ii} = 0, \qquad i = 1,2,...,N$$

$$\sum_{j=1}^{N} w_{ij} = 1, \qquad i, j = 1,2,...,N$$

(4) z_{itk}, k=1,2,…,K are exogenous variables that influence FDI in country i in period t. These control variables are discussed in the next section.

(5) u_{it} is a corresponding disturbance term in country i in period t.

(6) β, δ, and γ are correspondingly defined parameters.

A variable that measures local governance infrastructure is based on nine EBRD indices of reforms in the following categories: privatization, prices and trade liberalization; infrastructure reform, competitiveness and restructuring of enterprises; and financial sector reform.[18] A simple average of all indices is taken to produce an *index of local governance* for each country. The second variable in equation (1) $\sum_{j=1}^{N} w_{ij} * index_{jt}$ is a weighted average of indices of local governance in the neighboring countries. It can be interpreted as *an index of regional governance* for a country *i*.

In general, higher presence of multinational companies can have an impact on quality of governance, which means that constructed indices of local and regional are potentially endogenous. However, the uniqueness of investigated countries was that

[18] EBRD changed methodology of measuring reforms in legal sector from single index to two indices: one measuring effectiveness and one measuring extensiveness. Moreover, reform in legal system index is not available for all countries and all years, so we decided not to include it into the analysis.

institutional changes at the early stage were driven by political shock of the breakdown of the Soviet Union. As countries diverged in their institutional development, the primary factor that explained variations of institutional changes across transition countries were the degree of entrenchment of the Socialist formal institutions in everyday life through their influence on informal institutions, customs and traditions (Beck and Laeven, 2005). The second factor that also played an important role was a structure of economy. Countries that had a high share of resource-extracting industries in GDP performed poorly in the development of good institutions.

To estimate the model parameters, a three step Generalized Method of Moment (GMM) procedure is applied, which is described in the Appendix A.

Control variables

Market size and potential

Multinational companies prefer to locate production facilities where the big markets are (Brenton et al., 1999; Head and Mayer, 2004; Amiti and Javorcik, 2005). The log of GDP and the log of population proxy for the market size and potential as factors that influences FDI inflow. A bigger market is necessary to exploit economies of scale and more efficient use of resources through bigger market potential and supplier access. Populous countries are more attractive for multinational companies that search for new markets for their production. Therefore, coefficients for both variables are expected to be positive.

Openness to trade and trade barriers

Openness of the economy is also mentioned as a factor that affects FDI inflows. As traditionally used in the literature (Janicki and Wunnava, 2004; Clausing and Dorobantu, 2005), openness to trade is proxied by a ratio of export and import to GDP, (export + import)/GDP, as an independent variable. We also include a direct measure of trade barriers: a country import tariff rate averaged over t=1,2,…,T. High barriers to trade and other protectionists policies reduce market and supplier access and have a negative impact on FDI.

Natural Resources and EU market access

Because of their heterogeneity, transition countries have different sectoral composition of FDI. To account for high volume of investment in oil and gas industries in Russia, Kazakhstan, Azerbaijan, and Turkmenistan, a dummy for a natural resource rich country is included. An EU[19] dummy is also included to control for proximity and access to the European Union market.

Other country-specific characteristics

The literature also mentions following factors that can affect FDI: the log of GDP in 1991 to control for the differences in initial conditions (DeMelo et al., 1997); US long term interest rate to control for the effect of big developed economies on the

[19] We included all Eastern and Central European countries and Baltic States from our dataset. These countries are either members of EU or are scheduled to become members. In contrast to the Commonwealth of Independent States, these countries are more integrated into the European Union and have a better market access to the European Market.

FDI supply in emerging markets; and the number of telephone landlines per 100 people to measure quality of physical infrastructure (Campos and Kinoshita, 2003), the distance from Brussels as another control for proximity to the EU. Neither of those factors appeared significant and was not included in the base model.

Weighting matrices

A spillover effect of one country on another is expected to be negatively related to the distance between them. It has been suggested in the literature that the level economic activity between firms located in different countries and regions is negatively correlated with distance because of transportation costs, language and cultural barriers, and the effects of political and economic unions. As a result, neighboring countries tend to a have higher volume of economic and political interactions and have a higher influence on each other than remote countries do.

First, weights between countries *i* and *j,* w^*_{ij} are defined to be the inverse of the distance between them, where distance, d_{ij}, is defined as a distance between capitals of the countries. Diagonal elements of this preliminary weighting matrix set equal to zero and is defined as:

$$W^*_1 = \begin{bmatrix} 0 & 1/d_{12} & \dots & 1/d_{1N} \\ 1/d_{21} & 0 & \dots & 1/d_{2N} \\ \dots & \dots & \dots & \dots \\ 1/d_{N1} & 1/d_{N2} & & 0 \end{bmatrix}.$$

Each row of W_1^* is scale by the coefficient $k_i = \frac{1}{\sum_{\substack{j=1 \\ j \neq i}}^{N} 1/d_{ij}}$ in order to row normalize it,

i.e., the elements of each row sum to one[20]. The weighting matrix has the following form:

$$W_1 = \begin{bmatrix} 0 & k_1/d_{12} & \dots & k_1/d_{1N} \\ k_2/d_{21} & 0 & \dots & k_2/d_{2N} \\ \dots & \dots & \dots & \dots \\ k_N/d_{N1} & k_N/d_{N2} & & 0 \end{bmatrix}$$

An alternative specification of a weighting matrix was also considered where we assume that there are no spillover effects of governance in, for example, Central Asia on economic development of Central and Eastern European countries because of their remoteness as well as weaker cultural and political ties. In particular, it was assumed that only close enough countries influence each other's economic performance and the spatial externality and correlation of errors do not spread outside of the region where the country *i* is located[21]. Elements of the second weighting matrix, W_2, are proportional to the value of $1/d_{ij_g}$ if countries *i* and *j* are from the same region[22] and are set equal to 0 otherwise. Diagonal elements are again set equal to zero.

[20] This technicality simplifies estimation. It also makes variables of local and regional governance comparable in size.

[21] As mentioned earlier, we defined regions as follows : Central and Eastern European region (Albania, Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia, and Slovenia); European former Soviet Union region (Byelorussia, Estonia, Latvia, Lithuania, Moldova, Russia, and Ukraine); and Central Asia and Caucus former Soviet Union region (Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan)

[22] The coefficients of proportionality are chosen to normalize elements of each raw, so they sum to 1.

After careful investigation, W_2 had been chosen as the weighting matrix for the base regression because – measured in terms of statistical significance of the model coefficients - it captured existed spatial links better than W_1. In particular, it means that spatial spillovers are more pronounced within a certain region because of strong economic and political ties and are weaker between different regions. As a robustness check, the results with W_1 are also presented in section 5.3.3 where the alternative specification is tested.

Results and sensitivity analysis

Results: base spatial regression estimated by three step GMM procedure

It is a well-established fact that the quality of governance is an important determinant of FDI in transition countries. These findings are confirmed by showing that the coefficient of the index of local governance is positive and significant in all regressions. Results for the base model specification (1) are presented in the Table 11. To interpret the size of the effect, consider the following example. At the sample average of the index of local governance, 2.6, and the value of the coefficient 1.01 in the base regression, the elasticity of FDI with respect to the index of local governance is 2.66.

Table 11 Spatial GMM regression: base model

Dependent variable	***lnFDI***
	(1) [a]
Local governance	**1.01*** **
	[0.13] [b]
Regional governance	**0.88** **
	[0.20]
Log GDP	0.29**
	[0.12]
Log Population	0.53***
	[0.15]
Openness to trade	1.02**
	[0.40]
Average tariff	-0.0489**
	[0.0222]
Subsantial resources of oil or natural gas	1.80***
1=yes 0=no	*[0.23]*
EU	0.75***
1=yes 0=no	*[0.26]*
Constant	-0.95
	[1.27]
ρ^c	*0.29*
	[0.35] [d]
σ_v	*0.39*
	[0.21]
σ_1	0.99
	[1.13]
Observations	264

** significant at 10%; ** significant at 5%; *** significant at 1%*
a The base specification model. Spatial estimation. Dependent variable is the log of inward FDI. Elements of the weighting matrix are inversly proprtional to distance between countries from the same region
b Standard errors in square brackets
c Fully weighted GMM estimation
d. Standard errors are asymptotic approximations

More importantly, the coefficient of the regional governance is also positive, significant, and has the same order of magnitude as the local index of reforms. When the base spatial model specification is estimated, the coefficient of the regional governance is 0.88 that is not statistically different from the coefficient of local governance. The positive coefficient of the regional governance infrastructure shows that there is a positive spillover effect of improving governance in, for example, Czech Republic on FDI inflow in Hungary, Poland and other neighboring countries and vice versa. The elasticity of FDI in Czech Republic with respect to the index of regional governance is 2.58.[23] At the same time, a contribution of governance in each particular country *j* to FDI in Czech Republic is proportional to the weight the country j has. For example, Polish governance infrastructure enters the equation for FDI in Czech Republic with the weight 0.18. Therefore, an improvement in local governance in Poland by 1% increases FDI in Czech Republic[24] by 0.54%.

Positive externality also points out to the importance of geographical location on the economic development from the following standpoint: a country attracts more FDI and enjoys higher positive effects generated by foreign companies if it is located in a region where other countries have good economic institutions. However, it also works in the opposite direction: economic development of a country located in a region with poor governance is more problematic. In 2003, regional governance infrastructure indices in Hungry and Kyrgyzstan were equal to 3.1 and 2.7. Had Kyrgyzstan been located where Hungary is, it would increase foreign direct

[23] Elasticity is calculated for the sample average value of regional governance for Czech Republic 2.9 and the coefficient of regional governance 0.88

[24] Average index of local governance in Poland was 3.41 during the discussed period.

investment to Kyrgyz republic by 14%. The bad news is that Kyrgyzstan can not move out of Central Asia to improve its economic situation. However, a larger role for international organizations and regional unions can help to solve externality problems and substantially improve regional economic situation.

Both variables that capture a market size and potential effects are positive and significant. Elasticities of FDI with respect to GDP and population are 0.29 and 0.53 subsequently. According to our results, openness to trade measured as a ratio of export and import to GDP is one of the key factors that explain FDI inflow. Countries, more integrated in international trade of resources and products, receive more FDI. Elasticity of FDI with respect to openness to trade is equal to 1.02 in the base regression. Another trade related variable - average tariff rate - measures a degree of protection of local markets from international competition. It is negative and significant in the main specification in column (1) of Table 11.

The coefficient of the natural resource dummy is positive and significant. On average, Azerbaijan, Kazakhstan, Russia and Turkmenistan received almost seven times more FDI per year than other CIS countries, even though they did not have better economic policies and reform strategies.[25] In the light of high volatility of energy prices investors would like to secure valuable natural resources for current and future usage despite political and economic risks. This result tells that countries rich in natural resources have comparative advantage in attracting FDI. On the other hand,

[25] Average net FDI in oil and gas rich countries was 1.4 billion $US per year. All other countries of former Soviet Union on average received 200 million $US per year. At the same time, period average indices of local governance for natural resource rich countries and for other FSU countries were 2.1.and 2.5 consequently.

these countries have lower than average quality of governance. It might indicate that dependence on export of natural resources reduce incentives to invest in better governance and lead to lower levels of local governance infrastructure. The coefficient of the EU dummy is negative and significant. Again, taking a stand that geographical location is important, it can be explained as a disadvantage for countries that are located further from main economic centers such as European Union.

At the bottom of Table 11, estimates for the coefficient of the spatial lag ρ and standard errors σ_v and σ_1 that were calculated at the second stage of the estimation procedure are presented. The spatial lag has a positive value,0.26, but is not statistically different from zero.

Market access and regional governance

Better governance is positively associated with economic growth and GDP per capita. Higher levels of GDP and GDP per capita in neighboring countries, in turn, can generate regional agglomeration and market access effects, and induce higher inward FDI. Therefore, the main finding that regional governance has a positive effect on local inward FDI may be due to the fact that we do not take into account the effect of the regional GDP or GDP per capita.

The regional GDP and regional GDP per capita are defined similar to the definition of regional governance infrastructure as distance-weighted averages of GDP and GDP per capita of other countries in the region and estimate the model with additional controls. The results are presented in Table 12. First, it is important to check if a positive effect of higher regional GDP on local FDI inflow can be found

when the effect of regional governance is omitted from the regression. The model in column (2) includes the regional GPD and excludes the index of regional governance. The coefficient of the regional GDP is positive, but not significant. The model in column (3) includes both local and regional governance along with the regional GDP. The coefficient of the regional GDP is negative and significant. Therefore, as was expected, omitting regional governance creates an upward bias in the regression that evaluates an impact of regional GDP on local FDI. When positive effects of better governance and gains from trade on inward FDI are taken into account, higher regional GDP has a crowding-out effect since multinational enterprises prefer to invest in nearby countries with higher level of GDP. The same exercise is repeated for the regional GDP per capita as a measure of the attractiveness of the regional market. Results are presented in columns (4) and (5), in Table 12. The coefficient of the regional GDP per capita is not significant and changes sign from positive in the model (4) to negative in the model (5).

It might be the case that a positive impact of bigger regional markets on FDI has not been found in the previous paragraph because the market size effect primarily comes through trade channels. To check this hypothesis, models in columns (6)-(9) exclude openness to trade as an explanatory variable. Indeed, higher coefficients of the regional GDP and GDP per capita are observed in models presented in columns (6) and (7). The effect, however, disappears when regional governance is included in the regressions presented in columns (8) and (9).

Table 12 Regional governance and market potential

Dependent variable	***lnFDI***	***lnFDI***	***lnFDI***	***lnFDI***	***lnFDI***	***lnFDI***	***lnFDI***	***lnFDI***
	(2)	***(3)***	***(4)***	***(5)***	***(6)***	***(7)***	***(8)***	***(9)***
Local governance	**1.24*** **	**0.98*** **	**1.24*** **	**0.97*** **	**1.35*** **	**0.99*** **	**1.34*** **	**1.00*** **
	[0.14]	***[0.13]***	***[0.14]***	***[0.13]***	***[0.14]***	***[0.13]***	***[0.14]***	***[0.14]***
Regional governance		**1.05*** **		**1.00*** **		**1.22*** **		**1.14*** **
		[0.20]		*[0.22]*		*[0.19]*		*[0.21]*
Log GDP	0.45***	0.31***	0.37**	0.35***	0.33**	0.25**	0.21	0.25**
	[0.14]	*[0.11]*	*[0.15]*	*[0.12]*	*[0.14]*	*[0.11]*	*[0.15]*	*[0.12]*
Log Population	0.44**	0.51***	0.49***	0.49***	0.43**	0.50***	0.53***	0.50***
	[0.18]	[0.14]	[0.18]	[0.15]	[0.19]	[0.14]	[0.19]	[0.15]
Regional GDP	-0.03	-0.32**			0.25	-0.2		
	[0.18]	[0.14]			[0.17]	[0.14]		
Regional GDP per capita			0.23	-0.23			0.58***	-0.09
			[0.22]	*[0.20]*			*[0.21]*	*[0.20]*
Openness to trade	1.90***	1.22***	1.6841***	1.12***				
	[0.44]	*[0.41]*	*[0.4452]*	*[0.41]*				
Average tariff	*-0.009*	*-0.0345*	*-0.03*	-0.0369	*-0.0565***	*-0.0648****	*-0.0755****	-0.0675***
	[0.0283]	*[0.0222]*	*[0.03]*	[0.0243]	*[0.0276]*	*[0.0199]*	*[0.0279]*	[0.0216]
Subsantial resources of oil or natural gas	1.47***	1.56***	1.69***	1.63***	1.98***	1.84***	2.18***	1.92***
1=yes 0=no	*[0.31]*	*[0.24]*	*[0.33]*	*[0.27]*	*[0.31]*	*[0.23]*	*[0.31]*	*[0.25]*
EU	0.62*	0.91***	0.54	0.85***	0.54	0.88***	0.44	0.82***
1=yes 0=no	*[0.33]*	*[0.26]*	*[0.33]*	*[0.27]*	*[0.35]*	*[0.26]*	*[0.34]*	*[0.27]*
Constant	-1.33	5.58*	-2.7	-0.15	-4.34	4.79	-1.47	0.93
	[4.01]	*[3.19]*	*[1.73]*	*[1.42]*	*[4.22]*	*[3.19]*	*[1.77]*	*[1.36]*
ρ^b	0.38	0.31	0.38	0.3	0.41	0.29	0.4	0.29
σ_v	0.41	0.4	0.41	0.4	0.42	0.4	0.41	0.4
σ_1	1.58	0.86	1.54	0.94	1.76	0.89	1.63	0.95
Observations	264	264	264	264	264	264	264	264

* significant at 10%; ** significant at 5%; *** significant at 1%

a Standard errors in square brackets

b Fully weighted GMM estimation

It is also interesting to note that models that do not include regional governance as a determinant of inward FDI have ρ, a measure of unobservable spatial spillovers, higher as compared to the models that do include regional governance.

Overall, the main finding of the positive effect of the regional governance infrastructure on local inward FDI is unchanged. Its coefficient is positive and significant in all regressions where it is included. This result demonstrates importance of including a measure of regional institutions when studying the effect of market access on the location of FDI.

Sensitivity analysis

As shown in previous section, better regional governance has a large, positive, and significant effect on inward FDI. However, there are important concerns on how robust the results are. Three potential problems were identified: endogeneity of explanatory variables, omitted variable biases, and the sensitivity of results to the choice of the weighting matrix. This section will investigate each of these problems.

Endogeneity of explanatory variables

Some of the explanatory variables can be positively correlated with the error terms or potentially can be endogenous. We have a particular concern that inward FDI positively influences GDP and openness to trade which can lead to an upward bias of the coefficient of regional governance infrastructure. This problem is addressed by re-estimating the base model in column (1) in several other specifications. Table 13 presents the results of alternative model specifications. Lags of log GDP and openness to trade are included in the model in column (10). In the

model (11), all potentially endogenous variables are excluded from the regression. The model (12) uses log of the household expenditures as another proxy for the market size.[26] Finally, the log of GDP is instrumented by the spatial lag of the log of GDP and openness to trade is instrumented by import tariff rate and the spatial lag of openness to trade. The results of the second stage of the instrumental variable regression are presented in the model (13).

[26] We dropped Turkmenistan from the regression since it does not have the household expenditure data for several years.

Table 13 Endogeneity check

Dependent variable is the log of fdi inflow in current $US. Weighting matrix elements are inversly proportional to the distance between capitals of the countries from the same region

Dependent variable	***lnFDI***	***lnFDI***	***lnFDI***	***lnFDI***
	(10)	***(11)***	***(12)***	***(13)***
Local governance	**1.03*** **	**1.08*** **	**0.86*** **	**1.13*** **
	[0.13] [a]	*[0.13]*	*[0.15]*	*[0.15]*
Regional governance	**0.81*** **	**1.16*** **	**1.12*** **	**0.89*** **
	[0.20]	*[0.17]*	*[0.22]*	*[0.20]*
Log GDP	0.28**			0.07
	[0.11]			*[0.16]*
Log Population	0.48***	0.79***	0.48***	0.66***
	[0.15]	*[0.07]*	*[0.15]*	*[0.16]*
Openness to trade	0.82**		0.69	1.17
	[0.36]		*[0.44]*	*[0.78]*
Average tariff	*-0.038****	*-0.085****	*-0.070****	
	[0.02]	*[0.02]*	*[0.02]*	
Log Household Expenditures			0.32**	
			[0.13]	
Subsantial resources of oil or natural gas	1.85***	2.18***	1.95***	1.88***
1=yes 0=no	*[0.24]*	*[0.20]*	*[0.27]*	*[0.25]*
EU	0.71***	1.13***	0.78***	0.87***
1=yes 0=no	*[0.27]*	*[0.21]*	*[0.27]*	*[0.31]*
Constant	0.24	*1.48*	-0.92	1.48
	[1.30]	*[1.06]*	*[1.41]*	*[1.73]*
ρ	0.2 [b]	0.29	0.34	0.28
σ_v	0.24	0.4	0.38	0.41
σ_1	1.07	1.05	1	1.32
Observations	240	264	253	264

* significant at 10%; ** significant at 5%; *** significant at 1%

a Standard errors in square brackets

b Fully weighted GMM estimation

Overall, the positive and significant effect of regional governance does not change in any of alternative model specifications. The coefficients of local governance, population, natural resources, and CIS are all significant and robust to

the changes in the model specification. On the other hand, openness to trade is not significant in the model (4) and (5) while average tariff is not significant in the model (2). Log of GDP is positive but not significant in the instrumental variable specification.

Omitted variable bias

To check for omitted variables, several other regressions with more control variables are estimated (Table 14, models 14 - 18). In model (14), a log of GDP in 1991 as a proxy for dependence on initial conditions is included because the literature (DeMelo et al., 1997) mentions that the different starting points of transition countries may be responsible for variations in their economic performance. The results in the table indicate that it is not significant. Model (15) includes US long term interest rate to control for crowding-out effect of investment in developed countries on FDI in transition countries. The variable is not significant. Model (16) includes number of phone lines as a measure of physical infrastructure as discussed in the literature (Campos and Kinoshita, 2003). Investment in public infrastructure is accounted for as a part of the index of local governance. It may explain why the coefficient is not significant and has the "wrong" sign. Model (17) includes the log of the distance of the country's capital to Brussels to control for proximity to the EU. The model in column (18) includes all variables mentioned above and joint significance of additional coefficients is tested. The results of the test indicate that all three additional variables are jointly not significant.

Table 14 Spatial estimation. Check for omitted variables

Dependent variable is the log of fdi inflow in current $US. Weighting matrix elements are inversly proportional to the distance between capitals of the countries from the same region

Dependent variable	***lnFDI***	***lnFDI***	***lnFDI***	***lnFDI***	***lnFDI***
	(14)	***(15)***	***(16)***	***(17)***	***(18)***
Local governance	**1.02*** **	**1.02*** **	**1.01*** **	**1.00*** **	**1.02*** **
	[0.14]	***[0.13]***	***[0.13]***	***[0.14]***	***[0.14]***
Regional governance	**0.86*** **	**0.91*** **	**0.88*** **	**0.89*** **	**0.92*** **
	[0.21]	*[0.21]*	*[0.19]*	*[0.20]*	*[0.23]*
Log GDP	0.33*	0.29**	0.30**	0.31**	0.35*
	[0.17]	*[0.12]*	*[0.14]*	*[0.14]*	*[0.19]*
Log Population	0.55***	0.52***	0.51***	0.51***	0.53**
	[0.16]	*[0.15]*	*[0.17]*	*[0.16]*	*[0.22]*
Openness to trade	1.04**	1.02**	1.04**	1.04**	1.04**
	[0.42]	*[0.40]*	*[0.45]*	*[0.41]*	*[0.46]*
Average tariff	-0.0488**	-0.0489**	-0.0486**	-0.0477**	-0.0490**
	[0.0222]	*[0.0222]*	*[0.0222]*	*[0.0228]*	*[0.0232]*
Subsantial resources of oil or natural gas	1.80***	1.80***	1.78***	1.77***	1.78***
1=yes 0=no	*[0.23]*	*[0.23]*	*[0.24]*	*[0.26]*	*[0.28]*
EU	0.74***	0.73***	0.75***	-0.77***	-0.74***
1=yes 0=no	*[0.27]*	*[0.27]*	*[0.26]*	*[0.27]*	*[0.29]*
Log GDP in 1991	*-0.0496*				*-0.0591*
	[0.1760]				*[0.2087]*
US interest rate		*0.0301*			*0.0402*
		[0.0765]			*[0.0819]*
Number of phone lines per 100 inhabitants			*-0.0019*		*0.0006*
			[0.0106]		*[0.0123]*
Log Distance to Brussels				*0.0591*	*0.0768*
				[0.2615]	*[0.2724]*
Constant	-0.89	-1.2	-1.03	-1.5533	-1.9242
	[1.29]	*[1.42]*	*[1.39]*	*[2.9755]*	*[3.3854]*
ρ^b	0.3	0.3	0.3	0.3	0.3
σ_v	0.4	0.44	0.4	0.4	0.4
σ_1	0.99	1	0.96	1	0.93
Observations	264	264	264	264	264

* significant at 10%; ** significant at 5%; *** significant at 1%

a Standard errors in square brackets

b Fully weighted GMM estimation

The mentioned modifications of the base model do not change our main findings about the sign and significance of the coefficients of local and regional governance infrastructure. The coefficient of the local index is close to 1 in all specifications, while the coefficient of the regional index varies in a range from 0.86 to 0.93.

Choice of weights

To check the sensitivity of the results to the choice of the weighting matrix, we tried an alternative specification of the model:

$$\ln FDI_t = index_t \beta + W_1 index_t \delta_1 + W_2 index_t \delta_2 + z_t \gamma + u_t$$

where W_1 and W_2 are the weighting matrices defined in the section 4.

. Table 15 presents the spatial estimation results where two measures of the regional governance are included. The first index is weighted by the inverse of the distance between countries and does not take into account potential regional effects. It is negative but not significant. The second index of regional governance that is weighted by the inverse of the distance between countries located in the same region has a coefficient that is positive and significant.

The results indicate that the externality effect is not simply a linear function of the inverse of the distant between countries. An impact of, for example, Central and Eastern European countries on development of countries located outside of the region is small relative to the effect within the region. Additional research is necessary to specify the weighting matrix that will take into account such factors as common border, common language, cultural and political ties.

Table 15 Test for alternative weighting specification

Dependent variable	***lnFDI***
	(19)
Local governance	**1.06*** **
	[0.15] [b]
Regional governance *calculated with weights inversly prpoprtional*	**1.34** **
to distance between countries ***from the same region***	***[0.62]***
Regional governance *calculated with weights inversly prpoprtional*	***-0.56***
to distance between countries	***[0.72]***
Log GDP	0.28**
	[0.12]
Log Population	0.51***
	[0.15]
Openness to trade	1.05***
	[0.40]
Average tariff	-0.0519**
	[0.0225]
Subsantial resources of oil or natural gas	1.85***
1=yes 0=no	*[0.24]*
EU	0.63**
1=yes 0=no	*[0.31]*
Constant	-0.37
	[1.47]
ρ	*0.3* [c]
	[0.35] [d]
σ_v	*0.39*
	[0.22]
σ_1	0.99
	[1.14]
Observations	264

** significant at 10%; ** significant at 5%; *** significant at 1%*
a Spatial estimation. Dependent variable is the log of inward FDI.

b Standard errors in square brackets
c Fully weighted GMM estimation
d. Standard errors are asymptotic approximations

Conclusions

It is a well-established fact that countries with better governance attract more foreign direct investment. This paper demonstrates that regional governance is also an important determinant of inward FDI. Transition countries have significant regional differences in levels of governance infrastructure and FDI across regions. The variations of inward FDI can be explained by the variations in levels of regional governance infrastructure across regions. Better regional governance creates a positive externality of higher FDI inflows. The spillover effect of regional infrastructure on FDI is highly significant and comparable in size to the effect of governance inside the country.

The positive externality of better regional governance directly comes from better regional governance to more local inward FDI. As the results indicate, better governance in the region is more important factor for the choice of FDI location than bigger market potential. The results are robust to the choice of control variables and weighting matrix specification.

A population size, EU dummy, and substantial resources of oil and gas are explanatory variables that influence inward FDI and are robust in all model specifications. CIS countries that are rich in natural resources attract more FDI than other CIS countries even though they perform worse in terms of the development of the local governance infrastructure. Moreover, all CIS countries have additional disadvantage compared to Central and Eastern Europe because they are located further from European Union and are less integrated into the European Market.

Chapter 3: Spatial interdependence and relative geographical location as determinants of institutional development

Introduction

The majority of empirical papers that investigate cross-country differences in economic performance ignore the spatial dimension. Econometric models introduced in these papers study determinants of economic and institutional development within a country and have an implicit assumption that borders isolate countries from each other.[27] Under this assumption, good economic and political development in Croatia, which has made a considerable progress in improving its governance, has nothing to do with the fact that it is located in Central Europe, shares borders with Slovenia and Hungary, and have historical and cultural ties with Northern Italy. By and large, development is determined by some country specific factors and government policies according to these models. Likewise, the poor economic and political development of Ethiopia has nothing to do with the fact that it is located in a region where other countries also have economic and political problems and have a long history of unsuccessful reforms and political crises.

This is an unrealistic assumption that should be tested empirically for the following reasons. First of all, there are continuous interactions of formal and informal institutions across countries. It is natural to assume that these interactions are stronger for geographically close countries, especially for countries that share common borders and that are culturally close in terms of language, religion, social

[27] E.g., La Porta et al., 1999; Hall and Jones 1999; Barro, 1999

norms, and traditions. Borders themselves are subject to change, currently independent countries (e.g., former members of the Soviet Union or the Austrian Empire) shaped their governance under influence of political and economic institutions that have long ceased to exist but still have an impact on contemporaneous institutions. Secondly, economic globalization and the worldwide spread of the Internet increase mobility of capital and labor, thus allowing free exchange of information and ideas that reduce barriers between countries.

In the world of imperfect information and uncertainty, a benevolent government can learn from experience of successful policies and reforms carried out in other countries. Having more sources of information, it can emulate good governance practices and produce less uncertain outcomes easier than ever. Even if one think about a government as rent-seeking bureaucrats, more educated and informed population that has higher labor mobility will put a pressure on government officials when their performance and quality of public services are inferior to those in the neighboring countries. Therefore, the assumption of exclusively internal factors that determine institutional development should be softened by testing whether economic, political, and cultural links from abroad have an impact on internal institutional development.

This paper introduces external influence of governance in the neighboring countries on governance inside a country, which is also called as policy diffusion mechanism or spatial autoregressive process of governance development. The policy diffusion is empirically tested based on the indices of voice and accountability and governance effectiveness calculated by Kaufman et al. (2005) for 150 countries in

1996-2004. The governance diffusion is modeled as a spatial autoregressive process, which treats neighboring countries as spatially connected units. Spatial econometrics, pioneered by Cliff and Ord (1981) and further developed by Anselin (2003), Florax and Vlist (2003), Kelejian and Prucha (1999, 2004), investigates relationships between close spatial units (e.g., countries) in a similar fashion as time series analysis investigates relationships between observations from close time periods.

The rest of the paper has the following structure. First, some historical episodes when changes in governance structure had a strong spatial component are discussed. Second, an econometric model that includes the spatial autoregressive component is built and the estimation strategy and econometric technique is discussed. Third, main results are presented and robustness checks are presented. Finally, conclusions are drawn and possible extensions of the model are discussed.

Spatial dimensions of institutional and economic development

There is growing empirical literature that supports the idea that better institutions are correlated with economic development.[28] More importantly, there is evidence that causality goes from improved governance to higher economic growth. For example, Acemoglu, Johnson, and Robinson (AJR 2001 and 2002) demonstrated that institutions protecting property rights, established by European settlers in less developed areas of North America and Australia, more than 300 years ago, helped those countries to grow more rapidly than more developed and populated areas in Africa, South America, and Asia. Other studies that looked at the determinants of economic growth and established an important link from better institutions to higher

[28] See, for example, Knack and Keefer (1995), Mauro (1995), Barro (1999), Hall and Jones (1999)

economic growth include Easterly and Levine (1997), Rodrik, Subramanian, and Trebbi (2004), and Beck and Laeven (2005).

An important direction of research that naturally follows from this observation is to investigate fundamental factors that determine quality of governance. From the policy perspective, it is especially critical to investigate how political, economic, and cultural factors influence fluctuations of the quality of governance in the short run. Some lessons can be drawn from success stories such as the process of transition in the countries of Central and Eastern Europe (CEE) that demonstrate the possibility of considerable improvements in the quality of governance and economic development in a relatively short period.

In the beginning of the 90's, all CEE countries faced a difficult task of economic and political transformation from the command type of economy and communist system of government to the market economy and democratic system of government. CEE countries came through a difficult and painful process of reforms yet showed significant improvements in their political and economic institutions. Many countries of the region joined the European Union and have gradually converged in quality of governance to reach higher standards of the older EU members during the last fifteen years. More strikingly, there is an increasing diversion in quality of governance within countries of the former Soviet Bloc. As Figure 9 demonstrates, members of the Commonwealth of Independent States (CIS – the 12 former republics of the Soviet Union) were not able to replicate the success of CEE countries. The current picture is even more striking if one looks further in history, when these countries were members of the Soviet Bloc. Even though CEE

and CIS countries had similar starting positions, they have diverged substantially in the development path in a period of less than twenty years.

Some policy lessons can be drawn from the negative experience in other regions such as Africa. As Easterly and Levine (1997) pointed out: "Africa's economic history since 1960 is the classical definition of tragedy: potential unfulfilled, with disastrous consequences… On average, real per capita GDP did not grow in Africa over the 1965–1990 period, while, in East Asia and the Pacific, per capita GDP growth was over 5 percent and Latin America grew at almost 2 percent per year..."

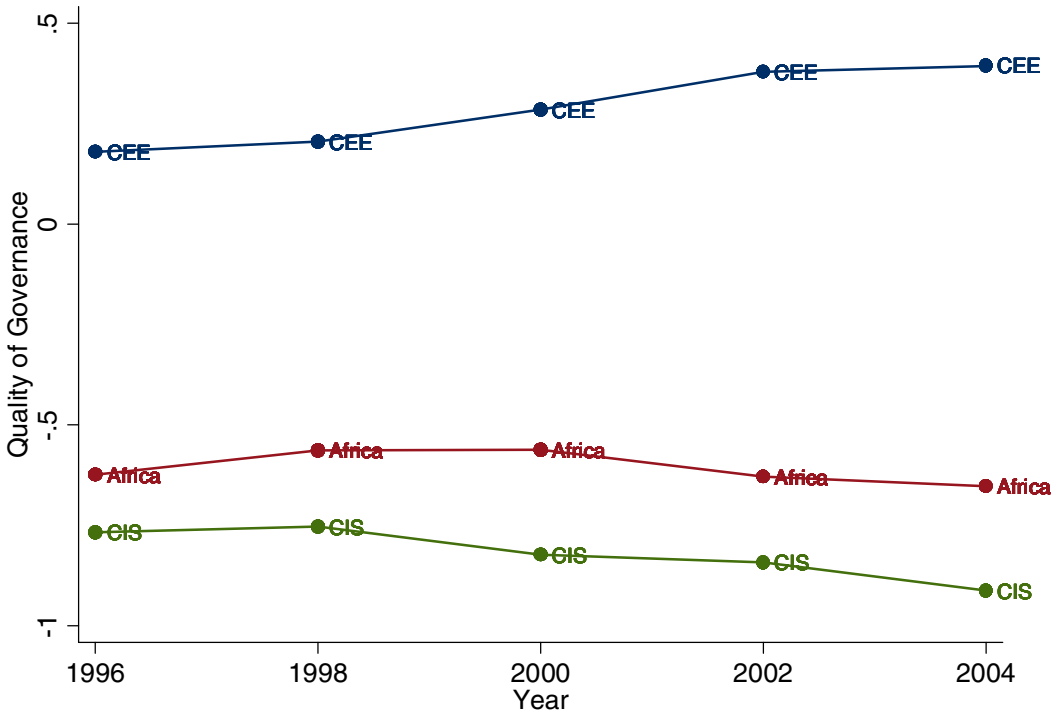


Figure 9 Quality of governance in the selected regions

Note: index of quality of governance is a simple average of six governance indicators by regions constructed by Kaufman et al. (2005).

What causes the difference between development of some transition countries and the development of African countries? Why did some countries succeed in improving governance and generating steady growth while others failed to do so? Some idiosyncratic factors partially explain the difference in institution building. Easterly and Levine (1997), for example, demonstrated that Africa's poor governance and bad government policies are partially caused by high ethnic diversity. Beck and Laeven (2005) have shown that dependence on natural resources and the length of period under Socialist rule explained a large part of variations in institutional quality for transition countries. Some researchers indicated that geographical location and climate are important determinants of economic development that can explain geographical clustering of countries (Gallup, Sachs, and Mellinger 1999). However, the geographical factors are fixed and can not explain rapid changes in economic and institutional development that are spatially correlated. The fact that even the slowest reformers in the CEE region made remarkable progress on the way towards market-oriented reforms and institutions, in a period of 15 years and achieved good economic growth, while most African countries were not able to reform for 40 years requires additional explanation.

An important determinant of the quality of domestic governance that is missing from many empirical studies is the impact of governance diffusion i.e., the impact of governance and its determinants in the neighboring countries[29] on governance inside a specific country. Geographically, close countries share strong cultural, social, and economic ties throughout their whole history. They also have

[29] We refer to works in the field of Economics. There is extensive literature in Political Science on policy diffusion and spatial effects of government policies and reforms. (Simmons and Elkins, 2004; O'Loughlin et al., 1998)

contemporaneous economic and political relationships with each other. As a result, institutions are endogenously determined by interactions of governance institutions of all countries in a particular region. The policy diffusion can explain the geographical clustering of countries in terms of quality of governance and shed some light on why there has been a persistence of bad governance in some geographic regions e.g., Africa and why it has been relatively easy for Central European countries to reform in a short period.[30]

Omitting the policy diffusion effect can lead to a biased estimation in a regression that studies determinants of good government and its impact on economic growth. Many African countries, for example, have poor governance, low income per capita, high ethnological fractionalization, and French origin of legal system. They are also located in a region where most of their neighbors have poor governance and low income per capita, as well. As demonstrated in this paper, a "bad neighborhood" effect (e.g., Cutler and Glaezer, 1997) of low regional GDP and bad regional governance reinforces the impact of adverse factors inside the country and makes bad governance more persistent. The omitted spatial lag of regional governance, in turn, leads to biases in estimation of other variables that are also correlated with "bad location" e.g., high ethnolinguistic diversity and French origin of legal system. High ethnolingistic fractionalization by itself does not cause political and economic instability. The European region, for example, is highly fractured both ethnically and

[30] In our opinion, proximity to the European Union helped to reform CEE countries more rapidly and smoothed the transition period. Out of all transition countries, the most successfully reformed countries are the countries that are located closer to the old EU members. On the other hand, Central Asia countries, which are located the furthest from the EU, are the least successful reformers. Similarly, lack of economically strong democratic states in Africa makes it more difficult to develop and improve governance in each country of the region.

linguistically, but it is more culturally homogeneous and is highly economically developed. This paper demonstrate that when measures of regional economic development and religious affiliation (cultural proxies) are controlled, the negative impact of ethnolingistic fractionalizations becomes insignificant.

Diffusion of governance: Europe before and after the revolutions of 1989

"Poland—10 Years; Hungary—10 Months; East Germany—
10 Weeks; Czechoslovakia—10 Days; Romania—10 Hours.""
A sign in Prague in 1989

Previous discussion can be illustrated by a historical episode of the end of the Cold War, in 1989-1991, when initial very limited reforms in Poland and Hungary produced a "cascade effect", which had a very clear spatial pattern, and influenced all countries of the Communist bloc. Earlier movers, e.g., Poland and Hungary, carried out their reforms under limited information and high uncertainty on the optimal set of reforms and their expected outcomes. It was much easier to reform governance for any subsequent mover due to reduced uncertainty and positive experience of the early movers which was an example of an informational cascade (Banerjee, 1992). The cascade, however, had a clear geographical pattern because the population in the later-reformed countries put an additional pressure on their decision makers and demanded changes similar to ones already made in earlier reformed countries. Which, in turn, made it more difficult to maintain status quo for ruling Communist parties. This section elaborates on this point and gives a historical background.

During the second half of the 20th century, Europe was split into two parts and featured distinctly different economic and political institutions. There were

substantial differences in the quality of life and political freedoms between countries of the Eastern and Western Bloc located in the same geographical region despite common historical and cultural backgrounds. Artificial barriers to prevent migration of people to the west and diffusion of political and economic institutions to the east were required to keep these differences intact. The Iron Curtain[31] was the barrier that, for almost half-a-century, helped to protect Eastern Bloc countries from Western European influence. Economically, the policy of the Iron Curtain took the form of high trade barriers and capital controls and thus prevented free trade and movement of capital between country-members of the two blocs. Politically, the Iron Curtain was a heavily guarded border with one of the highest concentration of military forces. In fact, the Berlin Wall, a symbol of the Cold War, was build, in 1961, to prevent mass-migration of East Germans to the West. "In the years between 1949 and 1961, about 2.5 million East Germans had fled from East to West Germany, including steadily rising numbers of skilled workers, professionals, and intellectuals…East Germany built a barrier to close off East Germans' access to West Berlin…By the 1980s this system of walls, electrified fences, and fortifications extended 28 miles (45 km) through Berlin, dividing the two parts of the city, and extended a further 75 miles (120 km) around West Berlin, separating it from the rest of East Germany."[32] Culturally, to prevent the proliferation of ideas and cultural exchange, interactions between common people were very limited due to restrictions on freedom of

[31] "The political, military, and ideological barrier erected by the Soviet Union after World War II to seal off itself and its dependent eastern European allies from open contact with the West and other noncommunist areas." **Iron Curtain**. (2006). In *Encyclopædia Britannica.*
[32] **Berlin Wall**. (2006). In *Encyclopædia Britannica.*

movement.[33] Moreover, government controlled media in the Eastern bloc countries provided biased information about everyday life of ordinary people in the Western bloc countries.

By the middle of 1980s, it became clear that the Eastern bloc countries were not able to keep up with the economic development of the Western bloc and reforms were necessary to fix inefficiencies in the socialist economy. Some steps were taken to soften economic and cultural barriers and to carry out partial market-oriented reforms. The initial objective was to open up communist countries, a little bit, in order to bring modern technologies and products from the West but not to give in to pressure of political and economic freedoms on a large scale. However, the subsequent events revealed that even the slight softening of the barriers opened up a Pandora's box of more efficient and socially attractive economic and political institutions of the West. The fall of the Berlin Wall, on November 9, 1989, as the symbol of European unification, in fact was just the last element in a chain of events that removed the Iron Curtain.

A very slow and carefully managed process of economic and political reforms that started in Poland and Hungary in the early 80's and, in the Soviet Union in the middle of the 80's, went out of control in 1989. In September of 1989, the first non-communist government was formed in Poland. In October, the Hungarian Communist party ceased to exist and the new government announced a course toward democratization, multi-party elections, and economic reforms. These events had an important impact on the political changes in neighboring countries, East Germany in

[33] For example, to go on vacation or business trip to another country, in addition to visa, a citizen of the Soviet Union should have gone through a lengthy process that included obtaining permission from a local branch of the Communist Party and presenting three letters of recommendation.

particular. "…a reformist Hungarian government began allowing East Germans to escape to the West through Hungary's newly opened border with Austria. By the fall, thousands of East Germans had followed this route, while thousands of others sought asylum in the West German embassies in Prague and Warsaw, demanding that they be allowed to emigrate to West Germany. At the end of September, Genscher, still West Germany's foreign minister, arranged for their passage to West Germany, but another wave of refugees from East Germany soon took their place. Mass demonstrations in the streets of Leipzig and other East German cities defied the authorities and demanded reforms…On the evening of November 9, Günter Schabowski, a communist functionary, mistakenly announced at a televised news conference that the government would allow East Germans unlimited passage to West Germany, effective "immediately." While the government had in fact meant to require East Germans to apply for exit visas during normal working hours, this was widely interpreted as a decision to open the Berlin Wall that evening, so crowds gathered and demanded to pass into West Berlin. Unprepared, the border guards let them go. In a night of revelry tens of thousands of East Germans poured through the crossing points in the wall and celebrated their new freedom with rejoicing West Berliners."[34] Subsequently, revolutions in the Czechoslovakia, Bulgaria, and Romania followed. Finally, the process of changes moved further eastward to the Baltic States, in 1990, and ended with the breakdown of the Soviet Union after an unsuccessful military coup, in 1991.

A phenomenon of very rapid institutional changes is not new in world history. The revolutions of 1848 in Europe, which had a very deep impact on the development

[34] **Germany**. (2006). In *Encyclopædia Britannica.*

of the European countries, also had distinct spatial structure. The first European revolution, in 1848, occurred in Sicily and spread across the whole of Central Europe during the same year. Only two countries, United Kingdom and Russia,[35] did not experience strong revolutionary upheaval were the countries located at the geographical periphery of the European continent. Another historical episode that had a clear spatial pattern was the processes of decolonization of Latin America in 19th century, South East Asia in the first part of the 20th century, and Africa in the second part of the 20th century.

Is it possible to explain deep economic and institutional changes that happened in a short period in each of the Eastern Bloc countries by some internal, country-specific factors alone? Obviously, each successful revolution in early reformed countries made it more likely that similar reforms would succeed in the later reformed countries producing an informational cascade. At the same time, neighboring countries experience similar political and economic processes and share close cultural and historical ties. Political forces, responsible for political changes in Poland in June of 1989, had some impact on other countries of the region, as well. Therefore, a spatial aspect of the changes that started, in 1989, and ended with the breakdown of the Soviet Union can be modeled as spatial shocks transmitted from country-to-country and the long-term forces that were shaping political and economic institutions in the region for centuries. This paper is not going to separate these two effects at this point but would like to point out that this issue requires careful investigation of its own.

[35]The Kingdom of Poland, the most western part of the Russian Empire, experienced a series of minor unrests inspired by a group of Polish immigrants in Paris. Those attempts did not bring any significant results but led to an immigration wave from Poland to the Western Europe and United States.

Measurement of governance and exogenous covariates

Governance matters IV: governance indicators for 1996-2004

It is not sufficient to measure quality of institutions in one dimension because the structure and scope of governance varies widely from country to country and there are no established standards for the ideal system of governance. This problem is dealt by looking at two different dimensions of governance quality, which evaluate governance in terms of political competitiveness and government efficiency as well as checking for spatial effects in each of those dimensions.

First, it is important to know how institutions of governance are formed and monitored by the population. The ideal index that measures this dimension of governance takes into account the following: How open and competitive is the selection process? Does population have access to full and unbiased information on the day-to-day work of elected officials? Is there equal access of all spectrum of population and organization to mass media? If political process has low barriers to entry and all involved parties and organizations have equal opportunities then the most efficient institutions representing interest of significant groups of populations are formed. Therefore, positive answers to these questions ensure that the moral hazard problem of selecting and monitoring government officials is minimized and interests of minorities are protected.

Second, it is essential to measure the effectiveness of government and regulatory organizations in forming their goals and implementing their policies.

Governments formed by a non-democratic procedure and representing interests of the elite score low on political competitiveness; still they can be very efficient in implementing policies that protect their own interests. On the other hand, a democratically elected government might have coordination problems in setting a policy agenda and implementing those policies in open but highly diverse societies that have highly heterogeneous interests.

Kaufmann et al. (2005) identified three dimensions of governance motivated by a broad definition of governance as the traditions and institutions by which authority in a country is exercised: (1) the process by which governments are selected, monitored, and replaced; (2) the capacity of the government to effectively formulate and implement sound policies; (3) the respect of citizens and the state for institutions that govern economic and social interactions among them. This paper concentrates on evaluating governance in the first two dimensions: political openness and effectiveness of government.[36] Therefore, the following governance indicators were chosen.

(1) the process by which governments are selected, monitored, and replaced:

"Voice and Accountability" includes a number of indicators measuring various aspects of the political process, civil liberties, and political rights. These indicators measure the extent to which citizens of a country are able to

[36] Kaufmann et al. (2005) introduced six governance indicators, two indicators per each dimension. We have found that spatial correlation is present for any indicator. In our study we present and discuss results for two indicators of governance, because we think that they are sufficient to measure quality of governance in two dimensions. The rest of indicators are highly correlated with two indicators we present in the paper.

participate in the selection of governments. It also includes indicators measuring the independence of the media, which serves an important role in monitoring those in authority and holding them accountable for their actions. Conditional on high standards of selection and monitoring of government officials in a region, population of any country within the region forms expectations for comparable quality of governance inside the country. These expectations, in turn, put pressure on the government officials to maintain comparable level of voice and accountability in the country.

(2) the capacity of the government to effectively formulate and implement sound policies:

“Government Effectiveness” combines responses on the quality of public service provision, the quality of the bureaucracy, the competence of civil servants, the independence of the civil service from political pressures, and the credibility of the government’s commitment to policies. The focus of this index is on “inputs” required for the government to be able to produce and implement good policies and deliver public goods. A government effectiveness index measures the "supply side" of governance. The policy diffusion effect from the "supply side" comes from the fact that a population judges its officials based on relative performance and compares local government effectiveness with government effectiveness of their neighbors. In addition, benevolent government officials learn from positive policy

experiments of their neighbors and imitate those policies that are most successful.

Covariates of governance

Literature on determinants of governance grew substantially in the last decade. Recent empirical studies that directly investigate determinants of good institutions include La Porta et al. (1999), Treisman (2000), Adsera, Boix, and Payne (2003), and AJR (2005). In addition, there was an extensive literature that investigated the contribution of good governance to economic growth by looking at the determinants of governance as a first stage of instrumental variable estimation (Easterly and Levine 1997, AJR 2000 and 2001, Beck and Laeven 2005)

La Porta et al. (1999) outlined three broad categories of determinants of institutional development as economic, political, and cultural. Economic theories suggest that new institutions emerge when it is efficient to create them. As countries get richer, they can afford a wider choice of institutional arrangements and more complex structure of government that are usually not available for poor countries (Demsetz, 1967; North 1981). As an economy grows and develops its markets, opportunities for new institutions become feasible and economically efficient. For example, development of modern financial system requires establishment of regulatory institutions that control and facilitate market transactions. Political theories (North, 1990; Olson, 1993) look at the conflict of interests between different groups of population (e.g. different ethnic and religious groups) and at the structural organization of a government. Cultural theories (Weber, 1958; Putnam, 1993; Greif,

1994, Landes, 1998) emphasize the role of social norms and informal institutions that have a strong and persistent effect on functioning of a government and perceptions of population. In particular, Weber argued that the Calvinist reformation played a crucial role in formation of the capitalist system and its institutions. As a result, countries with high share of Protestants developed institutions best suited for a modern market economy.

Log GDP per capita (PPP) in constant $2000 is included to control for the level of economic development. When a country gets richer, it can afford institutions, which are not economically efficient for poor countries (La Porta et al., 1999; Adsera, Boix, and Payne, 2003). The causality also goes in the opposite direction: better governance increases economic growth (Knack and Keefer, 1995; Mauro, 1995; Barro, 1999; Hall and Jones, 1999). To deal with a potential bias, several approaches are implemented: instrumenting GDP per capita by GDP of main trading partners (AJR, 2005), including lagged GDP per capita, and including GDP per capita in 1992. Log of population is included to control for a possible efficiency-of-scale effect. The relationship between quality of governance and log of population is not clear, ex ante. On the one hand, bigger countries can afford some institutions that are not economically efficient for small countries which leads to a positive effect; on the other hand, bigger countries are more difficult to govern due to coordination problems and more heterogeneous population - hence negative effect could be present.

More heterogeneous countries have a policy coordination problem due to conflict of interests between different ethnic and social groups. To control for ethnic

heterogeneity, an index of language fractionalization is included (Alesina et al., 2003a). Dummies for legal system origin (English, French, German, Scandinavian, Soviet: La Porta et al., 1999) are included to control for variation of legal system with respect to property right protection (e.g., socialist vs. others) and efficiency (common law vs. civil law). Egorov, Guriev, and Sonin (2006) argue that countries with abundant natural resources are more likely to have poor governance since they can afford an inefficient government and protect a status quo in a situation where resource-poor countries are forced to reform in order to develop non-extracting industries that require long-term investments, property rights protection, and efficient institutions. This consideration is empirically supported by Beck and Laeven (2005), Mehlum, Moene, Torvik (2006) who demonstrated that resource abundant countries tend to have lower quality of governance. Finally, proportions of Catholics, Muslims, and Protestants, in 1980, (La Porta et al. 1999) are used as proxies for the cultural differences across countries to evaluate importance of cultural theory of institutions.

Many studies that look at the relationship between quality of institutions and economic growth use instrumental variable technique to instrument quality of governance by its covariates. These studies include AJR (2000) and Easterly and Levine (1997). Determinants of current institutional arrangements can be traced back in time. AJR (2000) demonstrated that European colonization had a very deep and long-lasting impact on institutions in many parts of the world. European colonizers set rent-extracting type of institutions for populated and labor abundant countries in South East Asia and South America when a small group of the population concentrated political and economic power and prevent outsiders from political

process. At the same time, European colonizers set institutions that allowed a considerable part of the population to participate in the political process and institution building in the low populated areas of North America and Australia, which led to creation of institutions that protected property rights and had a positive impact on economic growth. As a consequence, "the reversal of fortunes" was observed when underdeveloped and poor areas of the world were able to surpass in more developed and populated areas during a relatively short period of time. A direct approach to control for the effect of colonization on current institutional arrangements would be inclusion of population densities at the start of colonization and variables that measure attractiveness of colonized countries for Europeans in terms of climate and local diseases that had an impact on settlers' mortality. Unfortunately, the data requirements to implement this approach would considerably reduce the number of countries that are investigated in the empirical analysis. Therefore, a different procedure is implemented. Absolute latitude has been used as a proxy for climate and settlers mortality. In addition, data on current population and natural resources capture the impact of factor endowments on institutional development and are highly correlated across time periods. Therefore, populated, resource abundant countries remain the same because these factors are largely determined by climate and geographical location - hence time invariant. As an alternative, country-fixed effects can be used to control for country-specific historical events that occurred in the past but have a long lasting effect on institutions.

Panel A of Table 16 presents the summary statistics for the dependent and explanatory variables. Appendix A gives definitions and data sources for variables

used in regressions and weighting matrices. Table 16 also provides descriptive statistics of the dependent variables and their spatial lags by continents in Panel B.

To investigate possible spatial links and spillovers of improvements in governance, we set up a model that allows for spatial interdependence of quality of governance, measure spatial autocorrelation, and test statistical significance of the external influence using spatial econometric tools developed in works pioneered by Cliff and Ord (1981) and further developed by Anselin (2003), Florax and Vlist (2003), Kelejian and Prucha (1999, 2004)

Table 16 Descriptive statistics and quality of governance by continent

A. Descriptive Statistics

Variable	Observations	Mean	Standard deviation	Min	Max
Governance Indicators					
Voice and accountability (VA)	750	-0.06	1.00	-2.32	1.76
Spatial lag of VA	750	-0.09	0.68	-1.02	1.70
Government Effectiveness (GE)	750	0.06	1.05	-2.59	2.59
Spatial lag of GE	750	0.02	0.60	-0.93	2.10
Economic Indicators					
Log GDP per capita	708	7.64	1.63	3.89	10.78
Log Population	747	16.14	1.55	12.51	20.98
Legal Origin					
English	750	0.28	0.45	0	1
French	750	0.42	0.49	0	1
Socialist	750	0.23	0.42	0	1
German	750	0.04	0.20	0	1
Scandinavian	750	0.03	0.18	0	1
Resources					
Log of Explored oil resources	750	-1.60	2.35	-3.00	5.57
Share of raw materials in export	705	0.25	0.29	0.00	0.97
Cultural heterogeneity					
Linguistic fractionalization	730	0.39	0.28	0.00	0.92
Religious affiliation					
Catholics	750	0.29	0.35	0.00	0.97
Muslims	750	0.25	0.36	0.00	1.00
Protestants	745	0.11	0.21	0.00	0.98
Other	745	0.35	0.33	0.00	1.00
Geography					
Landlocked: 1 yes 0 no	750	0.19	0.39	0	1
Absolute latitude	750	0.31	0.19	0	0.72

B. Quality of governance by continent

	Africa	America	Asia	Europe	Pacific
Voice and Accountability	-0.63	0.24	-0.63	0.86	1.04
	(0.72)	*(0.72)*	*(0.80)*	*(0.75)*	*(0.74)*
Spatial lag of VA	-0.65	0.18	-0.66	0.84	1.11
	(0.12)	*(0.11)*	*(0.15)*	*(0.17)*	*(0.33)*
Government Effectiveness	-0.61	-0.03	-0.09	0.89	1.05
	(0.72)	*(0.84)*	*(0.90)*	*(1.01)*	*(1.30)*
Spatial lag of GE	-0.64	-0.16	-0.09	0.85	1.18
	(0.11)	*(0.13)*	*(0.18)*	*(0.26)*	*(0.57)*
Number of countries	38	27	44	38	3

Note: Variable definitions and data sources are described in Appendix 1. In panel B, standard deviations are presented in parentheses

Econometric model and estimation

Econometric model of governance with spatial autoregressive lag

Suppose that there are N countries and T periods of observations. The basic model is represented as

$$index_{it} = \rho \sum_{j} w_{ij} index_{jt} + \sum_{k} \beta_k x_{itk} + \varepsilon_{it} \qquad (1)$$

where $index_{it}$ is the measure of the governance quality in country *i* in time *t.* The spatial lag of the index of governance, $\rho \sum_{j} w_{ij} index_{jt}$, is included to capture the effect of governance diffusion, i.e., the cumulative impact of the quality of governance in the neighboring countries j weighted with the corresponding weight wij. In the base model specification, the weight wij is inversely related to the distance between countries i and j. The spatial autoregressive parameter ρ, the main parameter of interest in the paper, measures spatial correlation of quality of governance between countries i and its neighbors. Spatial correlation is expected to be in the range $0 < \rho < 1$, which indicates tendency of neighboring countries to equalize governance quality due to common factors that shape it. $x_{1it}, x_{2it} \ldots x_{Kit}$ are exogenous variables that determine quality of governance in country i in period t. ε_{it} is an error term, capturing all omitted factors that influence quality of governance in country i in period t.

Let us denote

$$index_t = (index_{1t}, index_{2t}, ..., index_{Nt})'$$
$$x_{kt} = (x_{k1t}, x_{k2t}, ..., x_{kNt})'$$
$$\varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t}, ..., \varepsilon_{Nt})'$$

Stacking observations over t, the equation (1) can be written in a more compact form:

$$index = \rho W index + X\beta + \varepsilon \qquad (2)$$

where

$index = (index'_1, index'_2, ..., index'_T)'$ is a $NT \times 1$ vector.

$\varepsilon = (\varepsilon'_1, \varepsilon'_2, ..., \varepsilon'_T)'$ is a $NT \times 1$ vector.

$$X = \begin{bmatrix} X_{11} & X_{21} & ... & X_{K1} \\ X_{12} & X_{22} & ... & X_{K2} \\ ... & ... & ... & ... \\ X_{1T} & X_{2T} & ... & X_{KT} \end{bmatrix}$$ is a $NT \times K$ matrix of exogenous variables.

$$W = I(T) \otimes \begin{bmatrix} w_{11} & w_{12} & ... & w_{1N} \\ w_{21} & w_{22} & ... & w_{2N} \\ ... & ... & ... & ... \\ w_{N1} & w_{N2} & ... & w_{NN} \end{bmatrix}$$ is a $NT \times NT$ matrix of weights.

The variance-covariance matrix of errors has the following general form:

$$E(\varepsilon\varepsilon') = \begin{pmatrix} \Sigma_1 & 0 & \dots & 0 \\ 0 & \Sigma_{21} & \dots & 0 \\ \dots & \dots & \dots & \dots \\ 0 & 0 & \dots & \Sigma_T \end{pmatrix}$$

The intra-cluster variance-covariance matrix Σ_t is a NxN matrix. Σ_t can be of any form and is not explicitly modeled. The clustering can occur because governance indicators are derived by principle component analysis based on data from more than a hundred sources. The procedure implies that available government measures are imprecise and the degree of precision varies from one country to another depending on the number of sources and a measurement error.

The implication of the model written in the spatial autoregressive form can be seen if the equation (2) is transformed as follows:

$$(I - \rho W)index = X\beta + \varepsilon$$
$$index = (I - \rho W)^{-1} X\beta + (I - \rho W)^{-1}\varepsilon$$

Under conditions that the weighting matrix W is row normalized and $|\rho|<1$,[37] "Leontef transformation" is applied:

$$(I - \rho W)^{-1} = I + \rho W + \rho^2 W^2 + \ldots$$

Therefore

$$index = \sum_{i=0}^{\infty} \rho^i W^i X \beta + \sum_{i=0}^{\infty} \rho^i W^i \varepsilon \qquad (3)$$

The spatial autoregressive model (1) implies that quality of governance in country i is determined not only by exogenous variables X and unobservable shocks ε inside the country but also by spatial exogenous variables W^iX and spatial unobservable shocks $W^i\varepsilon$[38]. Misspecification of the model because of the omitted spatial lags leads to the biased estimation of coefficients and incorrect inference of variance-covariance matrix.

Weighting matrix

Currently, there are 193 independent states.[39] Many of those states were not independent less than a century ago. Decolonization, World Wars I and II, breakdown of the Soviet Union, all those events had a big impact on the political borders which

[37] We restrict the choice of weighting matrix to the set of matrices satisfying the following properties: $w_{ij} \geq 0$ and $\sum_{j=1}^{N} w_{ij} = 1$

[38] Empirically, the first lag of the exogenous variables and in some instances the first two spatial lags are used as instruments. This paper uses only the first lag of the exogenous variables as instruments. Using the second lag of exogenous variables has not changed main results so those results are not presented in this paper.

[39] According to the US Department of States, the term "independent state" refers to a people politically organized into a sovereign state with a definite territory recognized as independent by the US

are constantly changing during a time horizon that is long enough. As pointed by Alesina and Spolaore (2003b), these man-made institutions should be treated as endogenous when studying long-run determinants of governance. At the same time, geographical neighbors always interacted with each other regardless of the country borders through economic, cultural and political links.

The policy diffusion is modeled as a function of the distance between countries. The weighting matrix for the base model specification is defined as follows: a weight between countries *i* and *j,* w_{ij}, is equal to the inverse of the distance, where distance, d_{ij}, is a weighted distance[40] between the biggest cities in two countries, if they are located on the same continent. If countries i and j are located on the different continents then d_{ij} is set equal to infinity.[41] Diagonal elements of this preliminary weighting matrix set equal to zero:

$$W^* = \begin{bmatrix} 0 & 1/d_{12} & \dots & 1/d_{1N} \\ 1/d_{21} & 0 & \dots & 1/d_{2N} \\ \dots & \dots & \dots & \dots \\ 1/d_{N1} & 1/d_{N2} & & 0 \end{bmatrix}.$$

[40] The distance between any two biggest cities are weighted by the shares of those cities in the total population and than the average distance is calculated.

[41] The list of continents includes: Africa, America, Asia, Europe, and Pacific.

Each row of W^* is scaled by the coefficient $k_i = \frac{1}{\sum_{\substack{j=1 \\ j \neq i}}^{N} 1/d_{ij}}$ in order to row-normalize it, i.e., the elements of each row sum to one. The weighting matrix for the base model specification takes the following form:

$$W = \begin{bmatrix} 0 & k_1/d_{12} & \ldots & k_1/d_{1N} \\ k_2/d_{21} & 0 & \ldots & k_2/d_{2N} \\ \ldots & \ldots & \ldots & \ldots \\ k_N/d_{N1} & k_N/d_{N2} & & 0 \end{bmatrix}$$

Another weighting matrix specification that looks at the relative geographical position of the countries and is widely used in spatial modeling defines neighbors as countries that have common borders. These weights are complementary to the distance based weighting specification and can be used to check the sensitivity of results to the choice of weighting matrix. The weight is set equal to 1 if countries i and j have a common border and 0 otherwise. The matrix of weights is row-normalized.

Cultural, economic, and political links can also be strong between countries that share the same language and history but are not geographically close. Countries that share a common language have strong cultural ties and common history British Empire had colonies in the remotest parts of the World. Spanish colonies in South America were thousands of miles away from Madrid. Under alternative weighting specifications, countries are considered as neighbors when they share common culture or common history. Countries that share the same language are defined as

cultural neighbors. Similarly, Metropolises and their former colonies are defined as political neighbors.[42] Again, matrices of weights are row-normalized.

Test for spatial correlation and heteroskedasticity of errors

First, consider a typical model that does not include a spatial lag of dependent variable and have homoskedastic errors:

$$H_0 : index = X\beta + \varepsilon$$

where ε is $iid \sim N(0, \sigma^2)$. Here, X includes all covariates of governance mentioned in the literature. The model is tested for misspecification due to the omitted autoregressive lag and an alternative model is suggested:

$$H_1 : index = \rho Windex + X\beta + \varepsilon$$

Anselin (1988) suggested a Lagrange Multiplier test for an omitted spatial lag which has the following form:

$$LM_\rho = \frac{(\hat{\varepsilon}' Windex / \hat{\sigma}^2)^2}{NJ}$$

[42] Data on former colonies and colonizers is taken from CEPEII database. Colonizers of the country for a relatively long period of time and with a substantial participation in the governance of the colonized country. United States, for example is treated as a former colony of Great Britain.

with

$$J = \frac{1}{N\hat{\sigma}^2}[(WX\hat{\beta})'M(WX\hat{\beta}) + T\hat{\sigma}^2]$$

where $M = I - X(X'X)^{-1}X'$, $T = trace((W'+W)W)$, $\hat{\varepsilon} = M*index$ is a vector of OLS residuals, and $\hat{\sigma}^2 = \frac{\hat{\varepsilon}'\hat{\varepsilon}}{N}$. Under the null hypothesis, $LM_\rho \sim \chi^2(1)$.

Secondly, a standard instrumental variable estimation assumes homoskedastic standard errors and produces incorrect estimation of the variance covariance matrix if errors are heteroskedastic and clustered at the country level. Therefore, it is important to check for heteroskedasticity of errors using Breusch-Pagan / Cook-Weisberg test (see Breusch and Pagan, 1979; Cook and Weisberg, 1983). The null hypothesis is the constant variance of error term.

Consistent estimation of spatial autoregressive parameter ρ

If the test for no spatial autocorrelation and homoskedasticity fails, the model with the following functional form is estimated:

$$index = \rho Windex + X\beta + \varepsilon \qquad (2)$$

with general error structure which allows for heteroskedastic errors and clustering of index of governance:

$$E(\varepsilon\varepsilon') = \begin{pmatrix} \Sigma_1 & 0 & ... & 0 \\ 0 & \Sigma_{21} & ... & 0 \\ ... & ... & ... & ... \\ 0 & 0 & ... & \Sigma_T \end{pmatrix}$$

The spatial lag of the quality of governance is an endogenous variable and cannot be estimated by simple OLS regression as was demonstrated in the previous section. However, the model (2) can be estimated by the Generalized Method of Moments (GMM) that uses spatial lags of exogenous variables as instruments. From the equation (3), it follows that

$$E(index \mid X) = X\beta + \rho WX\beta + ...$$

and

$$E(W^i X\varepsilon) = 0, i = 0,1,2...$$

The model (1) is estimated and tested for validity and relevancy of instruments as described in Baum, Schaffer, and Stillman (2002). The spatial lag of the quality of governance is instrumented by the spatial lag of all exogenous explanatory variables that are present in the equation. Validity of the instruments is checked by testing orthogonality between the excluded first stage instruments and errors in the estimated equation. The test for overidentifying restrictions was suggested by Hansen (1982). Suppose that the model has L moment conditions and K regressors. The system of equations is overidentified when L>K which is the case in the model presented in this paper. The Hansen's J statistics, which is asymptotically distributed as $\chi^2(L-K)$ under the null hypothesis of orthogonality between instruments and errors, indicates whether suggested instruments are valid.

The suggested instruments should also be relevant and explain the instrumented variable reasonably well. F statistics that test if all excluded instruments are not significant in the first stage regression is reported in the next section. Rejection of the null hypothesis suggests that the instruments are relevant.

Results

Indices of governance and geography

A world distribution of governance measured by KKZ indices is non-random and geographically clustered. The distribution of governance indicators in 2004 is presented with the series of maps for voice and accountability (VA) and government effectiveness (GE), in Figure 10.[43] All countries are divided into four quartiles according to their ranking for a particular indicator of governance. Countries located in the top quartile (better governance) of an index distribution are shown in lighter grey color, in the second quartile in light grey, in the third quartile in dark grey, and in the last quartile in darker grey color. In addition, countries located in the top and bottom deciles are shown in white and black colors consequently. Based on this figures, two patterns can be observed. First, countries that have a high score in one cluster of governance tend to have high scores in other clusters. Second, countries with better governance are located further away from the equator with the majority located in Europe and North America while countries that are poorly governed are primarily located closer to the equator in Africa, Middle East and Central Asia.

[43] Maps generated by the interactive tool provided by the World Bank It is available at http://info.worldbank.org/governance/kkz2004/worldmap.asp#map

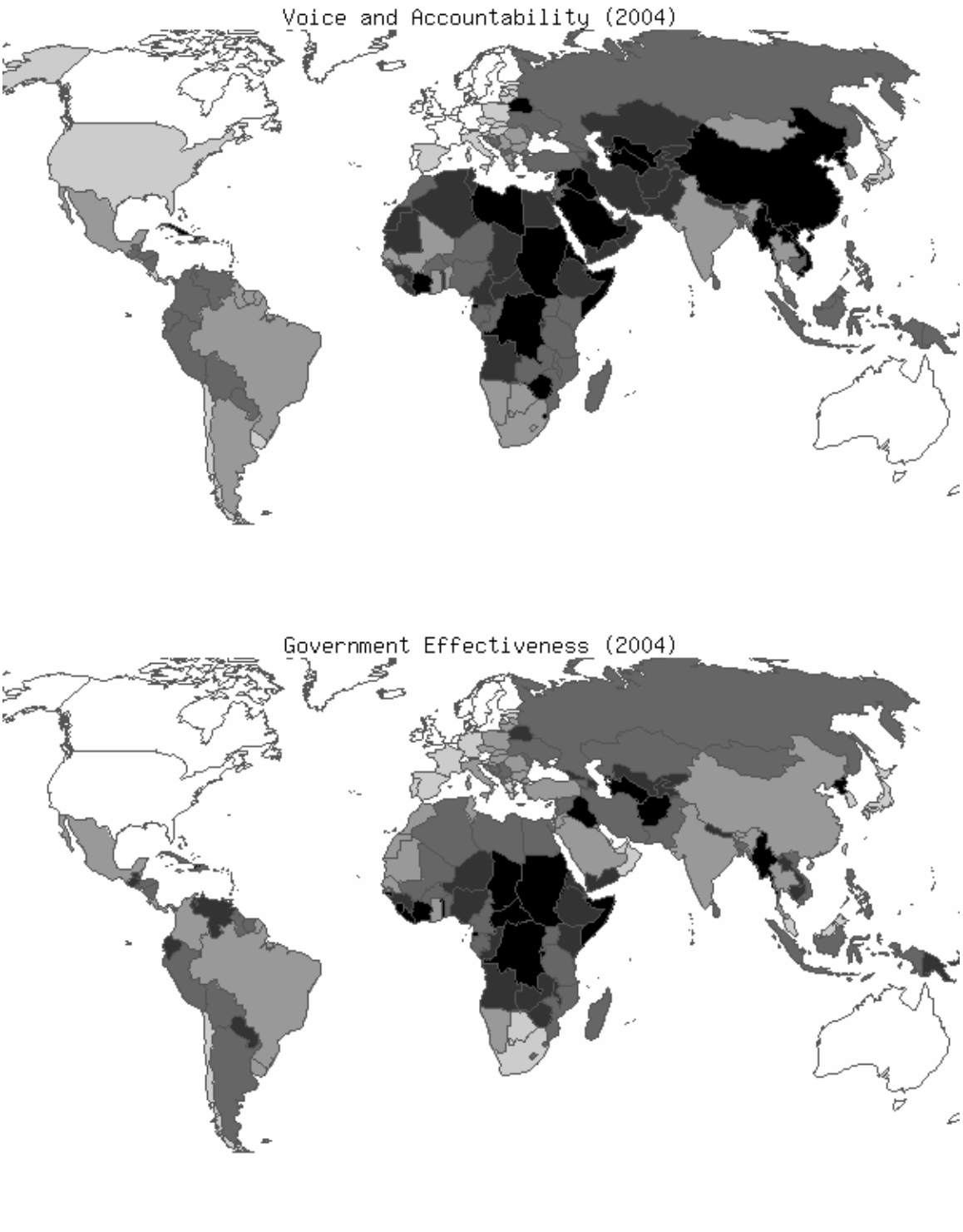


Figure 10 Governance indicators

In order to check whether the visual observations can be supported statistically, a presence of spatial autocorrelation of government indicators is tested. For any model specification discussed in the next section, an OLS regression that does not include a spatial lag of the dependent variable is evaluated and the Lagrange Multiplier test for a spatial autocorrelation of dependent variable is reported. The LM_ρ statistics indicate rejection of the null hypothesis at 1% confidence interval for all model specifications that do not include the spatial lag of the dependent variable.

Spatial autocorrelation of governance: IV regressions

A. Voice and accountability

Table 17 presents empirical evidences of the spatial autocorrelation of the voice and accountability index of governance. Columns (1)-(11) show results of panel regressions estimated by GMM procedure with the spatial lags of exogenous variables as instruments for the spatial lag of the dependent variable. Column (1) has results of two regressions with and without the spatial autoregressive lag, in the base model specification. First, the base model without the spatial lag is estimated and the spatial autocorrelation using the Lagrange Multiplier test is checked. The null hypothesis of no spatial autocorrelation of voice and accountability is strongly rejected as shown in the table. Second, the spatial lag of voice and accountability is included and the regression is estimated again. The coefficient of the spatial lag of index of governance, 0.232, is highly significant which implies that, for an average African country, relocation to the European continent would increase voice and

accountability by 56%.[44] If countries are ranked according to their index of voice and accountability, it means an upward movement in the ranking by 25 positions. Log of GDP per capita can cause biased estimates of coefficients due to reverse causality between the quality of governance and income. Column (2) presents results without log of GDP per capita as an explanatory variable. Alternative proxies for economic development are presented in columns (3)-(5). A lagged log of GDP per capita in column (3), log of GDP per capita in 1992 in the column (4), and the log of GDP per capita instrumented by the log of GDP per capita of the trading partners (AJR 2005) in column (5) are included to investigate the influence of potential biases on the estimated coefficients. The coefficient of spatial autocorrelation remains highly significant and stays in a range 0.232-0.348. Overall, the level of economic development has a positive impact on the index of voice and accountability. It is positive and significant in all model specifications. A country size measured by log of population has no impact on voice and accountability in all regressions at 5% significance level.

[44] Average index of spatial lag of voice and accountability is -0.65 in Africa and 0.84 in Europe. Other things being equal, relocation would increase index of voice and accountability from -0.63 to -0.28.

Table 17 Spatial lag of voice and accountability

	1a	1b	2	3	4	5	6
	Dependent variable is index of voice and accountability						
	Base Model		No GDP	Lag GDP	Init GDP	IV GDP	Raw Mat
Spatial lag of:							
Voice and accountability		0.232**	0.394***	0.307***	0.348***	0.247**	0.248***
		(2.454)	(3.898)	(3.106)	(3.440)	(2.239)	(3.194)
Log GDP per capita	0.271***	0.254***				0.243***	0.214***
	(12.111)	(5.654)				(2.697)	(5.897)
Lag of log GDP per capita				0.291***			
				(4.978)			
Log GDP per capita in 1992					0.273***		
					(4.245)		
Log Population	0.014	0.016	-0.077***	0.001	0.001	0.014	-0.031
	(0.917)	(0.587)	(2.981)	(0.029)	(0.032)	(0.370)	(1.257)
Absolute Lattitude	1.423***	1.053***	2.348***	1.207***	1.235***	1.079**	0.979***
	(7.879)	(3.088)	(7.679)	(3.463)	(3.362)	(2.275)	(3.344)
Landlocked (1=yes 0=no)	0.179***	0.205**	0.129	0.134	0.12	0.202*	0.206*
	(3.368)	(2.000)	(1.002)	(1.203)	(1.054)	(1.849)	(1.940)
Log of oil reserves, mln barrels	-0.093***	-0.070***	-0.01	-0.060***	-0.057***	-0.068***	
	(8.886)	(3.792)	(0.604)	(3.487)	(3.086)	(2.726)	
Share of raw materials in export							-0.604***
							(4.091)
Linguistic fractionalization	-0.224***	-0.131	-0.295*	-0.143	-0.163	-0.147	0.063
	(2.793)	(0.947)	(1.821)	(0.978)	(1.090)	(0.993)	(0.458)
Religion							
catho80	0.055	-0.085	-0.139	-0.115	-0.169	-0.102	-0.076
	(0.671)	(0.539)	(0.760)	(0.713)	(1.023)	(0.643)	(0.496)
muslim80	-0.855***	-0.800***	-0.993***	-0.736***	-0.771***	-0.808***	-0.739***
	(10.307)	(4.819)	(6.017)	(4.275)	(4.420)	(4.842)	(4.375)
protestants80	0.532***	0.506**	0.237	0.507**	0.436*	0.507**	0.505***
	(3.532)	(2.535)	(0.906)	(2.271)	(1.793)	(2.353)	(2.675)
Legal Origin (baseline is British)							
French	-0.079	-0.05	-0.104	-0.055	-0.056	-0.048	0.061
	(1.427)	(0.537)	(1.024)	(0.565)	(0.564)	(0.508)	(0.666)
Socialist	-0.579***	-0.524***	-1.133***	-0.636***	-0.678***	-0.545***	-0.392***
	(7.066)	(3.737)	(8.257)	(4.467)	(4.619)	(2.608)	(2.806)
German	-0.326***	-0.207*	0.173	-0.14	-0.141	-0.195	0.026
	(3.010)	(1.649)	(0.959)	(1.082)	(1.042)	(1.027)	(0.241)
Scandinavian	-0.467***	-0.473***	-0.603***	-0.509***	-0.517***	-0.489***	-0.328**
	(2.980)	(3.058)	(2.776)	(3.072)	(3.002)	(3.007)	(2.397)
Constant	-2.517***	-2.292***	1.162***	-2.534***	-2.312***	-2.156*	-1.094**
	(6.755)	(3.429)	(2.585)	(3.349)	(2.771)	(1.781)	(2.079)
Observations	708	708	747	686	690	708	678
Adjusted R squared	0.742	0.749	0.693	0.737	0.729	0.749	0.753
LM test for spatial autocorellation							
(spatial lag is not included in regression)	29.62***		49.05***	27.33***	29.22***	29.62***	32.56***
Relevancy of instruments							
Anderson canon. corr. LR statistic		1853.27	1824.90	1788.13	1853.76	210.98	1803.01
Validity of instruments							
Hansen J statistic (overidentification test of all instruments)		12.13	13.57	11.42	12.76	11.82	9.50
Chi-sq P-val =		0.44	0.26	0.50	0.39	0.38	0.66

Notes: Estimated by generalized method of moments with spatial lags of exogenous variables as instruments for the spatial lag of voice and accountability. Standard errors are heteroscedasticity- and cluster-robust. t-statistics presented in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

	7	8	9	10	11
	Dependent variable is index of voice and accountability				
	Culture	Legal	Colony	Colony&Legal	FD
Spatial lag of:					
Voice and accountability	**0.210****	**0.527*****	**0.182***	**0.242****	**0.781*****
	(2.094)	(5.621)	(1.737)	(2.306)	(3.561)
Log GDP per capita	**0.337*****	**0.295*****	**0.276*****	**0.222*****	**0.13**
	(9.563)	(5.778)	(8.407)	(5.737)	(0.719)
Log Population	**0.049***	**0.042**	**0.023**	**0.002**	**-0.003**
	(1.728)	(1.379)	(0.872)	(0.100)	(0.197)
Absolute Lattitude	**0.223**	**0.09**	**0.938*****	**1.292*****	
	(0.750)	(0.243)	(3.055)	(4.140)	
Landlocked (1=yes 0=no)	**0.126**	**0.182***	**0.063**	**0.1**	
	(1.208)	(1.647)	(0.644)	(1.022)	
Log of oil reserves, mln barrels	**-0.099*****	**-0.095*****	**-0.088*****	**-0.067*****	
	(5.997)	(4.588)	(6.117)	(3.942)	
Linguistic fractionalization	**0.03**	**-0.068**	**0.023**	**-0.131**	
	(0.212)	(0.446)	(0.160)	(0.900)	
Religion					
catho80	**0.038**		**0.144**	**-0.078**	
	(0.240)		(0.905)	(0.465)	
muslim80	**-0.617*****		**-0.639*****	**-0.796*****	
	(3.870)		(4.272)	(4.649)	
protestants80	**0.510*****		**0.560*****	**0.559*****	
	(2.803)		(3.178)	(2.595)	
Legal Origin (baseline is British)					
French		**-0.268*****		**0.158**	
		(2.832)		(1.381)	
Socialist		**-0.478*****		**-0.301***	
		(3.117)		(1.811)	
German		**-0.117**		**0.072**	
		(0.711)		(0.537)	
Scandinavian		**0.069**		**-0.335***	
		(0.417)		(1.903)	
Former Colony (baseline is British)					
Spanish			**-0.145**	**-0.18**	
			(1.015)	(1.115)	
French			**-0.338*****	**-0.349*****	
			(2.582)	(2.577)	
Russian			**-0.505*****	**-0.288**	
			(3.175)	(1.560)	
Other			**-0.271****	**-0.205**	
			(2.416)	(1.507)	
Never colony			**-0.246****	**-0.253****	
			(2.424)	(2.108)	
Country dummies					
Constant	**-3.544*****	**-2.854*****	**-2.678*****	**-1.850*****	
	(6.260)	(3.942)	(5.297)	(3.331)	
Observations	708	708	708	708	565
Adjusted R squared	0.73	0.70	0.74	0.75	0.03
LM test for spatial autocorellation (spatial lag is not included in regression)	25.39***	169.07***	23.93***	30.23***	
Relevancy of instruments					
Anderson canon. corr. LR statistic	1787.40	1795.23	1843.11	1961.51	173.40
Validity of instruments					
Hansen J statistic (overidentification test of all instruments)	8.50	18.25	10.64	17.30	0.67
Chi-sq P-val =	0.39	0.03	0.64	0.43	0.41

Notes: Estimated by generalized method of moments with spatial lags of exogenous variables as instruments for the spatial lag of voice and accountability. Standard errors are heteroscedasticity- and cluster-robust. t-statistics presented in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Due to omitted spatial lag in column (1a), the coefficient of the linguistic fractionalization, -0.224, indicates significant and negative impact on the quality of governance. The result, however, does not hold when the spatial lag of voice and accountability is included in column (1b). Similar effect is observed for the German legal origin indicator. It increases from -0.326 to -0.207 and loses significance. These evidences demonstrate importance of inclusion of the spatial dimension in cross-country regressions for correct estimation of regression coefficients.

Even after accounting for the spatial autocorrelation, geographic factors play an important role in determining quality of governance. A coefficient of the absolute latitude, which proxies for the effects of the absolute geographical location, is positive and significant. Nonetheless, it decreases from 1.42 in column (1a) to 1.05 in column (1b) that indicates importance of both absolute and relative geographical locations. Somewhat surprisingly, the base regression indicates that landlocked countries have better governance. It is likely that this phenomenon can be attributed to the fact that the population of landlocked countries have lower costs of relocation, while population of island-states, due to natural barriers, have higher costs of relocation and can be easily prevented from emigrating.

There is strong evidence in favor of the theory that abundance of natural resources reduces incentives of the government to react for the demand for higher accountability and more competitive political environment. Government can grant a permission to extract natural resources to several companies or even introduce a state controlled monopoly[45]. The government can further introduce high taxes on natural resource extracting businesses and high export duties in those sectors. As a result,

[45] For example, Gazprom in Russia is a private company controlled by the government.

government can effectively collect revenues without effective government policies in other sectors of the economy and without socially oriented reforms. Results hold when the measure of the natural resource potential is replaced by the actual share of the export of raw materials as presented in the column (6). However, these results should be interpreted with care due to potential endogeneity of this measure: industrial groups oriented to export raw materials can lobby for preferential treatment from the government and distort political processes to their own benefit.

Cultural differences measured by variations in composition of religious groups have an important impact on the quality of governance even when controlling for the spatial autocorrelation. Countries with high share of Muslims have lower quality of governance with the coefficient -0.8 in column (1b) while countries with high proportion of Protestants have better quality of voice and accountability with the coefficient 0.5. Proportion of Catholics, on the other hand, does not have a significant impact on the voice and accountability. These findings support the idea that cultural differences and traditions, shaped by religious beliefs, put constraints on the form of government and its performance (Weber, 1958; Landes, 1998). La Porta (1999) indicated that legal system origin and composition of religion groups are highly correlated with each other. For example, countries colonized by France inherited a French legal system and had a higher share of Catholics; while countries colonized by England inherited a English legal system, and had a higher share of Protestants. A regression that excludes country legal origin dummies was performed to see whether it has any effect on the coefficients of cultural variables in column (7).

Socialist origin of the legal system have a significant and negative coefficient, -0.524, in the base model specification and is robust in all model specifications. This result, however, should have an interpretation that goes beyond the legal system origin argument. Socialist legal origin dummy can be considered as a proxy for the Socialist system of government in general, which has a long-lasting adverse effect on the formation of democratic institutions of governance. In addition, Socialist countries experienced a period of transition that influenced quality of governance. Somewhat surprisingly, Scandinavian legal origin has a negative impact on voice and accountability. The result does not hold, however, if the share of Protestants is excluded from the regression due to high correlation between those two variables as demonstrated in column (8). Models in columns (9) and (10) investigate how colonial legacy, in addition to the legal system origin, influence voice and accountability. The baseline for these dummies is English former colony.

Finally, the results of regressions in the first differences are presented in columns (11). These allow us to remove country fixed effects and look at short-term fluctuations of governance and its determinants. The coefficient of the lag of voice and accountability remains highly significant. More importantly, it is higher than in regressions (1)-(10).

The test for spatial autocorrelation, presented below the adjusted R-squared is significant at 1% level for all model specifications. Tables also report diagnostic statistics of the first stage IV regressions to assess relevancy and validity of used instruments. Instruments are highly relevant in all models that is indicated by the high value of the LR statistics. An overidentification test presented below the LR statistics

demonstrates that instruments pass the test for orthogonality of instruments for all models except in the column (8) when cultural proxies are excluded from the regression.

Channels of the policy diffusion

This section discusses the sensitivity of results to the choice of weights and existence of alternative spatial links based on common language or common history that are not related to distance measures. Table 18 presents results in the base model specification for four different weighting matrices. Column (1) presents results with the weights inversely related to distance, which is the same regression as in column (1b) of Table 17. It is included as a reference point. In column (2), preliminary weights are set equal to 1 if countries i and j share a common border and 0 otherwise and scaled to add up to one in each row. An estimated spatial autoregressive parameter remains positive and significant and change value from 0.232 to 0.204. In this case, choice of the weighting matrix does not change signs and significance levels of the coefficients of independent variables with the exception of ethnolinguistic fractionalization. It also has little impact on quantitative values of estimated coefficients. In column (3), spatial neighbors are defined as countries that share a common language. The dummy variable that defines the common language is taken from the CEPII's geographical and distance measures dataset. As can be seen in column (3), a spatial autocorrelation of voice and accountability between countries that share common language is not significantly different from zero. Finally, in column (4), a hypothesis of a spatial autocorrelation of quality of governance between

countries that share common history during the colonization period is tested. The results show no evidence of policy diffusion through this channel.

Table 18 Spatial lag of voice and accountability: alternative weights

Different weighting matrices

	1	2	3	4
	Distance	Common border	Common language	Former colony
Spatial lag of:				
Voice and accountability	**0.232****	**0.204*****	**0.011**	**0.048**
	(2.454)	(2.647)	(0.173)	(0.867)
Log GDP per capita	**0.254*****	**0.237*****	**0.254*****	**0.262*****
	(5.654)	(5.393)	(5.685)	(6.212)
Log Population	**0.016**	**0**	**0.012**	**0.024**
	(0.587)	(0.003)	(0.414)	(0.838)
Absolute Lattitude	**1.053*****	**1.086*****	**1.513*****	**1.551*****
	(3.088)	(3.342)	(4.607)	(4.550)
Landlocked (1=yes 0=no)	**0.205****	**0.181****	**0.099**	**0.157**
	(2.000)	(1.963)	(0.928)	(1.522)
Log of oil reserves, mln thds barrels	**-0.070*****	**-0.089*****	**-0.085*****	**-0.098*****
	(3.792)	(4.967)	(4.574)	(5.669)
Linguistic fractionalization	**-0.131**	**-0.290****	**-0.255***	**-0.192**
	(0.947)	(2.084)	(1.693)	(1.320)
Religion				
catho80	**-0.085**	**-0.114**	**0.093**	**0.054**
	(0.539)	(0.783)	(0.678)	(0.399)
muslim80	**-0.800*****	**-0.763*****	**-0.841*****	**-0.742*****
	(4.819)	(4.730)	(5.394)	(4.802)
protestants80	**0.506****	**0.493*****	**0.505*****	**0.572*****
	(2.535)	(2.653)	(2.582)	(3.083)
Legal Origin:				
french	**-0.05**	**-0.052**	**-0.118**	**0.009**
	(0.537)	(0.533)	(1.206)	(0.088)
socialist	**-0.524*****	**-0.508*****	**-0.549*****	**-0.515*****
	(3.737)	(3.713)	(3.901)	(3.489)
german	**-0.207***	**-0.231***	**-0.301****	**-0.245****
	(1.649)	(1.858)	(2.210)	(2.164)
scandinavian	**-0.473*****	**-0.485*****	**-0.471*****	**-0.451*****
	(3.058)	(3.289)	(2.822)	(2.924)
Constant	**-2.292*****	**-1.847****	**-2.332*****	**-2.768*****
	(3.429)	(2.530)	(3.360)	(4.105)
Observations	708	708	708	708
R squared	0.749	0.752	0.74	0.74
Relevancy				
Anderson canon. corr. LR statistic	1853.27	558.70	1184.11	1590.98
Validity				
Hansen J statistic (overidentification test of all instruments)	12.13	7.12	9.96	12.34
Chi-sq P-val =	0.44	0.85	0.53	0.42

Standard errors below the coefficients

* significant at 10%; ** significant at 5%; *** significant at 1%

Notes:We report results in the base model specification for different weighting matrices. In column (2), weights are set equal to 1 if countries have a common border and 0 otherwise. In column (3), weights are set equal to 1 if countries share the same language and 0 otherwise. In column (4), weights are set equal to 1 if one of the countries was a colony of the other one and 0 otherwise. All weights are raw-normalized, t-statistics presented in parentheses.

B. Government effectiveness

There is a high correlation between measures of voice and accountability and government effectiveness that is equal to 0.79 for the whole sample. Nevertheless, some distinct geographical patterns of distribution of the government effectiveness index across continents are observed that are not identical to the spatial distribution of the index of voice and accountability. For example, countries located in American continent score higher than Asian countries in terms of voice and accountability: 0.24 in America and -0.63 in Asia. At the same time, they have about the same averages of government effectiveness: -0.03 in America and -0.09 in Asia. Theoretically, other things being equal, countries that have more competitive selection of government should also have more effective governments. On the other hand, countries differ in terms of their size, population diversity, and structure of political system. This diversity can create coordination problems and redistribution conflicts that can be relatively easily solved by an authoritarian ruler and very difficult to solve by a democratic society. Therefore, investigation of determinants of government effectiveness gives additional insights on the spatial diffusion of governance.

We run regressions similar to the ones discussed in the previous chapter with the dependent variable of index of government effectiveness. However, a different weighting matrix that defines neighbors as countries having a common border is used in all models discussed in this section because regressions using weights inversely related to distance do not pass the Hansen J test. Robustness of results with alternative weighting specifications is presented and discussed in the next section.

Columns (1a) and (1b) in Table 19 present results of the base model specification with and without the spatial lag of government effectiveness. The hypothesis of no spatial autocorrelation in column (1a) is strongly rejected as indicated by a high value of Anselin's Lagrange Multiplier statistic, 39.83. The estimated coefficient of the spatial autoregressive parameter in column (1b) is 0.254. The result is robust the use of alternative measures of GDP per capita in columns (3) and (4) and is significant at 6% level if log of GDP per capita is instrumented by the weighted log of GDP of the main trading partners as shown in column (5). The spatial autoregressive lag decreases substantially and loses its significance when legal origin dummies are not included as explanatory variables in the column (7). It is not surprising, since the legal system is a very important government institution which determines how efficient the government is. When dummies of legal origin are excluded, it is also implicitly assumed that there is no policy diffusion mechanism that works through the legal system channels. At the same time, the coefficient of the spatial lag of government effectiveness is positive and significant in column (8) where cultural proxies are excluded. Therefore, it can be concluded that cultural channels of policy diffusion are weaker determinants of government effectiveness than legal channels are. Similarly to the analysis of voice and accountability, the coefficient of spatial autocorrelation is substantially higher when we run a regression in the first differences in column (11).

When the results of the models in columns (1a) and (1b) are compared, coefficients of absolute latitude, linguistic fractionalization, share of Muslims, and French legal origin lose their significance after a spatial lag is included. Rich and

populated countries tend to have more efficient governments as indicated by positive and significant coefficients of log of GDP per capita and log of population. The coefficient of log of GDP per capita in (1b), 0.468, is almost twice as big as the same coefficient in the regression with voice and accountability discussed in the previous section. The log of population has a positive and significant coefficient, 0.099, in the base model specification but the result is not robust in some of the alternative specifications. It is also important to mention that causality can also go in the opposite direction: more efficiently governed states are bigger and more prosperous.

Three factors that are important and robust in virtually all model specifications include: abundance of natural resources, share of Catholics, and Socialist legal origin. A negative sign of log of oil reserves supports the theory that abundance of natural resources has an adverse effect on the efficiency of state bureaucrats. When an alternative proxy in column (6) is used - a share of raw materials in total export - the effect is even stronger. Countries with high proportion of Catholics have less efficient governments. Finally, the Socialist legal origin has a negative impact on the government effectiveness. As in the previous section, it is likely that the Soviet legal system origin dummy proxies not only for a distinct structure of Soviet legal system but also for the whole system of Socialist institutions. It also captures an effect of transition period on governance that was experienced by former Socialist countries

Table 19 Spatial lag of government effectiveness

	1a	1b	2	3	4	5	6
	Dependent variable is index of government effectiveness						
	Base Model		No GDP	Lag GDP	Init GDP	IV GDP	Raw Mat
Spatial lag of:							
Government effectiveness		0.254***	0.472***	0.309***	0.369***	0.210*	0.216***
		(3.439)	(4.587)	(4.508)	(4.942)	(1.894)	(3.247)
Log GDP per capita	0.562***	0.468***				0.523***	0.397***
	(26.568)	(10.334)				(4.650)	(10.024)
Lag of log GDP per capita				0.538***			
				(10.591)			
Log GDP per capita in 1992					0.491***		
					(8.568)		
Log Population	0.099***	0.080***	-0.086***	0.02	0.015	0.096**	0.015
	(6.771)	(3.065)	(3.069)	(0.836)	(0.575)	(2.353)	(0.812)
Absolute Lattitude	0.505***	0.37	2.395***	0.653*	0.707*	0.197	0.475
	(2.959)	(1.084)	(5.744)	(1.809)	(1.829)	(0.438)	(1.575)
Landlocked (1=yes 0=no)	0.222***	0.182**	-0.119	0.122	0.085	0.216*	0.127
	(4.410)	(2.010)	(0.947)	(1.139)	(0.739)	(1.948)	(1.480)
Log of oil reserves, mln barrels	-0.107***	-0.096***	0.01	-0.068***	-0.065***	-0.109***	
	(10.802)	(5.916)	(0.469)	(4.351)	(3.787)	(3.842)	
Share of raw materials in export							-0.784***
							(6.479)
Linguistic fractionalization	0.170**	0.152	-0.18	-0.016	-0.105	0.197	0.293**
	(2.240)	(1.202)	(0.965)	(0.127)	(0.787)	(1.244)	(2.447)
Religion							
catho80	-0.340***	-0.358***	-0.102	-0.340**	-0.375**	-0.371***	-0.215*
	(4.386)	(2.741)	(0.542)	(2.345)	(2.381)	(2.800)	(1.646)
muslim80	-0.190**	-0.118	-0.366*	-0.122	-0.174	-0.09	0.034
	(2.424)	(0.851)	(1.926)	(0.837)	(1.141)	(0.583)	(0.245)
protestants80	0.141	0.202	-0.179	0.199	0.129	0.243	0.464**
	(0.992)	(0.877)	(0.553)	(0.764)	(0.447)	(0.976)	(2.406)
Legal Origin (baseline is British)							
French	-0.141***	-0.097	-0.263**	-0.107	-0.121	-0.094	-0.036
	(2.693)	(1.112)	(2.010)	(1.169)	(1.259)	(1.022)	(0.440)
Socialist	-0.406***	-0.342**	-1.142***	-0.578***	-0.633***	-0.284	-0.271**
	(5.232)	(2.501)	(6.062)	(3.858)	(3.932)	(1.537)	(2.184)
German	-0.433***	-0.297*	0.550***	-0.1	-0.066	-0.406	0.043
	(4.233)	(1.810)	(3.051)	(0.615)	(0.391)	(1.631)	(0.351)
Scandinavian	0.026	0.03	-0.069	-0.052	-0.069	0.028	0.004
	(0.174)	(0.134)	(0.232)	(0.210)	(0.249)	(0.122)	(0.023)
Constant	-5.950***	-4.909***	1.327***	-4.812***	-4.241***	-5.598***	-3.199***
	(16.878)	(7.459)	(2.740)	(7.145)	(5.675)	(3.733)	(6.392)
Observations	708	708	747	686	690	708	678
Adjusted R squared	0.8	0.811	0.646	0.788	0.763	0.812	0.807
LM test for spatial autocorellation							
(spatial lag is not included in regression)	39.83***		106.22***	52.70***	58.93***	39.83***	34.80***
Relevancy of instruments							
Anderson canon. corr. LR statistic		531.84	468.96	485.58	455.06	94.84	494.22
Validity of instruments							
Hansen J statistic (overidentification test of all instruments)		14.81	18.00	15.77	14.53	15.19	14.32
Chi-sq P-val =		0.25	0.08	0.20	0.27	0.17	0.28

Notes: Estimated by generalized method of moments with spatial lags of exogenous variables as instruments for the spatial lag of voice and accountability. Standard errors are heteroscedasticity- and cluster-robust. t-statistics presented in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

	7	8	9	10	11
	Dependent variable is index of government effectiveness				
	Culture	Legal	Colony	Colony&Legal	FD
Spatial lag of:					
Government Effectiveness	**0.179***	**0.205*****	**0.345*****	**0.257*****	**0.652****
	(1.658)	(2.834)	(4.100)	(3.700)	(2.163)
Log GDP per capita	**0.521*****	**0.462*****	**0.453*****	**0.448*****	**0.376*****
	(11.430)	(9.739)	(12.175)	(10.577)	(3.711)
Log Population	**0.092*****	**0.067****	**0.079*****	**0.085*****	**-0.364**
	(3.493)	(2.526)	(3.669)	(3.829)	(1.620)
Absolute Lattitude	**-0.04**	**0.488**	**0.311**	**0.656***	
	(0.161)	(1.451)	(1.041)	(1.933)	
Landlocked (1=yes 0=no)	**0.150***	**0.157***	**0.151***	**0.209****	
	(1.688)	(1.687)	(1.782)	(2.389)	
Log of oil reserves, mln barrels	**-0.098*****	**-0.092*****	**-0.083*****	**-0.083*****	
	(5.836)	(5.943)	(5.844)	(5.409)	
Linguistic fractionalization	**0.21**	**0.254****	**0.201**	**0.211**	
	(1.593)	(1.992)	(1.631)	(1.636)	
Religion					
catho80	**-0.310****		**-0.301****	**-0.290****	
	(2.451)		(2.372)	(2.232)	
muslim80	**-0.016**		**-0.102**	**-0.162**	
	(0.120)		(0.815)	(1.200)	
protestants80	**0.447*****		**0.328****	**0.16**	
	(2.816)		(2.055)	(0.709)	
Legal Origin (baseline is British)					
French		**-0.233*****		**0.024**	
		(2.901)		(0.239)	
Socialist		**-0.402*****		**-0.147**	
		(2.964)		(0.964)	
German		**-0.262***		**-0.04**	
		(1.741)		(0.241)	
Scandinavian		**0.330****		**0.239**	
		(2.146)		(0.898)	
Former Colony (baseline is British)					
Spanish			**-0.181**	**-0.223**	
			(1.325)	(1.513)	
French			**-0.086**	**-0.121**	
			(0.804)	(0.901)	
Russian			**-0.396*****	**-0.421*****	
			(2.897)	(3.113)	
Other			**-0.334*****	**-0.316*****	
			(3.604)	(2.814)	
Never colony			**-0.278****	**-0.298*****	
			(2.476)	(2.925)	
Constant	**-5.608*****	**-4.777*****	**-4.724*****	**-4.829*****	
	(8.355)	(7.109)	(9.023)	(8.477)	
Observations	708	708			565
Adjusted R squared	0.80	0.80	0.81	0.82	
LM test for spatial autocorellation (spatial lag is not included in regression)	48.79***	26.10***	38.43***	36.11***	
Relevancy of instruments					
Anderson canon. corr. LR statistic	293.99	408.51	502.50	581.40	14.26
Validity of instruments					
Hansen J statistic (overidentification test of all instruments)	11.65	14.28	16.63	20.94	1.14
Chi-sq P-val =	0.17	0.11	0.22	0.23	0.28

Notes: Estimated by generalized method of moments with spatial lags of exogenous variables as instruments for the spatial lag of voice and accountability. Standard errors are heteroscedasticity- and cluster-robust. t-statistics presented in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Channels of the policy diffusion

The previous section discussed results with only contiguous countries defined as neighbors. There are no significant differences in results when distance based weights are used as shown in columns (1) and (2) of Table 20. An interesting result that distinguishes these regressions from results of the previous section is a positive and significant coefficient of the spatial autoregressive parameter in column (4) where neighbors are defined as a pair of countries one of which previously was a colony of the other.

Table 20 Spatial lag of governance effectiveness: alternative weights
Different weighting matrices

	1	2	3	4
	Distance	Common border	Common language	Former colony
Spatial lag of:				
Government Effectiveness	**0.244****	**0.254*****	**0.073**	**0.086****
	{2.403}	{3.439}	{0.786}	{2.027}
Log GDP per capita	**0.525*****	**0.468*****	**0.552*****	**0.532*****
	{10.589}	{10.334}	{11.969}	{11.073}
Log Population	**0.092*****	**0.080*****	**0.095*****	**0.090*****
	{3.472}	{3.065}	{3.816}	{3.521}
Absolute Lattitude	**0.454**	**0.37**	**0.56**	**1.017****
	{1.136}	{1.084}	{1.480}	{2.433}
Landlocked (1=yes 0=no)	**0.299*****	**0.182****	**0.213****	**0.214****
	{3.353}	{2.010}	{2.277}	{2.434}
Log of oil reserves, mln thds barrels	**-0.108*****	**-0.096*****	**-0.115*****	**-0.106*****
	{5.750}	{5.916}	{6.645}	{5.823}
Linguistic fractionalization	**0.242***	**0.152**	**0.21**	**0.121**
	{1.776}	{1.202}	{1.581}	{0.874}
Religion				
catho80	**-0.320****	**-0.358*****	**-0.219**	**-0.361****
	{2.240}	{2.741}	{1.643}	{2.510}
muslim80	**-0.15**	**-0.118**	**-0.02**	**-0.122**
	{0.990}	{0.851}	{0.139}	{0.821}
protestants80	**0.211**	**0.202**	**0.126**	**0.109**
	{0.891}	{0.877}	{0.509}	{0.474}
Legal Origin:				
french	**-0.109**	**-0.097**	**-0.11**	**-0.031**
	{1.148}	{1.112}	{1.182}	{0.340}
socialist	**-0.518*****	**-0.342****	**-0.365****	**-0.444*****
	{3.583}	{2.501}	{2.538}	{3.256}
german	**-0.429****	**-0.297***	**-0.408****	**-0.245**
	{2.374}	{1.810}	{1.970}	{1.215}
scandinavian	**-0.128**	**0.03**	**0.165**	**-0.052**
	{0.590}	{0.134}	{0.681}	{0.221}
Constant	**-5.612*****	**-4.909*****	**-5.967*****	**-5.847*****
	{8.107}	{7.459}	{9.517}	{9.245}
Observations	708	708	708	708
R squared	0.798	0.811	0.799	0.8
Relevancy				
Anderson canon. corr. LR statistic				
Validity	1674.77	531.84	1366.30	1285.82
Hansen J statistic (overidentification test of all instruments)				
Chi-sq P-val =	26.07	14.81	19.63	20.72
Standard errors below the coefficients	0.01	0.25	0.05	0.05

* significant at 10%; ** significant at 5%; *** significant at 1%

Notes:We report results in the base model specification for different weighting matrices. In column (2), weights are set equal to 1 if countries have a common border and 0 otherwise. In column (3), weights are set equal to 1 if countries share the same language and 0 otherwise. In column (4), weights are set equal to 1 if one of the countries was a colony of the other one and 0 otherwise. All weights are raw-normalized, t-statistics presented in parentheses.

Conclusions

Political and economic institutions inside a country are determined not only by internal, country-specific factors but also by broader regional factors, especially in neighboring countries. Formation of institutions of governance is a long process which is shaped by economic, cultural, and political factors that interact within a country and between different countries. In the long run, country borders are endogenously determined because of political and economic competition among country states. During the process, successful, economically and politically viable countries succeed in expanding their borders and spheres of economic and cultural influence while unsuccessful, non-efficient governments contract and lose ground on the international arena.

Because of this interconnectedness, economic and political studies of development should take into account spatial links between countries. The policy diffusion effect is robust and quite substantial on its own. More importantly, failure to include spatial autoregressive lag leads to biased estimates of the coefficients in regressions that study determinants of governance and impact of governance on economic development. In this paper, the negative effect of ethnolingustic fractionalization on voice and accountability disappears when the spatial lag is included. The negative impact of French legal system on voice and accountability and negative impact of French or German legal system on government effectiveness becomes not significant when the spatial autocorrelation is included in the regressions. At the same time, the effect of the socialist legal origin on quality of governance remains negative and robust. Results for the cultural determinants of

quality of governance remain robust and agree with the previous studies. Economic factors and abundance of natural resources have significant impact on the quality of governance and work in opposite directions: economically rich countries have better governments but natural resource rich countries have worse governance due to lower incentives to reform.

It is important to point out that we have found a useful instrumental variable to investigate the impact of institutions on economic growth and development: spatial lags of economic, cultural, and political variables are correlated with institutions inside the country and are less likely to correlate with errors as demonstrated by IV regressions in tables 16-20.

From the policy perspectives, an important lesson can be drawn: it is very unlikely to build a democratic and efficient government in a separate country that is surrounded by authoritarian governed countries. It is equally unlikely that a dictatorship will last in a predominantly democratic region. Therefore, development policies should focus on regional development in poor regions with bad governance rather than on separate countries.

Appendices

A. Estimation of the model parameters[46]

Stacking observations in (1) over *i=1,2,…,N* yields

$$\ln FDI_t = index_t\beta + W\ index_t\delta + z_t\gamma + u_t \qquad (2)$$

where

$$\ln FDI_t = (\ln FDI_{1t,}\ \ln FDI_{2t,}...,\ln FDI_{Nt})'$$

$$index_t = (index_{1t,} index_{2t,}...,index_{Nt})'$$

$$W = \begin{bmatrix} w_{11} & \cdots & w_{1N} \\ \cdots & \cdots & \cdots \\ w_{N1} & \cdots & w_{NN} \end{bmatrix}$$

$$z_t = \begin{bmatrix} z_{1t1} & \cdots & z_{1tK} \\ \cdots & \cdots & \cdots \\ z_{Nt1} & \cdots & z_{NtK} \end{bmatrix}$$

$$u_t = (u_{1t,} u_{2t,}...,u_{Nt})'$$

Note that $lnFDI_t$, $index_t$, and u_t are Nx1 vectors which relate to, respectively, the dependent variable, the index of governance, and the disturbance term over the N countries at time t. W_1 is an *NxN* time invariant weighting matrix, and z_t is an *NxK* matrix of observations of K exogenous variables.

[46] We use a modified version of the program available at http://www.econ.umd.edu/~prucha/Research_Prog3.htm.

In the next step, the spatial error structure is specified. Because of unobservable regional shocks, errors are expected to be spatial correlated[47]. Therefore, the following error structure is assumed:

$$u_t = \rho W u_t + \varepsilon_t, \qquad |\rho|<1$$

where ρ is a scalar autoregressive parameter and

$$\varepsilon_t = (\varepsilon_{1t,}\varepsilon_{2t,}...,\varepsilon_{Nt})'$$

is $N \times 1$ vector of innovations in period *t*.

These innovations consist of a country specific error component and an error component that varies across countries and time periods. The specification is consistent with a classical one way error component model. Specifically, the *i-th* element of ε_t has the following form:

$$\varepsilon_{it} = \mu_i + \nu_{it}$$

where μ_i is *i.i.d.* $(0,\sigma_\mu^2)$, ν_{it} is *i.i.d.* over both *i* and *t* with $(0,\sigma_\nu^2)$ and the processes $\{\mu_i\}$ and $\{\nu_{it}\}$ are independent.

Stacking the observations over t=1,2,…,T yields

$$\ln FDI = index * \beta + (I_T \otimes W) index\delta + Z * \gamma + u \qquad (2)$$

with

$$\ln FDI = (\ln FDI_1, \ln FDI_2, ..., \ln FDI_T)'$$

is an NTx1 vector of observations on the dependent variable.

[47] For example, Russian financial crisis in August 1998 had a spillover effect on financial systems of all transition countries. Introduction of protective trade barriers or quotas is another example of a shock that can spread over the region.

$$index = (index_1, index_2, ..., index_T)'$$

is an NTx1 vector of index of governance.

$$Z = (Z'_1, Z'_2, ..., Z'_T)'$$

is an NTxK matrix of exogenous variables that influence lnFDI. Also

$$u = \rho(I_T \otimes W)u + \varepsilon$$

$$\varepsilon = (e_T \otimes I_N)\mu + \nu$$

where

$$\mu = (\mu_1, \mu_2, ..., \mu_N)'$$

is an *N×1* vector of unit specific error components.

$$\nu = (\nu_1, \nu_2, ..., \nu_T)'$$

is a *NTx1* vector of error components that varies over cross-sectional units and time periods.

Among other things, our assumptions imply

$$E(\varepsilon\varepsilon') = \sigma_\mu^2 (e_T e'_T \otimes I_N) + \sigma_\nu^2 I_{NT}$$

Based on the error structure of the model, the covariance between elements of ε has the following form

$$E(\varepsilon_{it}\varepsilon_{js}) = \begin{bmatrix} \sigma_\mu^2 + \sigma_\nu^2 & if & i = j, t = s \\ \sigma_\mu^2 & if & i = j, t \neq s \\ 0 & & otherwise \end{bmatrix}$$

and

$$E(\varepsilon) = 0$$

The variance-covariance matrix of ε can be expressed in the following form

$$\Omega_{\varepsilon,N} = \sigma_n^2 Q_{0,N} + \sigma_1^2 Q_{1,N}$$

where

$$\sigma_1^2 = \sigma_n^2 + T\sigma_0^2$$

and

$$Q_{0,N} = (I_T - \frac{J_T}{T}) \otimes I_N$$

$$Q_{1,N} = \frac{J_T}{T} \otimes I_N$$

where $J_T = e_T e_T^{'}$ is a TxT matrix of unit elements.

$Q_{0,N}$ and $Q_{1,N}$ are symmetric, idempotent, and orthogonal to each other. Therefore, the inverse of the variance-covariance matrix of ε is $\Omega_{\varepsilon,N}^{-1} = \sigma_\nu^{-2} Q_{0,N} + \sigma_1^{-2} Q_{1,N}$

The advantage of the suggested decomposition is that the inverse of the variance covariance matrix can be easily calculated for large N.

To estimate the model (2), Kapoor, Kelejian, and Prucha (2004) suggested a three-step GMM procedure:

Step1 Initial estimation of residuals u

Use OLS to estimate the regression residuals $\hat{u}$:

$$\hat{u} = \ln FDI - index * \hat{\beta} - (I_T \otimes W) * index * \hat{\delta} + Z * \hat{\gamma} = \ln FDI - \Gamma \hat{\theta}$$

where

$$\Gamma = (index, (I_T \otimes W) index, Z),$$

$$\theta = (\beta, \delta, \gamma)'$$

$$\hat{\theta}=(\Gamma'\Gamma)^{-1}\Gamma' y$$

Step 2 Generalized method of moments (GMM)

Kapoor, Kelejian, and Prucha (2004) give six moment conditions that relate to the coefficients ρ, σ_v, σ_1 of the model. Based on the moment conditions they suggest the following GMM procedure.

Let $a = \hat{u}$, $b = W\hat{u}$, $c = W^2\hat{u}$. Initial consistent estimators of the parameters ρ, σ_v, say $\tilde{\rho}, \tilde{\sigma}_v$, are calculated follows:

$\tilde{\rho}, \tilde{\sigma}_v$ are obtained by minimizing the quadratic form

$$(\tilde{\rho}, \tilde{\sigma}^2{}_v) = \underset{\rho, \sigma_v^2}{\arg\min} (B_1\lambda - B_2)'(B_1\lambda - B_2)$$

where $\lambda = (\rho, \rho^2, \sigma^2{}_v)'$,

$$B_1 = \begin{bmatrix} \frac{2}{N(T-1)} a' Q_{0,N} b & -\frac{1}{N(T-1)} b' Q_{0,N} b & 1 \\ \frac{2}{N(T-1)} b' Q_{0,N} c & -\frac{1}{N(T-1)} c' Q_{0,N} c & \frac{1}{N} Tr(W_N' W_N) \\ \frac{1}{N(T-1)} (a' Q_{0,N} b + c' Q_{0,N} c) & -\frac{1}{N(T-1)} b' Q_{0,N} c & 0 \end{bmatrix},$$

$$B_2 = \begin{bmatrix} \frac{1}{N(T-1)} a' Q_{0,N} a \\ \frac{1}{N(T-1)} b' Q_{0,N} b \\ \frac{1}{N(T-1)} a' Q_{0,N} b \end{bmatrix}$$

Initial estimator of σ^2_1, $\tilde{\sigma}^2_1$, is defined as

$$\tilde{\sigma}^2_1 = \frac{1}{N}(\hat{u} - \tilde{\rho}b)' Q_{1,N} (\hat{u} - \tilde{\rho}b)$$

In the second part of Step2 the fully weighted GM estimator for $\rho, \sigma^2_v, \sigma^2_1$ is computed by minimizing a quadratic form

$$(\hat{\rho}, \hat{\sigma}^2_v, \hat{\sigma}^2_1) = \underset{\rho, \sigma^2_v, \sigma^2_1}{\arg\min} (\hat{A}_1 \lambda_1 - \hat{A}_2)' \tilde{\Upsilon}^{-1} (\hat{A}_1 \lambda_1 - \hat{A}_2)$$

where $\lambda_1 = (\rho, \rho^2, \sigma^2_v, \sigma^2_1)'$

$$A_1 = \begin{bmatrix} \frac{2}{N(T-1)} a' Q_{0,N} b & -\frac{1}{N(T-1)} b' Q_{0,N} b & 1 & 0 \\ \frac{2}{N(T-1)} b' Q_{0,N} c & -\frac{1}{N(T-1)} c' Q_{0,N} c & \frac{1}{N} Tr(W'_N W_N) & 0 \\ \frac{1}{N(T-1)} (a' Q_{0,N} b + c' Q_{0,N} c) & -\frac{1}{N(T-1)} b' Q_{0,N} c & 0 & 0 \\ \frac{2}{N} a' Q_{1,N} b & -\frac{1}{N} b' Q_{1,N} b & 0 & 1 \\ \frac{2}{N} b' Q_{1,N} c & -\frac{1}{N} c' Q_{1,N} c & 0 & \frac{1}{N} Tr(W'_N W_N) \\ \frac{1}{N} (a' Q_{1,N} b + c' Q_{1,N} c) & -\frac{1}{N} b' Q_{1,N} c & 0 & 0 \end{bmatrix},$$

$$A_2 = \begin{bmatrix} \frac{1}{N(T-1)} a' Q_{0,N} a \\ \frac{1}{N(T-1)} b' Q_{0,N} b \\ \frac{1}{N(T-1)} a' Q_{0,N} b \\ \frac{1}{N} a' Q_{1,N} a \\ \frac{1}{N} b' Q_{1,N} b \\ \frac{1}{N} a' Q_{1,N} b \end{bmatrix}$$

and

$$\mathrm{Y} = \begin{bmatrix} \frac{1}{T-1}\sigma_\nu^4 & 0 \\ 0 & \sigma_1^4 \end{bmatrix} \otimes \begin{bmatrix} 2 & 2Tr(\frac{W_N^{'}W_N}{N}) & 0 \\ 2Tr(\frac{W_N^{'}W_N}{N}) & 2Tr(\frac{W_N^{'}W_N W_N^{'}W_N}{N}) & Tr(\frac{W_N^{'}W_N(W_N^{'}+W_N)}{N}) \\ 0 & Tr(\frac{W_N^{'}W_N(W_N^{'}+W_N)}{N}) & Tr(\frac{W_N W_N + W_N^{'}W_N}{N}) \end{bmatrix}$$

is the weighting matrix that lead to the efficient estimators

Step 3 Generalized least square estimation of the coefficient $\theta = (\beta, \delta, \gamma)'$

Estimate coefficients θ by feasible generalized least square method:

$$\hat{\theta}_{FGLS} = (\Gamma^{*'}\Omega_\varepsilon^{-1}\Gamma^{*})^{-1}\Gamma^{*'}\Omega_\varepsilon^{-1} y^{*}$$

where

$$\Gamma^{*} = [I_T \otimes (I_N - \rho W)]\Gamma$$
$$y^{*} = [I_T \otimes (I_N - \rho W)]y$$

and $\hat{\Omega}_\varepsilon = \hat{\sigma}_\nu^2 Q_{0,N} + \hat{\sigma}_1^2 Q_{1,N}$

B Data sources

Variable	Description	Source
Governance Indicators		
Voice and accountability	Measures various aspects of the political process, civil liberties and political rights.	Governance matters IV: Governance indicators for 1996-2004
Government Effectiveness	Measures responses on the quality of public service provision, the quality of the bureaucracy, the competence of civil servants, the independence of the civil service from political pressures, and the credibility of the government's commitment to policies.	Governance matters IV: Governance indicators for 1996-2005
Economic Indicators		
Log GDP per capita	PPP based log of GDP per capita in constant 2000 $US	World Development Indicators 2005, World Bank
Log Population	Log of population	World Development Indicators 2005, World Bank
Legal Origin	Identifies the legal origin of the Company Law of Commercial Law of each country. There are fove possible origins: (1) English Common Law; (2) French Commercial Code; (3) German Commercial Code; (4) Scandinavian Commercial Code; (5) Socialist/Communsit Laws	La Porta et al (1999)
Resources		
Explored oil resources	Log of proved reserves of oil, thousand million barrels – Generally taken to be those quantities that geological and engineering information indicates with reasonable certainty can be recovered in the future	Statistical Review of World Energy 2006, BP report
Share of raw materials in export	Share of export of raw materials to total export, calculated as period average share based on sectoral export data for each country	The Commodity Trade Statistics database (UN Comtrade)
Cultural heterogeneity		
Linguistic fractionalization	Index of fractionalization constructed based on the shares of languages spoken as "mother tongues"	Alesina et al 2003
Religious affiliation	Religion identifies the percentage of population of each country that belonged to the three most widely spread world religions in 1980. The numbers are in percent (scale from 0 to 100). The three religions identified are: (1) Roman Catholic; (2) Protestant; (3) Muslim.	La Porta et al (1999)
Geography		
Landlocked: 1 yes 0 no		CEPII's distance measures and geographical data
Absolute latitude	Latitude: the absolute value of latitude of the country scaled from 0 to 1.	La Porta et al (1999)
Weights		
Distance-based*	Inverse of distance between countries if they are located at the same continent, 0 otherwise	CEPII's distance measures and geographical data
Common border*	1 if countries have common border, 0 otherwise	CEPII's distance measures and geographical data
Common language*	1 if countries have common language, 0 otherwise	CEPII's distance measures and geographical data
Colony*	1 if one of the countires is a former colony of the other country, 0 otherwise	CEPII's distance measures and geographical data

* All weights are further row-normalized: weights in any row of a weighting matrix add up to one

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