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Decentralization (Localization) and Corruption

New Cross-country Evidence

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Abstract

This paper attempts to improve the understanding and measurement of decentralization and its relationship with corruption in a worldwide context. This is done by presenting the conceptual underpinnings of such relationship as well as using superior and more defensible measures of both decentralization in its various dimensions as well as corruption for a sample of 182 countries. It is the first paper that treats various tiers of local governments (below the inter-mediate order of government) as the unit of comparative analysis. In contrast, previous analyses erroneously focused on subnational governments as the unit of analysis which yields invalid cross-country comparisons. By pursuing rigorous econometric analysis, the paper demonstrates that decentralization, when properly measured to mean moving government closer to people by empowering local governments, is shown to have significant negative effect on the incidence of corruption regardless of the choice of the estimation procedures or the measures of corruption used. In terms of various dimensions of decentralized local governance, political decentralization matters even when we control for fiscal decentralization. Further voice (political accountability) is empirically shown to be more important in combating corruption than exit options made available through competition among jurisdictions.

This paper—a product of the Governance Division , World Bank Institute—is part of a larger effort in the department to stregthen institutions of accountable governance in developing countries. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at shah.anwar@gmail.com.

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Decentralization (localization) and corruption: New cross-country evidence

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1 Introduction

During the past two decades, a silent revolution has swept the globe and a large number of industrial and developing countries have pursued localization/decentralization reforms (see Boadway and Shah, 2009, Shah, 1998, for motivations for such a change). The reform agenda has been pursued through varying combinations of political, administrative and fiscal decentralization initiatives. These reforms have proven to be controversial. This is because localization is perceived both as a solution to problems, such as a dysfunctional public sector, lack of voice and exit, as well as a source of new problems, such as capture by local elite, aggravation of macroeconomic management due to lack of fiscal discipline and perverse fiscal behavior by sub-national units.

The impact of localization on corruption (defined as the abuse of public office for private gain or exercise of official powers against public interest) is an area of growing interest inviting much controversy and debate. However, the empirical literature on this subject is scant, and much of the discussion is grounded in selective anecdotal evidence at the micro or macro level. In this paper we use new cross-country data on decentralization and corruption to synthesize and strengthen the empirical foundations of this debate by trying to isolate the role of decentralized decision making in creating an enabling environment for an accountable public sector.

This paper represents a major departure from existing literature. The existing literature uses subnational governance as an indicator of decentralization. This is clearly indefensible as provinces and states in federal countries are typically larger than nation states in many unitary countries. Therefore simply shifting responsibilities to intermediate tier may not represent strengthened local decision making. This paper overcomes this problem by focusing on decentralized local governance and capturing its myriad dimensions- political, fiscal and administrative into composite indexes for a worldwide sample of 182 countries (see Ivanyna and Shah, 2010, for details on the underlying data and their aggregation).

The paper further utilizes improved measures on the incidence of corruption. We use three different datasets for this purpose, two of which have not been used before in similar studies. As a base measure of corruption we use Transparency International's Corruption Perception Index, which is an aggregate index based on the opinion of country experts. Further, with the help of Global Corruption Barometer Survey, which is also conducted by the Transparency International, we measure corruption - its frequency and amount - at the household level for 71 countries with more than 55 thousands households covered. Our third dataset is the World Bank Enterprises Survey, which covers 99 countries, and provides micro-level data on corruption - both frequency and amount of bribery - for more than 80,000 firms in different industries. Therefore, our research on corruption and decentralization extends both to micro- and macro-level data, and encompasses both households and businesses.

The paper is organized as follows. Section 2 presents a brief review of conceptual and empirical literature. The dataset on decentralization is described in Section 3, and various measures of corruption, which we use in this paper, are presented in Section 7. This is followed by a discussion on empirical model and variables in

Section 5. Section ?? presents empirical results and a concluding section presents the main findings and limitations of current research.

The paper concludes that decentralization (localization) has significant negative effect on the incidence of corruption in the majority of our settings. Empowering local governments reduces frequency of bribery and amount of bribes paid to government officials both by households and by firms. Political decentralization matters even when fiscal side of decentralization is controlled for. The empirical results presented here further demonstrate that voice (local accountability) matters more than exit (interjurisdictional competition) in combating corruption.

2 How decentralization affects corruption: A brief survey of of the theoretical and empirical literature

A brief review of the conceptual and empirical literature is presented in this section to serve as a background for the empirical framework results subsequently reported in this paper.

2.1 Theoretical perspectives

Various authors have presented diverse perspectives on the role of localization in combating corruption. First we review various arguments advanced to support the view that decentralization may worsen corruption. Then we turn to the arguments for decentralization as a tool to restrain bureaucrats. Refer to Bardhan and Mookherjee (2005) for detailed literature survey of the topic.

2.1.1 Localization breeds corruption

It has been argued that localization brings officials in close contact with citizens promoting personalism, and a higher degree of discretion leading to safeguard of individual citizens needs at the expense of public interest. It also leads to weakening of monitoring, controls and audits by central agencies thereby creating opportunities for corruption (Tanzi (1995), Prud'homme (1994)). Treisman (1999) has argued that fiscal decentralization leads to overgrazing by police forces reporting to various orders of government and by regional politicians as they yield strong influence over central institutions of accountability in governance. Several authors have argued that political decentralization promotes higher incidence of corruption through the involvement of a larger number of officials in dealing with potential investors e.g. feudal lords and oligarchs (Shleifer and Vishny (1993), Blanshard and Schleifer (2000)) and by interest group capture where feudals and oligarchs dominate local political scene (Shah (1998)).

2.1.2 Localization limits opportunities for corruption

A growing body of conceptual literature, on the other hand, argues that localization offers potential for greater accountability by moving the decision making closer

to people. Arguments that have been advanced to support the positive impact of decentralization in reducing corruption include: enhanced accountability and reduced corruption in view of competition among local governments (Weingast (1995), Arikan (2004)); exit and voice mechanisms at the local level; higher level of information (Seabright (1996), Boadway and Shah (2009)); lower expected gains from corruption but higher probability of detection and punishment at the local level (Carbonara (1999), Wildasin (1995)); enhanced transparency (Ahlin (2000)), and lower transaction costs for citizens and improved countervailing institutions (Boadway and Shah (2009)).

Thus the conceptual literature is inconclusive regarding the impact of decentralization on corruption. This literature suggests that such an impact is better assessed through empirical work on this question.

2.2 Empirical perspectives

The empirical literature on this subject also presents diverse perspectives - both negative and positive.

2.2.1 Negative impacts

Treisman (2000) from analysis of cross-country data concluded that decentralized countries have higher perceived corruption and poorer service delivery performance in public health services. A recent study by Fan et al. (2009) using a cross section data of eighty countries finds that in countries with a large number of government or administrative tiers and (given local revenues) a larger number of public employees, reported bribery was more frequent.

2.2.2 Positive impacts

A number of studies provide support for the positive influence of decentralization in controlling corruption. Crook and Manor (2000) examined the process of political decentralization in India (Karnatka state), Bangladesh, Cote d'Ivoire and Ghana and found that decentralization led to enhanced transparency and reduced incidence of corruption. They conclude that decentralization reduces grand theft but increases petty corruption in the short run but in the long run, both may go down. Fiszbein (1997) based upon a review of political decentralization in Colombia concluded that competition for political office opened the door for responsible and innovative leadership that in turn became the driving force behind capacity building, improved service delivery and reduced corruption at the local level. Kuncoro (2000) found that in Indonesia, administrative decentralization led to lower corruption as firms relocated to areas with lower bribes. Wade (1997) found that over-centralized top down management accompanied by weak communications and monitoring system contributed to corruption and poor delivery performance for canal irrigation in India. Huther and Shah (1998) using international cross-section and time series data found that fiscal decentralization was associated with enhanced quality of governance as measured by citizen participation, political and bureaucratic accountability, social justice, improved economic management and reduced corruption. Arikan (2004) reconfirms

the same result. De Mello and Barenstein (2001) based upon cross-country data concluded that tax decentralization was positively associated with improved quality of governance. Fisman and Gatti (2002) found a negative relations between fiscal decentralization and corruption. Gurgur and Shah (2002) identify major drivers of corruption in order to isolate the effect of decentralization. In a sample of industrial and non-industrial countries, lack of service orientation in the public sector, weak democratic institutions, economic isolation (closed economy), colonial past, internal bureaucratic controls and centralized decision making are identified as the major causes of corruption. For a non-industrial countries sample, drivers for corruption are lack of service orientation in the public sector, weak democratic institutions and closed economy. Decentralization has a greater negative impact on corruption in unitary countries than in federal countries. They concluded that decentralization was confirmed here to support greater accountability in the public sector and reduced corruption. Dincer et al. (2006) using data for US states finds that localization by inducing yardstick competition discourages corruption.

3 Measuring decentralization

Decentralization attempts to move public sector decision making closer to the people. The existing literature has treated decentralization to be synonymous with subnational governance. This is clearly an indefensible view as intermediate orders of government in large federal countries may be farther removed from people than the central government in smaller unitary states. Therefore it would be inappropriate to compare provinces in Canada or states in Brazil, India, or the USA with municipalities, say, in Greece. After all, central governments of small countries (Monaco, Lichtenstein, etc.) can themselves be considered as fully-decentralized local governments. In view of this local government serves as a better unit of analysis for comparative analysis of decentralization.

As an aside, another example of inappropriate choice of units for comparative analysis is in Fan et al. (2009), where the authors create a dummy variable, which is equal to 1 when the executive bodies at the lowest tier of government are elected. As a result, say Bangladesh gets 0, and Indonesia gets 1. However, the average population of a lowest unit in Indonesia is about 0.5 million, while in Bangladesh (according to the definitions in the paper) it is about 100 people. There are elected executive bodies in Bangladesh at a level of units with population even less than 0.5 million, which implies that Bangladesh may be more politically decentralized than Indonesia.

Once local government is selected as the unit for comparative analysis, one must also pay attention to the structure of local government as local government is not a monolithic entity in most countries. If horizontal interjurisdictional competition (exit) is conjectured to be the outcome of increased decentralization than it is the mobility of residents and businesses - both inside a country and internationally, and availability of options for exit that should matter when comparing units of government in different countries. For both arguments - be it either voice or exit - the administrative structure of local government is of paramount importance .

We adopt the following general structure of a government. General government

(GG) consists of 3 parts: Central Government (CG), State Government (SG) - though many countries do not have that part, and Local Government (LG). Each part consists of governmental units (in case of CG - only 1 unit), which are united into 1 or more tiers (in case of CG - 1 tier). So far as data permits, Social Security Funds are consolidated with an appropriate part of GG.

Definition *Governmental unit* - public institutional entity, which has the following properties:

1. It is separate corporate entity, which may own assets and incur liabilities, sue and be sued. To say simpler, it has its own budget.

2. It has planning, legislative and executive powers.

Note that this definition is stronger (imposes more requirements for an institution to be a unit of government) than the one of D. Treisman used in Fan et al. (2009) and for his dataset.[1] At the same time, Definition 3 is weaker (imposes less restrictions) that the one used in (UCLG, 2008). There, the public entity is a governmental unit only if it has elected council,[2] while we allow for governmental bodies, which are fully appointed by an upper-tier government.[3]

Definition *Tier* - a system of governmental units, which covers the whole territory of a country.

Tiers are needed to calculate the average population of LG (or SG or SNG - subnational) administrative unit. For instance, if LG in a country with the population P has 3 tiers (X_1 units on 1st tier, X_2 units on 2nd, X_3 units on 3rd) then the average population of LG unit is $3P/(X_1 + X_2 + X_3)$ - countries are penalized for having too many and too big governmental units at LG level. In general, the formula looks the following way:

$$LG_pop = \frac{T * P}{\sum_{i=1}^{T} X_i}, \tag{1}$$

where *LG_pop* is the average population of an LG unit, T is the number of tiers in the country, P is its population, and X_i is the number of LG units at the i'th tier.

Definition *Local government* - the lowest level governmental units (may be grouped into several tiers). Higher tiers of LG should not have substantial powers, and are used for coordination between lowest level units.

Definition *State government* - the second highest (after CG) level of governmental units. It should have substantial fiscal and administrative powers.

[1]The definition is the following: A is a governmental unit if (a) it has government or at least a governor, and (b) it represents level of general administration, not a particular service. Further, set of A's of the same type represent a "tier" if a higher "tier" is at least in some parts is subdivided into A-type units

[2]They themselves relax this definition for some countries

[3]In fact, election of council is one of our decentralization variables

Definitions of LG and SG are quite vague. In particular, it is not always clear if some intermediate tier should be ascribed to LG or SG. IMF's GFS does not give a precise definition either, which results into countries deciding for themselves and reporting corresponding data. As a result, France with 3 tiers has only LG, and Spain - which in many ways has similar administrative structure - has 1 tier of SG, and 2 tiers of LG. Giving more precise definitions for LG and SG, which could be applied to all countries, proves to be pretty difficult. We cannot use responsibilities by outlays (such as LG are responsible for municipal services, SG are not) or some political variables, because the cross-country variation of these variables is too high, and - precisely for this reason - we use many of them in our set of variables to obtain decentralization index (measure). The way distinguish between LG and SG now is the following: we approach each country separately, take whatever data is reported for it, and penalize those countries, which include larger governmental units into LG structure.

In addition to the decentralization variables themselves, dataset used here contains a detailed information about administrative structure of every country. In particular, we report which tiers of GG are ascribed to a local government, and number of governmental units at each tier. Further, we calculate the average size (in terms of population and area) of a local government in each country. The descriptive statistics of administrative structure variables is reported in Table 4. In particular, of the sample of 182 countries only 20 have state governments (SG), while the rest of the countries have only local and central governments. 26% of the countries have only 1 tier of local government, 46% have 2 tiers, while 23% and 6% have 3 and 4 tiers correspondigly. The average population of a local government unit (note that it accounts for a number of tiers) ranges from 1.4 thousands people in Equatorial Guinea to 1.8 million people in Indonesia, with an country-average population of 101 thousand people. The average area of a local government unit ranges from 4.4 th. sq.m in Malta to 70 th. sq.km in Lybia (cross-country average is 2.2 th. sq.km).

3.1 Decentralization variables

Table 1: Decentralization variables used in regressions

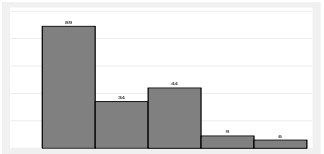
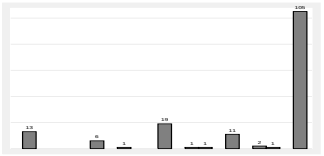
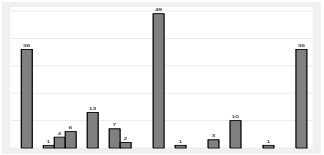
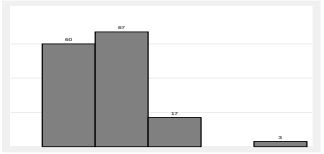
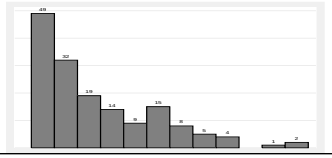
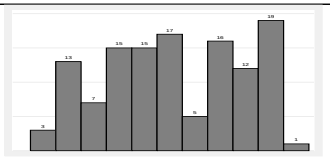
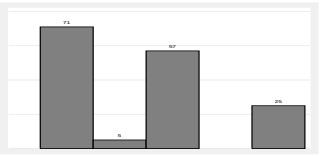
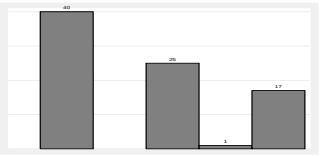
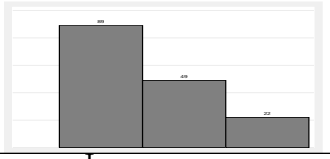
Name	Type	Definition	N	Distribution
Political independence				
LG independence	Discrete: 0, 0.25, 0.5, 0.75, 1	1 - legislative safeguards against dismissal of LG council by CG; 0.5 - LG can be dismissed under certain circumstances (prescribed by law or constitution); 0 - LG can be dismissed in an arbitrary situation. 0.25 or 0.75 - if LG are treated asymmetrically	182	
LG legislative election	App. continuous: 0-1	Final value: average over all tiers considered; for each tier: 1 - whole council is directly elected; 0.5 - council is partly elected, partly appointed, council is elected indirectly, LG are treated asymmetrically; 0 - council is appointed, or does not exist	173	
LG executive election	App. continuous: 0-1	Final value: average over all tiers considered; for each tier: 1 - mayor is directly elected; 0.5 - mayor is indirectly elected, does not exist, coexist with an appointed executive, LG are treated asymmetrically; 0 - major is appointed	169	
Direct democracy	Discrete: 0, 0.25, 0.5, 1	1 - obligatory referendum in case of certain gov't decisions (prescribed by law or constitution); 0.5 - obligatory public approval in case of certain gov't decisions (public hearings, citizen assemblies); 0.25 - leg. provisions for other forms of citizen participation (civil councils, open LG sessions, possibility to submit petition or initiate referendum); 0 - no leg. provisions for direct democracy	147	
Fiscal autonomy				
LG expenditures	Continuous: 0-100	LG expenditures as % of GG expenditures	158	

Table 1: (continued)

Name	Type	Definition	N	Distribution
LG vertical gap	Continuous: 0-100	Grants from other govt's (same- or upper-tier, also from other countries) as % of LG revenues	123	
LG taxation autonomy	Discrete: 0, 0.25, 0.5, 0.75, 1	1 - LG regulates fully (sets base and rate) at least one major tax (property, income, or sales tax); 0.5 - LG partly regulates (sets rate or base in CG defined boundaries, or only after CG approval) at least one major tax, or fully regulates some fees and minor taxes; 0 - no administration of major taxes, partial administration of minor taxes; 0.25 or 0.75 - LG are treated asymmetrically	158	
LG unconditional transfers	Discrete: 0, 0.25, 0.5, 0.75, 1	1 - at least half of transfers (to LG budgets from same- or upper-tier governments) are unconditional and formula-based; 0.5 - quarter to half of transfers are unconditional and formula-based; 0 - all transfers are either conditional or discretionary; 0.25 or 0.75 - LG are treated asymmetrically	159	
LG borrowing freedom	Discrete: 0, 0.25, 0.5, 0.75, 1	1 - borrowing is not regulated by CG; 0.5 - borrowing only from CG or under CG approval or regulation; 0 - borrowing is not allowed; 0.25 or 0.75 - LG are treated asymmetrically	160	

Note: Definitions and characteristics of decentralization variables are shown. Year of the data - 2005. Datasource: Ivanyna and Shah (2010). Abbreviations used: *LG* - local government, *CG* - central government, *GG* - general government.

The descriptions, definitions and sample distributions of decentralization variables used in regressions are reported in Table **??**. They can be grouped into 2 different dimensions of empowering local governments. For the full description of our dataset refer to our working paper Ivanyna and Shah (2010).

- **Political decentralization:** Does LG have means to provide policymaking, which is independent from CG or SG - central or state government?

  The following variables are used to characterize political decentralization:

  - *LG independence(lg_indep)*: Can CG or SG dissolve LG council[4] or mayor[5] without any reason? Can it dissolve LG for some specific reason?
  - *LG legislative election(lg_legel)*: Are legislative bodies at the local level elected or appointed? Is the truth somewhere in between? (e.g. part of council members is appointed, part is elected, or members of councils are elected from preapproved by CG list)
  - *LG executive election(lg_exel)*: Are executive bodies at the local level elected - directly or indirectly - or appointed?
  - *Direct democracy(lg_dirdem)*: Are there legislation provisions for the elements of direct democracy? (e.g. obligatory local referendums in case of some LG decisions, direct citizen participation in decision making process)

- **Fiscal decentralization:** Does LG have fiscal means to provide services it is entitled to provide?

  The following variables characterize fiscal decentralization:

  - *LG expenditures(lg_expdec)*: What part of GG (general government) expenditures is spent on local level?

    This variable is central in our analysis, and our main decentralization index is based on it. Obviously, it is not a perfect measurement of expenditures freedom or potential of LG - a chunk of local expenditures may be earmarked by CG for specific purposes. However, this variable is what the actual data available dictates us to use. Besides, all contracts are incomplete, and LG have always some autonomy over the money they receive. For instance, if LG gets funding from CG to maintain schools or roads, it is up to LG how to spend this money in a given boundaries (say, buy extra computers vs. improve food quality in school cafeterias). At the same time, CG's direct expenditures on schools or roads would completely omit LG's influence.
  - *LG vertical gap(lg_vergap)*: What part of LG revenues are grants from higher-tier governments?

    Vertical gap proxies fiscal dependence of LG on CG - if funds are transferred from a higher-tier government it means that the LG in question

[4]Here council is a general name for legislative bodies

[5]Here mayor is a general name for executive bodies

may not have full autonomy over how to spend them. Grants can be different though: formula-based unconditional grant gives most freedom to the LG, while earmarked grants give almost none. Therefore, vertical gap alone does not tell us much about true fiscal autonomy of the LG.

- *LG taxation autonomy (lg_taxaut)*: Do LG have powers to regulate (set rate and base, create new ones) local taxes? In other words, can LG raise funds through taxation independently from CG?
- *LG unconditional transfers (lg_transf)*: Are grants from SG or CG (or other LG, which is rare) formula-based? Are they unconditional? In other words, if LG depends on grants, how likely is that their availability does not depend on political situation, and how much discretion do LG have over spending the money received?
- *LG borrowing freedom (lg_borrow)*: Can LG borrow money to satisfy their needs? Can the borrowing be done without consent or regulation of CG?

Nine decentralization variables are depicted in Figure 1. Except for LG vertical gap, the darker color of a country for some variable means it is more decentralized in corresponding dimension (political, fiscal, or administrative). As expected, European countries and North America score high in most cases. African and Middle East countries are almost always at the lowest percentiles. Interestingly, Brazil is in the top 50th percentile by all dimensions. At the same time, China scores low in political decentralization, but very high in the fiscal one.

3.2 Decentralization indexes

Our main assumption is that decentralization should matter only when local governments have some expenditure discretion, i.e. the fiscal decentralization variables are dominant in our main measures of decentralization. Indeed, it is hard to believe that local governments - however politically or administratively independent they are from the center - have a significant influence on policymaking if their budget is close to nothing. We test this assumption later by contrasting fiscal variables with political ones, but our main measurement of decentralization - similarly to most empirical studies of the subject - is based on fiscal indicators.

The main variable used in the economic literature[6] to measure decentralization is sub-national expenditure decentralization (SNG expenditures as % of GG expenditures) , which was constructed by the World Bank based on the IMF's Government Finance Statistics dataset. We update this variable for 2005, and add estimates for the countries, which are not reported in GFS. The resulting variable - LG expenditure decentralization (*lg_expdec*) - is the basis for our decentralization index.

The way it is reported to IMF (or recorded in national accounts), expenditure decentralization does not fully reflect the actual expenditure discretion that local governments have. First, LG may be simple distributors of the funding transferred to them from an upper-tier government, and have little choice over how the money in their budget should be spent. If the LG vertical gap (difference between LG

[6]See for instance Fisman and Gatti (2002), Fan et al. (2009)

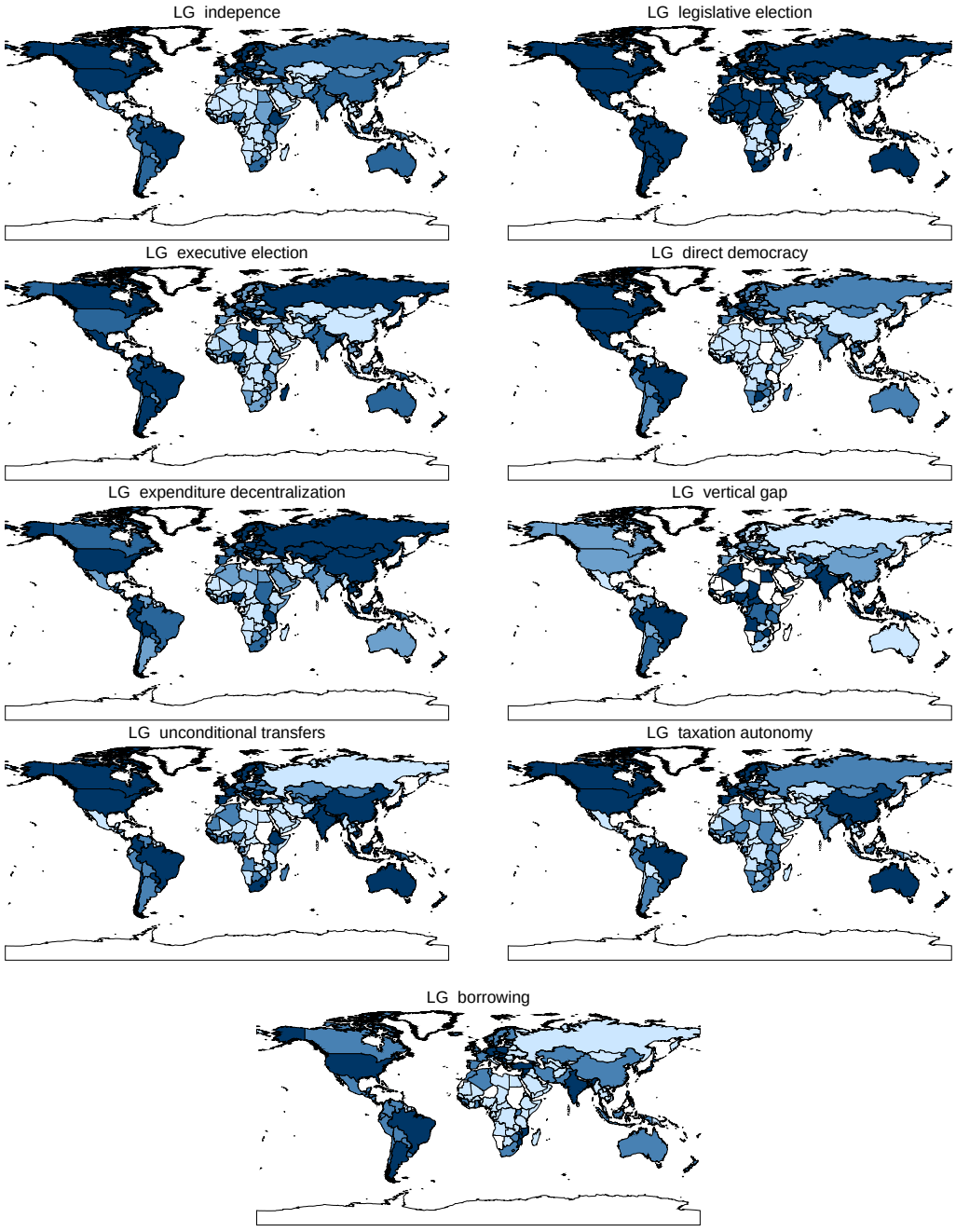


Figure 1: Decentralization variables in 2005 - World Map

Note Source: Ivanyna and Shah (2010). Each country is colored according to value of corresponding decentralization variable (see Table **??** for definitions). The lighter is the color of the country the smaller value of decentralization variable in this country is. Shades of the color (4 in each subfigure) correspond to 0-25th, 25-50th, 50-75th, 75-100th percentiles of the world's distribution.

expenditures and LG non-transfer revenues) is wide, and if the transfers from upper-tier governments are earmarked and discretionary, the actual spending power of LG may be much lower than it would be indicated by *lg_expdec*. Second, even the own revenues of LG (tax revenues or borrowed funds) may strongly depend on CG policy. If LG are not allowed to regulate taxes without CG interference (usually in such cases they receive a revenue-share of a tax, which is regulated by CG), then they cannot fully rely on the revenues from these taxes, and their policy would still be partly dependent on CG[7]

We adjust for the first argument - that the real LG expenditure autonomy depends on the vertical gap and the structure of intergovernmental grants - by defining LG expenditure discretion variable (*lg_expdiscr*):

$$lg_expdiscr = lg_expdec * (1 - lg_vergap * (0.75 - 0.5 * lg_transf)), \tag{2}$$

Note from (2), that even if a country has widest possible vertical gap (1), and smallest possible share of unconditional formula-based transfers (0) it still keeps 0.25 share of its original expenditure decentralization. This is to reflect the fact that discretionary conditional grant from CG still gives more autonomy to the LG than the direct spending of CG. At the same time, country with a positive vertical gap and best possible set of transfers gets less than *lg_expdec* - $(1-0.25) * lg_vergap$ share of it. This is to reflect the fact that even the best set of transfers does not give LG as much fiscal independence as its own revenues.

To adjust for the second argument - that LG tax revenues should be accompanied with taxation regulation autonomy - we alter *lg_expdiscr* by LG taxation autonomy (*lg_taxaut*). The formula for our main decentralization index (*di_main*) is the following:

$$di_main = lg_expdiscr * (0.25 + 0.5 * lg_taxaut). \tag{3}$$

Again, while the index penalizes those countries, where LG do not have taxation autonomy, it is still positive for this countries (equal to 0.25 share of *lg_expdiscr*) reflecting the fact that own revenues do grant some degree of discretion to LG. At the same time, countries with full taxation autonomy get an index, which is equal to 0.75 of *lg_expdiscr*. This is to reflect the fact that in most countries LG tax revenues are comprised of the own tax revenues and the tax shares, even if LG are allowed to regulate some of the major taxes. It means that for these countries there is still some influence of CG over LG spending decisions. The exact composition between tax shares and own revenues varies from country to country, but the data on this are only available for the most developed countries. In order for us to be able to make comparisons in a wider sample of countries we use rougher dummy indicators, and smooth them to avoid extremes.

If there is no data on *lg_taxaut*, *lg_vergap* or *lg_transf*, then the worst possible values are assumed: *lg_taxaut*=*lg_transf*=0, *lg_vergap*=1. This is a reasonable assumption since in most cases countries, which do not report this figures, have simply

[7]The degree of such dependence depends on specific institutional arrangements in tax sharing. Of course, if the rules are prescribed in constitution, then the influence of CG should be minimal. However, if CG chooses how much of the revenue should be alloted to LG, then it may condition the decision on specific spending patterns that it wants to achieve

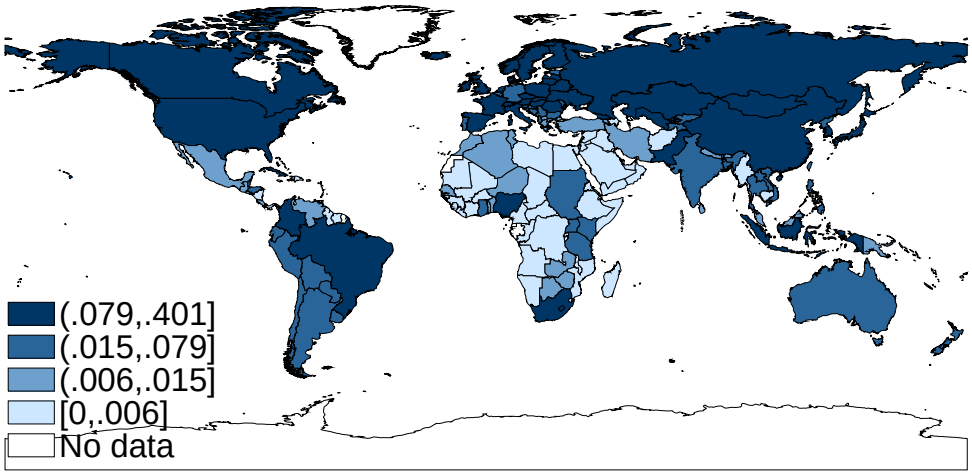


Figure 2: Index of decentralization 2005 - World Map

Note Source: Ivanyna and Shah (2010). Each country is colored according to its index of decentralization, given by the formula (3). The lighter is the color the less decentralized the country is.

nothing to report. Besides, these extreme values are effectively smoothed in our final formula. At the same time, if our main decentralization variable *lg_expdec* is not available then the country is excluded from further analysis. As a result, the index is built for 158 countries worldwide. Together they comprise 98% of the world's GDP, and 99% of the world's population.

The Figure 2 depicts distribution of the decentralization index on the World map. The darker the color of a country, the more decentralized it is. European countries, North America, Brazil, China are the most decentralized. Countries from Latin America, former USSR, and East Asia receive average decentralization index, while Middle East and African countries are the least decentralized. Denmark (0.4), China (0.35), Sweden (0.31), Finland (0.26), and Norway (0.22) have the five highest scores.

4 Measuring the incidence of corruption

In our main estimation we use 5 different measures of corruption. 2 of them are taken from the Transparency International Global Corruption Barometer (GCB) survey, 2 - from the World Bank Enterprises Surveys (WBES) and the 5th is TI Corruption Perception Index (CPI) - a measure, which is commonly used in empirical research on corruption. The definitions of corruption variables are given in Table 2, and their descriptive statistics are given in Table 4.

The Global Corruption Barometer is an annual survey of households conducted by Transparency International, and commenced in 2003. The data we have is from 2005 - 55 thousands households were surveyed in 68 countries from all continents, and all income groups. Apart from demographic characteristics of a respondent, the GCB questionnaire have questions in the following groups: which sectors and

Table 2: Measures of corruption

Name	Type	Source	Definition	Years	obs.	countr.
paid bribe	binary: 0, 1	TI GCB	Question *5* in survey; 1 if Yes, 0 if No	2005	50704 (0's-88%)	68
bribe burden	cont., corner at 0	TI GCB	Question *5.1* in survey; lower estimates of bribe paid divided by current GDP per capita	2005	48470 (0's-86%)	66
informal gift	binary: 0, 1	WBES	Surveys 2002-05: maximum by questions *40(v), 40(vi), 42(i)*; Surveys 2006-09: maximum by questions *j5, j12, j15*; 1 if at least one Yes, 0 if all No	2004-2006	40721 (0's-77%)	80
bribe %sales	cont., corner at 0	WBES	Surveys 2002-05: question *39*; Surveys 2002-05: question *j7*; percent of annual sales spent on bribes	2004-2006	40309 (0's-71%)	79
corruption perception	approx. cont.	TI CPI	aggregate index of different corruption perception indexes	2005, 2007	175	175

Question 5: In the past 12 months, have you or anyone living in this household paid bribe in any form? *Answers:* 1) Yes; 2) No
Question 5.1: What was the approximate amount of money paid overall in bribes by your household in the past 12 months? *Answers:* 1) Under 30 USD;... 11) 1000 USD and more
Question 42(i)-j5: In any of the tax inspections or meetings was a gift or informal payment expected or requested? *Answers:* 1) Yes; 2) No
Question 40(v)-j12: In reference to the application for an import license, was an informal gift or payment expected or requested? *Answers:* 1) Yes; 2) No
Question 40(vi)-j15: In reference to the application for an operating license, was an informal gift or payment expected or requested? *Answers:* 1) Yes; 2) No
Question 39-j7: We've heard that establishments are sometimes required to make gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc. On average, what percent of total annual sales do establishments like this one pay in informal payments or gifts to public officials for this purpose? *Answer:* % of sales (0-100)

Note Measures of corruption used in the paper are described. Abbreviations: *TI GCB* - Transparency International Global Corruption Barometer, *TI CPI* - Transparency International Corruption Perception Index, *WBES* - World Bank Enterprises Surveys.

institutions are most affected by corruption (opinion of a respondent); which spheres of life does corruption affect most (opinion of a respondent); how is corruption evolving over time (opinion of a respondent); how frequently do people bribe (real facts from a respondent's life); how much does it cost (real facts from a respondent's life); what form does bribery take (real facts from a respondent's life).

Two measures of corruption that we use - *paid bribe* and *bribe burden* - utilize a respondent's answers about real facts from his/her life. For the first measure, a respondent is asked if he/she paid bribe during last 12 months. For the second measure, the question is what was the amount of all bribes paid.[8] The survey was completely anonymous, and the rate of non-response on these questions is relatively low (3.3% for *paid bribe*, 6.8% for *bribe burden*). Therefore, these measures provide more or less objective assessments of corruption (at least, of petty corruption) level among households in a country: the former one estimates the frequency of the bribery, while the latter one estimates its burden in terms of GDP.

To capture the extent of corruption in the business world we utilize the World Bank Enterprises Surveys dataset. WBES is a survey of firms from different sectors of economy (services, manufacturing, construction, etc.) with number of official employees more than 5. It is conducted annually in developing and countries in transition (regular survey are being conducted since 2002). The questions that the representatives of the firms are asked during an interview pertain to the firm's general characteristics and financial indicators, the investment climate in a country, where they operate, the state of infrastructure, labor market, degree of competition, etc. The separate group of questions concerns business-government relations. This group contains several questions about bribing governmental officials: are there any informal gifts or payments expected or requested during certain kinds of interaction between a firm and a government official (e.g. tax inspections, obtaining operating or import license, etc.); what percentage of annual sales goes to such gifts and payments; does a firm try to secure a contract with a government, and what percentage of its value is paid back to government officials. All these questions concern real experience that a firm had with a government.

We use two main measures of corruption from WBES. The first one - *informal gift* - captures frequency of bribery among the businesses in a country. *informal gift* is equal to 1 if a responded told that an informal gift or payment was expected or requested when the firm dealt with tax inspections, or operating licenses, or import licenses. The second measure of corruption - *bribe%sales* - captures the burden of bribery on a firm. It is equal to the percentage of annual sales that the firm spends on informal gifts to "get things done" with the government. This figure is directly asked about in the survey. Similary to TI GCB, WBES is a completely anonymous survey, and the rate of non-responce to the questions of our interest is quite low: less than 3% for *bribe%sales*, and less than 2% for *informal gift*. Therefore, these measures quite credibly reflect the situation with corruption among businesses in a country.

As an alternative to our "objective" (or "factual") measures of corruption, we also use a measure, which is opinion-based. It is *corruption perception* - Transparency International's Corruption Transparency Index, which does not need intro-

[8]We then take this amount as a percentage of country's GDP per capita

duction for most of empirical economists. In short, this commonly and frequently used index is a composite score of about 15 (may be different each year) polls of experts, expressing their opinion about the level of corruption in a given country. This measure may obviously be subject to certain perceptional and ideological biases, image of a country in mass media, etc. The advantage of it, however, is it's availability for a large sample of countries (174 in 2005, 169 in 2007), and over a long period of time (annually from 2001 to 2007, also for 1996, 1980-1985, 1988-1992).

The state of corruption in the world based on our 5 measurements is shown in Table 3. As expected, developed countries are the least corrupted based on any measure, while African and former Soviet Union countries are among the most corrupted. There is big variation in level of corruption in the world. For example, bribe burden in Singapore is virtually 0, while in Senegal people pay up to 14% of GDP in bribes. In Spain firms spend 0.1% of their annual sales on unofficial payments to governmental officials, while in Paraguay this figure reaches 10%. In Kyrgyzia about 85% contacts of the firms with governmental officials end up in paying bribes, while in Namibia it is only 1.2%.

Table 3 also shows the distribution of the countries by income and region (see World maps) for each measure. Comparing the distributions with the one for *corruption perception*, which is available for almost all countries and can be considered representative, one can see that GCB sample (variables *paid bribe* and *bribe burden*) is somewhat skewed towards high and upper middle income countries, with most representation in Europe, CIS, Latin America and East Asia. At the same time, the WBES sample (variables *paid bribe* and *bribe burden*) is somewhat skewed to lower middle and low income countries, mostly in Africa, CIS, Eastern Europe and South America. Analysis of all 4 corruption variables would therefore provide the most objective picture.

5 Econometric specifications

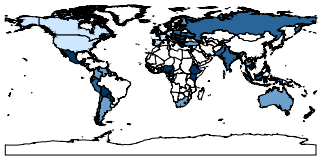
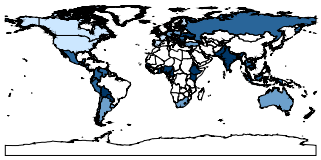
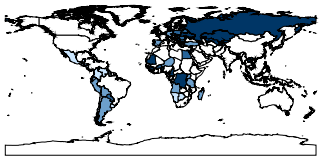
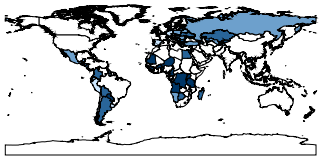
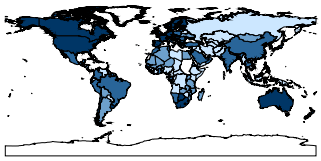
Our goal is to identify empirical effect of decentralization on corruption, where the population of interest is the world's countries. Our general approach is to regress:

$$\text{corruption} = \beta_0 + \beta_1 * \text{decentralization} + \text{other controls}. \tag{4}$$

β_1 is coefficient (coefficients if we use several variables for decentralization) we are interested in, provided the other factors which may affect the relationship between decentralization and corruption are properly controlled for. To cover as many appearances of corruption in a society as possible as well as to make our research robust to small sample bias and sample selection we use 5 different variables to measure corruption. They are described in detail in Section 7. The distribution of these variables drives several different econometric specifications of the equation 4.

In the case of *paid bribe* variable we have binary responses of individuals from different countries, 1 meaning that they paid bribe in the last 12 months, 0 meaning that they did not. Therefore, we are estimating the probability of an individual i

Table 3: Corruption in the world

Corruption variable	World map	Top-5 least cor.	Top-5 most cor.	Inc. distr
paid bribe		Hong Kong (0.2%) Japan (0.3%) Spain (0.4%) UK (0.7%) Netherlands (0.8%)	Cameroon (48%) Paraguay (46%) Cambodia (37%) Nigeria (35%) Ethiopia (35%)	24 17 19 8
bribe burden		Singapore (0%) Hong Kong (0%) Netherlands (0.1%) USA (0.1%) Portugal (0.3%)	Senegal (14%) Cameroon (13%) Togo (12%) Ethiopia (11%) Ghana (10%)	23 17 18 8
informal gift		Namibia (1.2%) Jordan (1.3%) Uruguay (1.7%) El-Salvador (1.8%) West Bank & Gaza (2.6%)	Kyrgyzia (85%) Albania (76%) Cameroon (70%) B&H (70%) DR Congo (69%)	11 22 28 19
bribe%sales		Spain (0.1%) Korea (0.1%) Slovenia (0.2%) Sri Lanka (0.2%) Cape-Verde (0.2%)	Paraguay (10%) Niger (7%) Burkina Faso (7%) Guinea (5%) Cameroon (5%)	11 21 28 19
corruption perception		Iceland(9.66) Finland (9.63) New Zealand (9.58) Denmark(9.51) Singapore (9.41)	Korea, Dem. Rep. (1.48) Guinea (1.66) Bangladesh (1.68) Chad (1.7) Myanmar (1.8)	48 37 49 48

Note Corruption variables: see definitions of in Table 2. Maps: the darker the country the greater is the value assigned to it (the more corrupted it is, except the case of *corruption perception*). Distribution by income (World Bank's classification of countries): 1st row - # of high income countries in the sample; 2nd row - upper middle income; 3rd row - lower-middle income; 4th row - low income.

from country j to pay bribe given our set of controls:

$$P(paid\ bribe_{ij} = 1) = P(\beta_0 + \beta_1 * decentralization_j + \beta_2 * ind\ controls_i + \quad (5)$$
$$+\beta_4 * country\ controls_j + u_{ij} > 0) = F(\beta_0 + \beta_1 * decentralization_j +$$
$$+\beta_2 * ind\ controls_i + \beta_4 * countrycontrols_j),$$

where i changes from 1 to N_j - number of individuals in the sample, which are residents of the country j; j changes from 1 to N - number of countries covered by the survey. F is error u's cumulative distribution function. In particular, our interest is to find how the probability changes with the changes in decentralization having all other controls fixed. Assuming that the errors u_{ij} are normally distributed the natural way to estimate this probability is to use probit model (F becomes then a cumulative function of a normal distribution). Note that *decentralization* variable(s) are the same for all individuals from one country, and we use both individual-specific and country-specific controls. In addition, we also fit a linear probability model in this case (ordinary OLS), since it is robust to the distribution of the error and possible heteroscedasticity in the data.

Similar reasoning concerns the *informal gift* measure. This is also a dummy variable, which is equal to 1 if a respondent firm maid or was requested to make an informal present to a government official in exchange of certain standardly provided service, and equal to 0 if the firm did not do it. Therefore, in this case we are estimating the probability of a firm to make an informal gift (pay bribe) to a government official. The probit and the linear probability models are also used in this case:

$$P(informal\ gift_{ij} = 1) = F(\beta_0 + \beta_1 * decentralization_j + \quad (6)$$
$$+\beta_2 * ind\ controls_i + \beta_4 * country\ controls_j)$$

The *bribe burden* measure varies from 0 for those who did not pay any bribes to a maximum of 458% of country's GDP per capita. The distribution of *bribe burden* has clearly a corner solution at 0 (in fact, 86% of observations in the sample are equal to 0). With such distribution of dependant variable the most appropriate way is to estimate tobit cencored model with the lower limit set to 0:

$$bribe\ burden^*_{ij} = \beta_0 + \beta_1 * decentralization_j + \quad (7)$$
$$+\beta_2 * ind\ controls_i + \beta_4 * country\ controls_j + u_{ij},$$
$$u_{ij}| < \text{controls} > \sim \text{Normal}(0, \sigma^2),$$
$$bribe_burden_{ij} = \max(0, bribe_burden^*_{ij}), \quad (8)$$

where *bribe_burden** is a latent (unobservable) variable, <controls> are all right hand side variables in the regression. For a comparison purpose we also estimate usual OLS model in this case.

The variable *bribe%sales* is treated similarly to *bribe burden*. Indeed, most of the firms in the sample (71%) report 0 as a percentage of annual sales that go for informal payments to governemnt officials. Therefore, we again fit tobit cencored model with lower limit set to 0. As an alternative specification, an ordinary OLS model is also estimated.

In the case of the *corruption perception* measure we use the standard OLS model. This variable is close to continuous, and there is no censorship in the sample. Therefore, OLS appears to be the most appropriate and straightforward way to estimate the effects of interest:

$$corruption\ perception_j = \beta_0 + \beta_1 * decentralization_j + \beta_4 * country\ controls_j + u_j. \quad (9)$$

Note that *corruption perception* is measured not at an individual but on a country level. As usual, index j in equation 9 indicates that the observation is from country j, but there are no individual-specific controls.

The descriptive statistics of all variables, which we use in our regressions are given in Table 4. As it was mentioned before, the dependent variables are *paid bribe*, *bribe burden*, *informal gift*, *bribe%sales corruption perception* - 5 different measures of corruption. The main variable which we use as a measure of decentralization is *decentralization index*. Besides, we use several alternative measures (see Table 4).

Table 4: Variables used in regressions: Definitions, sources, summary statistics

Variable	Definition	Source	Mean	St.dev.	Min	Max
		Corruption				
paid bribe	see Table 2	see Table 2	.11	.32	0	1
bribe burden	see Table 2	see Table 2	1.23	11.7	0	458
informal gift	see Table 2	see Table 2	.23	.42	0	1
bribe%sales	see Table 2	see Table 2	1.67	5.9	9	300
corruption perception	see Table 2	see Table 2	4	2.1	1.48	9.66
		Decentralization (country-level sample)				
decentralization index, main	see Section 3	equation (3)	.05	.06	0	.35
decentralization index, aux.	main dec.index, with adj. for tax. autonomy	own calculations	.1	.11	0	.54
LG independence	see Table 1	see Table 1	.24	.28	0	1
LG legislative election	see Table 1	see Table 1	.8	.31	0	1
LG executive election	see Table 1	see Table 1	.45	.35	0	1
LG direct democracy	see Table 1	see Table 1	.22	.22	0	1
LG expenditures	see Table 1	see Table 1	0.14	0.13	0.01	0.59
LG vertical gap	see Table 1	see Table 1	44.5	24.4	0	100
LG taxation autonomy	see Table 1	see Table 1	.36	.37	0	1
LG unconditional transfers	see Table 1	see Table 1	.36	.39	0	1
LG borrowing freedom	see Table 1	see Table 1	.51	.33	0	1
		Administrative structure				
1 LG tier	1 if LG has only 1 tier in a country	various sources	.26	.44	0	1
2 LG tiers	1 if LG has 2 tiers in a country	various sources	.46	.5	0	1
3 LG tiers	1 if LG has 3 tiers in a country	various sources	.22	.41	0	1
>3 LG tiers	1 if LG had 4 or more tiers in a country	various sources	.06	.24	0	1
LG population size	average population of LG unit in a country, thds people;	own calculations (Section 3)	101	175.5	1.4	1709
# units	number of units (jurisdictions) at all tiers of LG	various sources	4117	20635	3	250671
# units at tier 1	number of units at tier 1 of LG	various sources	4056	20663	3	250671
# units at highest tier	number of units at the highest LG tier	various sources	1579	18839	1	250671

Table 4: (continued)

Variable	Definition	Source	Mean	St.dev.	Min	Max
LG area	average area of LG unit, thds sq. km	various sources	2.1	6.9	0	70.38
	Other country-specific controls					
GDP per capita	PPP units, 2005	WDI (World Bank)	9548	14645	101	81777
log(GDP per capita)	log. of GDP per capita, PPP units, 2005	WDI (World Bank)	7.67	1.62	4.5	10.7
openness	(exports + imports) as % of GDP, constant prices, 2005	Penn World Tables	96.5	53.6	2	446
gov. consumption	GG consumptiona as % of GDP, 2005	Penn World Tables	18.5	9.45	3.11	62.21
start business	# of procedures needed to start business, 2005	WB Doing Business	10.2	3.4	2	19
enforce contract	# of procedures needed to enforce contract, 2005	WB Doing Business	37.38	6.32	21	55
religious fractionalization	concentration (Herfindahl) index for religious groups in a country; higher for multi religious societies	Alesina et al. (2003)	.43	.23	0	0.86
lingual fractionalization	concentration (Herfindahl) index for linguistic groups in a country; higher for multi lingual societies	Alesina et al. (2003)	.39	.28	0	.92
ethnical fractionalization	concentration (Herfindahl) index for ethnical groups in a country; higher for multi ethnical societies	Alesina et al. (2003)	.45	.25	0	.93
population	population of a country, mln people, 2005	WDI (World Bank)	35.69	130.2	0.7	1303.7
UK legal origin	1 if country has British legal origin	Treisman (2000)	.3	.46	0	1
protestant	1 if protestants is a major religious group in a country	Pippa Norris dataset	.21	.4	0	1
catholic	1 if catholics is a major religious group in a country	Pippa Norris dataset	.29	.46	0	1
muslim	1 if muslims is a major religious group in a country	Pippa Norris dataset	.28	.45	0	1
orthodox	1 if orthodox people is a major religious group in a country	Pippa Norris dataset	.07	.25	0	1
	Individual-specific controls					
male	1 if male	-	.48	.5	0	1
age 30	age under 30	-	.31	.46	0	1
age 30-50	age between 30 and 50	-	.42	.45	0	1
age 50-65	age between 50 and 65	-	.18	.39	0	1
income low	low income (self-definiton)	-	.49	.5	0	1
income middle	middle income (self-definiton)	-	.37	.48	0	1
education basic	basic or no education	-	.22	.41	0	1
education sec.	secondary education	-	.49	.5	0	1
unemployed	1 if unemployed	-	.11	.31	0	1
employed	1 if partially or fully employed	-	.52	.5	0	1
	Firm-specific controls					
size small	1 if 5 to 20 employees	-	.5	.5	0	1
size medium	1 if 20 to 100 employees	-	.32	.46	0	1
manufacturing	1 if firm is in manufacturing sector	-	.58	.49	0	1
services	1 if firm is in services sector	-	.3	.45	0	1
private domestic	share in a firm of private domestic owners	-	86.7	31.84	0	100
private foreign	share in a firm of private foreign owners	-	10.28	28.45	0	100

Note: Descriptions of variables, which are used in our regressions. Abbreviations used: *LG* - local government, *CG* - central government, *GG* - general government.

There are several country control variables' groups, which we include based on the theoretical arguments described in Section 2. First, we include variables, which characterize administrative structure of a country: average size of local government, tiers dummies, and number of LG units at a lowest tier. We also control for the level of country's development (*log(GDP per capita)*), it's openness (*openness*), origin of its legislature (*legal origin*), consumption needs of a general government (*gov. consumption*), and the level of bureaucracy (*start business, enforce contract*) - a standard set of variables used in empirical investigations on corruption. We also control for a country's heterogeneity by including such variables as *religious fractionalization*, *lingual fractionalization* of a country's population. Individual controls included in the regressions are sex, age, education, income, and employment status. Firm-specific controls that we use are size of a firm (number of employees), its sector (manufacturing, services or other), and its ownership (domestic private, foreign private or state).

6 Main results

Our main results are presented in Table 5. Here *decentralization index* is used as our main measure of decentralization, while dependent variables are our 5 measures of corruption. A linear probability (OLS) estimates are reported in the columns (1), (4), (7), (10), (13) and (14) - for all 5 variables. In columns (2) and (8) the coefficients from probit regressions are reported, when *paid bribe* and *informal gift* are dependent variables. Since, the coefficients in the probit model do not have a direct interpretation (except for their direction, relative magnitude and statistical significance), in columns (3) and (9) we report average partial effects of each variable on corruption, evaluated at the corresponding samples. Columns (5) and (11) report tobit estimates, when *bribe burden* and *bribe%sales* are used as dependent variables. Similarly to probit estimates, there is no direct interpretation for tobit estimates (again, except their direction, statistical significance and relative magnitude). Since the share of corner responses is so high (70-90% are 0's) in the sample, the estimates cannot be directly compared with OLS estimates. Therefore, in columns (6) and (12) we report average partial effects of each variable, evaluated at the corresponding samples. Columns (13) and (14) report OLS estimates when the dependent variables are *corruption perceptions* in 2005 and 2007 correspondingly. For comparison, in the second and third row of the table (in italic) we also report the resulting coefficients, when *LG expenditure decentralization* and *auxilliary ecentralization index* are used as the measures of decentralization, all other regressors the same. In all specifications (were feasible) we allow for heteroscedasticity and serial correlation between errors inside one country.

Table 5: Results of the main estimation

	paid bribe			bribe burden			informal gift			bribe%sales			corr. perception	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
est. method	lpm	pr	ape	lpm	tob	ape	lpm	pr	ape	lpm	tob	ape	2005	2007
dec. index, main	-0.13	-0.93	-0.17	-6.01*	-29.39	-2.99	-0.68*	-2.25*	-0.55*	-4.55	-17.15	-4.62	4.14**	5.03***
	(0.16)	(0.89)	(0.16)	(3.32)	(32.59)	(7.45)	(0.38)	(1.25)	(0.31)	(3.28)	(12.63)	(8.53)	(1.83)	(1.51)
exp. decentr.	-0.04	-0.26		-2.37*	-8.26		-0.25	-0.93		-3.11*	-8.27		1.10	1.48
	(0.09)	(0.43)		(1.41)	(15.38)		(0.17)	(0.58)		(1.71)	(6.58)		(1.01)	(0.92)
dec. index, aux.	-0.02	-0.24		-3.08	-6.78		-0.29	-1.16*		-2.83*	-10.04		1.96	2.39**
	(0.11)	(0.52)		(1.91)	(19.27)		(0.19)	(0.62)		(1.59)	(6.46)		(1.24)	(1.10)
1 LG tier	0.04	0.30	0.06	-0.54	11.74	1.36	-0.10**	-0.33**	-0.07***	0.34	0.37	0.10	0.83**	0.78**
	(0.04)	(0.20)	(0.04)	(0.60)	(7.90)	(1.95)	(0.04)	(0.14)	(0.03)	(0.44)	(2.03)	(1.08)	(0.39)	(0.35)
2 LG tiers	0.00	0.12	0.02	-1.24**	4.88	0.50	-0.11**	-0.32***	-0.08***	-0.07	-1.50	-0.4	0.41	0.35
	(0.02)	(0.11)	(0.02)	(0.56)	(4.35)	(1.48)	(0.04)	(0.12)	(0.03)	(0.29)	(1.47)	(0.69)	(0.27)	(0.22)
UK legal origin	-0.04	-0.21	-0.04	-2.24**	-11.20	-1.06	-0.05	-0.15	-0.03	-1.48***	-6.50***	-1.75	-0.09	-0.04
	(0.04)	(0.24)	(0.04)	(0.89)	(8.71)	(2.67)	(0.05)	(0.17)	(0.04)	(0.48)	(2.31)	(1.14)	(0.35)	(0.31)
start business	-0.01	-0.03	-0.00	-0.14**	-0.82	-0.08	-0.00	0.00	0.00	0.09	0.24	0.07	-0.06	-0.04
	(0.00)	(0.02)	(0.00)	(0.07)	(0.80)	(0.17)	(0.00)	(0.01)	(0.00)	(0.07)	(0.26)	(0.12)	(0.04)	(0.04)
enforce contract	-0.00	0.00	0.00	-0.00	0.21	0.02	0.01**	0.03**	0.01**	-0.05*	-0.24*	-0.07	-0.02	-0.02
	(0.00)	(0.01)	(0.00)	(0.05)	(0.44)	(0.12)	(0.00)	(0.01)	(0.00)	(0.03)	(0.15)	(0.08)	(0.02)	(0.02)
gov. consumption	-0.01***	-0.03***	-0.01***	-0.09**	-1.35***	-0.14	-0.00	-0.01*	-0.00*	-0.01	0.04	0.01	0.02	0.01
	(0.00)	(0.01)	(0.00)	(0.04)	(0.42)	(0.10)	(0.00)	(0.00)	(0.00)	(0.02)	(0.07)	(0.05)	(0.02)	(0.01)
log (GDP/capita)	-0.05***	-0.30***	-0.05***	-0.58*	-12.0***	-1.22*	-0.02	-0.12**	-0.03**	-0.26	-1.16*	-0.31	0.91***	0.78***
	(0.01)	(0.06)	(0.01)	(0.32)	(3.08)	(0.71)	(0.02)	(0.05)	(0.01)	(0.16)	(0.70)	(0.57)	(0.14)	(0.11)
firm, ind. controls	ind	ind	ind	ind	ind	ind	firm	firm	firm	firm	firm	firm	no	no
dataset	GCB	GCB	GCB	GCB	GCB	GCB	WBES	WBES	WBES	WBES	WBES	WBES	CPI	CPI
standard errors	cluster	cluster	margeff	cluster	cluster	bootstr.	cluster	cluster	margeff	cluster	cluster	bootstr.	robust	robust
observations	36821	36821	36821	36296	36296		32775	32775	32775	33824	33824	118	118	
R-squared	0.10			0.05			0.19	0.04		0.04	0.86	0.82	0.86	
# countries	57			57			60			60			111	111

Note * - significant at 10% level, ** - significant at 5% level, *** - significant at 1% level. Dependent variable: columns (1)-(3) - *paid bribe*; columns (4)-(6) - *paid bribe*; columns (7)-(9) - *informal gift*; columns (10)-(12) - *bribe%sales*; column (13) - *corruption perception, 2005*; column (14) - *corruption perception, 2007* (see definitions in Table 2). Estimation methods: columns (1), (4), (7), (10), (13), (14) - OLS; columns (2), (8) - probit; columns (5), (11) - tobit with lower limit at 0; columns (3), (6), (9), (12) - average partial effects over sample. Standard errors are reported in brackets: columns (1), (2), (4), (5), (7), (8), (10), (11) - clustered by country and heteroscedasticity robust; columns (13) (14) - heteroscedasticity robust; columns (3), (9) - estimated by *margeff*; columns (6), (12) - cluster bootstraped (500 iterations). Additional controls are included in all regressions, but not reported here due to a lack of space. These are regional dummies, year dummies, individual and firm controls, population, openness, fractionalization, # of units, LG population size, LG area.

As Table 5 shows, decentralization measured by *main decentralization index* has a negative effect on corruption in all specifications and for all datasets that we use. When clustered by country standard errors are used the effect is only marginally statistically significant (p-value of 0.05-0.15) when dependent variables are *bribe burden*, *informal gift*, or *bribe % sales*, while for *paid bribe* it is practically insignificant. However, the average size of a cluster in our data is 646 observations for GCB sample, and 546 observations for WBES sample, while the number of clusters is 57 in GCB, and 60 in WBES. As is argued by Wooldridge (2006), for relatively small number of clusters and big size of clusters inference based on clustered standard errors may be too conservative (meaning that it produces too big standard errors).[9]

In Table 6 we report the results from identical (to the ones in Table 5) regressions, but we do not cluster the standard errors (columns (1), (3), (5), (7)). We show only results from OLS, but the results from probit and tobit have the same property: while the point-estimates of the decentralization's effect on corruption remain the same, the standard errors are now much smaller. In all above-mentioned specifications decentralization has negative and strongly statistically significant effect on corruption.

Ignoring countries' fixed effects completely - as it is done in columns (1), (3), (5), (7) of Table 6 - would be too optimistic. As an alternative, we use the inference for a clustered data proposed by Donald and Lang (2006). For that we just average our data by country (take means of every series by country) and run the same regressions as before, only with the number of observations, which corresponds to a number of countries in our samples. The standard OLS standard errors would be then correct. The results for each of our four measures of corruption are presented in columns (2), (4), (6), (8) of Table 6. The effect of decentralization on corruption remains negative in all four specifications. It is significantly different from 0 though only if dependent variables are *bribe burden* and *informal gift*. These results are supported by the ones in the columns (13)-(14) from Table 5, when we run a regression on a cross-country sample and use TI *corruption perception* as our measure of corruption.

While the effect of decentralization on corruption is not statistically significant in all of our specifications, Tables 5 and 6 present a strong evidence that it is strictly negative. First, the point-estimates of the effect are negative in all our specifications, and they are insensitive to the inclusion of additional regressors on the right hand side. Second, even if conservative clustered standard errors are used, it is statistically significant on the margin in certain specifications, and this fact is supported by the Donald and Lang (2006) approach. The strongest (statistically) evidence is for the amount of bribes that households pay (*bribe burden*), and for the frequency of bribery among firms (*informal gift*). Therefore, both households and firms are affected by decentralization. As our cross-country regressions suggest, it also has a positive effect on *corruption perception* of a country among experts (which is higher for less corrupted countries).

Decentralization also has significant economic effect on corruption. From column (2) of Table 5 it follows that a 0.1 increase in decentralization of local governments - which effectively means extending their expenditures and own revenues by 10

[9]Difference in cluster sizes (646 vs. 546) may also explain why standard errors in regressions run on GCB sample are in general higher that the ones from WBES sample

Table 6: Results of the main estimation - alternative inference

	paid bribe		bribe burden		informal gift		bribe%sales	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
est. method	lpm	dl	lpm	dl	lpm	dl	lpm	dl
dec. index, main	-0.13***	-0.09	-6.01***	-13.10**	-0.68***	-1.50**	-4.55***	-7.50
	(0.04)	(0.31)	(1.48)	(5.17)	(0.07)	(0.70)	(1.07)	(9.50)
exp. decentralization	-0.04*	-0.02	-2.37***	-4.66	-0.25***	-0.61**	-3.11***	-3.94
	(0.02)	(0.16)	(0.65)	(2.84)	(0.03)	(0.24)	(0.46)	(3.33)
dec. index, aux.	-0.02	-0.02	-3.08***	-6.51*	-0.29***	-0.83***	-2.83***	-3.17
	(0.02)	(0.19)	(0.81)	(3.39)	(0.03)	(0.27)	(0.49)	(3.94)
standard errors	robust	stand.	robust	stand.	robust	stand.	robust	stand.
dataset	GCB	GCB av.	GCB	GCB av.	WBES	WBES av.	WBES	WBES av.

Note * - significant at 10% level, ** - significant at 5% level, *** - significant at 1% level. Dependent variable: columns (1)-(2) - *paid bribe*; columns (3)-(4) - *paid bribe*; columns (5)-(6) - *informal gift*; columns (7)-(8) - *bribe%sales* (see definitions in Table 2). Estimation methods: columns (1), (3), (5), (7) - OLS on the whole sample (lpm); columns (2), (4), (6), (8) - OLS on the averaged data from the corresponding sample (see Wooldridge (2006)). Standard errors are reported in brackets: columns (1), (3), (5), (7)- heteroscedasticity robust; columns (2), (4), (6), (8) - standard. Other controls included in the regressions are identical to that of in Table 5.

percentage points - in an average country would reduce the average probability of a household paying a bribe by 1.7 percentage points. While this may seem a small number, one should note that the mean probability of paying a bribe in the sample is 11%, and 1.7 percentage points represent more than a 15% decrease in the frequency of bribery among households. As for the *bribe burden*, empowering local governments by 10 percentage points more would decrease the bribe burden (share of his/her incomes spent on bribes) for an average person by about 0.30 percentage points, which is more than a quarter decrease from an average bribe burden in the sample. The effect of decentralization on frequency and amount of bribery is much stronger for firms than for households. Columns (9) and (12) from Table 5 suggest that a 10 percentage points increase in LG decentralization is associated with 5.5 percentage points decrease in frequency of "informal gifts" and 0.74 percentage points decrease in share of annual sales alloted to bribery. Finally, 10 percentage points increase in decentralization would raise the corruption perception index in 2007 by 0.5 points, which is equivalent for an average country to moving up by about 12 positions in TI's country ranking.

In Tables 5 and 6 - raws 2 and 3 (in italic) - we also report the results, when we use other decentralization measures in identical regressions. We consider two additional measures - a widely used in other literature *LG expenditure decentralization* and an *auxiliary decentralization index* (see the definitions in Table 4. The effect of *LG expenditure decentralization* is smaller than the effect of the *main decentralization index* in all our specifications, even accounting for a higher mean of *LG expenditure decentralization*. In most specifications, it is also less statistically different from 0 (i.e. t-statistics are smaller). The biggest difference can be seen in the columns (13)-(14), where *corruption perception* is used as a measure of corruption. There the *main decentralization index* is shown to have a very significant positive effect, while the effect of *LG expenditure decentralization* is statistically and economically zero. The behavior of the *auxiliary decentralization index* is similar to the one of *LG expenditure decentralization*, which suggests that just decentralizing expenditures

is generally not enough to have a significant effect on a government's integrity. Increasing a government's own revenues, taxation autonomy and financing it with unconditional formula-based transfers is an essential part of successful story.

In addition to average partial marginal effects of decentralization, calculated in a pooled sample of all countries, which may not be of particular interest, for variable *paid bribe* we calculated marginal effects of decentralization on corruption for an average person in every single country from our sample. The results are reported in Table 7. As one can see from the table, the effect is very high for less developed (and less decentralized) countries: Togo - -32, Senegal - -27, Paraguay - -28, Guatemala - -27, Cameroon - -28, Cambodia - -29. At the same time, the effect is close to 0 for such countries as USA, UK, Canada. For Australia, Costa Rica, France, Iceland, Ireland, Panama, Portugal, Spain, Switzerland, UK and USA the effect is only marginally statistically different from 0.

6.1 Voice vs. exit

Our main specifications, which are reported in Table 5, do not allow us to disentangle the channels through which decentralization may affect corruption. The theory names two major channels. First, decentralizing government brings power closer to people, which makes it more controllable and thus accountable. This is so-called "voice" argument. Second, decentralized local governments obtain more instruments to compete with other governments and attract mobile residents or businesses. From the other side, if the residents or businesses are dissatisfied with integrity at their present jurisdiction, they can move to the other one. This is so-called "exit" argument. In this section we test whether one of the channels - "voice" or "exit" - is dominant.

The theoretical assumptions about a country for voice or exit arguments to work are quite different, which potentially allows to identify these effects separately. Exit of residents is possible only if they are mobile, i.e. can choose in which jurisdiction to reside, and if they have options of where to exit. This is not needed for a voice argument to work. Instead, under this argument, it is government's closeness to people that makes voice of the people "louder" and thus behavior of the government more accountable. For instance, abstracting from international mobility, such country as Lichtenstein has quite bad premises for the exit argument to work (since its residents simply do not have options of where to move inside the country), but extremely good premises for the voice argument to work - after all, the central government of Lichtenstein is closer to its people (in terms of population over which it governs) than most of the local governments elsewhere.

Table 7: Decentralization effect on corruption by country

country	dec. index	av. effect	95% conf. interval		country	dec. index	av. effect	95% conf. interval	
Argentina	.021	-.15	-.3	-.00	Australia	.045	-.04	-.09	.01
Bolivia	.045	-.21	-.4	-.02	Bulgaria	.025	-.16	-.3	-.02
Cambodia	.004	-.29	-.55	-.03	Cameroon	.001	-.28	-.56	-.01
Canada	.1	-.02	-.03	-.00	Colombia	.117	-.18	-.33	-.02
Costa Rica	.014	-.13	-.26	.00	Denmark	.313	-.02	-.04	-.00
Dominican Republic	.006	-.19	-.37	-.00	Ecuador	.054	-.19	-.36	-.02
Finland	.226	-.07	-.14	-.00	France	.126	-.04	-.1	.00
Georgia	.125	-.18	-.3	-.05	Germany	.062	-.04	-.08	-.00
Ghana	.016	-.25	-.47	-.03	Greece	.01	-.09	-.17	-.01
Guatemala	.012	-.27	-.52	-.01	Iceland	.19	-.06	-.12	.00
India	.019	-.16	-.29	-.02	Indonesia	.128	-.23	-.43	-.01
Ireland	.089	-.04	-.08	.00	Japan	.139	-.04	-.07	-.01
Kenya	.02	-.26	-.48	-.03	Korea, Rep.	.12	-.05	-.09	-.01
Lithuania	.075	-.13	-.26	-.00	Malaysia	.008	-.11	-.22	-.00
Mexico	.009	-.22	-.43	-.01	Moldova	.0451	-.21	-.35	-.06
Nicaragua	.003	-.25	-.49	-.01	Nigeria	.114	-.26	-.47	-.04
Norway	.174	-.03	-.05	-.01	Pakistan	.08	-.18	-.33	-.3
Panama	.005	-.13	-.28	.02	Paraguay	.014	-.28	-.55	-.01
Peru	.076	-.14	-.28	-.01	Philippines	.066	-.16	-.3	-.02
Poland	.113	-.09	-.17	-.01	Portugal	.059	-.07	-.16	.01
Romania	.09	-.16	-.29	-.03	Russian Federation	.124	-.17	-.31	-.03
Senegal	.012	-.27	-.5	-.04	South Africa	.086	-.08	-.15	-.00
Spain	.075	-.07	-.13	.00	Switzerland	.147	-.05	-.1	.00
Thailand	.015	-.1	-.17	-.03	Togo	.01	-.32	-.59	-.04
Turkey	.01	-.14	-.26	-.02	Ukraine	.114	-.17	-.31	-.02
United Kingdom	.034	-.02	-.05	.01	United States	.126	-.01	-.02	.00
Uruguay	.061	-.13	-.26	-.00					

Note For every country in the sample (*paid bribe* as a dependent variable), marginal effect of decentralization on corruption for an average person is shown. Column (2) - point-estimates; columns (3), (4) - 95% confidence interval.

Our specification strategy in this section is the following:

$$\text{corruption} = \beta_0 + \beta_1 * \text{decentr.} + \beta_2 * \text{decentr.} * \text{mobility} + \\ + \beta_3 * \text{decentr.} * \text{exit_options} + \text{other controls.} \quad (10)$$

Including the interaction of decentralization and mobility in (10) allows us to test for significance of the exit argument. Indeed, if $\beta_2 >$ it means that the effect of decentralization on corruption increases with mobility of firms and residents. Following the theoretical discussion above this may happen only if exit argument for decentralization works. The same holds for β_3. Therefore, under specification (10) $\beta_2 + \beta_3$ would be a measurement for "exit" part of decentralization effect on corruption. β_1 then encompasses the "voice" part of the effect (together with other possible channels, through which decentralization may affect corruption).

The estimation results of our new specification are shown in Table 9. There, as a proxy for residents and firms mobility we use average area of LG unit (based on the presumption, that moving is costly, when the distance is longer - e.g. moving from state to state is more expensive that moving from county to county). As a proxy for number of exit options we use number of LG units in a country (shown to have an effect on corruption in Arikan (2004)). We run 5 different specifications, each time a different corruption variable is used. To ease the interpretation we restrict current analysis only to OLS, ignoring the non-linear nature of dependent variable.

It can be seen from Table 9 that none of the 5 specifications provide a conclusive evidence in favor of existence of "exit" effect on practice. Coefficient near *dec. index*, which corresponds to our β_1 from (10), remains economically and statistically significant in almost all specifications, but neither β_2, coefficient near *dec.index*LG area*, nor β_3, coefficient near *dec.index*# LG units*, have predicted sign and economical significance. $\beta_3 > 0$ in all specifications (statistically significant only in 2 of them), which is contrary to what we expected, and its magnitude is virtually 0. β_2 is greater than 0, which is what we expected, in only one specification (third column) of 5. Therefore, from the data that we have, we cannot conclude that the decentralization works through an exit channel.

6.2 Does politics matter?

Our main decentralization index is based solely on the fiscal side of the decentralization: expanse of local expenditures is adjusted on how much of these expenditures are financed by own local revenues or by unconditional transfers. So far, we did not include political indicators in our analysis. Yet, it may make a big difference whether the local money - no matter how autonomously obtained - are spent by someone, who is elected by local people, or someone who is appointed from above (and what is more important, can be dismissed from above in case of disobedience). In this section we test whether politics matter when local finances are taken into account. The specification we are testing is similar to that in Section 6.1:

$$\text{corruption} = \beta_0 + \beta_1 * \text{decentr.} + \beta_2 * \text{decentr.} * \text{polit_decentr.} + \\ + \beta_3 * \text{polit_decentr.} + \text{other controls.} \quad (11)$$

Table 8: Voice vs. exit

	paid bribe	bribe burden	informal gift	bribe%sales	corr. perception
	(1)	(2)	(3)	(4)	(5)
dec. index	-0.25***	-14.76**	3.45	-17.8	-0.78
	-0.06	-5.72	-2.74	-28.07	-3.59
dec.index*(# units)	0.00***	0	0	0.00*	0
	0	0	0	0	0
LG area	0.01***	0.54	-0.06*	0.22	0
	0	-0.36	-0.03	-0.37	-0.01
dec.index*LG area	-0.23***	-10.07	0.85*	-6.01	0.1
	-0.05	-6.09	-0.5	-7.14	-0.12
dec.index*GDP/capita	0.06	0	0	0.00**	0.00***
	-0.05	0	0	0	0
# units	-0.00***	0	0	0	0
	0	0	0	0	0
1 tier	-0.15***	-6.78	-0.12**	-0.45	0.31
	-0.06	-6.64	-0.05	-0.53	-0.39
2 tiers	-0.17***	-7.47	-0.16***	-0.29	0.12
	-0.05	-6.51	-0.05	-0.37	-0.23
3 tiers	-0.17***	-6.46			
	-0.05	-6.71			
UK legal origin	-0.08***	-3.05***	-0.02	-0.05	0.36
	-0.01	-0.86	-0.06	-0.54	-0.29
fractionalization	0	-0.36	0	0.23**	-0.03
	0	-0.29	-0.02	-0.11	-0.08
start business	-0.01***	-0.17*	0	0.13	-0.09**
	0	-0.09	0	-0.08	-0.04
enforce contract	-0.00***	0	0.01*	-0.02	-0.03
	0	-0.06	0	-0.04	-0.02
# countries	54	56	56	56	101

Note * - significant at 5% level, ** - significant at 3% level, *** - significant at 1% level. Dependent variable: column (1) - *paid bribe*; columns (2) - *paid bribe*; columns (3) - *informal gift*; columns (4) - *bribe%sales*; column (5) - *corruption perception, 2007* (see definitions in Table 2). Estimation method: linear probability (OLS). Standard errors are reported in brackets: columns (1), (2), (5) - heteroscedasticity robust; columns (3), (4) - clustered by country. Additional controls are included in all regressions, but not reported here due to a lack of space. These are regional dummies, year dummies, individual and firm controls, population, openness, log (GDP per capita), # of units, LG population size.

Table 9: Does politics matter?

	paid bribe	bribe burden	informal gift	bribe%sales	corr. perception
	(1)	(2)	(3)	(4)	(5)
dec.index	-0.81**	-53.58***	-2.39***	-38.25***	30.86**
	-0.39	-13.82	-0.6	-10.35	-12.97
LG exec. el.	0.14***	0.04	-0.10***	-2.12***	0.54
	-0.02	-0.87	-0.02	-0.51	-0.82
dec.index*LG exec. el.	-3.60***	50.14***	2.92***	36.93***	-0.82
	-0.45	-16.21	-0.4	-10.32	-14.13
LG indep.	-0.07***	-3.24***	-0.13***	-1.67*	2.21*
	-0.02	-0.69	-0.03	-0.94	-1.12
dec.index*LG indep.	-1.56***	18.88**	0.79*	28.24**	-16.59
	-0.26	-8.99	-0.41	-13.17	-13.61
LG direct dem.	-0.04	-3.03***	0.27***	1.22	-0.46
	-0.03	-1.03	-0.04	-0.92	-1.05
dec.index*LG dir.dem.	0.74**	-7.54	-5.97***	-13.24	14.84
	-0.31	-11.15	-0.72	-16.19	-11.69
LG leg. el.	-0.25***	-2.18**	0.08***		-0.06
	-0.03	-1.01	-0.02		-0.57
dec.index*LG leg.el.	4.58***	-9.97	0.12		-20.79
	-0.69	-22.78	-0.54		-14.07
LG area	-0.02**	1.20***	-0.01***	-0.04***	0.01
	-0.01	-0.29	0	-0.01	-0.01
dec.index*LG area	0.15	-21.35***	-0.25***	0.15	4.06***
	-0.12	-4.37	-0.05	-1.86	-1.46
1 tier	0.17**	-17.95***	-0.02**	0.55	-0.26
	-0.07	-3.12	-0.01	-0.45	-0.46
2 tiers	0.12*	-18.46***	-0.06***	-0.28	-0.18
	-0.07	-3	-0.01	-0.36	-0.32
3 tiers	0.1	-17.67***			
	-0.07	-3.01			
UK legal origin	-0.04***	-2.98***	0.04**	0.81	-0.12
	-0.01	-0.45	-0.02	-0.57	-0.35
fractionalization	0.04***	-0.50***	0.02***	0.31***	-0.07
	0	-0.16	0	-0.1	-0.12
start business	-0.01***	-0.06	0.01***	0.08**	-0.10*
	0	-0.04	0	-0.03	-0.05
enforce contract	0.00***	-0.04	0.01***	0	-0.03
	0	-0.03	0	-0.02	-0.03
log (GDP/capita)	-0.07***	-0.19			0.31
	-0.01	-0.22			-0.24
Observations	33925	33459	27217	28773	72
R-squared	0.1	0.05		0.05	0.93
# countries	54	56	56	56	101

Note * - significant at 5% level, ** - significant at 3% level, *** - significant at 1% level. Dependent variable: column (1) - *paid bribe*; columns (2) - *paid bribe*; columns (3) - *informal gift*; columns (4) - *bribe%sales*; column (5) - *corruption perception, 2007* (see definitions in Table 2). Estimation method: columns (1), (2), (4), (5) - linear probability (OLS); column (3) - probit (average partial effects are reported). Standard errors are reported in brackets: columns (1), (2), (5) - heteroscedasticity robust; columns (3), (4) - clustered by country. Additional controls are included in all regressions, but not reported here due to a lack of space. These are regional dummies, year dummies, individual and firm controls, population, openness, # of units, LG population size.

Again, if political decentralization of local governments matters than the more decentralized they are (politically) the bigger should be the effect of decentralization (fiscal) on corruption, i.e. β_2 should be greater than 0. In addition, politics can work independently from fiscal decentralization. In this case β_3 should be different from 0.

We include all political decentralization variables in regression. Defined in Section 3, they are LG independence, LG executive election, LG direct democracy, and LG legislative election. We also include interactions of these variables with our main decentralization index. The results are depicted in Table 9. Again, we run 5 different specifications - each corresponds to a different corruption variable.

The results reported in Table 9 definitely suggest that the political decentralization is an important factor affecting corruption, even if fiscal decentralization is controlled for. In all specifications *dec.index* still has economically and statistically significant negative impact on corruption. Yet, each political variable in the regression adds up some new information. In only 2 of 5 specifications election of executive at a local level increases the effect of decentralization on corruption. At the same time, 2 of 5 specifications suggest that when LG are not decentralized (fiscally) local election of executive may actually worsen corruption (coefficient near *LG exec. el.* is positive in (1) and (2)). LG independence is shown to have an independent significant negative effect on corruption in all 5 specifications. The interaction between decentralization index and LG independence does not work as well suggesting that nominal independence of LG matters less when local governments are independent fiscally. Availability of direct democracy mechanisms in local governance generally (in almost all specifications) improves the situation with corruption both independently and in interaction with fiscal decentralization. Finally, local election of legislative council does not seem to have a significant effect on corruption. A possible reason for that may come from the pure statistics - very few countries in the world (20% of our sample) restrict elections of councils at a local level. A lack of variation in this variable may potentially blow up the variance of a corresponding estimator making it hard to come to any conclusions.

7 Robustness discussion

The results from the previous sections suggest a strong and robust negative correlation between decentralization in a country and extent of corruption in it. The statistical estimation of the causal effect is however more complicated. There are at least two problems with that. First, even if decentralization is exogenous in our setup, the right hand side of our regressions still contains variables, which are clearly endogenous (like *GDP per capita*). This drags estimator of decentralization effect to inconsistency. The second problem is more serious: both extent of corruption and decentralization could be driven by the same omitted process, say "benevolency" of a government, or a "level of country's development". Then the effect we estimate in our main specifications is inconsistent, and identifies only a strong correlation rather than causal effect.

Further we analyze both of the problems in more detail.

7.1 Endogenous right hand side variables

To isolate the effect of decentralization on corruption in a country we need to control for wealth of the country (and some other macroindicators, which apparently are correlated with both decentralization and corruption). However, no one would argue, that the wealth of the country heavily depends on extent of corruption in it (and more generally, on the "quality of institutions"). In fact, wealth and corruption may be viewed as jointly determined: rich people fight more against corruption, while corruption makes people poor. In this situation, even if the decentralization itself is exogenous in our analysis, its effect may be estimated inconsistently.

The problem may be relieved by the establishment of the direction of inconsistency. Indeed, it is reasonable to assume that wealth and corruption are negatively correlated - the richest nations in the world are the least corrupted. At the same time, rich people are more mobile as well as they are more demanding to government and willing to make its decisions as close to their preferences as possible. If that is the case - and the data clearly point in this direction - then the correlation between wealth and decentralization is positive even after controlling for other factors, which are included in the right hand side of our regressions. A general econometric result states that if an error and endogenous variable are negatively correlated, and variable of interest and endogenous variable are positively correlated controlling for other variables in a regression, than OLS estimator underestimates the true coefficient near the variable of interest. Our case quite possibly fits all needed conditions of this result, and therefore we may conclude that OLS estimates of our coefficient near decentralization are smaller than the actual coefficient if GDP per capita is included in the regressions (which is the case in all specifications).

A similar reasoning concerns a possible measurement error in our measurement of decentralization. The possibility of the measurement error is high, since the data are very scarce and many of the data points are roughly estimated. Part of our reasoning for usage of composite indexes rather than separate variables is because this way measurement errors may offset each other. However, chances are that the errors are present. Assuming that they satisfy classical assumptions (i.e. they are uncorrelated with the variables in regressions), our OLS estimates suffer from "attenuation" bias. A general econometrics result is that, again, "attenuation" bias causes OLS estimates may understate true relationship.

7.2 Endogenous decentralization

A more serious threat to our estimates of an effect of decentralization on corruption is that these two variables may be caused by the same omitted process or variable, which would mean that decentralization is endogenous. Indeed, such a claim is quite possible, since it is government, which is exposed to corruption, and it is government, that designs and decides on decentralization. One possible relief in our situation is that we run a petty corruption (mostly on the local level) on decentralization, which is generally decided on the central government level. However, it is hard to believe that these levels are independent.

It is possible to correct the endogeneity of decentralization if we assume that both corruption and decentralization are driven by a variable, which is fixed in time

(at least, in a span of few years). A "level of development" or "cultural values of a government" could be such variables. Then, if we have measurements of corruption and decentralization for consecutive periods the fixed effect can be differenced out.

We do not have the same measurements of corruption and decentralization for two or more periods. The data on decentralization collected by us is for 2005 only, and WBES and GCB datasets, from which we draw our corruption measures, are cross-sectional (at least, those which are available to us). However, we construct a new decentralization index for 2000 from the data, which is available at the D. Treisman's web site (and used in Fan et al. (2009)). We also use Corruption Perception Index from 2000 as an alternative proxy for corruption in 2000. Having different proxies for the same variables in two periods may also help to eliminate fixed effect from a regression. Indeed, suppose we have two equations:

$$cor_{t_1} = \beta_0 + \beta_1 dec_{t_1} + \beta X_{t_1} + \gamma c + \epsilon, \tag{12}$$

$$cor^{'}_{t_2} = \beta^{'}_0 + \beta^{'}_1 dec^{'}_{t_2} + \beta^{'} X_{t_2} + \gamma^{'} c + \epsilon^{'}, \tag{13}$$

where cor_{t_1}, $cor^{'}_{t_2}$ are two different proxies for corruption in two different periods, dec_{t_1}, $dec^{'}_{t_2}$ - are two proxies for decentralization, c - is the fixed effect that we want to eliminate, X - are some other controls, ϵ and $\epsilon^{'}$ are errors, which are assumed to be uncorrelated with each other.

We can express c from (13) and insert the expression in (12). We obtain:

$$cor_{t_1} = \beta_0 + \beta_1 dec_{t_1} + \beta X_{t_1} + \frac{\gamma}{\gamma^{'}} \left(cor^{'}_{t_2} - \beta^{'}_0 - \beta^{'}_1 dec^{'}_{t_2} - \beta^{'} X_{t_2} - \epsilon^{'} \right) + \epsilon \tag{14}$$

Under our assumptions, β_1 can be consistently estimated from (14), since $\epsilon^{'}$ and ϵ are uncorrelated. If we further assume that X's do not change with time too, (14) reduces to:

$$cor_{t_1} = \beta^{''}_0 + \beta_1 dec_{t_1} + \beta^{''}_2 cor^{'}_{t_2} - \beta^{''}_3 dec^{'}_{t_2}. \tag{15}$$

If we take cor_{t_1} to be, say, *bribe burden*, dec_{t_1} to be our main decentralization index, $cor^{'}_{t_2}$ to be CPI in 2000, and $dec^{'}_{t_2}$ to be decentralization index in 2000, then we expect $\beta_1 < 0$, $\beta^{''}_2 < 0$, and $-\beta^{''}_3 > 0$.

The results of our estimation are presented in Table 10. We run 4 different specifications - 1 for each corruption variable except *corruption perception*. Further we use two decentralization indexes for 2005 - our main dec. index and *auxiliary dec.index*, defined in Table 4.

The results in Table 10 are inconclusive. All our expectations hold only in one specification - when *informal gift* is used as a dependent variable. In the first specification coefficients mostly have predicted sign, but are statistically insignificant. In specifications (2) and (4) decentralization of 2000 has the opposite sign to what we would expect. Even when significant, the coefficient near *dec. index, 2005* is much smaller than the one reported in our main specification, suggesting that some part of the correlation between corruption and decentralization is driven by some omitted variable.

There may be several reasons for such twofold results. First, the data on decentralization - both for 2000 and 2005 - are very noisy. For most of the countries

Table 10: Corruption and decentralization: controlling for fixed country effects

	paid bribe	bribe burden	informal gift	bribe%sales
	(1)	(2)	(3)	(4)
main dec. index	-0.02	-0.44*		-0.13**
	-0.03	-0.26		-0.07
corruption perception, 2000	-0.02***	0.05***	-0.36***	-0.01***
	0	-0.02	-0.01	0
exp. dec., 2000	-0.01	-0.58*	3.35***	
	-0.04	-0.3	-0.63	
aux. dec. index			-1.77***	
			-0.29	
aux. dec. index, 2000				-0.10***
				-0.02
Observations	23301	23079	25254	23408
R-squared	0.07	0.03	0.02	0.02

Note * - significant at 5% level, ** - significant at 3% level, *** - significant at 1% level. Dependent variable: column (1) - *paid bribe*; columns (2) - *paid bribe*; columns (3) - *informal gift*; columns (4) - *bribe%sales* (see definitions in Table 2). Estimation method: linear probability (OLS). Heteroscedasticity robust standard errors are reported in brackets.

they are simply not reported. Therefore, severe measurement error could inhibit any signs of predicted behavior. The same role could be played by a small variation of decentralization in our main samples - GCB concentrates mostly on high income countries, while WBES - on low income countries. However, there may be a problem with the fixed effect estimation - fixed variable, which drives both decentralization and corruption, may be not that fixed after all. In this case, an exogenous source of variation for a change in decentralization is needed to provide consistent estimates.

8 Conclusion

This paper has pursued rigorous quantitative analysis to explore the impact of decentralization (empowering of local governments) on the incidence of corruption in a sample of 182 countries. The paper has shown that decentralization, when properly measured to mean moving government closer to people by empowering local governments, has a significant negative (positive in the sense of good governance) effect on corruption regardless of the choice of the estimation procedures or the measures of corruption used. In terms of various dimensions of decentralized governance, political decentralization matters even when fiscal decentralization is controlled for. Further voice (political accountability) is considered more important in combating corruption than exit options made available though competition among jurisdictions. Shah (2006)

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