Governmental decentralization and corruption revisited: Accounting for potential endogeneity

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HIGHLIGHTS

- Estimate the causal effect of decentralization on corruption in the absence of traditional instrumental variable.
- Identification achieved by applying Lewbel (2012) approach.
- Mild evidence of political decentralization being endogenous.
- Controlling for it yields significantly larger positive effect on corruption.
- Fiscal decentralization reduces corruption; there is no evidence it is endogenous.

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ABSTRACT

The causal effect of governmental decentralization on firm-level corruption is inconclusive due to the difficulty in obtaining a traditional instrumental variable. Circumventing the issue by using the Lewbel (2012) identification strategy, we find mild evidence of *political* decentralization being endogenous but no support for *fiscal* decentralization being endogenous.

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1. Introduction

Recent empirical studies on governmental decentralization and corruption have utilized better data to facilitate relatively finer analyses (Fan et al., 2009). Various measures, besides fiscal and federal structure, are available as proxies for decentralization (Treisman, 2002, 2007; Fan et al., 2009). For corruption, household- and firm-level surveys are used to obtain experience-based measures, replacing prior data based on the *perceptions* of individuals. Experience-based measures are arguably an advancement as perceptions are likely to be characterized with more measurement error (Treisman, 2007). Cultural–political–economic factors which tend to lower corruption bias the perception indices downward from actual corruption experiences (Donchev and Ujhelyi, 2014). Razafindrakoto and Roubaud (2010) found a number of biases in the perceptions of the experts as compared to actual experiences of corruption by the ordinary citizens for some African countries. Thus, studying the impact of decentralization on *direct corruption experiences* has become crucial. Nevertheless, empirical studies have been unable to credibly identify the causal relation between decentralization and corruption experiences.

First, decentralization is a complicated, multi-dimensional process; a single, accurate measure is seemingly unrealistic. Fan et al. (2009, p. 33) state: "Although the data we use are more detailed and precise than in previous explorations, they are still likely to contain some measurement error." This is because several diverse factors are closely associated with decentralization, impacting each other at various levels and contexts. It is not only

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difficult to disentangle them, but segregation of each form of decentralization from the other is unfavorable due to its overlapping features. To circumvent this problem, Ivanyna and Shah (2011) use a composite index of several variables, yet could not disregard the chances of measurement error being present. Moreover, the 'actual' government power existing at a local level is not just due to 'formal' decentralization, but also 'informal' decentralization due to various cultural, traditional, and historical relics of a country that is beyond control of the central government. For example, Vu et al. (2014, p.3) distinguish between "legitimate level of autonomy" assigned by the central government to subcentral level and "de facto discretion in subcentral government decision making" and how this difference affects subcentral government performance. Difficulty for econometricians is that this *actual* governmental decentralization remains unobserved. Instead, we observe the formal decentralization given at a country level.

Second, omitted variable bias cannot be ruled out. Unobserved determinants of corruption like quality of politicians, administrative ability of public officials, long-standing traditions of informal institutions, willingness of common people to participate in politics, etc. may be correlated with decentralization.

Third, reverse causation may be a problem (Arikan, 2004; Fan et al., 2009). Corrupt bureaucrats can be strong supporters of decentralization since it is more conducive to extract rent when they interact with people locally. Besides, regional elites having financial and political incentives encourage decentralization. It provides them with greater opportunity to control public resources and hold offices. National executives reinforce their interest if they have electoral benefits to receive in return. Increasing chance of getting re-elected at the central level by winning regional support, therefore, incentivizes alliances between local elites and central executives leading to further promotion of decentralization (Grossman and Lewis, 2014). In such an instance, corruption *causes* decentralization. Likewise, an alternate argument is also plausible. Regional officials may be close enough to local people to work in their favor and maintain higher accountability than those working at the center. Thus, decentralization gets supported by honest local bureaucrats with the target of having better governance. Referring to these possibilities, Fan et al. (2009, p. 33) state: "… the direction of causation is open to question for all the dimensions of decentralization examined but especially for the results concerning fiscal decentralization."

The traditional way of addressing endogeneity is elusive in this context due to the difficulty of finding a credible instrumental variable (IV) for decentralization. Again, Fan et al. (2009, p. 33) state: "Lacking any reasonable instruments for decentralization, we can suggest plausible interpretations of the patterns in the data, but cannot make confident claims about their causes."

This paper advances on the existing studies by addressing the potential endogeneity of decentralization using cross-country, firm-level data on corruption from the World Business Environment Survey (WBES) conducted in 1999–2000. Building on previous work in Fan et al. (2009), we circumvent the requirement of a traditional IV by applying the Lewbel (2012) estimation approach. This uses conditional second moments of the data for identification.

The identification strategy performs reasonably well in the current context; the results are notable. There is only mild evidence of *political* decentralization being endogenous when analyzing bribe amounts, but not bribe frequency. There is no support for *fiscal* decentralization being endogenous using either measure of corruption. Also, unlike *political* decentralization, *fiscal* decentralization has a beneficial impact on (reducing) corruption.

2. Empirical analysis

2.1. Estimation

The model[1] is given by

$$C_{ij} = \alpha + \beta D_j + X_j\theta_1 + X_{ij}\theta_2 + \varepsilon_{ij} \tag{1}$$

$$D_j = \pi_0 + X_j\pi_1 + X_{ij}\pi_2 + \eta_{ij}, \tag{2}$$

where C_{ij} is the corruption measure of firm i in country j, D_j indicates the decentralization measure, X_j is a vector of country-level covariates, X_{ij} is a vector of firm-level covariates, $\theta_1, \theta_2, \pi_1,$ and π_2 are conformable vectors of parameters, and ε and η are mean zero, possibly correlated error terms.[2]

The Lewbel (2012) identification requires some of the covariates to be related with the conditional variance of the first stage error (η_{ij}) but unrelated to the conditional covariance between the first stage (η_{ij}) and second stage (ε_{ij}) errors. Formally, if there exists $z \subseteq X$, where $X \in \{X_j, X_{ij}\}$, such that

$$E[z'\eta^2] \neq 0 \tag{3}$$

$$E[z'\varepsilon\eta] = 0, \tag{4}$$

then $\widetilde{z} \equiv (z - \overline{z})\eta$ are valid instruments.

To provide some intuition in the current context, consider the following factor loading error structure:

$$\varepsilon_{ij} \equiv \sigma_\varepsilon(z)\lambda_{ij} \tag{5}$$

$$\eta_{ij} \equiv \sigma_\eta(z)\lambda_{ij}. \tag{6}$$

If λ_{ij} is a common homoskedastic factor, independent of z, with mean zero and unit variance and $\sigma_\varepsilon(z)$ and $\sigma_\eta(z)$ are standard deviations of ε and η, respectively, each depending on z but independent of λ_{ij}, then conditions (3) and (4) will be satisfied.[3]

As an example, consider Indonesia's extensive decentralization in late 1990s. Upon decentralization, it became apparent that there was an insufficient pool of capable local agents to organize and administer (International Crisis Group, 2012). Thus, decentralization resulted in a reduction in the quality of government officials. In the above error structures, λ_{ij} may represent the (unobserved) administrative ability of public officials at the subnational level. The impact of administrative ability on decentralization, operating through η_{ij}, is enhanced or diminished by specific country-level and/or firm-level attributes captured by $\sigma_\eta(z)$. For instance, countries long open to democracy are likely to experience higher bargaining power among local agents. High ability local agents in these areas are expected to influence the central level more, leading to more localization of power. Rich countries with higher GDP per capita tend to have better infrastructure and resources to allow public administration to run more smoothly at all levels. Areas having relatively more high skilled officials are expected to use these resources more efficiently. Hence, variation in decentralization can be observed across different regions depending on the economic status of the country. Firms with government ownership in its financial stake have higher political connections and influences than private firms. Subnational level officials may be forced to conform

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[1] Note that the 'true' model is given by: $C_{ij} = \alpha + \beta D_{ij}^* + X_j\theta_1 + X_{ij}\theta_2 + \widetilde{\varepsilon}_{ij}$ where $D_j = D_{ij}^* + \mu_{ij}$ and $\varepsilon_{ij} = \widetilde{\varepsilon}_{ij} - \beta\mu_{ij}. D_{ij}^*$ captures the unobserved formal and informal decentralization experienced by firm i in country j, and μ_{ij} is measurement error.

[2] Note, the dependent variable in (2) is at the country level, but as is traditional in two-stage models, the first-stage regressions control for all exogenous variables from the second-stage and is, thus, estimated using the full sample and controlling for X_{ij}.

[3] Actually, (5) is stronger than is necessary. Even if ε_{ij} is homoskedastic, (3) and (4) will still be satisfied.

Table 1
Summary statistics and description of the variables.

Variable	N	Mean	SD	Definition
Bribe frequency	9130	2.914	1.683	It is common for firms in my line of business to have to pay some irregular "additional payments" to get things done: (1) never, (2) seldom, (3) sometimes, (4) frequently, (5) mostly, (6) always.
Bribe amount	5246	2.427	1.542	On average, what percentage of revenues do firms like yours typically pay per year in unofficial payments to public officials: (1) 0%, (2) greater than 0 and less than 1%, (3) 1%–1.99%, (4) 2%–9.99%, (5) 10%–12%, (6) 13%–25%, (7) over 25%.
Tiers	9785	3.898	0.947	Number of tiers of government. A tier is coded as a "tier of government" if state executive body at that level (1) was funded from the public budget, (2) had authority to administer a range of public services, and (3) had a territorial jurisdiction.
Sub-national revenues	7877	5.950	5.141	Subnational revenues (% of GDP), average 1994–2000, available years, from World Bank Decentralization Indicators, constructed from IMF GFS.
Federal	9785	0.219	0.414	Dummy variable that takes the value 1 if the country is classified as "federal", 0 otherwise.
Bottom unit size	9114	1.739	8.862	Average size of bottom tier units, thousand sq km (i.e., surface area divided by estimated number of bottom tier units).
Foreign ownership	9673	0.188	0.391	Dummy variable that equals 1 if any foreign company or individual has a financial stake in the ownership of the firm, 0 otherwise.
State ownership	9645	0.122	0.327	Dummy variable that equals 1 if any government agency or state body has a financial stake in the ownership of the firm, 0 otherwise.
Exporter	9463	0.356	0.479	Dummy variable that equals 1 if firm exports, 0 otherwise.
Firm size	9087	9.982	7.803	Natural logarithm of firm's sales.
Industry dummies	9141	2.103	1.238	A series of dummy variables that represent the firms' industries (Manufacturing, Construction, Service, Agriculture, and Others).
GDP per capita	9728	8.447	0.938	Natural logarithm of country's GDP per capita in year 1999.
Democratic	9785	0.126	0.332	Democratic in all years 1950–2000.
Fuel	9111	13.973	21.434	% of mineral fuels in manufacturing exports, 2000.
Imports	9685	41.199	19.158	Imports of goods and services as % of GDP, 2000.
Protestant	9932	0.084	0.126	Protestant as % of the population.
British colony	9683	0.207	0.405	Dummy variable that takes the value 1 if the country is a former British colony, 0 otherwise.

Notes: Description of the variables are taken directly from Fan et al. (2009).

to certain political realities when dealing with such firms. This may reduce their de facto power to administer and execute regulations. Consequently, the impact of administrative ability may be diminished for regions with greater share of government owned firms.

If the errors constitute only administrative ability, then the correlation between ε and η is necessarily positive. An error structure consistent with the Lewbel (2012) requirements but that does not impose a positive correlation between ε and η is the following

$$\varepsilon_{ij} \equiv \sigma_{\varepsilon}(z)\lambda_{ij}\epsilon_{1ij} \tag{7}$$

$$\eta_{ij} \equiv \sigma_{\eta}(z)\lambda_{ij}\epsilon_{2ij}, \tag{8}$$

where ϵ_{1ij} and ϵ_{2ij} denote unpredicted shocks – perhaps related to the political environment – to corruption and decentralization, respectively. Now the correlation between ε and η depends on the correlation between ϵ_{1ij} and ϵ_{2ij} (see, e.g., Schroeder, 2014). For conditions (3) and (4) to hold, the ϵ_{ij}s must be independent of z and λ_{ij}.

To better understand (7) and (8), suppose a country is endowed with a pool of agents of certain quality, λ_{ij}, and faces a natural catastrophe. The impact on subnational revenue (or some other measure of local political power) may be negative due to an increase in the central government spending (or power) to address the crisis (i.e., $\epsilon_{2ij} < 0$). In addition, firms and industries may be destroyed. To re-start business, these firms need to interact with the public officials to get their work done, perhaps with a priority. So, in order to get preferential treatment, the supply of bribes rises (i.e., $\epsilon_{1ij} > 0$). Thus, this shock induces events that affect decentralization and corruption, but in opposite directions. However, shocks such as this must be independent of firm- and country-level characteristics and abilities of public officials.

To proceed, we first choose those covariates as z variables which are related to the first stage error variances. For that, we apply the Breusch–Pagan test for heteroskedasticity and use the estimated η to generate instruments $\tilde{z}$ within the model (see, e.g., Millimet and Roy, 2014). The structural model is then estimated via GMM. Heteroskedasticity-robust standard errors are clustered by

country to allow for correlation among errors across firms within a particular country.[4]

2.2. Data

Corruption data comes from the WBES of 1999–2000. The dependent variables are *Bribe Frequency* and *Bribe Amount*, each representing a separate dimension of corruption. Summary statistics and description of the variables are presented in Table 1.[5]

We consider two broad forms of decentralization: political and fiscal decentralization. Three proxies used for political decentralization are: (i) total number of administrative and governmental layers (*tiers*) representing the vertical design of the government, (ii) *Federal* structure (as defined by Elazar, 1995) representing the political structure of power devolution, and (iii) the *average size of bottom tier units* measuring the horizontal lay out of power on the lowest rung of the administration. The proxy used for fiscal decentralization is *subnational share of government revenue (as % of GDP)*. Each proxy, therefore, represents a specific form of decentralization having its own policy implication, but most likely with overlapping features. These measures are from the mid-1990s. Fan et al. (2009) provides a good review of various theoretical arguments on different forms of decentralization influencing corruption.

We run two sets of regressions (for each of the two corruption measures) on one decentralization proxy at a time. Using multiple proxies for the primary variable of interest in the same model results in estimates that are difficult to interpret.[6] Note, there is

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[4] We also estimate ordered probit model via control function approach to account for ordered categorical measure of corruption. The results are imprecise but available upon request.

[5] The data set is taken from Daniel Treisman's web site: http://www.sscnet.ucla.edu/polisci/faculty/treisman/Pages/publishedpapers.html.

[6] It is in this respect that our basic model differs from that mainly used by Fan et al. (2009). In their paper, the authors control for the number of tiers in all the regressions estimating the effect of each of the other decentralization variable. They

some asymmetry in the sample across estimations due to missing observations.

Following the previous literature, various firm-level controls are included: dummy variables for firm ownership, *State* and *Foreign*, an *Exporter* dummy, *Firm Size* and *Industry Classification*. At the country level, the controls are *Log of GDP per Capita, Imports, Democratic, British Colony, Fuel* and *Protestant*.[7]

3. Results

Main results are presented in Table 2. For brevity, we only report the coefficients on the decentralization proxies. OLS estimates are presented for comparison.

Of the eight cases that are estimated using GMM, instruments pass the underidentification and overidentification tests in six. The instruments have good explanatory power in five out of those six since the Kleibergen–Paap F-statistic is higher than the standard threshold. The three cases where there is some weak instruments concern, the Anderson and Rubin (1949) test robust to weak instruments indicates statistical significance at least at the $p < 0.05$ confidence level in two and another one at the $p < 0.10$ confidence level. We interpret these to be evidences in support of the identification strategy.

Given this, we obtain some interesting findings. First, there is only mild evidence of *political* decentralization being endogenous. Specifically, we reject exogeneity of federalist structure at the $p < 0.05$ confidence level when corruption is measured in terms of bribe amount. Controlling for this results into significantly larger positive effect indicating federalist structure to be conducive for corruption. To be specific, the IV estimate is almost three times larger than OLS and statistically significant at least at the $p < 0.05$ confidence level by both the traditional approach and the Anderson–Rubin weak instrument robust test. Also, we reject exogeneity of bottom tier units' average size at the $p < 0.10$ confidence level for bribe amount. The statistical significance is at the $p < 0.01$ confidence level once we control for endogeneity. These results imply that countries with federalist structure and greater horizontal dispersion of power in terms of smaller lowest level units received bribes in larger amounts.

Second, contrary to usual speculation and unlike political decentralization, we find no evidence of endogeneity for *fiscal* decentralization. Moreover, fiscal decentralization has some *beneficial effect* on corruption by reducing bribe frequency. The effect is statistically significant at the $p < 0.05$ confidence level.

Theoretically, size of the bottom tier units are positively associated with the moving cost of mobile capital and consequently to (less) interregional competition (Tiebout, 1956; Brennan and Buchanan, 1980). This should induce more corruption when the average size of the lowest level units is larger. Yet, the results here are opposite. We interpret this as a support for the alternate hypothesis (Cai and Treisman, 2004). Local governments tend to attract firms that are promised to receive beneficial treatment for their local businesses upon establishment. Besides, the useful impact of greater fiscal decentralization on mitigating corruption comes with a potential cost. While giving larger revenue share may disincentivize the local officers from demanding bribes, there is also a possibility of greater embezzlement in the official fund

argue that the way power and resources are distributed across tiers, their effect on corruption is expected to depend on the number of tiers as well. Though they also run a separate set of regressions without controlling for tiers, the results mainly reported in the paper are those with multiple proxies in the same regression.

[7] We used additional variables, *total government revenue (% of GDP)* and *total government employment* to control for the government size but the sample changes considerably due to missing observations. Results are available upon request.

Table 2
Corruption measures and decentralization variables.

Variables	Bribe frequency		Bribe amount	
	OLS	GMM	OLS	GMM
Tiers	0.383[*]	0.506[*]	0.493[*]	0.371[**]
	(0.139)	(0.178)	(0.146)	(0.169)
Underid test		0.024		0.090
F-stat		11.997		7.933
Overid test		0.323		0.497
Endogeneity		0.487		0.177
Sig. Endog.	0.008	0.001	0.001	0.059
N	6676	6676	4102	4102
Federal	0.077	0.381	0.208	0.660[*]
	(0.160)	(0.347)	(0.182)	(0.229)
Underid test		0.007		0.007
F-stat		29.190		26.456
Overid test		0.891		0.950
Endogeneity		0.315		0.028
Sig. Endog.	0.631	0.533	0.259	0.018
N	6676	6676	4102	4102
Bottom unit size	−0.013[**]	−0.038[*]	−0.124[**]	−0.126[**]
	(0.005)	(0.008)	(0.051)	(0.052)
Underid test		0.057		0.020
F-stat		69.573		264.885
Overid test		0.141		0.517
Endogeneity		0.190		0.051
Sig. Endog.	0.014	0.012	0.019	0.003
N	6527	6527	4102	4102
Subnational revenues	−0.033[**]	−0.054	0.013	−0.008
	(0.014)	(0.049)	(0.015)	(0.035)
Underid test		0.035		0.027
F-stat		4.441		38.459
Overid test		0.155		0.605
Endogeneity		0.660		0.516
Sig. Endog.	0.021	0.026	0.390	0.856
N	5716	5716	3496	3496

Notes: Heteroskedasticity-robust standard errors clustered by country are in parentheses. Controls are State Ownership, Foreign Ownership, Exporter, Firm Size, GDP per Capita, Democratic, Fuel, Imports, Protestant, British Colony and Industry Dummies. Instruments based on: Exporter, GDP per Capita (Tiers, Bribe Frequency); Exporter, Fuel, Protestant (Tiers, Bribe Amount); Imports, British Colony (Federal, Bribe Frequency); GDP per Capita, Fuel, Imports (Federal, Bribe Amount); Fuel, Industry Dummy (Bottom Unit Size, Bribe Frequency); Firm Size, Industry Dummy (Bottom Unit Size, Bribe Amount); Exporter, Protestant, Industry Dummy (Subnational Revenues, Bribe Frequency); Exporter, British Colony (Subnational Revenues, Bribe Amount). Underid Test reports the *p*-value of Kleibergen–Paap (2006) rk LM statistic where rejection implies identification. *F*-stat reports the Kleibergen–Paap rk *F*-statistic for weak identification. Overid Test reports the *p*-value Hansen *J*-statistic where rejection raises doubt about the instruments' validity. Endogeneity reports the *p*-value of the Endogeneity test of endogenous decentralization regressor. Sig. Endog. reports the *p*-value of the Anderson and Rubin (1949) chi-square weak instrument robust test of significance of the endogenous regressor for GMM and the standard two-sided *p*-value for OLS.

[*] $p < 0.01$.
[**] $p < 0.05$.
[***] $p < 0.10$.

to earn additional income if the opportunity cost to swindle is less.

Since our specifications differ from those primarily reported in Fan et al. (2009), we exercise restraint from making any 'direct' comparison of the results. However, on a qualitative note, it can be concluded that the signs of the impacts of decentralization proxies on corruption, in general, are in agreement with those found by Fan et al. (2009). But, for cases where we find evidence of endogeneity, we often obtain statistically significant estimates in contrast to Fan et al. (2009).

4. Conclusion

The causal relation between governmental decentralization and firm-level corruption experience remains an open question because of unobserved heterogeneity and/or measurement error in

decentralization. Recognizing the difficulty of obtaining a traditional instrumental variable, we advance on existing studies by addressing the *potential* endogeneity issue in the literature, focusing specifically on Fan et al. (2009). Using the Lewbel (2012) estimation approach for identification, we find mild evidence of *political* decentralization being endogenous. Controlling for this results into a *larger positive* effect indicating political decentralization to induce more corruption. The results here also suggests the economic significance of decentralization to be greater than suggested by the prior literature. However, we find no support for *fiscal* decentralization to be endogenous. This is contrary to standard conjecture. Further, *fiscal* decentralization helps to reduce corruption, unlike *political* decentralization. To the best of our knowledge, this attempt is first of its kind in this literature. So, though instructive, yet more evidences are warranted concerning the result.

Acknowledgments

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