Institutions Matter, but in Surprising Ways:
New Evidence on Regional Institutions in Africa

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Abstract

Quantitative research on institutions and development tries to show convincingly that institutions matter for development, but the cross-country literature is saddled with the problem of endogeneity and cannot tell us which institutions are important. Micro and meso level studies argue for the importance of particular institutions, but they have small, non-representative samples. This paper uses household wealth and regional (within country) institutional variables to analyze the effects of multiple institutions in a large representative sample that covers thirteen African countries. The analysis avoids the problem of endogeneity and thus provides new evidence on institutions. I find that several distinct institutions are highly significant. Reducing the fear of crime increases wealth and improving the legal system increases wealth when fear of crime or trust in the national government is high. Corruption in different levels of government has positive and negative effects, which suggests that policies aimed at reducing crime and improving courts will be more effective than those broadly targeted at corruption. The effects of institutions are nonlinear and interactions between different institutions are important. Variation in urban versus non-urban regions and between local and national level institutions matters as well, suggesting that country-level work on institutions ignores important aspects of institutional functioning.

New Evidence on Regional Institutions in Africa

I. Introduction

It has long been argued that certain political institutions are necessary for economic growth, (North 1990) and recent years have seen many attempts to quantitatively show that institutions matter (Acemoglu, Johnson and Robinson 2001, Bardhan 2005, Rigobon and Rodrik 2005, Bates 2006). However, cross-country regressions are mired in problems of endogeneity with very few instrumental variables, and quantitative micro-level evidence on institutions typically comes from small samples and is not generalizable (Pande and Udry 2005, Fafchamps 2004). Thus the literature has on the one hand country-level studies that assert that institutions matter but cannot identify which ones and on the other hand micro and meso level works that point to specific institutions – property rights, contracts, crime, trust or corruption – but do not have representative samples. This paper brings both parts of the literature together. I use household wealth with regional institutional variables to identify the effects of multiple institutions on wealth in a large representative sample covering thirteen African countries.

This analysis confirms the assertion of the country-level literature that institutions matter, but also shows that within country variation in institutions is important. It further tests the effects of several institutions. I find that reducing fear of crime is beneficial for wealth, while improving the legal system is beneficial if fear of crime or trust in national government is high. Corruption in different levels of government has positive and negative effects on wealth. The effects of institutions are nonlinear and there are significant differences between urban and non urban regions.

The results here are that several distinct institutions have a highly significant effect on household wealth, but that the appropriate specification is nonlinear. This finding stands in contrast to the country-level literature which either has only one institutional variable (Acemoglu, Johnson and Robinson 2001) or has two but finds that nonlinearities are not present (Acemoglu and Johnson 2005).

Section II provides background on macro and micro/meso work on institutions. Section III discusses in detail the data on institutions used here, measurement issues and the estimation strategy. Section IV presents the results and Section V discusses them in detail. Section VI concludes.

II. Background

Although interest in the economic effects of political institutions is a longstanding question in economics (North 1990, Becker 1969, Becker and Stigler 1974), quantitative research on institutions is a relatively recent phenomenon. Sparked by the works of Acemoglu, Johnson and Robinson (2001, hereafter AJR) and Sokoloff and Engerman (2000), economists have begun an attempt to econometrically identify the effects of institutions in cross-country regressions. The main estimation problem is endogeneity, so most of the literature concerns itself with finding appropriate instruments for institutions (AJR, Bardhan 2005, Pande and Udry 2005). However, good instruments are rare, and the results are often difficult to interpret. The use of instruments generally limits the regressions to static estimations and limits the institutional variables to one (Pande and Udry 2005, Rigobon and Rodrik 2005). Even Acemoglu and Johnson (2005), who make use of all available plausible instruments, use only two institutional variables. The upshot is that this literature has not progressed much further than asserting that

institutions matter for growth. Empirical questions of which institutions matter and how they change over time have not been addressed.

Micro and meso level research on institutions has identified some of the institutions that may be important. The importance of property rights is a common theme from broad macro-level work (Bates 2006, AJR) to surveys of African traders carried out by Fafchamps (2004) and Fafchamps and Minten (2001). The latter two works emphasize that relationships and trust are very important in economic transactions among African traders. Fafchamps and Moser (2003) as well as Fafchamps and Minten (2001) emphasize the negative effect of crime on trade – not always through measurable theft, but through the costly adjustments made by individuals to avoid theft. These works all also discuss the importance of contract enforcement. The court system is very important for the threat of legal action, even if few disputes are actually settled there. Dixit (2004) models this enforcement "in the shadow of the law," and both Dixit (2004) and Fafchamps (2004) refer to a long literature on the importance of contract enforcement for economic development.

Other research argues for the importance of infrastructure for growth. Pinstrup-Andersen and Shimokawa (2006) argue that infrastructure is systematically under-provided in African countries. Moser, Barrett and Minten (2005) explore how transactions costs due to poor infrastructure in Madagascar lead to poor price transmission and low market integration, and Kimenyi (2006) argues that public goods such as roads and schools have in many cases in Africa been distributed along ethnic lines. Bates and Humphreys (2005) model provision of public goods by an elected

government and argue that electoral accountability is key for public good provision in Africa.

The emphasis on accountability ties into a large literature on democracy and growth. Schmitter and Karl (1991) argue that accountability is one of the defining characteristics of democracy, and Gerring, Bond, Brandt and Moreno (2005) argue that a country's "stock" of democracy is critical for growth. Rodrick and Wacziarg (2004) also argue that democracy is good for growth, but the cross-country evidence is limited. Gerring, Bond, Brandt and Moreno (2005) do not account for endogeneity and their result depends on an arbitrary "interest rate" for democracy. Bates (2006) finds that accountability does matter, but also that democratic transitions may lead to instability. Van de Walle (1999) looks carefully at democratic transitions in Africa and finds no consistent link between short-term democratic transitions and economic outcomes.

Finally, corruption has received a good deal of attention in the literature. Bardhan (1997) offers a review, and emphasizes that theoretically corruption can decrease efficiency by raising transactions costs, but it can also increase efficiency by allowing individuals to bypass distortionary policies. The World Bank has sought to root out corruption in developing countries and Easterly (2006) argues that governments in developing countries are so corrupt that aid given to them will be wasted. Sachs (2005), on the other hand, claims that governments in Africa are reasonably good given their level of development and that corruption is not a big problem.

The quantitative literature on institutions and economic development is still in the early stages. The cross-country literature, relying heavily on IV methods, confirms that institutions matter for growth, but cannot tell us which ones or how. Many other works

point to specific institutions: crime, contracts, property rights, accountability and corruption, but the evidence is either from small samples or from questionable cross-country regressions. This paper begins to fill in the questions of which institutions matter and how they affect economic outcomes with quantitative evidence from nationally representative surveys in thirteen African countries.

III. Methods and Data

What are institutions and what can we measure?

The literature on institutions is frustratingly vague with regards to what institutions are and how they can be measured. I will thus attempt to offer some clarity before proceeding. Institutions are rules that form people's expectations of others' behavior (North 1990). The economic study of institutions focuses on how different rules affect economic outcomes. For example, it is widely accepted that a set of rules defining what is property and respecting ownership of property (even against the government) are beneficial for economic efficiency and investment.

The key to this definition is that institutions are rules, which presents difficulties in terms of measurement. Informal rules/institutions cannot be directly measured; formal rules can in theory be measured directly. In practice, what matters is how the formal rules/laws are applied, and it is unlikely that the formal reading of a rule will map exactly onto its application. Thus formal rules present measurement difficulties as well, particularly in a developing country context where law enforcement may be ineffective, as is the case for most of the African countries studied in this paper.

While rules cannot be reliably measured, outcomes and expectations can. However, such measurements link only indirectly to the institutions themselves, which is

an unavoidable problem in this type of research. Outcome based measures have the advantage of being objective but the disadvantage of being noisy. For example, one can measure the levels of various public goods, the pay and education level of judges, or the number of murders or robberies in a society, which are all outcomes that depend on the institutions of governance and public good allocation. However, these outcomes map very imprecisely back to the institutions themselves. The level of public goods tells us nothing about the rules of allocation, higher judicial pay and education cannot tell us if there are biases in a legal system and lower crime rates themselves give no indication of who provides security and what measures individuals take to avoid crime.

Some surveys thus measure expectations directly. These measures have the advantage of being less noisy but the disadvantage of being subjective. They capture peoples' perceptions of how others will behave, which can then be linked back to institutions. For example, consider the institutions surrounding basic security. If a society is secure, all people follow the rule of not harming others, which then leads to the expectation that people do not harm each other. If the security is perfect, then both the objective measure (no crime is reported) and the subjective measure (people do not expect to be harmed) give an accurate measure of the institution. However, consider the situation where objective crime rates are low but not zero. These rates could arise because security is good and almost everyone follows the rule of not harming others, but low rates could also arise if most people engage in opportunistic crime. If everyone follows the rule: commit crime opportunistically (i.e. steal when it is easy), the expectation is that others will steal from you if you do not protect your goods, so everyone makes costly adjustments. The result is that objective crime is still low, but

only because people always travel in large groups, lock their doors and do not leave goods unattended. Objective measures of crime cannot differentiate between these two situations, but subjective measures can. This distinction is important because the economic implications of the two different security institutions are vastly different.

Subjective measures thus have some advantage over objective measures. It is critical, however, that subjective measures capture the perceptions of people who are relevant to the institution and the economic outcome and that they are representative of the population of interest. Many of the subjective indicators of institutions that are commonly used in the literature do not meet these criteria. The governance indicators constructed by the World Bank[2] and the indices of legal formalism used by Acemoglu and Johnson (2005) rely on the perceptions of "experts" (i.e. lawyers or scholars) who are in no way representative of the population of interest (Kurtz and Schrank 2007, Kaufmann, Kraay and Mastruzzi 2005). Furthermore, many of the commonly used institutional measures are some form of index that has an arbitrary weighting system, which introduces further noise into the measurement.

I therefore develop subjective expectations-based measures of institutions from Afrobarometer surveys that capture relevant institutions, are representative of the population of interest and avoid arbitrary indexing.[3] Afrobarometer surveys are nationally representative surveys that ask questions about democracy, corruption, governance, etc. The Afrobarometer surveys are stratified into regions/provinces and then further into urban and rural areas of each region/province. This stratification allows

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[2] The world bank indicators are available at www.worldbank.org/wbi/governance/govdata/
[3] See www.afrobarometer.org

for the construction of regional variables that are representative due to the random selection of observations at the regional level. I created regional variables from the individual responses in the Afrobarometer surveys and matched them to household data from Demographic and Health Surveys (DHS) in thirteen African countries where data were available. Each Afrobarometer variable corresponds to the perceptions of a percentage of the population of a region.[4]

Fear of Crime

In the example above I presented two possible security institutions: do not harm others and commit crime opportunistically. Since opportunistic crime leads to costly adjustments, it will have a negative effect on wealth. Fafchamps and Minten (2001) and Fafchamps and Moser (2003) point out that crime is problematic in Africa for precisely this reason. The Afrobarometer surveys ask people how often they fear crime, with the possible responses being never, rarely, sometimes, a lot or always. This forms the first regional variable, Crime, which measures the percentage of people in a region who fear crime rarely, sometimes, a lot or all of the time. This variable measures peoples' expectations of opportunistic crime. The first hypothesis follows naturally:

> Hypothesis 1: Living in a region where fear of crime is higher will result in lower
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> household wealth. The sign of the estimated coefficient on Crime should be
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> negative.

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[4] See appendix 1 for a complete description of how the variables were constructed and a comparison with other measures of institutions. Afrobarometer data can be found at www.afrobarometer.org DHS data can be found at www.measuredhs.com

Contract and Law Enforcement

Fafchamps (2004) also refers to a large literature that argues that contract enforcement is important for development. Indeed, a fundamental part of market economics that is often taken for granted is the ability of anonymous individuals to engage in intertemporal trade. Such transactions require institutions of trust on the parts of the individuals and enforcement in the case of breach or hold up. Dixit (2004) models how the effectiveness of courts matters even when few disputes ever reach a courtroom; it is the legitimate threat of going to court that improves contract enforcement.

The Afrobarometer surveys contain three questions that pertain directly to law enforcement. The best of these asks people how likely it is the law will be enforced if someone obtains goods or services without paying, but this variable is not available in all Afrobarometer surveys. The other two, which are available in all surveys, ask how likely it is the law will be enforced if someone does not pay their taxes or if someone commits a serious crime. Law-tax is the percentage of people who think it is very likely the law will be enforced if someone does not pay their taxes, and Law-crime is the same if someone commits a serious crime. The second regional variable, Law, is a weighted sum of Law-tax and Law-crime.[5] This variable captures people's expectations of law enforcement, which measure the degree to which institutions of formal law enforcement are present. It is increasing in the expectation that the law will be enforced.

> Hypothesis 2: Living in regions with better systems of law and contract
> enforcement will result in greater household wealth. The estimated coefficient on
> Law should be positive.

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[5] The weights were derived through factor analysis. See Appendix 2 for a description of the factor techniques and the loadings for each factor.

Trust

The fundamental point made above is that anonymous individuals need to be able to engage in economic transactions for markets to function efficiently. Another way to measure how well institutions in a region allow this is by asking people about their general level of trust of people they know, of strangers, and of the government. The expectation is that the higher the general level of trust, the better the institutional framework is for anonymous transactions. General levels of trust are expected to correlate positively with effective systems of property rights and contract enforcement.

There are five measures of trust that I used from the Afrobarometer surveys: how much people trust the army, the courts, the police, their national representative, and their local representative. The first four of these are highly correlated, so I use Trust Army and Trust Local Rep as the third and fourth regional variables.[6] These simply measure the percentage of people who trust the army or their local representative a lot. They capture peoples' expectations of the general level of trust.

Hypothesis 3: living in a region with higher levels of trust will lead to greater wealth. The estimated coefficient on both trust variables should be positive.

Corruption

Corruption is likely to be present in most African countries, and the World Bank has put together programs to fight corruption. However, the theoretical result is that corruption could have negative or positive effects on wealth (Bardhan 1997). Paldam and Gundlach (2008) aptly dub these two effects the "cost effect," which is the negative effect of increased transactions costs due to corruption, and the "grease effect," which is

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[6] Using any one of the first four trust measures did not change the results in any significant way

the positive effect of corruption enabling beneficial transactions to take place. The net effect of corruption is therefore an empirical question. I generally expect that corruption in African countries decreases efficiency because governments are unlikely to be strongly enforcing distortionary regulations.

There are three relevant questions on corruption in Afrobarometer: how people view the level of corruption in their representatives, judges, and police. The corruption measures in representatives and judges are highly correlated, so I only use corruption in representatives and police in the regression. The fifth and sixth regional variables, Reps Corrupt and Police Corrupt, measure the percentage of people who think that some or all of their representatives or policemen are corrupt. These are measures of peoples' expectations of corruption.

Hypothesis 4: living in a region with higher levels of corruption decreases household wealth. The estimated coefficients on Reps Corrupt and Police Corrupt should be negative.

Table 1 summarizes the Afrobarometer variables.

Table 1: Summary Statistics of Afrobarometer Variables

Institution	Variable	What it measures	Hypothesis	Mean	Std. Dev.
Opportunistic Crime	Crime	Percentage who fear crime at least a little	Negative effect on wealth	0.33	0.17
Contract / Law Enforcement	Law	Percentage who think it very likely the law will be enforced for taxes and serious crimes	Positive effect on wealth	*0.00	1.00
Trust	Trust Army	Percentage who trust national government a lot	Positive effect on wealth	0.34	0.31
	Trust Local Rep	Percentage who trust local reps a lot	Positive effect on wealth	0.42	0.22
Corruption	Reps Corrupt	Percentage who think some or all reps are corrupt	Negative effect on wealth	0.60	0.18
	Police Corrupt	Percentage who think some or all police are corrupt	Negative effect on wealth	0.40	0.17

*The mean of Law is zero because it is a weighted sum of two variables and has been standardized; see Appendix 2.

Endogeneity

Endogeneity is the fundamental econometric problem in this type of analysis. The most common techniques to avoid endogeneity are to use instrumental variables (IV) and/or to use lags of the independent variables. I take a different approach here which is to identify the effects of institutions through a multilevel specification. This section defines the problem of endogeneity and discusses the differences in using lags, using IV methods and the multilevel strategy used here.

Endogeneity is often referred to as a problem of reverse causality (Acemoglu and Johnson 2005), but the term reverse causality suggests that causality either runs from institutions to growth or from growth to institutions, or possibly both. In reality, what we have are governments that make choices. Institutions are typically thought of as being chosen or at least being directly affected by the choices of governments, as are the economic outcomes of interest. Thus both institutions and growth are endogenous to the governments' choices.

The argument that lags of an independent variable are exogenous even if the contemporaneous variable is endogenous follows from the reverse causality logic. If the problem is that growth in the present may cause institutions in the present, a natural argument is that growth in the present cannot cause institutions in the past. However, when the problem is cast as one of government choices affecting both institutions and growth, this logic breaks down. Government choices in the past were made with consideration of the future in mind, so both growth in the present and institutions in the past are impacted by government choices in the past. In general, the choices of the government in the past affect both institutions and growth in the past and in the present, so using lags to avoid endogeneity fails.

There may be cases where there has been a regime change such that the choices of the past government are exogenous to present outcomes. In that case data from the old regime could plausibly instrument for the present institutions. This argument leads to the IV method.

The IV method consists of finding some clearly exogenous variables that meet an exclusion restriction, which says that they affect the dependent variable only indirectly through their effect on the endogenous variable. This restriction is not directly testable, so the success of an instrument hinges on the plausibility of the argument that the exclusion restriction is met. There are very few plausible instruments for country level institutions, which limits what can be identified through this method. At best, two institutional variables may be included in an IV regression of growth or GDP on institutions (Acemoglu and Johnson2005).

Since lags are not exogenous and instruments are rare, this paper uses a multilevel identification strategy that consists of regressing a household level dependent variable on household controls and aggregate institutional variables. The assumption necessary for this strategy to succeed is that households treat institutions as exogenous to their choices about consumption and production.[7] Since institutions are typically thought of as being chosen by governments at a highly aggregated level, this assumption is relatively innocuous.[8] It is similar to the standard economic assumption that individuals are price-takers, even though prices are jointly determined by the actions of all individuals. It is thus arguably far less demanding than the typical exclusion restrictions required for IV estimation, and this strategy has the further benefit of identifying multiple institutional variables and their interactions.

Household Data

The drawback of the multilevel strategy is that the results are the effects of institutions on household wealth rather than on national growth. However, policies that on average increase household wealth should lead to aggregate growth. The household wealth variables are from Demographic and Health Surveys (DHS), which are large, nationally representative surveys, so the results are generalizable at least to the countries

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[7] The concern is often raised that this technique is equivalent to regressing regional means of the household variable on the regional variables and thus is still endogenous. See appendix 3 for a proof that this is not the case since household controls are used.
[8] One can imagine a model where it is not. For example, if households choose where to live based on a vector of institutions at each location, then the resulting institutions could arise endogenously due to household selection into different locations (the "voting with their feet" idea). For this model to make sense, one needs moving costs to be low, which implies that locations are close together, that other considerations (like wages) change little across locations, and that people are free to move. None of these conditions are met in the data used here: institutions vary across regions that are large and differ greatly on dimensions other than institutions.

in the sample.[9] These surveys follow a standard form and have been carried out in many

developing countries. They ask a wide variety of questions ranging from education and

household characteristics to individual health and anthropometric information. However,

DHS surveys do not measure income or wealth directly. They do measure the presence

of goods in the household such as radio, television, electricity, etc. These variables are

indicators of wealth, so I use wealth factor scores created from them.

There are several ways to create factor scores, and some DHS surveys include

wealth factor scores derived by the principal components method. I prefer minimum

distance techniques because they give greater weight to more precise indicators, fit a

specific model, and provide a test of fit. I created wealth factor scores for the pooled data

from all thirteen countries using minimum distance factor analysis.[10] These scores are

the dependent variables in the regressions. At the household level I use the education,

age, and gender of the household head as well as an indicator for urban areas as

independent variables. I also created some regional controls from the DHS data. These

include the mean education level in each region and a public goods factor score which

was created from the regional mean levels of five goods (piped water, flush toilets,

electricity, telephone, and dirt floors).[11] Table 2 presents summary statistics of the DHS

data.

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[9] The countries are Ghana, Kenya, Lesotho, Madagascar, Malawi, Mali, Mozambique,
Namibia, Nigeria, Senegal, South Africa, Tanzania, and Zambia.
[10] Please see Appendix 2 for a full description of the technique.
[11] This factor score was also created using minimum distance techniques as described in
Appendix 2. The variables were too highly correlated to include in the regression
together, thus factor analysis is used as a variable reduction technique here.

Table 2: Summary Statistics of DHS Variables

Variable	Mean	Std. Dev.	Min	Max
Wealth	0.00	1.00	-0.74	2.65
Incomplete Primary Ed.	0.27	0.44	0.00	1.00
Complete Primary Ed.	0.12	0.33	0.00	1.00
Incomplete Secondary Ed.	0.14	0.35	0.00	1.00
Complete Secondary Ed,	0.06	0.24	0.00	1.00
Higher Ed,	0.05	0.21	0.00	1.00
Age	45.52	16.04	9.00	98.00
Female	0.27	0.45	0.00	1.00
Urban	0.35	0.48	0.00	1.00
Public Goods Factor Score	0.00	1.00	-0.82	3.50
Mean years of Education	5.14	2.61	0.62	11.91

IV. Estimation and Results

I carried out weighted least squares estimation (the weights are the DHS survey weights) with wealth factor scores at the household level as the dependent variable. The household level independent variables are education dummies for level completed, age and age squared and dummies for female household head and urban area. The estimated coefficients on these household variables are significant and have the expected signs, which increases confidence in the wealth factor scores as a reasonable measure of wealth.[12] The regional variables are the six Afrobarometer regional institutional variables, two Afrobarometer controls,[13] the two DHS regional controls, and a regional level indicator for regions that are entirely urban (other regions are mostly rural but may

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[12] See the full regression reports in Appendix 4 for the coefficients on these variables

[13] These variables, Contact Local Rep and Contact National Rep, measure the percentage of people in a region who never contact their local or national representatives.

be partly urban).[14] All estimations include dummies for the thirteen countries and adjust the standard errors for the regional clusters.[15]

Table 3 presents the results. I began with the broadest possible model that includes each regional variable, its square and interactions with all other regional variables. Given this large set of closely related variables, multicollinearity could be a problem, so I first eliminated the interaction terms that had a correlation greater than .75 with any other variable. From this broad regression I then tested to see if a simpler specification was appropriate. I was able to clearly reject the joint test that all the interaction terms were zero and the joint test that all of the squared terms were zero, so the nonlinear specification is correct. I next considered each insignificant variable in turn and compared a regression without the variable to one with it. If the coefficients on other variables changed when I dropped a variable, I kept that variable in the final specification so as to not introduce bias. Some of the variables were dropped, so the final specification does not include all of the interactions and squared terms in the initial regression, but it is still highly nonlinear. The results presented in table 3 are the marginal effects of each variable and its interactions calculated at the regional means for urban and non-urban regions. The number beside the marginal effects is the p-value of the joint test of the variable and all of its interactions.

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[14] Several specifications were tried with different formulations of the wealth factor scores and using Law-tax alone rather than Law. In general, the results are robust to variations in how the factor scores were created. The Law-tax variable was jointly significant only at the ten percent level, but Law was significant at one percent, which suggests that more than just the perception of tax enforcement is important for wealth.

[15] To test the robustness I also computed standard errors under homoskedasticty, general heteroskedasticity (White estimator) and clusters at the country level. The p-values in table 3 only change marginally with these different calculations and all variables remain significant.

Table 3: Marginal Effects of Institutional Variables

Variable	Marginal Effect at Means			Hypothesis	Confirmed?
	Non Urban	Urban	Joint p-value		
Crime	**-0.161**	**-0.310**	0.00	negative	yes
Law	**0.004**	**0.067**	0.01	positive	yes
Trust Army	**0.233**	**-0.278**	0.00	positive	no
Trust Local Rep	**-0.312**	**-1.182**	0.00	positive	no
Reps Corrupt	**0.047**	**-1.403**	0.00	negative	yes
Police Corrupt	**0.504**	**1.791**	0.00	negative	no

Regressions by weighted least squares with 118,262 observations and 151 regions. Wealth factor scores are the dependent variable; they are standardized so the units are standard deviations.

V. Discussion

Hypothesis 1 says that living in a region where fear of crime is higher will decrease household wealth. This hypothesis is supported by the data. The effect of the Crime variable is negative at the regional means and significant at the one percent level. Crime has a stronger negative effect on wealth in urban regions. The effect of Crime also interacts positively with Law. Figure one plots the marginal effect of Crime as Law varies across its range, holding all other variables at their means. It shows clearly that fear of crime has a stronger deleterious effect on wealth when expectations of law enforcement are lower. This interaction suggests that improving the legal system will lessen the negative effect of crime on wealth.

Figure 1
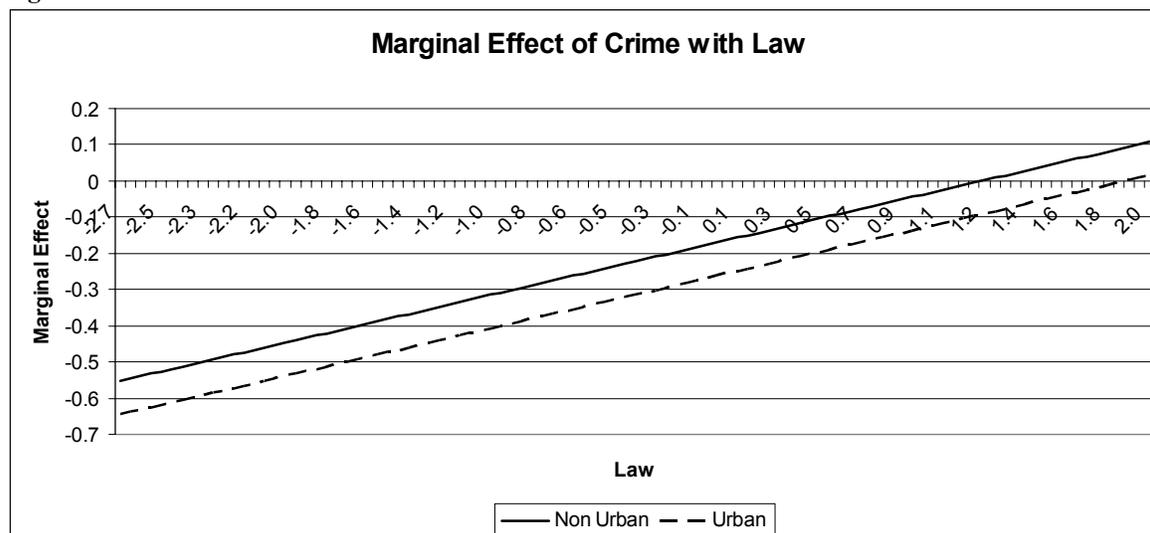
Hypothesis 2 says that living in a region with a better legal system will increase wealth. The effect of Law is significant, but the marginal effect is near zero at the regional means in non-urban regions. This result is simply due to calculating the marginal effect at the means. Figure 2 plots the marginal effect of Law as Trust Army varies from zero to one (recall that it is a percentage), holding all other variables at their means.

Figure 2
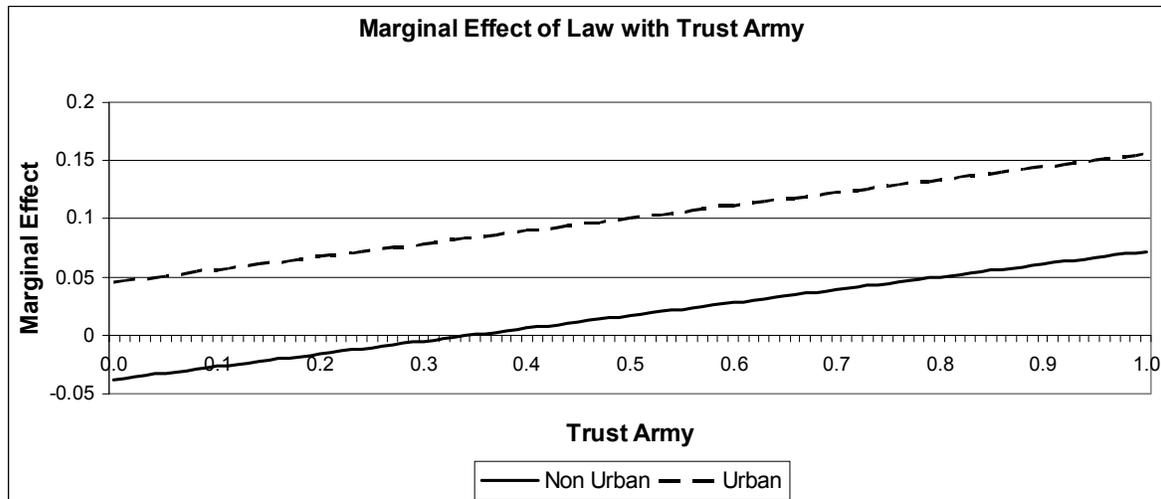
It is clear in figure 2 that the effect of Law is stronger when Trust Army is higher for both urban and non-urban regions. Since Trust Army serves as a proxy for trust in national government, this intuitive interaction suggests that improving the legal system will be more beneficial for wealth when people have greater trust in national government. Another interesting result from figure two is that when trust is very low in non-urban regions the marginal effect of Law is negative, suggesting that having a stronger legal system imposes some costs on households.

Figure 3 shows the marginal effect of Law as Crime varies, holding all other variables at their means. This figure suggests that improving the legal system will have a

stronger positive impact on wealth when fear of crime is higher. It also shows that if fear of crime is very low in non-urban areas then efforts to improve the legal system could be detrimental to wealth.

Figure 3

Marginal Effect of Law with Crime
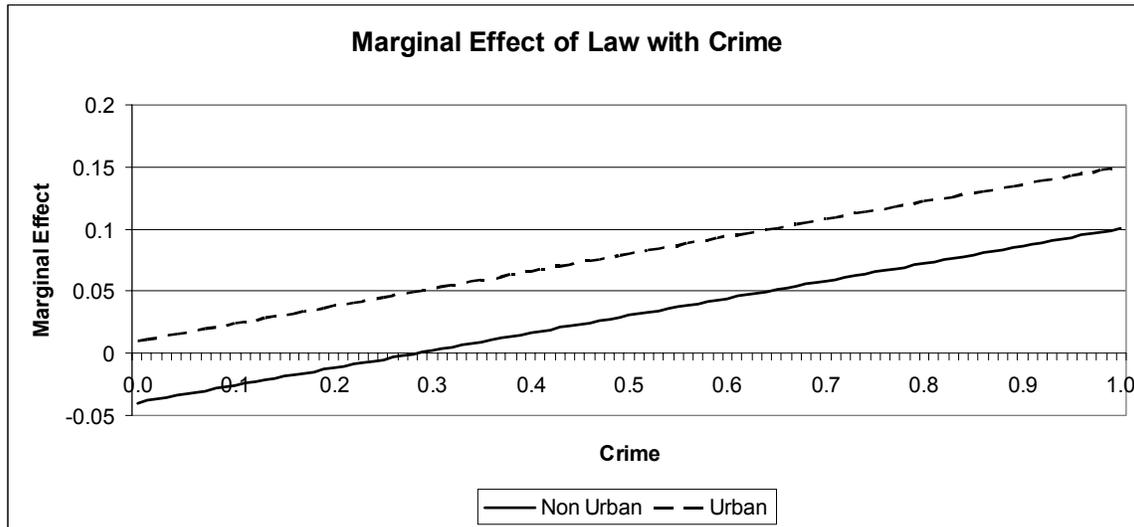
Law thus has a clear positive effect in urban regions and a positive effect in non-urban regions when Crime and Trust Army are at or above their means. These results suggest that improving the legal system will be beneficial when people fear crime and trust national government more, but may backfire when crime is not a problem and trust is low.

It is surprising that the effect of Law on wealth is negative at any point. Law may capture to some degree the perception that the government will be oppressive, particularly when trust in the national government and fear of crime are low so government meddling is seen as threatening and unnecessary. It is plausible that African governments are prone to collect taxes in a heavy-handed fashion and higher expectations of law enforcement therefore mean lower expectations of freedom. Thus improving the legal system is associated with greater government interference. When people trust the

government and fear crime this interference is beneficial, but if crime is not a problem and trust in the government is low government interference is detrimental to wealth in non-urban areas.

Hypothesis 3 says that living in a region with higher levels of trust will lead to greater wealth. The evidence here is surprising. The effect of Trust Army, which reflects a general level of trust in national government (recall its high correlations with the other trust variables), is positive in non-urban regions but negative in urban regions at the means. The marginal effect of Trust Local Reps is negative. Given that both of these variables measure trust and that they are positively correlated (.64), it is surprising that they have the opposite sign. The significance of these variables suggests that trust is indeed important, but the negative signs suggest that perceptions of trust perhaps capture naivety rather than a good institutional setting. Alternatively, it is possible that higher trust in one's local representative reflects a greater reliance on local leaders, perhaps because they are at odds with the national government. Unfortunately, I lack data to investigate this further.

Hypothesis 4 says that living in a region with higher levels of corruption decreases household wealth. The evidence here is complex. Both corruption variables are significant, but their signs differ. In urban regions the marginal effect of Reps Corrupt is large and negative and the effect of Police Corrupt is larger and positive. In non-urban regions the effect of Reps Corrupt is positive but small, while the effect of Police Corrupt is also positive but not as large as in urban regions.

Let's focus first on urban regions. Theoretically, corruption can decrease wealth if it merely reflects wasteful government (the "cost effect"), but it can increase wealth if

it allows individuals to bypass unwieldy red tape (the "grease effect") (Bardhan 1997, Paldam and Gundlach 2008). It is possible that we are seeing both effects here. The Reps Corrupt variable reflects the level of corruption in the government itself and in representatives whom individuals rarely come into contact with. It is not surprising then that in urban areas this variable captures the negative effects of worse governance. The Police Corrupt variable, however, measures the level of corruption in an arm of government with which individuals can expect to have contact. Thus if the government is heavy-handed and imposes strict regulations in urban areas, greater corruption among the police may indicate more possibilities for individuals to get around government rules. Thus corruption among the police is good and living in urban areas where the police are more corrupt increases individual wealth. This line of thought is supported further by the negative interaction of Police Corrupt with Trust Local Rep shown in figure 4. This figure shows that when the level of trust of the local representative is low, the benefit of police corruption is larger.

Figure 4

Marginal Effect of Police Corrupt with Trust Local Representative
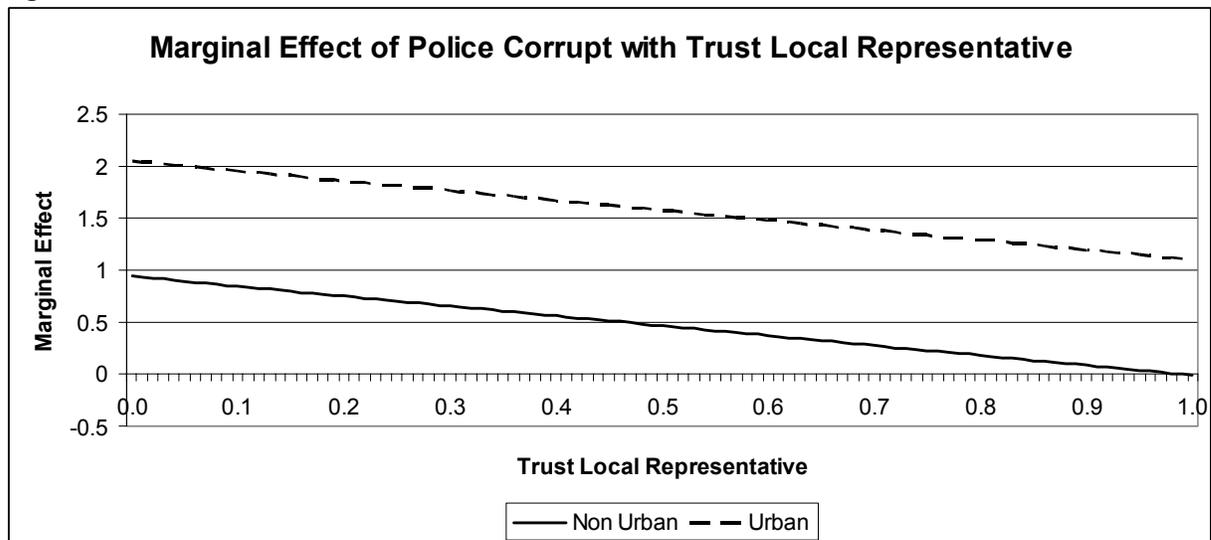
In non-urban regions the story is less clear. The effect of Reps Corrupt is small but positive here, perhaps because in places where the government is less present, this variable captures people's awareness of how government works. Thus the positive effect is due to greater awareness of the workings of government, and the deleterious effects of increased corruption in representatives are felt less in non-urban regions. Police Corrupt has a smaller positive effect in non-urban regions, so there are no negative effects of corruption at the means in non urban regions.

The multiple effects of corruption at different levels of government and the stark differences in urban versus non urban regions are an important result. Measures of corruption in the literature often come from surveys of businessmen who do business in the country. It is likely that these surveys have an urban bias because international business will naturally be focused in urban areas. Using these measures for the whole country then distorts the different effects of corruption in urban and non urban regions. The results here indicate that there are no negative effects of corruption in non urban regions, and that the "grease effect" may be slightly larger than the "cost effect" in urban regions (Paldam and Gundlach 2008). Policies aimed at reducing corruption may therefore have little or no benefit to household wealth.

VI. Conclusion

There are several interesting results from this analysis. The broad results are that the effects of institutions are non-linear and that within-country variation is important. Furthermore, the urban/non-urban and local/national dichotomies, as well as the different effects of corruption at different levels of government could not be captured by a single country-level variable. These results suggest that the country-level literature ignores

important variation within countries and also may be underspecified because it cannot account for the nonlinear effects of institutions.

The specific results are that living in regions with greater fear of crime decreases household wealth and that living in urban regions where legal systems are better increases wealth. The positive interactions between the legal system and fear of crime and the legal system and trust are intuitive and interesting. These interactions suggest first that policies to improve the legal system will be better targeted at areas where fear of crime is higher but also where trust of national government is higher. The interactions also show that it is naïve to expect any of these variables to have an independent direct effect on wealth.

The first surprising result is the negative effect of improving the legal system when crime and trust in national government are at or below their means in non-urban regions, suggesting that higher expectations of laws being enforced can also mean a more oppressive government that imposes other costs and constraints on wealth.

The second surprising result is that there seem to be good and bad kinds of corruption, particularly in urban regions. Corruption in representatives, which proxies for the general level of corruption in the government, is detrimental to wealth in urban regions. However, corruption among the police has a positive effect on wealth in urban regions, suggesting that corruption at lower levels where people interact with the government may allow for more flexibility to bypass oppressive policies.

These results as a whole suggest that the workings of institutions are complex and that policies based on country-level data may be misguided. For example, the existence of positive effects of increased corruption, particularly among the police in urban areas,

suggests that policy initiatives aimed at curtailing corruption of all types may fail to increase wealth. Policy makers need to be aware that there may be strong urban/non-urban and local/national dichotomies in institutional functioning in African countries. Policy initiatives will thus be better targeted where there is a clear effect, such as in reducing the fear of crime or improving legal systems in high-crime urban areas rather than attempting to weed out general corruption or promote democracy.

Finally, these results indicate that further research is needed. Dynamic effects of political institutions may be important but are not analyzed here. Future research will hopefully have panel data to investigate dynamic problems and will also develop clearer measures of regional institutions to further our understanding of the role these institutions play in growth and development.

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Appendix 1: Construction of Institutional Variables and Comparison with Other Measures

To create the regional institutional variables, I first identified variables of interest from the Afrobarometer survey. These variables are all measured on an ordinal scale. For example, the question may be "do you trust your local representative?" and the answers are "always," "most of the time," "sometimes," "rarely," or "never." I took the variables and calculated the percentages of each response by region. I also grouped the responses in different combinations. For example, I calculated the percentage of people who "always" or "most of the time" trust their local representative, and the percentage of people who "always," "most of the time" and "sometimes" trust their representatives. Thus each ordinal question from the survey yields five to seven potential variables. I selected the potential variable with the highest variance across all regions as the regional measure. This method effectively captures the variation in the data without arbitrarily indexing the responses.

Since I am using subjective variables as regional indicators of corruption, contract enforcement, etc., some comparison of the variables used here with other common measures of governance is needed. Unfortunately, regional data on governance in Africa is not available. Thus I computed the country-level variables for each of the Afrobarometer variables for all thirteen countries (with the exception of Law, which is replaced here by Law-tax) and compared them with Freedom House scores and selected indices from the Mo Ibrahim index of governance.[16] Tables A1 and A2 present the

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[16] See www.freedomhouse.org and www.moibrahimfoundation.org respectively for more information on these measures. Law-tax replaces Law here because factor scores created from a sample of 13 would be substantively different from those created from a sample of

correlations of the Afrobarometer indicators with the Mo Ibrahim measures and Freedom House Scores, respectively.

Table A1: Correlations of Afrobarometer and Mo Ibrahim Variables

		Crime	Law-tax	Trust Army	Trust Local Rep	Reps Corrupt	Police Corrupt
Mo Ibrahim	Contracts	0.53	-0.14	-0.44	-0.38	-0.27	-0.22
Mo Ibrahim	Safety	-0.57	0.25	0.40	0.48	-0.44	-0.62
Mo Ibrahim	Corruption	-0.09	-0.28	-0.17	-0.15	-0.26	-0.45
Mo Ibrahim	Participation	-0.17	0.06	-0.03	-0.04	-0.45	-0.46
Mo Ibrahim	Rule of Law etc.	-0.10	-0.20	0.00	-0.05	-0.42	-0.42

The variables from the Mo Ibrahim (hereafter MI) foundation are all indices that range from zero to 100, and all are scaled so that higher scores are better. Thus the expectation is that Crime, Reps Corrupt and Police Corrupt will all be negatively correlated with the MI measures, and strongly so with those that are closest to what the Afrobarometer variables measure. Law-tax and the trust variables should generally be positively correlated with the MI variables.

Crime is negatively correlated with MI safety, as expected, but is surprisingly positively correlated with MI contracts. Law-tax has no large correlations and is surprisingly negatively correlated with MI contracts and MI rule of law etc. The trust variables are moderately correlated with MI safety, but negatively correlated with MI contracts. It seems that MI contracts is not a clear variable. Reps Corrupt and Police Corrupt are negatively correlated with all the MI variables as expected.

Table A2: County-Level Correlations of Afrobarometer and Freedom House Variables

	Crime	Law-tax	Trust Army	Trust Loc. Rep	Reps. Corrupt	Police Corrupt
FH Political Rights	0.00	0.56	0.21	0.26	0.13	0.17
FH Civil Liberties	-0.06	0.51	-0.07	-0.01	0.11	0.02

151, whereas Law-tax is a percentage measure and is comparable across different levels of aggregation.

Freedom House scores range from one to seven, with one being the best score. Thus I expect positive correlations with Crime and the corruption variables and negative correlations with Law-tax and the trust variables. However, the correlations in general are low. The one surprising result is that Law-tax is moderately positively correlated with both Freedom House indices, which implies that higher expectations of taxes being collected are associated with fewer political rights and civil liberties.

The comparison with other measures of governance, while limited to a thirteen country sample, does offer some insight. The corruption variables are the only Afrobarometer measures that consistently correlate negatively with the MI indices, which suggests that they are perhaps better measures of governance than the trust variables. The correlations with the Crime and Law-tax variables are not as strong as expected, and the positive correlation of Law-tax with the Freedom House scores indicates that this variable may capture government heavy-handedness.

The comparison also points out the strengths of the Afrobarometer variables and the methods used to create them. For example, it seems that the MI contracts index is problematic – its correlations go the wrong way with most of the Afrobarometer variables. Since it is an index, it is not clear if the problem is with the variable itself or is a result of the arbitrary weights used to scale it. The positive correlations of Law-tax with the Freedom House scores are surprising as well, but since it is clear what Law-tax measures – the percentage of people who expect the law to be enforced if they do not pay taxes – it is possible to explain the surprising result.

Appendix 2: Minimum Distance Factor Analysis

The basic idea of factor analysis is that if one has many variables that are indicators of a single underlying unobserved variable, a structure is implied on the variance covariance matrix of the indicators. Suppose that the model is

$$y_i = \beta_i u + \varepsilon_i \qquad\qquad\qquad (A1)$$

where y is the indicator and u is the unobserved variable. This model implies a certain structure. For example, if $i = 4$ and we assume that $\sigma_{\varepsilon_i \varepsilon_j} = 0$ for all i,j, then the variance-covariance matrix V has the following structure:

$$
\begin{array}{llll}
\beta_1^2 \sigma_u^2 + \sigma_{\varepsilon 1}^2 & \beta_1 \beta_2 \sigma_u^2 & \beta_1 \beta_3 \sigma_u^2 & \beta_1 \beta_4 \sigma_u^2 \\
\beta_2 \beta_1 \sigma_u^2 & \beta_2^2 \sigma_u^2 + \sigma_{\varepsilon 2}^2 & \beta_2 \beta_3 \sigma_u^2 & \beta_2 \beta_4 \sigma_u^2 \\
\beta_3 \beta_1 \sigma_u^2 & \beta_3 \beta_2 \sigma_u^2 & \beta_3^2 \sigma_u^2 + \sigma_{\varepsilon 3}^2 & \beta_3 \beta_4 \sigma_u^2 \\
\beta_4 \beta_1 \sigma_u^2 & \beta_4 \beta_2 \sigma_u^2 & \beta_4 \beta_3 \sigma_u^2 & \beta_4^2 \sigma_u^2 + \sigma_{\varepsilon 4}^2
\end{array}
$$

Under the critical assumption that $\sigma_{\varepsilon_i \varepsilon_j} = 0$ for all i,j, there are in this case nine structural variables and ten unique entries in V, so the system appears to be identified. However, σ_u^2 is never observed separately from one of the βs, so we cannot yet identify all the parameters. It is necessary to make some normalization, so we normalize $\beta_1 = 1$, and then we can identify all of the other parameters in the system.

The parameters are then estimated by minimum distance. We take the computed variance covariance matrix and stack the upper right triangle into the vector Π. We then stack the upper right triangle of V as well into the vector v and choose the parameter set Θ to minimize the distance between Π and v. The problem is:

$$\min{}_\Theta (\Pi - v)' \Omega (\Pi - v)$$

For efficient minimum distance, the matrix Ω should be the inverse variance of Π, that is the inverse variance of the sample variance. Solving this problem gives parameter estimates as well as a test of fit of the model. The parameter estimates are then used to create the factor scores. If we let G be the estimated matrix from the parameters, b be the vector of factor loadings for each indicator and X be the matrix of data, the factors scores are then given by:

$$\text{Scores} = X * G^{-1} * b * \sigma^2_u \qquad\qquad (A2)$$

In the analysis of this paper, I used the following indicators of wealth to create the wealth factor scores: radio, television, refrigerator, car/truck, and dirt floor. The coefficients for each of these indicators were estimated by a model exactly as presented above. The coefficient for the radio indicator was normalized to one and the factor scores were then computed from the estimated parameters. This same technique was used to create the public goods factor score and the Law variable. Table A3 presents the factor loadings for each of the three factor scores used in the analysis.

Table A3: Factor Analysis Results

Public Goods	Loading	Law	Loading	Wealth Factor	Loading
Flush Toilet	1.000	Law-Tax	1.000	Radio	1.000
Electricity	1.400	Law-Crime	0.122	Television	1.744
Telephone	0.637	Courts Bind*	0.327	Refrigerator	1.201
Piped Water	1.338	Trust Courts	0.236	Car/Truck	0.575
Dirt Floor	-0.546	Judges Corrupt	-0.248	Dirt Floor	-1.068
$\sigma^2_{\varepsilon 1}$	0.010	$\sigma^2_{\varepsilon 1}$	0.000	$\sigma^2_{\varepsilon 1}$	0.224
$\sigma^2_{\varepsilon 2}$	0.029	$\sigma^2_{\varepsilon 2}$	0.000	$\sigma^2_{\varepsilon 2}$	0.041
$\sigma^2_{\varepsilon 3}$	0.004	$\sigma^2_{\varepsilon 3}$	0.006	$\sigma^2_{\varepsilon 3}$	0.054
$\sigma^2_{\varepsilon 4}$	0.008	$\sigma^2_{\varepsilon 4}$	0.010	$\sigma^2_{\varepsilon 4}$	0.049
$\sigma^2_{\varepsilon 5}$	0.221	$\sigma^2_{\varepsilon 5}$	0.056	$\sigma^2_{\varepsilon 5}$	0.213
σ^2_u	0.052	σ^2_u	0.068	σ^2_u	0.043
Chi2(5)	1979.075	Chi2(5)	16735.901	Chi2(5)	2919.562

*Courts Bind measures the percentage of people who agree or strongly agree that court rulings should bind

Note that the loadings in table A1 are not the same as the actual weights used to create the factor scores. The loadings represent the β's from equation A1, that is they

represent the effect of wealth (or public goods, or court systems) on the indicator. The

actual index weights used to create the variables used in the paper are given by:

$$\text{Weights} = G^{-1} * b * \sigma^2_u \qquad\qquad (A3)$$

Table A4 presents the index weights applied to each of the three variables created

through this method in the paper. The interesting finding here is that for the Law

variable, the weights on the last three variables that go into it are zero. Thus this variable

is actually a weighted average of only two factors, Law-tax and Law-crime, because the

results of the factor model are that the other three indicators of court functioning have a

weight of zero.

Table A4: Index Weights for Factor Analysis Variables

Public Goods Variables	Index Weights	Law Variables	Index Weights	Wealth Variables	Index Weights
Flush Toilet	0.19	Law-Tax	0.50	Radio	0.03
Electricity	0.09	Law-Crime	4.38	Television	0.27
Telephone	0.31	Courts Bind	0.00	Refrigerator	0.16
Piped Water	0.33	Trust Courts	0.00	Car/Truck	0.08
Dirt Floor	0.00	Judges Corrupt	0.00	Dirt Floor	-0.05

Appendix 3: Concerning the endogeneity of regional level variables on household wealth

The concern is often raised that the technique used in this paper of regressing household (lower level) wealth on regional (upper level) institutional variables does not avoid the problem of endogeneity because the institutional variables are identified off of the regional means of the household variables. If this concern is valid, the estimations here are equivalent to regressing regional means of household variables on regional institutional variables. I show that when household controls are included regressing household variables on regional institutional variables is different than regressing regional means on the regional institutional variables, and further that the coefficients on the regional institutional variables are identified off of both household and regional level data, not just off of the regional means of the household data.

Proof: Let y be the 1 x n dependent variable at the household (lower) level and let X be a 2 x n matrix of independent variables where X_1 is a household level variable and X_2 is a regional (upper) level variable.

We begin with the least squares estimator

$$\beta = (X'X)^{-1}(X'y) \qquad (1)$$

Expansion of (1) gives

$$\beta_2 = [X_1'X_2X_2'y - X_2'X_1X_1'y]/\det(X'X) \qquad (2)$$

β_2 is the coefficient on the regional variable. Now consider two cases. In the first case, let y and X_1 be the regional means of the household variables. In the second case, let y and X_1 remain household variables. In case one, we have

$$X_1'X_2X_2'y = [X_{2r1}\Sigma_{r1}X_1/j + \ldots + X_{2rm}\Sigma_{rm}X_1/j]*[X_{2r1}\Sigma_{r1}y/j + \ldots + X_{2rm}\Sigma_{rm}y/j] \qquad (3)$$

$$X_2'X_1X_1'y = [X_{2r1}\Sigma_{r1}X_1/j + \ldots + X_{2rm}\Sigma_{rm}X_1/j]*[\Sigma_{r1}X_1\Sigma_{r1}y/j^2 + \ldots + \Sigma_{rm}X_1\Sigma_{rm}y/j^2] \qquad (4)$$

Where r stands for region and there m regions, each of which has j households. In case two, we have

$$X_1'X_2X_2'y = [X_{2r1}\Sigma_{r1}X_1 + \ldots + X_{2rm}\Sigma_{rm}X_1]*[X_{2r1}\Sigma_{r1}y + \ldots + X_{2rm}\Sigma_{rm}y] \tag{5}$$

$$X_2'X_1X_1'y = [X_{2r1}\Sigma_{r1}X_1 + \ldots + X_{2rm}\Sigma_{rm}X_1]*[X_{11}y_1 + X_{12}y_2 + \ldots + X_{1n}y_n] \tag{6}$$

It is clear that the first term in β_2, $X_1'X_2X_2'y$, differs across the two cases only by a factor of j^2. That is (3) is equivalent to (5)/j^2. However, the second term in β_2, $X_2'X_1X_1'y$, is substantively different across the two cases. The first part, $X_2'X_1$, differs only by a factor of j, but the second part, $X_1'y$, is truly different. In case one $X_1'y$ consists of the regional means of X_1 times the regional means of y. Expanding these terms gives an expression that includes each x_{1i} multiplied by y_i and by y_j for all other j in the same region. In case two, the $X_1'y$ term consists of each x_{1i} multiplied only by y_i. Thus this last term differs substantively across the two cases. It follows that in general β_2 is different in the two cases and thus regressing regional variables on household data is not equivalent to regressing regional variables on regional means so long as household controls are included. The coefficient on the regional variable is identified from both regional and household variation, not just from regional variation and is therefore not endogenous (so long as the assumption that households treat institutions as exogenous holds).

Appendix 4: Full Regression Results

Estimation by weighted least squares, dependent variable is wealth factor score.

Observations: 118,262   R-squared: 0.5259

Variable	Coefficient	Std. Err.	t-stat	p-value
Complete Primary Education	0.17	0.02	8.78	0.00
Incomplete Secondary Education	0.43	0.03	13.80	0.00
Complete Secondary Education	0.81	0.06	13.97	0.00
Higher Education	1.25	0.04	29.91	0.00
Age	0.02	0.00	8.63	0.00
Age Squared	0.00	0.00	-9.05	0.00
Female Household Head	-0.08	0.02	-4.90	0.00
Household in Urban Area	0.40	0.03	13.02	0.00
Law	-0.07	0.03	-2.04	0.04
Trust Army	0.96	0.26	3.73	0.00
Trust Local Rep	-0.90	0.28	-3.19	0.00
Contact Local Rep	1.76	0.66	2.67	0.01
Contact Local Rep Squared	-0.83	0.33	-2.52	0.01
Reps Corrupt	-0.96	0.47	-2.04	0.04
Police Corrupt	1.43	0.52	2.73	0.01
Police Corrupt Squared	-1.27	0.47	-2.74	0.01
Public Goods Factor Score	0.19	0.10	1.89	0.06
Crime*Law	0.14	0.08	1.64	0.10
Crime*Trust Army	-1.29	0.36	-3.58	0.00
Crime*Trust Local Rep	1.41	0.35	4.07	0.00
Crime*Ed Years	-0.08	0.02	-3.18	0.00
Crime*Urban	0.29	0.21	1.36	0.18
Law*Trust Army	0.11	0.04	2.70	0.01
Law*Public Goods Factor	0.05	0.02	2.53	0.01
Trust Army*Ed Years	-0.08	0.03	-2.48	0.01
Trust Local Rep*Police Corrupt	-0.95	0.42	-2.30	0.02
Trust Local Rep*Ed Years	0.12	0.02	4.94	0.00
Trust Local Rep*Urban	-1.44	0.33	-4.38	0.00
Contact Local Rep*Contact Nat Rep	-0.63	0.54	-1.17	0.24
Contact Local Rep*Urban	0.94	0.33	2.88	0.01
Contact Nat Rep*Reps Corrupt	1.20	0.62	1.95	0.05
Contact Nat Rep*Public Goods Factor	0.15	0.10	1.52	0.13
Reps Corrupt*Urban	-1.51	0.45	-3.34	0.00
Police Corrupt*Urban	1.24	0.36	3.48	0.00
Public Goods Factor*Urban	-0.09	0.03	-3.13	0.00
Country1	0.14	0.25	0.55	0.58
Country2	-0.06	0.12	-0.48	0.63
Country3	0.06	0.11	0.51	0.61
Country4	0.13	0.12	1.04	0.30
Country5	-0.26	0.14	-1.78	0.08
Country6	-0.08	0.12	-0.67	0.50
Country7	0.04	0.12	0.32	0.75
Country9	0.13	0.12	1.11	0.27
Country10	0.15	0.11	1.46	0.15
Country11	0.50	0.08	6.14	0.00
Country12	-0.20	0.13	-1.61	0.11
Country13	-0.20	0.12	-1.63	0.11
Constant	-1.58	0.21	-7.48	0.00