Is the Devil in the Shadow?

A Reexamination of the Relationship between Institutions and Income

Jamie Bologna Pavlik
Texas Tech University
Agricultural and Applied Economics
Free Market Institute
em: jamie.bologna@ttu.edu

Ryan Blake Williams
Texas Tech University
Agricultural and Applied Economics
em: ryan.b.williams@ttu.edu

[Preliminary draft: Please do not cite!]

Selected Paper prepared for presentation at the Southern Agricultural Economics Association's 2018 Annual Meeting, Jacksonville, FL, February 2-6, 2018

Is the Devil in the Shadow?

A Reexamination of the Relationship between Institutions and Income

Abstract: The positive relationship between institution quality and "official" income is well-documented. It is unclear, however, if this relationship holds once the "unofficial" economy is accounted for. An improvement in institutional quality tends to shift production out of the shadow and into the official sector. This can result in an increase in official income, at the expense of the shadow economy. This paper uses data from 4,954 Brazilian municipalities to explore the effects of institutional quality on formal, informal, and total income per-worker. The results indicate that an improvement in institutional quality leads to a positive change in total income per-worker. Importantly, the effect of improved institutional quality on income per-worker in the informal sector is neutral to positive, contradicting the findings of previous models. It seems that while positive institutional change does reallocate production from the shadows to the official sector, the reallocation increases overall productivity in the economy.

1. Introduction

Institutions are often identified as the "rules of the game" (North 1990, p. 3) in a society. These are the rules that shape human interaction and therefore affect the likelihood of mutually beneficial exchange (Greif, 2005). Consequently, institutions are regularly associated with development outcomes. While institutions are broadly defined to include 'informal' rules, like social norms, 'formal' rules are often synonymous with institutions.[1] 'Good' institutions are those that facilitate mutually beneficial exchange through the use of property rights protection and the rule of law, for example, while 'bad' institutions hinder this exchange. Institutions that fall in the latter category tend to be extortionary and coercive.

The positive association between good institutions and economic development is well-established in the literature (e.g., Hall and Jones, 1999; Acemoglu et al., 2002; Rodrick et al., 2004). However, policy prescription given these findings is subject to two caveats. First, it is unclear that the positive association between economic outcomes and institutions is driven by the latter. Second, these findings general rely exclusively on "official" measures of output (e.g., GDP). This first caveat is extensively addressed in the literature, finding that institutions are fundamental to development despite increased demand for quality governance in developed nations.[2] The second caveat, however, is frequently overlooked and will be the focus of this paper.

Official measures of economic output aim to capture economic activity. However, these measures exclude a sizeable portion of economic activity that occurs in the informal sector,

[1] For a review of the literature associating informal institutions (e.g., culture) with development outcomes see Zak and Knack (2001), Williamson (2009), and Casson et al. (2010).
[2] A review of this literature can be found in Acemoglu et al. (2005), Flachaire et al. (2014), and Bjornskov and Foss (2016).

defined as the share of the economy where legal goods and services are exchanged without

government detection. Informal sectors tend to form as a second-best solution when formal

governance is inadequate or, in some cases, a deterrent (Rodrik, 2008). Consequently, official

measures of output in areas with facilitative institutions will more accurately capture the entirety

of economic activity, thus making it appear that these areas are more productive even if the true

level of economic activity is the same as those areas with less than ideal institutional structures.

Using a measure of economic output adjusted for informal production, Dreher, Méon,

and Schneider (2014) show that the impact of institutions on output and productivity is, at best,

not as strong as typically thought and, at worst, non-existent. However, their study is limited to

cross-sectional data at the national level with an indirect measure of informal production. Their

measure is taken from Schneider (2005a, 2005b) where the relative size of the informal economy

is estimated using structural equation modeling employing variables like taxation, regulation,

and the growth rate of real GDP. Schneider and Bhuen (2016) summarize the major drawbacks

to this measure, noting that this measure cannot distinguish between legal and illegal goods and

the lack of stability in response to data and model specification changes. The former concern is

especially problematic if inferior institutions are associated with more crime due to a lack of

property right enforcement. In this case, it may not make sense to adjust GDP per-capita upward

given the size of the informal economy as measured in Dreher, Méon, and Schneider (2014).

In this paper, we follow Ulyssea (2010) and define the informal sector as the share of

workers in legal occupations who do not contribute to social security using data on 4,954

municipalities in Brazil from the 2000 Census.[3] Thus, we have direct estimates of the share of

the economy that is productive, but potentially missing from the official GDP estimates. We

---

[3] We do exclude military workers from this definition as they are not required to contribute to social security, but are
clearly formal workers. Detailed definitions and sources are discussed in the data section below.

additionally have estimates of the average total (formal plus informal) income per-worker in each municipality, as well as the average income per-worker within each sector separately. Using this data, we reexamine the institution-development hypothesis using outcome measures that include all economic activity.

Our measures of institutional quality include a measure of efficiency and organizational capacity of the local administration and a measure of the distribution of land following Naritomi, Soares, and Assunção (2012). The first institutional measure, calculated by the Brazilian Census Bureau (IBGE), is intended to proxy for municipalities that rely on taxation rather than resource rents as these tend to be the areas with governments that are more accountable to constituents (Ross, 1999). The second measure is intended to capture the distribution of political power within each municipality, with the idea being that a more equal distribution of land is associated with dispersed political power and consequently better institutions.

While Dreher et al. (2014) motivate the bias of institutional coefficients from an accounting perspective, it is important to note that these coefficients may also be biased due to the omission of informality as a control. Theoretically, the formal and the informal economy may be positively or negatively related. For example, Choi and Thum (2005) show that informality may constrain an official's ability to engage in distortionary policy, increasing productivity in the formal sector as a result. This effect would put a downward pressure on institutional coefficients provided this type of constraint is independently important to formal output. Alternatively, La Porta and Shleifer (2008; 2014) argues that because firms and workers in the informal sector are generally unproductive, but small, they do not have any effect on formal output. However,

Farrell (2004) argues further that due to significant cost advantages, informal firms can gain market share from formal firms, dragging down total productivity and output.[4]

In the context of Brazil, Bologna (2016) finds that the informal sector, as measured by the share of employees that are informally contracted, is positively associated with average formal income per-worker across a sample of Brazilian municipalities. This is most in line with the ideas presented in Choi and Thum (2005). However, Bologna (2016) also finds that the informal sector has a robust negative relationship with official measures of GDP per-capita, which partially includes estimates of informal production, and total (formal plus informal) income per-worker. This finding is more in line with the ideas presented in Farrell (2004) and La Porta and Shleifer (2008; 2014). These results emphasize that the true relationship between informality and economic development lies somewhere between the theoretical extremes and that these theories are not mutually exclusive. Informality may act as a political constraint putting an upward pressure on formal income, but informal firms are also inefficient which may reduce an area's total productivity.

Regardless of the direction of the informality-income relationship, if one is interested in the relationship between institutions and the productivity of workers it is clear the informal sector is an important omitted variable. For example, if output per-worker increases in response to improved institutions this does not necessarily mean the individual workers became more productive. Rather, it may indicate that formal firms are able to take up a larger share of the market, à la Farrell (2004), biasing the institutional coefficient upward. The coefficient will also be picking up the fact that informal workers may join the productive formal sector when

---

[4] Alternatively, Loayza (1996) and Johnson et al. (1997) argue that a large informal sector can significantly reduce tax revenue and the quality of public services, which may result in a reduction in formal income. However, institutions are modeled as a channel through which informality impacts outcomes in this latter idea and will not result in a bias assuming the institutional measures accurately capture the affected attributes.

institutions improve. If one is interested in estimating the effect of institutions on the outcome of the municipality as a whole, these biases are not necessarily a problem. However, if one is interested in the relationship between institutions and the productivity of workers, then these estimates must be interpreted with care.

We aim to provide estimates of the relationship between institutions and *total* income per-worker, while carefully controlling for informal sector size. Using data from a cross-section of 4, 954 municipalities in Brazil, we find that institutional quality is associated with increased income. Further, we find that this positive association holds when looking at formal income per-worker and informal income per-worker separately. While our results are robust to the inclusion of a number of standard controls, we plan on implementing an instrumental variable analysis following Narotimi et al. (2012) as a final robustness check.

The remainder of the paper is as follows: section 2 presents a brief theoretical model along with a further review of the literature; section 3 presents the data; section 4 presents the empirical methodology and discusses the results; section 5 concludes.

2. The Model

[Section coming soon!]

3. Data

The data for this paper comes from two main sources: the 2000 decennial Census of the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística (IBGE)) and the Institute of Applied Economic Research (Instituto de Pesquisa Econômica Aplicada (IPEA)). All employment related measures are constructed using Census individual level data files that include only a subsample of the population. Many of the demographic controls are constructed using the individual level data as well. However, measures are taken from the Census population

files when possible. Remaining controls come from IPEA data. We begin our discussion of the data with a discussion of the distinction between formal and informal employment.

3.1   Formal versus Informal

To label employment we utilize the type of worker and social security contribution variables found in the individual Census files. The type of worker variable categorizes an individual's main job into nine types that we can use to classify workers into formal or informal worker groups. However, workers classified as belonging to three of these categories earn zero income by definition. These categories include: (1) workers that produce for their own consumption; (2) workers that are unpaid members of the household; and (3) apprentices or trainees without pay. While these workers are productive, they are reported as earning an income of zero. If these workers are included in the average income per-worker estimates, this will bias income downward. We therefore focus only on the first six categories of employment (see **Table 1**) in the primary results. However, results where these workers are included are presented in the Appendix [coming soon].

The primary definition of informality considers employees and self-employed workers (categories 1 – 5, **Table 1**). We identify workers as informal if they do not contribute to social security. This definition is common in the literature (Boeri and Garibaldi, 2005; Bosch, 2006; Uylssea, 2010) and pools self-employed individuals and employees that are working without a formal contract into the same group.[5] All formally contracted workers are required to contribute to social security. This is reasonable because both self-employed and informally contracted individuals are in an unprotected occupation and are extremely flexible (Uylssea, 2010). We

---

[5] While military public service workers are generally employed without formal contracts, they are clearly in the formal workforce. However, because they are required to contribute to social security they are naturally excluded from our definition.

therefore exclude them from the informal category. We measure informal sector size as the share of total workers within the first five categories that fall into this informal category (*Informal Size A*).

However, self-employed workers and informally contracted individuals may differ in some important ways despite similarities in flexibility. For example, self-employed individuals tend to earn a higher income. Further, the number of informal employers should be considered as well (category 6, **Table 1**). Following Uylssea (2015), we develop separate measures of informality for informal *employees* and informal *employers* to use as a robustness check. For employees, we define informal workers as those employed without formal contracts alone and measure informal sector size as the share of total *employees* that fall into this informal category (*Informal Size B*). We define employers to be informal when they do not contribute to social security and measure informal sector size as the share of total employers that fall into this category (*Informal Size C*).

On average, 57 percent of workers falling categories 1 – 5 of Table 1 are informal (see **Table 3**). This number decreases to 47 percent when measuring look at the proportion of employees that are informal. Similarly, the percentage of employers that are informal is right around 50 percent. According to all three definitions, the informal sector is an integral part of Brazil's economy.

3.2   Income and Productivity Measures

We measure economic output in a number of ways. We first use the IPEA's measure of GDP per-capita, given in constant 2000 dollars. Unlike the traditional international measures of economic output, this estimate explicitly includes the value added from some informal workers (IBGE). Most notably, estimates include the value added in the construction industry from

employees employed informally (IBGE, 2004). However, given the size of the informal sector and the numerous industries in which these workers may be employed it is unlikely to fully capture informal production.

We therefore use alternative measures that fully capture production in the informal sector. First, we use total (formal plus informal) productive income per-worker as an additional dependent variable. This measure includes only income from work and rental income. All other income categories include some degree of transfers that should not be considered as output (e.g., unemployment insurance, social security payments, etc.). Our second measure includes total income per-worker from work alone so that we are able to gauge the impact institutions have on the average worker's productivity.

Lastly, we separate working income into informal and formal categories according to the above definitions. This allows us to focus on the relationship between institutions and worker productivity within each sector. If institutions are positively associated with productivity in both sectors, we should see *total* output increasing despite the fact that some of the increase in formal output results from a reduction in informal output.

3.3   Institutional Quality

To measure institutional quality, we use an index called *The Municipal Institutional Quality Indicator* (Indicador de Qualidade Institucional Municipal (IQIM)) constructed by the IBGE.[6] The IQIM index contains three categories: (*a*) extent of political participation, (*b*) financial capacity, and (*c*) management capacity. Category *a*, political participation, is scored based on the existence of municipal councils where citizens can express their concerns and

---

[6] This index has been employed in several empirical studies including Naritomi, et al. (2007), Bologna (2015), and Bologna and Ross (2015).

monitor their elected officials. Category *b*, financial capacity, is scored based on a municipal government's ratio of debt to revenue and its real savings per capita. The municipality's ability to coordinate with nearby municipalities to provide public services is also reflected in its financial capacity score. Management capacity measures the efficiency of the municipal government in terms of the cost effectiveness of its tax system and the number of planning and administrative tools that are available to it. A higher score on the IQIM index represents higher quality governance. To measure the concentration of power in each municipality we use a measure of land distribution using data from the Census of Agricultural conducted by the IBGE in 1996. [More will be written on this measures.]

3.4   Other Controls

As controls, we include municipal population and density from the IPEA. Both variables enter the regression in logged form. We also include a cost of transport index from each municipality to São Paulo Municipal Headquarters, as São Paulo is a central economic location Brazil. Lastly, using the Census data, we aggregate several individual level characteristics into municipal measures. Namely, we include the share of population that is male, average population age, percent of adult population that is married, percent of population that has never moved, percent of adult population that is literate, average years of schooling for adult population, and percent of employment in 14 of Brazil's primary sectors. All control variables, and their sources, are given in **table 5**. We also include state fixed effects in all regressions.

4.   Results & Methodology

Our preliminary results are presented in **Table 6** through **Table 9**. **Table 6** through **Table 8** show OLS estimates the relationship between institutions while controlling for each of the

three different measures of informality. **Table 9** shows heteroskedasticity robust Probit estimates of the association between institutions and informal sector size.

4.1 Institutions and Economic Output

To understand the effect of institutions on economic output we estimate the following model:

(4.1) $y_{ms} = \alpha_0 + \alpha_1 Institutions_{ms} + \alpha_1 Land\ Equality_{ms} + \alpha_2 Informality_{ms} + \theta X_{1ms} + \gamma_s + \varepsilon_{ms},$

where m and s index municipality and state, respectively; y is one of our various measures of *GDP* per-capita or income per-worker; *Informality* is one of our measures of informal sector size; *Institution* is the IBGE institutional index; *Land Equality* is the inverse of our calculated land GINI coefficient; X is a matrix of additional controls including all controls listed in **Table 5** as well as Employer and Self-Employed shares from **Table 3**; γ_s represents state intercepts; and ε is the error term.

As Table 6 shows, institutions are positively associated with all measures of economic output and productivity. It is especially interesting to note that institutions are not only associated with formal income per-worker, but informal income per-worker. This suggests that the positive effects from institutional improvements are not specific to the informal sector. However, it is interesting to note that the increased productivity in the informal sector only applies to the informality definition that incorporates self-employed workers.

4.2 Institutions and Informality

While we find that institutions do increase total output and productivity, holding informality constant, it is still interesting to see if institutions do reduce the size of the informal sector as hypothesized in Dreher et al. (2014). We therefore estimate the following:

(4.2) $Informality_{ms} = \alpha_0 + \alpha_1 Institutions_{ms} + \alpha_1 Land\ Equality_{ms} + \theta X_{1ms} + \gamma_s + \varepsilon_{ms},$

where *m* and *s* index municipality and state, respectively; *Informality* is one of our measures of informal sector size; *Institution* is the IBGE institutional index; *Land Equality* is the inverse of our calculated land GINI coefficient; *X* is a matrix of additional controls including all controls listed in **Table 5** as well as Employer and Self-Employed shares from **Table 3**; γ_s represents state intercepts; and ε is the error term. However, given that our dependent variable is constrained between zero and one we should a heteroskedasticity corrected Probit model. As indicated in **Table 9**, institutions are negatively correlated with informal sector size suggesting that as institutions increase, informality decreases.

4.3   Robustness Checks [To do]

- Reanalyze with zero-income workers included.

- Reanalyze using the share of income attributed to informal workers as a measure of informal sector size.

- Instrumental variable analysis.

5. Conclusion

This research takes advantage of a unique set of data to investigate the effect of improved institutions (property rights, rule of law, etc.) on economic productivity. While others have identified a positive relationship between the two measures, results have historically demonstrated that much of the gain may be at the expense of the informal sector of the economy – both in total output and productivity. The data used herein contains reported informal sector employment and income information, which allows for an evaluation of the changes in the two sectors which comprise the whole economy. Our results indicate that there is a strong positive relationship between improved institutions and productivity, consistent with previous findings. However, and more importantly, our analysis suggests that while there is a likely transition of

income from the informal sector to the formal sector of the economy, there isn't a reduction in the labor productivity in the remaining informal sector. These findings, while unable to speak to causality, provide strong support for the notion that strong institutions and economic productivity are indeed correlated and not merely a representation of a transition from production in the informal sector to the formal sector of the economy.

Future work on this question is warranted to identify causality, as improving institutions may be the result, and not the cause, of increasing productivity. Additionally, while we find that informal productivity – collectively – doesn't come at the cost of formal productivity, it is unlikely that these effects are homogeneous across sectors. It would be informative to identify the relative winners and losers to gain an understanding of which segments of the economy have productivity improvements most strongly correlated with institutional improvements.

References

Acemoglu, D., Johnson, S., and Robinson, J. A. 2005. Institutions as a fundamental case of long-run growth. in(P. Aghion and S. N. Durlauf, eds.) Handbook of Economic Growth, Volume 1A, North-Holland: Elsevier.

Acemoglu, D., Johnson, S., Robinson, J. 2002. Reversal of fortune: geography and institutions in the making of the modern world income distribution. Quarterly Journal of Economics 117(4), 1231-1294.

Bjørnskov, C. and Foss, N.J. 2016. Institutions, entrepreneurship, and economic growth: what do we know and what do we still need to know? The Academy of Management Perspectives, 30(4), 292 – 315.

Boeri, T., and Garibaldi, P. 2005 Shadow sorting. NBER International Seminar on Macroeconomics 2005, 125 – 163.

Bologna, J. 2016. The effect of informal employment and corruption on income levels in Brazil. Journal of Comparative Economics 44(3), 657 – 695.

Bosch, M. 2006. Job creation and job destruction in the presence of informal labor markets. Center for Economic Performance Discussion Paper No. 761.

Casson, M. C., Giusta, M. D., and Kambhampati, U. S. 2010. Formal and informal institutions and development. World Development 38(2), 137 – 141.

Choi, J. P., Thum, M., 2005. Corruption and the shadow economy. International Economic Review 46(3), 817-836.

Dreher, A., Méon, P., and Schneider, F. 2014. The devil is in the shadow. Do institutions affect income and productivity or only official income and official productivity. Public Choice 158(1 – 2), 121 – 141.

Farrell, D., 2004. The hidden dangers of the informal economy. McKinsey Quarterly 2004, 26-37.

Flachaire, E., García-Peñalosa, C. and Konte, M. 2014. Political versus economic institutions in the growth process. Journal of Comparative Economics 42(1), 212 – 229.

Greif, A. 2005. Commitment, Coercion, and Markets: The Nature and Dynamics of Institutions Supporting Exchange. in(C. Ménard and S. Shirley, eds.) Handbook of New Institutional Economics, Netherlands: Springer.

Hall, R. E., Jones, C. I. 1999. Why do some countries produce so much more output per worker than others? Quarterly Journal of Economics 114(1), 83-116.

Johnson, S., Kaufmann, D., Shleifer, A., 1997. The unofficial economy in transition. Brookings Papers on Economic Activity 1997 (2), 159-239.

La Porta, R., Shleifer, A., 2008. The unofficial economy and economic development. NBER Working Paper Series No. 14520.

La Porta, R., Shleifer, A., 2014. Informality and development. Journal of Economic Perspectives 28(3), 109 – 126.

Loayza, N. A., 1996. The economics of the informal sector: a simple model and some empirical evidence from Latin America. Carnegie-Rochester Conference Series on Public Policy 45, 129-162.

Naritomi, J., Soares, R., and Assunção, J. 2012. Institutional development and colonial heritage within Brazil. Journal of Economic History 72(2), 393 – 422.

North, D. C. 1990. Institutions, Institutional Change and Economic Performance. Cambridge: Cambridge University Press.

Rodrick, D. A., Subramanian, A., Trebbi, F. 2004. Institutions rule: the primacy of institutions over geography and integration in economic development. Journal of Economic Growth 9(2), 131-165.

Rodrik, D. 2008. Second-best institutions. American Economic Review, 98(2), 100 – 104.

Schneider, F. 2005a. Shadow economies of 145 countries all over the world: estimation results of the period 1999–2003 (Discussion paper). University of Linz: Department of Economics.

Schneider, F. 2005b. Shadow economies around the world: what do we really know? European Journal of Political Economy 21, 598–642.

Schneider, F., and Buehn, A. 2016. Estimating the size of the shadow economy: methods, problems, and open questions. IZA Discussion Paper No. 9820.

Ulyssea, G. 2010. Regulation of entry, labor market institutions and the informal sector. Journal of Development Economics 91, 87 – 99.

Ulyssea, G. 2017. Firms, informality and development: theory and evidence from Brazil. American Economic Review (*forthcoming*).

Williamson, C. R. 2009. Informal institutions rule: institutional arrangements and economic performance. Public Choice 139(3 – 4), 371 – 387.

Zak, P. J., and Knack, S. 2001. Trust and growth. The Economic Journal 111, 295 – 321.

Table 1: Categories of employment for income earning workers.	
Category	Description
1	Domestic Employee with a Formal Contract
2	Domestic Employee without a Formal Contract
3	Employee with a Formal Contract
4	Employee without a Formal Contract
5	Self-Employed
6	Employer

Source: IBGE Census 2000 individual level data. In the data, categories 5 and 6 are switched. We use this numbering for readability.

Table 2: Formal versus Informal Definitions

Informal A	Employees without formal contracts (excluding military) or self-employed workers that *do not* contribute to social security.
Formal A	Employees with formal contracts, and military personnel, or self-employed and informally contracted employees that *do* contribute to social security.
Informal B	Employees without formal contracts (excluding military) that *do not* contribute to social security.
Formal B	Employees with formal contracts, military personnel, or informally contracted employees that *do* contribute to social security.
Informal C	Employers that do not contribute to social security.
Formal C	Employers that do contribute to social security.

Source: IBGE Census 2000 individual level data.

Table 3: Variable names, brief descriptions, and summary statistics for employment type controls.

Variable Name	Brief Description	Mean	Std. Dev.	Min.	Max.
Employers	Share of income earning workers that correspond to category 5 of **table 1**, regardless of social security contributions.	0.022	0.015	0	0.119
Self-Employed	Share of income earning workers that corresponds to category 5 of **table 1**, regardless of social security contributions.	0.317	0.138	0.042	0.845
Formal Self-Employed	Share of self-employed workers that contribute to social security.	0.054	0.063	0	0.724
Informal Self-Employed	Share of self-employed workers that do not contribute to social security.	0.263	0.135	0.025	0.805
Informal Size A	Share of income earning workers (category 1 – 5 in **table 1**) that corresponds to Informal A definition in **table 2**.	0.570	0.167	0.101	0.928
Informal Size B	Share of income earning *employees* (category 1-4 in **table 1**) that corresponds to Informal B definition in **table 2**.	0.472	0.162	0.056	0.92
Informal Size C	Share of income earning *employers* (category 5 in **table 1**) that corresponds to Informal C definition in **table 2**.	0.472	0.162	0.056	0.92

Source: IBGE Census 2000 individual level data. *Employers* and *Self-Employed* are included as controls in all regression.

Table 4: Variable names, brief statistics, and sources for all other variables.

Variable Name	Brief Description	Source
Dependent Variables		
GDP per-capita	Gross domestic product per-capita, in constant 2000 dollars.	IPEA
Total Productive Income	Avg. income from productive sources (working and rental income).	Census
Working Income	Average income per worker.	Census
Working Income Formal	Average income per formal worker.	Census
Working Income Informal	Average income per informal worker.	Census
Independent Variables		
Key Variables of Interest		
Institutional Quality	Municipal institutional quality index; scaled from 1 (poor institutions) to 6 (good institutions).	Census
Land Equality	The inverse of a Gini coefficient for land distribution.	Census
Controls		
Population	Number of people (enters regression in logged form).	Census
Density	People per square kilometer (in thousands).	IPEA
Urban	% of population that lives in an urban area.	Census
Male	% of population that is male.	Census
Distance	Cost of transport distance index to Sao Paulo.	Census
Schooling	Avg. years of schooling for individuals aged 10 plus.	Census
Teenager	% of population aged 10 - 19 years old.	Census
Working Age	% of population aged 20 - 59 years old.	Census
Retirement Age	% of population aged 60 plus years old.	Census
Employed without Pay	% of workforce that is employed without income.	Census
Agriculture	% of employment in agricultural industry.	Census
Fishing	% of employment in fishing industry.	Census
Mining	% of employment in mining industry.	Census
Manufacturing	% of employment in manufacturing industry.	Census
Utilities	% of employment in utilities industries.	Census
Construction	% of employment in construction industry.	Census
Trade	% of employment in trade (in goods) industry.	Census
Recreation	% of employment in acc. & food services industries.	Census
Transportation	% of employment in transport & communication industries.	Census
Finance	% of employment in finance industry.	Census
Real Estate	% of employment in real estate industry.	Census
Public Administration	% of employment in public administration.	Census
Education	% of employment in education industry.	Census
Health Services	% of employment in health services industry.	Census
Other Services	% of employment in other services industry.	Census

Notes: All employment and income measures exclude `workers' who earn zero income by definition.

Table 5: Summary Statistics

Variable Name	Mean	Std. Dev.	Min	Max
Dependent Variables				
GDP per-capita	4101	4560	641	123701
Total Productive Income	4719	2090	1037	17944
Working Income	4652	2050	1022	17868
Working Income Formal A	6570	2682	1901	31864
Working Income Informal A	3266	1366	694	16067
Working Income Formal B	4755	1406	1854	15849
Working Income Informal B	2276	808	751	19692
Working Income Formal C				
Working Income Informal C				
Independent Variables				
Key Variables of Interest				
Institutional Quality	3.044	0.54	1	4.9
Land Equality	0.316	0.134	0.016	1
Controls				
Population	30833	186751	795	1.04E+07
Density	0.089	0.435	0	12.916
Urban	0.606	0.224	0.016	1
Male	0.507	0.014	0.462	0.603
Distance	1.575	1.165	0.01	10.512
Schooling	4.568	1.186	1.21	9.071
Teenager	0.217	0.028	0.143	0.293
Working Age	0.484	0.05	0.309	0.612
Retirement Age	0.096	0.025	0.02	0.214
Employed without Pay	0.155	0.148	0	0.781
Agriculture	0.414	0.202	0.001	0.889
Fishing	0.009	0.03	0	0.492
Mining	0.005	0.016	0	0.325
Manufacturing	0.097	0.087	0	0.7
Utilities	0.002	0.003	0	0.087
Construction	0.056	0.031	0	0.34
Trade	0.106	0.052	0.002	0.315
Recreation	0.031	0.02	0	0.29
Transportation	0.031	0.017	0	0.159
Finance	0.004	0.004	0	0.04
Real Estate	0.02	0.018	0	0.165
Public Administration	0.056	0.035	0.005	0.4
Education	0.054	0.022	0	0.249
Health Services	0.016	0.012	0	0.104
Other Services	0.021	0.012	0	0.102

Table 6: OLS results of institutional measures and informal sector size association with various income measures.

	GDP per-capita (1)	Total Income (2)	Working Income (4)	Formal Income (5)	Informal Income (6)
Institutional Quality	0.121***	0.034***	0.033***	0.038***	0.015**
	(0.013)	(0.007)	(0.007)	(0.007)	(0.008)
Land Equality	-0.072	0.103***	0.100***	0.072***	0.224***
	(0.055)	(0.028)	(0.028)	(0.028)	(0.032)
Informal Size A	-0.708***	-0.255***	-0.253***	0.396***	0.060
	(0.058)	(0.039)	(0.039)	(0.037)	(0.046)
Observations	4,954	4,954	4,954	4,954	4,954
R-squared	0.766	0.824	0.822	0.672	0.739

Notes: *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively. Regressions include all controls listed in **Table 5** and state fixed effects. Standard errors, given in parenthesis, are heteroskedasticity corrected.

Table 7: OLS results of institutional measures and informal sector size association with various income measures; with additional employment controls.

	GDP per-capita (1)	Total Income (2)	Working Income (4)	Formal Income (5)	Informal Income (6)
Institutional Quality	0.122***	0.034***	0.034***	0.027***	-0.010
	(0.013)	(0.007)	(0.007)	(0.006)	(0.006)
Land Equality	-0.061	0.107***	0.105***	0.031	0.050*
	(0.055)	(0.028)	(0.028)	(0.023)	(0.028)
Informal Size B	-0.669***	-0.190***	-0.187***	0.354***	-0.130***
	(0.054)	(0.034)	(0.034)	(0.026)	(0.032)
Observations	4,954	4,954	4,954	4,954	4,954
R-squared	0.766	0.824	0.821	0.714	0.704

Notes: *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively. Regressions include all controls listed in **Table 5** and state fixed effects. errors, given in parenthesis, are heteroskedasticity corrected.

Table 8: OLS results of institutional measures and informal sector size association with various income measures; with additional employment controls.

	GDP per-capita (1)	Total Income (2)	Working Income (4)	Formal Income (5)	Informal Income (6)
Institutional Quality	0.131***	0.033***	0.033***	0.003***	-0.001
	(0.013)	(0.007)	(0.007)	(0.001)	(0.001)
Land Equality	-0.063	0.108***	0.105***	0.001	0.006
	(0.057)	(0.028)	(0.028)	(0.003)	(0.004)
Informal Size C	-0.108***	-0.107***	-0.105***	0.003*	0.001
	(0.023)	(0.014)	(0.014)	(0.001)	(0.002)
Observations	4,698	4,698	4,698	4,698	4,698
R-squared	0.757	0.826	0.824	0.707	0.723

Notes: *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively. Regressions include all controls listed in **Table 5** and state fixed effects, as well as *Employers* and *Self-Employed*. Standard errors, given in parenthesis, are heteroskedasticity corrected.

Table 9: Heteroskedasticity corrected Probit model results of institutional quality's association with informal sector size.

	Informal Size A	*Informal Size B*	*Informal Size C*
	(1)	(2)	(3)
Institution	-0.031*	-0.005	-0.155
	(0.016)	(0.003)	(0.200)
Land Equality	0.030	0.001	0.284
	(0.047)	(0.010)	(0.454)
Observations	4,955	4,955	4,699

Notes: *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively. Regressions include all controls listed in **Table 5** and state fixed effects.