INSTITUTIONAL QUALITY AND DEVELOPMENT: ON THE ROLE OF INFORMALITY

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ABSTRACT

It is well understood that developing countries have large informal sectors. The informal sector, however, has a theoretically ambiguous effect on development. Some view informality as one aspect that comes from lacking full development, while others see informal activity as a restraint to growth. We argue that this ambiguity is because its impact is conditional on both the size of the locale and the existing institutional environment. Good institutions facilitate productive activity and voluntary exchange when informal networks are insufficient. Informal activity facilitates economic growth most effectively in smaller communities. We explore how the conditional effects vary across different population sizes. This diverges with the view that informality and formal activity are substitutes. We hypothesize that instead they can be complimentary in certain aspects. Using data from 5,505 Brazilian municipalities, we analyze the relationship between (formal) institutions, informality, and development. We use three separate measures for institutional quality: governance quality, de facto law provisions, and distribution of political power. In a previous study, these indicators were found to be positively associated with economic performance. Following the previous literature, we define the informal sector as those that do not contribute to the country's social security. In our baseline results, we find inconsistent results between the conditionality of institutional quality and informality. Only once we include the conditionality of population size do we find that formal institutions and informal production tend to be substitutable in areas with large populations, and complementary in small municipalities. We emphasize our differential effects, which have less potential endogeneity concerns. However, we stress that our results should not be interpreted as causal. Our results do highlight the importance of informal networks to economic development, especially in small locales. Future research may be warranted to address causality, as well as exploring the cultural aspect associated with informal networks and population size.

INTRODUCTION

It is well known that developing countries tend to have large informal sectors (Schneider and Enste 2000; 2013). However, the effect of this informal production on economic output is unclear. While many argue that informality is simply a byproduct of underdevelopment (La Porta and Shleifer 2008; 2014), others view informal production as a deterrent to growth (Farrell 2004; Hsieh and Klenow 2009). Both arguments view the informal sector as a less-productive, second-best option to formal work.[1] Conversely, some researchers

argue that informality offers the flexibility necessary for productive individuals that would be otherwise constrained by inefficient formal institutions (de Soto 1989). This latter line of reasoning implies that informality may be beneficial to development.

In a recent paper, Ulyssea (2018) argues that these views are simultaneously correct and that they simply reflect the heterogeneous nature of firms. As a result, he finds that the welfare effects of reducing informality depend on *how* informality is reduced. Both increased enforcement of informal firms and decreased formal sector entry costs, for example, reduce informality. However, while the latter increases welfare, the former does not. Ulyssea (2018) also finds that reducing the payroll tax decreases informal employment and increases welfare. Reducing entry costs and payroll taxes in the formal sector lessen the burden of formal institutions. Thus, the welfare results of Ulyssea (2018) seem to support the de Soto (1989) view.[2]

We aim to generalize the results of Ulyssea (2018) by examining the *conditional* effect of informality on development. That is, we are interested in how the effect of informality changes when we vary the level of institutional quality. If formal governance is inefficient, extractive, or otherwise burdensome, informality may offer a beneficial escape. However, if formal governance fosters growth by creating a productive environment through the effective use of the rule of law or contract enforcement, informality may act as a drain on the economy. Empirically, we test these hypotheses using data on informality, formal institutional quality, and income per-capita across a maximum of 5,505 municipalities in Brazil.[3]

We also explore how these conditional effects vary across population size. The de Soto (1989) view argues that the informal sector is a viable substitute for formality. However, we have reason to suspect the two are complementary in specific instances. The effectiveness of formal institutions on development often depends on the supporting informal norms (Helmke and Levitsky 2004; Williamson 2009; Estrin and Prevezer 2011; Voigt 2018; Cruz-García and Peiró-Palomino 2019). This is especially true in developing countries (Tarabar 2017). To the extent that a large informal sector signals a cohesive informal network, informality may benefit the economy when the formal institutions are strong and complementary. We argue that this is most likely the case in small communities. Similarly, it is well understood that informal institutions foster economic growth best in small populations (Leeson 2009; Leeson 2013; Skarbek 2010; Skarbek 2012). Informality in a large locale, however, is unlikely indicative of cohesivity and is likely only beneficial when formal institutions are lacking.[4]

We follow Naritomi, Soares, and Assunção (2012) and measure formal institutional quality three ways. Our first measure is derived from a general local governance quality index that aims to measure the general efficiency of the municipal government and their ability to rely on legitimate taxation over resource rents. Our second measure is intended to capture the *de facto* extent of the rule of law. It records the existence of specific municipal courts that citizens can access. Our third measure captures the *de facto* distribution of political power. It estimates an inverse Gini coefficient for the distribution of land using an agricultural land census. The latter two measures come directly from Naritomi, Soares, & Assunção (2012); the former measure is constructed by the Brazilian Census Bureau (IBGE). All three institutional measures are positively correlated with economic development (Jahan, Bologna Pavlik, & Williams 2020). As such, we expect

municipalities with higher scores in all three institutional areas to be less extractive and more conducive to productive activities.

We follow Ulyssea (2010; 2018) and define informal sector size as the share of workers that do not contribute to social security. This definition pools together employees working without a formal labor contract and self-employed workers. Both groups have similar levels of flexibility and are able to work without governmental supervision. We also separate employees from the self-employed as a robustness check. Both measures are found to be negatively correlated with economic development (Jahan, Bologna Pavlik, & Williams 2020). Bologna (2016) also finds the negative relationship between the share of informal employees and development to be robust to an instrumental variable analysis. Thus, it seems clear that on average, informality negatively affects economic development. However, interpreting these average effects as general is dangerous for policy prescription. In this paper, we aim to use interaction terms to find the conditional effects of development and informality, contingent on institutional quality and population size. This should lead to a clearer vision for policy proposals.

As noted in Bologna (2016), understanding how to reduce the size of the informal sector properly requires an understanding of the underlying causes of informality. The results of Ulyssea (2018) suggests that individuals are choosing informal work when the policy costs of formality are high.[5] If the costs of formality are *inefficiently* high, then a larger informal sector may encourage development.[6] Likewise, if the benefit (e.g. access to formal court systems) of formality is low, a larger informal network may prove to be a beneficial alternative. It is these extreme cases, where formal institutions are at opposing ends of the quality spectrum, that we are interested in.

The remainder of the paper is as follows: Section 2 presents the data; Section 3 presents the empirical methodology and discusses the results; Section 4 concludes.

DATA

We obtain our data from three sources: the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística (IBGE)), the Institute of Applied Economic Research (Instituto de Pesquisa Econômica Aplicada (IPEA)), and Naritomi, Soares, & Assunção (2012). Employment variables are constructed using individual level Census data, which includes a subsample of the general population. Similarly, our educational control variable is derived using this individual level data as well.[7] However, whenever possible, we take our demographic measures from the Census total population files. All other controls are derived from the IPEA database.

Institutional Quality

Following Naritomi, Soares, & Assunção (2012) and Jahan, Bologna Pavlik, & Williams (2020), we utilize three separate measures of institutional quality. These measures include an aggregate index of municipal governance (*Institutional Quality*) constructed by the IGBE[8], an access to justice index (*Access to Justice*) constructed by Naritomi, Soares, & Assunção (2012), and an inverse land Gini coefficient (*Land Equality*) as a measurement of power, also constructed by Naritomi, Soares, & Assunção (2012). We present the summary statistics for these institutional measures in **Table 1**. All three measures are positively correlated to economic activity (Jahan, Bologna Pavlik, & Williams 2020).

TABLE 1. NAMES, BRIEF DESCRIPTION, AND SUMMARY STATISTICS FOR MAIN VARIABLES OF INTEREST

Variable	Description	Mean	Std. Dev.	Min	Max
Dependent Variables					
Total Income	Total Income Per-Person	2,522	1,461	395	32,499
Total Working Income	Total Working Income Per-Worker	4,566	2,116	925	26,831
Independent Variables: Institutions					
Institutional Quality	Municipal institutional quality index; scaled from 1 (poor institutions) to 6 (good institutions).	3.026	0.552	1	4.9
Land Equality	The inverse Gini coefficient for land distribution.	0.195	0.085	0.056	1
Access to Justice	Access to justice index; scaled from 0 (no access) to 3 (most access).	1.143	0.937	0	3
Informality					
Informal Size A	Share of informally contracted employees and self-employed individuals that do not contribute to social security.	0.590	0.170	0.092	0.992
Informal Size B	Share of informally contracted employees that do not contribute to social security.	0.476	0.163	0.056	0.989

Our first measure, *Institutional Quality*, is our broadest. *The Municipal Institutional Quality Indicator* (Indicador de Qualidade Institucional Municipal (IQIM)) contains three major components: political participation, management capacity, and financial capacity. Political participation is calculated based on the presence of a municipal council. The idea is that municipalities with councils allow for citizens to voice their opinions and keep track of government leaders, leading to a more transparent governing system. Management capacity is based on how efficient the government is at utilizing its tax system, as well as the administrative tools available to it. Finally, financial capacity measures the financial status of the municipality. Specifically, the index incorporates the municipality's debt to revenue ratio, real savings per capita, and ability to coordinate with bordering municipalities on providing services.

Access to Justice measures the citizens' access to the judicial system within a municipality. We utilize Naritomi, Soares, & Assunção's (2012) index, which is constructed from a 2001 survey conducted by the IBGE. The index is a sum of three binary variables that indicates the existence of three types of courts: Consumer Commissions ("Comissão de Defesa do Consumidor"), Youth Councils ("Conselho Tutelar"), and Small Claims ("Tribunal de Pequenas Causas"). Consumer Commissions handle consumer rights cases. Youth Councils are in charge of protecting the rights of children and adolescents. Small Claims are designed to handle simple small dollar cases. Because municipalities in Brazil do not have a formal role in governing the judicial system, the existence of these councils reveals information concerning their effective access to the justice.

Land Equality is an inverse measure of power concentration. Acemoglu, Johnson, and Robinson (2005) argue that the *de facto* political power obtained via the distribution of resources is the most harmful to growth. To capture this *de facto* power, Naritomi, Soares, & Assunção (2012) estimate a Gini coefficient based on land distribution. They calculate this coefficient using data from the 1996 Census of Agriculture conducted by the IBGE. We utilize the inverse of their constructed coefficient as our measure. Thus, a higher number implies more equality. If economic resources are more evenly distributed, political power should be as well; when economic resources are concentrated, then political power is likely concentrated amongst a small number of elites.

Formal versus Informal

We define the informal economy as the *illegal* production of *legal* goods and services.[9] Thus, we are concerned with the part of Brazil's economy that is hidden from official accounts, yet productive. To measure this informal activity, we utilize data derived from individual level Census surveys.[10] The Census requires workers to categorize their employment into nine categories. These categories include: (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; (7) workers that produce for their own consumption; (8) workers that are unpaid members of the household; and (8) trainees without pay. A majority of workers fall into the first five categories. These five categories serve as the basis for computing the informal size.[11] In addition to employment categorization, the Census also requires a "yes" or "no" response to social security contributions. Using responses to these two questions, we classify workers into separate formal or informal worker groups. The share of workers that fall into the informal category represents our estimate of informal sector size.

Our main definition pools self-employed and workers employed without a formal contract together as both groups face similar levels of flexibility (Ulyssea 2010). More specifically, we consider workers to be informal if they do not contribute to social security.[12] All formally contracted employees are required to contribute to social security. Employees without formal contracts and the self-employed generally do not make these contributions.[13] We define informal sector size to be the share of workers (summed over the first five categories) that fit this informal definition (*Informal Size A)*. Despite their flexibility, there are clear differences between self-employed workers and those working without a formal contract. Self-employed workers tend to be more entrepreneurial and earn a higher income on average. We therefore additionally measure informal sector size using

employees (summing over the first four categories) only. We refer to the share of employees that are informal as *Informal Size B*.

On average, the informal sector represents 59 percent of the workforce according to *Informal Size A*; this share decreases to 48 percent when considering *Informal Size B* (see **Table 1**). Thus, regardless of how informality is measured, it is clear that this sector is a vital part of Brazil's economy. In this paper, we explore the effect of this informality on income, conditional on the municipality's quality of formal institutions and population size.

Income and Other Controls

We measure economic activity two ways: total income per-person and total working income per-worker. Total income per-person includes all income sources.[14] This figure includes all individuals 10 years of age or older, regardless of employment. The second measurement, total working income per-worker, includes only income earning workers. This allows us to measure the impact institutions have on the average worker's productivity. This measure includes *only* work-related income from *only* those who are employed for the purposes of earning income. This means we exclude the unemployed and those that are employed with zero income by definition.

Our control variables are outlined in **Table A1,** with summary statistics listed in **Table A2.** Following Bologna (2016) and Jahan, Bologna Pavlik, & Williams (2020), we control for population size and density constructed from the full 2000 Census survey and distributed through the IPEA database. We also control for the share of the population that resides within an urban area and the cost of transport to the São Paulo Municipal Headquarters using an index constructed by the IBGE.[15] Our demographic controls include the share of population that is male, age population shares (i.e. young, working age, and retirement), percentage of adult population that is literate, and average years of schooling for the adult population. Gender, age, and literacy are derived from the 2000 Census total population estimates, the years of schooling data comes from the weighted sample.

Lastly, we control for employment factors using the simple average of the individual Census sample. These controls include the percentage of employment in 16 of Brazil's primary sectors and the percentage of the income earning workforce that are employers or self-employed. We also include percentage of workforce that receives no income by definition and the percent of the adult population that is unemployed. The idea behind these latter two variables is to capture unobservable characteristics of underdeveloped areas correlated with both income and institutions. All regressions include state fixed effects.

EMPIRICAL METHODOLOGY AND RESULTS

We separate the discussion of our results into three groups. We first estimate the unconditional effect of institutional quality and informal sector size on our income measures (**Table 2** and **Table 3**). We refer to this set of results as our baseline. We then estimate the marginal effect of informality on income, conditional on the level of institutional quality using our three measures (**Table 4** and **Table 5**). Lastly, we allow the conditional effect of informality found in **Table 4** and **Table 5** to vary across population size (**Tables 6a** through **7b**). For all tables, we present the coefficient estimates of our main variables of interest only.[16]

Institution Quality, Informality, and Income
We first estimate the unconditional effect of institutional quality and informal sector size on income to establish a baseline. More specifically, we estimate the following equation:

(3.1) $y_{ms} = \alpha_0 + \alpha_1 Institutional\ Quality_{ms} + \alpha_2 Informal\ Size_{ms} + \theta X_{1ms} + \gamma_s + \varepsilon_{ms}$,

where m indexes the municipality and s indexes the state; y is either total income per-person or working income per-worker; *Institutional Quality* is one of the three measures of institutional quality discussed above; *Informal Size* is one of the two measures of informality discussed above; X_1 is a matrix of controls as listed in **Table A2**; γ_s represents state intercepts; and ε is the error term. Standard errors are clustered at the state level. We also estimate **Equation (3.1)** with all three institutional measures together.[17] These results are presented in **Table 2** for total income per-person and **Table 3** for working income per-worker. ***Panel a*** of each table uses *Informal Size A* as a control; ***Panel b*** uses *Informal Size B*.

TABE 2. THE EFFECT OF INSTITUTIONS AND INFORMAL SECTOR SIZE ON TOTAL INCOME PER-PERSON

***Panel a*: Informal Definition A**

	(1)	(2)	(3)	(4)
Institutional Quality	0.026***			0.026***
	(0.005)			(0.006)
Access to Justice		0.004		0.005
		(0.005)		(0.006)
Land Equality			0.146***	0.140***
			(0.043)	(0.041)
Informal Size A	-0.182***	-0.188***	-0.202***	-0.193***
	(0.044)	(0.044)	(0.050)	(0.051)
Observations	5,505	5,504	4,972	4,972
R-Squared	0.913	0.913	0.916	0.916
***Panel b*: Informal Definition B**				
Institutional Quality	0.027***			0.027***
	(0.005)			(0.006)
Access to Justice		0.004		0.005
		(0.005)		(0.006)
Land Equality			0.148***	0.141***
			(0.046)	(0.044)
Informal Size B	-0.110**	-0.115**	-0.132**	-0.125**
	(0.048)	(0.048)	(0.048)	(0.050)
Observations	5,505	5,504	4,972	4,972
R-Squared	0.913	0.912	0.915	0.916

Notes: *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively. Regressions include all controls listed in **Table A1** in addition to state fixed effects. Standard errors, clustered by state, given in parentheses

TABLE 3. THE EFFECT OF INSTITUTIONS AND INFORAL SECTOR SIZE ON WORKING INCOME PER-WORKER

Panel a: **Informal Definition A**

	(1)	(2)	(3)	(4)
Institutional Quality	0.029***			0.033***
	(0.006)			(0.006)
Access to Justice		0.001		0.001
		(0.005)		(0.006)
Land Equality			0.230***	0.221***
			(0.071)	(0.066)
Informal Size A	-0.251***	-0.259***	-0.277***	-0.267***
	(0.056)	(0.055)	(0.061)	(0.063)
Observations	5,505	5,504	4,972	4,972
R-Squared	0.827	0.826	0.828	0.829

Panel b: **Informal Definition B**

	(1)	(2)	(3)	(4)
Institutional Quality	0.030***			0.034***
	(0.006)			(0.006)
Access to Justice		0.001		0.002
		(0.006)		(0.006)
Land Equality			0.233***	0.224***
			(0.075)	(0.071)
Informal Size B	-0.174***	-0.179***	-0.202***	-0.194***
	(0.057)	(0.056)	(0.056)	(0.059)
Observations	5,505	5,504	4,972	4,972
R-Squared	0.826	0.825	0.827	0.828

*Notes: *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively. Regressions include all controls listed in **Table A1** in addition to state fixed effects. Standard errors, clustered by state, given in parentheses.*

Our coefficient estimates for each variable are consistent across estimations. Informality, regardless of its definition, is negatively related to both measures of income across all specifications. These effects are consistent with the existing literature (Bologna 2016; Jahan, Bologna Pavlik, & Williams 2020). Further, our most general measure of institutional quality has a robust positive relationship with income across all specifications. This is also consistent with the vast literature concerning the effect of institutional quality on income (e.g. Acemoglu, Johnson & Robinson 2002; Rodrik, Subramanian & Trebbi 2004). In addition, the estimates are largely unaffected by the exclusion or inclusion of the alternative institutional measures. Similarly, the coefficient on land quality is consistent in size, positive, and significant regardless of the specification. The coefficient on the access to justice variable is consistent in size as well but is never statistically significant. Thus, all three coefficient estimates of our institutional variables are stable across all specifications. As a result, we focus on each institutional measure separately when estimating the conditional effect of informality for simplicity.

The Conditional Effect of Informality

The above estimates focus on the average effect of both institutions and informality on income. We now allow this effect to vary across each respective level. In other words, we estimate the following:

(3.2) $y_{ms} = \beta_0 + \beta_1 Institutional\ Quality_{ms} + \beta_2 Informal\ Size_{ms}$
$+ \beta_3 Informal\ Size_{ms} \times Institutional\ Quality_{ms} + \theta^I X_{1ms} + \gamma^I_s + \varepsilon^I_{ms},$

where all is defined in **Equation (3.1)** with the additional inclusion of an interaction term between informality and institutional quality. The marginal effect of informality, therefore, can be written as:

(3.3) $\dfrac{\delta y_{ms}}{\delta Informal\ Size_{ms}} = \beta_2 + \beta_3\ Institutional\ Quality_{ms}.$

Thus, the effect of informality explicitly depends on β_3 and the level of institutional quality. If β_3 is positive, this suggests that informality and institutional quality are complementary. The effect of informality increases in magnitude when formal institutions are higher quality. If β_3 is negative, this suggests that informality and institutional quality are substitutable. In this case, informality is less harmful when formal institutions are lacking. These results are presented in **Table 4** and **Table 5**. *Panel a* and *Panel b* within these tables are analogous to those presented in the baseline results of **Table 2** and **Table 3**.

TABLE 4. THE EFFECT OF INSTITUTIONS, INFORMAL SIZE, AND THEIR INTERACTION ON TOTAL INCOME PER-PERSON

Panel a: Informal Definition A

	(1)	(2)	(3)
Institutional Quality	0.040*		
	(0.021)		
Access to Justice		-0.008	
		(0.013)	
Land Equality			0.065
			(0.112)
Informal Size A	-0.105	-0.207***	-0.239***
	(0.120)	(0.044)	(0.083)
Interaction	-0.024	0.019	0.173
	(0.035)	(0.023)	(0.276)
Observations	5,505	5,504	4,972
R-Squared	0.913	0.913	0.916

Panel b: Informal Definition B

	(1)	(2)	(3)
Institutional Quality	0.059***		
	(0.020)		
Access to Justice		-0.003	
		(0.009)	

	(1)	(2)	(3)
Land Equality			0.126
			(0.093)
Informal Size B	0.088	-0.127**	-0.144
	(0.128)	(0.049)	(0.085)
Interaction	-0.067	0.014	0.061
	(0.042)	(0.020)	(0.264)
Observations	5,505	5,504	4,972
R-Squared	0.913	0.912	0.915

*Notes: *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively. Regressions include all controls listed in **Table A1** in addition to state fixed effects. Standard errors, clustered by state, given in parentheses.*

TABLE 5. THE EFFECT OF INSTITUTIONS, INFORMAL SIZE, AND THEIR INTERACTION ON WORKING INCOME PER-WORKER

Panel a: Informal Definition A

	(1)	(2)	(3)
Institutional Quality	0.001		
	(0.022)		
Access to Justice		-0.047**	
		(0.020)	
Land Equality			0.002
			(0.107)
Informal Size A	-0.401***	-0.339***	-0.380***
	(0.127)	(0.061)	(0.091)
Interaction	0.047	0.081**	0.481*
	(0.036)	(0.031)	(0.274)
Observations	5,505	5,504	4,972
R-Squared	0.827	0.827	0.828

Panel b: Informal Definition B

	(1)	(2)	(3)
Institutional Quality	0.050**		
	(0.022)		
Access to Justice		-0.034**	
		(0.014)	
Land Equality			0.222
			(0.144)
Informal Size B	-0.056	-0.242***	-0.208**
	(0.125)	(0.060)	(0.096)
Interaction	-0.040	0.074**	0.030
	(0.043)	(0.028)	(0.307)
Observations	5,505	5,504	4,972
R-Squared	0.826	0.826	0.827

*Notes: *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively. Regressions include all controls listed in **Table A1** in addition to state fixed effects. Standard errors, clustered by state, given in parentheses.*

As indicated in the tables, there is limited evidence of either complementarity or substitutability. Most interactive effects are either insignificant or contingent upon the definition of informality. The only exception to this is our access to justice variable. Access

to justice and informality appear to be complementary when looking at working income per-worker alone (**Table 5**). This result is particularly interesting given the results presented in **Table 3** and in Jahan, Bologna Pavlik, & Williams (2020). The effect of justice has no clear positive effect on working income per-worker and seems to have a negative effect on informal income specifically (see Jahan, Bologna Pavlik, & Williams 2020). This suggests that justice is particularly harmful to informal workers and may proxy for general enforcement. This could also be due to corruption within the courts themselves. The results of **Table 5** refine this idea. When informality is sufficiently large, increased access to justice has a positive effect on working income per-worker. This could indicate that when a municipality relies heavily on informality, informality is more likely to be permitted, and the focus of the judicial system is on more productive issues.[18] When the municipality is less reliant on informality, the focus may be more so on enforcement.[19] In other words, the size of the informal sector may be indicative of the relative focus of the judicial system.

Despite this access to justice result, the inconsistency here is surprising. Especially given the consistent positive effects uncovered in **Tables 2** and **3**. We therefore explore whether the substitutability or complementarity of formal institutions and informality depends on municipal size in the following section.

The Conditional Effect of Informality across Population Size
We now allow the interaction effect to vary across population size. We do this by re-estimating *Equation (3.2)*, but additionally include all relevant two-way interactions between informality, formal institutions, and (logged) population as well as a three-way interaction between the three variables. Therefore, the marginal effect of informality is now a function of both population size and institutional quality. We present the marginal effect of informality at varying levels of both variables in **Table 6a** through **Table 7b**. The left panel of each table shows the marginal effect of informality conditional on levels of each institutional quality measure when population is at its minimum (in logged form); analogous results are presented on the right when population is at its maximum.

TABLE 6A. THE CONDITIONAL MARGINAL EFFECT OF INFORMAL SECTOR SIZE A ON TOTAL INCOME PER-PERSON ACROSS DIFFERENT VALUES OF INSTITUTIONAL QUALITY, HOLDING POPULATION FIXED AT MIN AND MAX VALUES

Institutional Quality Index	Minimum Logged Population (= 6.678)			Maximum Logged Population (= 16.161)		
	Index Value	*dy/dx*	*p*-value	Index Value	*dy/dx*	*p*-value
Minimum	1	-0.647	0.003	1	1.226	0.025
Median	3	-0.223	0.011	3	-0.084	0.786
Maximum	4.9	0.180	0.170	4.9	-1.331	0.005
Access to Justice Index	Minimum Logged Population (= 6.678)			Maximum Logged Population (= 16.161)		
	Index Value	*dy/dx*	*p*-value	Index Value	*dy/dx*	*p*-value
Minimum	0	-0.402	0.000	0	0.349	0.405
Median	1	-0.209	0.019	1	-0.041	0.908

	3	0.176	0.297	3	-0.823	0.034
Maximum						

	Minimum Logged Population (= 6.678)			Maximum Logged Population (= 16.161)		
Land Equality Index	Index Value	dy/dx	p-value	Index Value	dy/dx	p-value
Minimum	0.056	-0.255	0.090	0.056	-0.072	0.849
Median	0.179	-0.184	0.034	0.179	-0.265	0.379
Maximum	1.000	0.287	0.659	1.000	-1.550	0.292

*Notes: Regressions are analogous to **Table 4 panel a** with the additional inclusion of all two-way interactions between population, institutional quality, and informality. Regressions also include all controls listed in **Table A1** in addition to state fixed effects. Standard errors, clustered by state, given in parentheses.*

TABLE 6B. THE CONDITIONAL MARGINAL EFFECT OF INFORMAL SECTOR SIZE B ON TOTAL INCOME PER-PERSON ACROSS DIFFERENT VALUES OF INSTITUTIONAL QUALITY, HOLDING POPULATION FIXED AT MIN AND MAX VALUES

	Minimum Logged Population (= 6.678)			Maximum Logged Population (= 16.161)		
Institutional Quality Index	Index Value	dy/dx	p-value	Index Value	dy/dx	p-value
Minimum	1	-0.521	0.036	1	1.563	0.019
Median	3	-0.242	0.015	3	0.264	0.402
Maximum	4.9	0.024	0.876	4.9	-0.970	0.029

	Minimum Logged Population (= 6.678)			Maximum Logged Population (= 16.161)		
Access to Justice Index	Index Value	dy/dx	p-value	Index Value	dy/dx	p-value
Minimum	0	-0.446	0.001	0	0.908	0.052
Median	1	-0.270	0.013	1	0.436	0.237
Maximum	3	0.081	0.584	3	-0.507	0.152

	Minimum Logged Population (= 6.678)			Maximum Logged Population (= 16.161)		
Land Equality Index	Index Value	dy/dx	p-value	Index Value	dy/dx	p-value
Minimum	0.056	-0.129	0.333	0.056	0.021	0.951
Median	0.179	-0.187	0.030	0.179	0.072	0.798
Maximum	1.000	-0.577	0.203	1.000	0.416	0.756

*Notes: Regressions are analogous to **Table 4 panel b** with the additional inclusion of all two-way interactions between population, institutional quality, and informality. Regressions also include all controls listed in **Table A1** in addition to state fixed effects. Standard errors, clustered by state, given in parentheses.*

TABLE 7A. THE CONDITIONAL MARGINAL EFFECT OF INFORMAL SECTOR SIZE A ON WORKING INCOME PER-WORKER ACROSS DIFFERENT VALUES OF INSTITUTIONAL QUALITY, HOLDING POPULATION FIXED AT MIN AND MAX VALUES

Institutional Quality Index	Minimum Logged Population (= 6.678)			Maximum Logged Population (= 16.161)		
	Index Value	*dy/dx*	*p*-value	Index Value	*dy/dx*	*p*-value
Minimum	1	-0.926	0.000	1	1.288	0.028
Median	3	-0.347	0.002	3	-0.011	0.976
Maximum	4.9	0.202	0.156	4.9	-1.245	0.024

Access to Justice Index	Minimum Logged Population (= 6.678)			Maximum Logged Population (= 16.161)		
	Index Value	*dy/dx*	*p*-value	Index Value	*dy/dx*	*p*-value
Minimum	0	-0.525	0.001	0	0.212	0.640
Median	1	-0.291	0.008	1	-0.080	0.841
Maximum	3	0.176	0.343	3	-0.663	0.169

Land Equality Index	Minimum Logged Population (= 6.678)			Maximum Logged Population (= 16.161)		
	Index Value	*dy/dx*	*p*-value	Index Value	*dy/dx*	*p*-value
Minimum	0.056	-0.537	0.003	0.056	0.286	0.544
Median	0.179	-0.336	0.002	0.179	-0.151	0.673
Maximum	1.000	1.006	0.185	1.000	-3.067	0.104

*Notes: Regressions are analogous to **Table 5 panel a** with the additional inclusion of all two-way interactions between population, institutional quality, and informality. Regressions also include all controls listed in **Table A1** in addition to state fixed effects. Standard errors, clustered by state, given in parentheses.*

TABLE 7B. THE CONDITIONAL MARGINAL EFFECT OF INFORMAL SECTOR SIZE B ON WORKING INCOME PER-WORKER ACROSS DIFFERENT VALUES OF INSTITUTIONAL QUALITY, HOLDING POPULATION FIXED AT MIN AND MAX VALUES

Institutional Quality Index	Minimum Logged Population (= 6.678)			Maximum Logged Population (= 16.161)		
	Index Value	*dy/dx*	*p*-value	Index Value	*dy/dx*	*p*-value
Minimum	1	-0.645	0.011	1	1.650	0.023
Median	3	-0.393	0.002	3	0.480	0.203
Maximum	4.9	-0.154	0.385	4.9	-0.631	0.203

Access to Justice Index	Minimum Logged Population (= 6.678)			Maximum Logged Population (= 16.161)		
	Index Value	*dy/dx*	*p*-value	Index Value	*dy/dx*	*p*-value

Minimum	0	-0.623	0.001	0	1.042	0.054
Median	1	-0.406	0.003	1	0.617	0.161
Maximum	3	0.029	0.856	3	-0.233	0.598

	Minimum Logged Population (= 6.678)			Maximum Logged Population (= 16.161)		
Land Equality Index	Index Value	dy/dx	p-value	Index Value	dy/dx	p-value
Minimum	0.056	-0.256	0.065	0.056	0.294	0.485
Median	0.179	-0.329	0.002	0.179	0.251	0.457
Maximum	1.000	-0.814	0.066	1.000	-0.032	0.983

*Notes: Regressions are analogous to **Table 4 panel a** with the additional inclusion of all two-way interactions between population, institutional quality, and informality. Regressions also include all controls listed in **Table A1** in addition to state fixed effects. Standard errors, clustered by state, given in parentheses.*

We now see a consistent pattern in our results. In all but one specification, the marginal effect of informality worsens with increased institutional quality when population is large. The marginal effects presented in the outlier specification are never statistically significant. Similarly, the marginal effect of informality improves with increased institutional quality when population is small. This is true for all but two specifications. In these two outlier cases, the significant effects are dominantly negative.

For our broadest measure of institutional quality, we see that the effect of informality at both extremes is significant with a large population across all but one specification. This implies that when formal institutions are low quality, informality is beneficial. However, once formal institutions improve beyond a specific threshold, increases in informality become detrimental to development. This pattern holds, though to a lesser extent, for the other two institutional measures as well. Thus, informality and institutional quality appear to be substitutable in large municipalities. On the contrary, when population is small, informality and institutional quality appear to be complementary. However, in this latter scenario the positive effect of informality is never statistically significant for any of our measures of institutional quality.

While all three measures show consistent patterns across population sizes, it is important to relate these three-way interactive results to the two-way results uncovered in the conditional effect of informality section. All three measures of institutional quality yield a pattern of substitutability in large areas. However, only specifications with the general institutional quality index have statistically significant coefficients of opposing signs at either end of the quality spectrum. Moreover, these effects are much larger in magnitude than in the smaller population case. In addition, with few exceptions, in specifications with the distribution of land and access to justice measures the marginal effect of informality is statistically significant only in smaller areas. This aligns with the negative two-way interactive effect for our general institutional measure and the positive two-way interactive effect for the latter two measures found in **Tables 4** and **5**. Thus, our results suggest that the interactive relationship between formal institutions and informality depends on the size of the area and, consequently, the informal networks that are present.

CONCLUSIONS

Developing countries are characterized by large informal sectors. The effect of this informal production on economic output, however, is unclear. While many view the informal sector as a less-productive, second-best option to formal work (La Porta and Shleifer 2008; 2014; Hsieh and Klenow 2009), others argue that informality offers a beneficial escape for productive individuals that would be otherwise constrained by inefficient formal institutions (de Soto 1989). Recently, Ulyssea (2018) found that reducing formal sector entry costs and payroll taxes significantly improved welfare, suggesting that this latter view may be the most relevant. We aim to generalize the results of Ulyssea (2018) by examining the *conditional* effect of informality on development.

Utilizing data from 5,505 municipalities in Brazil, we estimate the effect of informality on income per-capita, conditional on institutional quality. We subsequently allow this effect to vary according to population size. This latter estimation yields our most robust and consistent result. Formal institutions and informal production tend to be substitutable in areas with large populations, and complementary in small localities. These results are robust across our institutional quality and informality measures and are robust to the inclusion of a wide range of controls. These patterns hold in all but three (out of twenty-four) specifications. In these outlier specifications, the marginal effect of informality is either wholly insignificant or dominantly negative across the board. Overall, our results suggest that informality in smaller locales signals a strong cohesive network that complements formal institutional arrangements. The total effect of informality in these small economies, however, is never positive and significant.[20]

When focusing only on the institutionally conditional effect of informality on income, our results are seemingly inconsistent. More specifically, when forcing the conditional effect to be identical across population sizes, our results depend on the measure of institutional quality employed. For our general institutional quality index, the relationship seems to be substitutable. For our *de facto* distribution of power and rule of law measures, the relationship seems to be complementary. However, once population is incorporated, we begin to understand this apparent inconsistency. While all three measures show a pattern of substitutability in large areas, only specifications with the general institutional quality index have statistically significant coefficients of opposing signs at both ends of the quality spectrum. It may be that the average (two-way) relationship is substitutable for our general institutional quality measure because this type of governance is especially important in large locales, making the substitutability effect dominant. Similarly, the distribution of land and access to justice measures are mostly statistically significant in smaller areas alone. Thus, access to justice and the distribution of power may be relatively more important in smaller municipalities. Taken together, the inconsistency of our two-way results highlights the importance of population size.

Our results contribute to the informality-development debate. In large localities, informality acts a substitute to formal institutions. Therefore, having a large informal sector in municipalities with low quality institutions may spur development. In a majority of cases, our estimated coefficient for informality is positive and statistically significant in the largest areas with the worst institutions. This finding supports the de Soto (1989) view. However, we also find that informality and institutions are complementary in small municipalities. This suggests that our informal measures may be proxying for an

unobservable cultural factor. As such, our results also contribute to the vast literature linking formal with informal institutions (Williamson 2009; Williamson and Kerekes 2011) and culture more generally (Alesina and Giulano 2015; Gorodnichenko and Roland 2017). Small areas with a large informal dependence seem to have informal networks that complement existing formal institutions. It may be that informality in these smaller markets fosters the trust necessary for formal institutions to function effectively (Nooteboom 2007). In large municipalities, however, formal institutions may be necessary to cultivate trust. In this latter case, informality may only be beneficial when these formal institutions are overly burdensome. Given the economic importance of cultural factors like trust (Zak and Knack 2001), these findings highlight the role of informal markets in development outcomes.

We emphasize here that our emphasis is on the *differential* effect of informality, not the *total* effect. This differential effect is less tainted with endogeneity concerns. For example, while the number of potential omitted variables that could underlie the total effect of informality is vast, there are fewer candidates that could explain away the different patterns revealed across population sizes. Nonetheless, these results should not be interpreted as causal. Further research concerning identification is warranted. In addition, given the differential effect of informality in small locales, we hope future researchers explore the cultural component of informal networks across population size. Our results suggest that the cohesiveness of informal networks depends on the size of the region. An interesting future analysis would be to examine the relationship between informality and different aspects of informal institutions using experimental evidence as a basis of measurement as suggested by Voigt (2018).[21] It would then be interesting to test if the uncovered effect varies across municipal size.

APPENDIX

TABLE A1. VARIABLE NAMES AND BRIEF DESCRIPTIONS OF ALL INCLUDED COVARIATES

Other Controls Included in All Regressions

Variable Name	Brief Description
Population	Number of people (enters regression in logged form).
Density	People per square kilometer (in thousands; enters regression in logged form).
Urban	% of population that lives in an urban area.
Distance	Cost of transport distance index to Sao Paulo.
Male	% of population that is male.
Schooling	Avg. years of schooling for individuals aged 10 plus.
Literacy Rate	% of population aged 10 plus that is literate.
Teenager	% of population aged 10 - 19 years old.
Working Age	% of population aged 20 - 59 years old.
Retirement Age	% of population aged 60 plus years old.

Self	% of income earning workforce that are self-employed.
Employer	% of income earning workforce that are employers.
Employed without Pay	% of workforce that is employed without income.
Unemployed	% of adult working age population that are unemployed.

Industry Composition Measures[1]

Agriculture	% of employment in the agricultural, forestry, and logging industries.
Fishing	% of employment in the fishing industry.
Mining & Extractive	% of employment in extractive industries (e.g., mining).
Manufacturing	% of employment in manufacturing industries.
Utilities	% of employment in electricity, gas, and water.
Construction	% of employment in construction industries.
Retail Trade	% of employment in trade in goods industry.
Accommodation	% of employment in the accommodation or recreation industry.
Transportation	% of employment in transportation, storage, and communication industries.
Finance	% of employment in finance, insurance, and related services industries.
Professional Services	% of employment in professional services (e.g. real estate) industry.
Public Administration	% of employment in public administration, defense, and social security industries.
Education	% of employment in health and social services industries.
Health Services	% of employment in education services industry.
Other Services	% of employment in other services industry.
Domestic services	% of employment in other community, social, or personal services industries.

Notes: All data is derived from the 2000 Census (either the random sample or the universe) except for land area (used in density calculation) and distance; these variables come from IPEA data.
[1] International services are the excluded industry controls.

TABLE A2. VARIABLES NAMES AND SUMMARY STATISTICS OF ALL INCLUDED COVARIATES

Other Controls Included in All Regressions

Variable Name	Mean	Std. Dev.	Min.	Max.
Population	30,833	186,751	795	10,400,000
Density	98	534	0.132	12,916
Urban	0.588	0.233	0.016	1.000
Male	0.508	0.014	0.460	0.603
Distance	1076	445	0.000	2868
Schooling	4.449	1.192	1.178	8.911
Literacy Rate	0.801	0.116	0.409	0.992
Teenager	0.205	0.039	0.106	0.391

Working Age	0.481	0.051	0.309	0.612
Retirement Age	0.095	0.025	0.013	0.214
Self	0.326	0.147	0.034	0.935
Employer	0.021	0.016	0.000	0.161
Employed without Pay	0.165	0.155	0.000	0.884
Unemployed	0.362	0.096	0.010	0.782
Industry Composition Measures				
Agriculture	0.345	0.178	0.001	0.844
Fishing	0.009	0.032	0	0.468
Mining & Extractive	0.006	0.021	0	0.421
Manufacturing	0.103	0.089	0	0.708
Utilities	0.008	0.009	0	0.137
Construction	0.064	0.033	0	0.421
Retail Trade	0.113	0.050	0	0.425
Accommodation	0.044	0.024	0	0.291
Transportation	0.035	0.018	0	0.161
Finance	0.004	0.005	0	0.044
Professional Services	0.022	0.018	0	0.166
Public Administration	0.068	0.044	0.006	0.431
Education	0.067	0.033	0	0.329
Health Services	0.017	0.013	0	0.122
Other Services	0.009	0.006	0	0.065
Domestic services	0.076	0.034	0	0.306

Notes: All data is derived from the 2000 Census; except for land area (used in density calculation) and distance, these variables come from IPEA data. All employment share measures are calculated using individual level data and exclude "workers" who earn zero income by definition. The employed without pay variable is also constructed using individual level data. All other measures are constructed using the weighted sample data provided by the Census.

ENDNOTES

* We thank Joana Naritomi for generously sharing her data upon request.

[1] However, in this latter view, informal firms are assumed to be productive enough to compete with their more productive formal counterparts given the cost savings from informality.

[2] Ulyssea (2018) does not classify the welfare effects according to each view. He only categorizes firms into three groups according to their response to the elimination of entry costs into the formal sector and productivity levels.

[3] It is well-known that informal activity varies greatly within countries (e.g. Di Caro and Nicotra 2016), we can use this variation to estimate the effect of informal production on economic output.

[4] This is in line with the hypothesis that the benefit of formal institutions increases with the size of the population (Nakabashi, Pereira & Sachsida 2013).

[5] Here we mean costs to include all costs associated with formality (e.g. taxes, regulation, etc.), not just entry cost.

[6] If the costs of formality are high, but necessary due to a market failure, then not following these regulations and producing informally may benefit the firm but would result in a drain on the economy. If the costs of formality are inefficiently high, they may be unnecessary, making informal production relatively more beneficial for both the firm and the overall economy.

[7] For the education data, we use the weighted sample data provided by the Census. For employment and income variables, we use the average of the sample data from the Census instead of the weighted average. This is done because the sample weights are constructed on a household basis when considering the entire population. Our informality measures are derived from the working population alone.

[8] See Naritomi, Soares, & Assunção (2012), Bologna and Ross (2015), Bologna (2016), and Jahan, Bologna Pavlik, & Williams (2020) for other papers that utilize this index. Naritomi, Soares, & Assunção (2012), however, uses only one component of this index. We are focused on the aggregate measure.

[9] Our measure of the informal economy would not include the production of illegal drugs for example.

[10] The Brazilian government cannot use these responses to prosecute those that are in the informal sector of the economy due to a confidentiality agreement.

[11] Workers in the last three categories ("workers that produce for their own consumption" through "trainees without pay") earn zero income by definition. We are only concerned with the income earning workforce. We therefore exclude them from our informality definition. They are also excluded from our working income estimates, though their share of the workforce will be included as a control. Employers are also excluded from our definition of informality. They represent only two percent of the income earning work force and do not possess the same flexibility that informal workers have. They are, however, included in our working income estimates. All individuals, regardless of worker type, are included in our total income estimates.

[12] This definition is common in the literature (see, e.g., Boeri and Garibaldi, 2005; Bosch, 2006; Ulyssea, 2010).

[13] Military personnel and civil servants are employed without formal contracts. Because they do contribute to social security, however, they fall into the formal category by default. Those that are self-employed and contribute to social security are considered to be formal.

[14] This is inclusive of transfer payments, such as unemployment insurance and social security payments.

[15] Both measures are provided by the IPEA. The urban population estimate is derived from the 2000 Census total population survey.

[16] Full results are available upon request.

[17] These results are identical to those reported in Jahan, Bologna Pavlik, & Williams (2020).

[18] Note that we are holding the size of the informal sector constant; i.e. we are looking at only municipalities with equally large informal sectors. Thus, the positive effect cannot be due to increased enforcement of informality.

[19] In either case, the effect of justice on informal income specifically could still be negative. In the former, the positive effect on formal incomes would outweigh the negative effect on informal incomes.

[20] This is important to note precisely because it coincides with our priors. Informality on its own is not conducive to economic growth, but informality when institutional quality is high (and particularly in small, low population areas) can be.

[21] Voigt (2018) suggests using identical cross-country experiments to measure informal institutions such that the measure can be used for cross-country studies. Similar experiments could be conducted at a more disaggregated, subnational, level.

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