BLACK GOLD OR BLACK HOLE?

THE EFFECTS OF OIL ON THE INFORMAL ECONOMY

by

Leslie Stanaland

APPROVED BY SUPERVISORY COMMITTEE:

Jonas Bunte, Chair

Harold D. Clarke

Clint W. Peinhardt

Karl K. Ho

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To my amazing wife

for the support shown the past five years

I promise you'll never have to proofread again

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by

LESLIE STANALAND, BS, MA

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Leslie Stanaland, PhD
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Supervising Professor: Jonas Bunte, Chair

Does oil revenue enlarge or diminish the size of a country's informal economy? I examine the effects of oil revenue on informal economy size for all available countries and by studying the case of Ghana, which had little oil before a large find in 2007. I first construct an estimate of the informal economy using a confirmatory factor analysis modeling approach based on robust model runs and careful theoretical consideration. Then I analyze the domestic determinants of the informal economy and add to the literature by finding that oil revenues do negatively impact a country's informal economy through the rentier effect channel. This is to say that if taxes go down as a result of oil rents, the informal economy will grow larger. Next, I analyze foreign determinants and find the oil rents have a larger negative impact on the informal economy in countries with lower levels of industrialization. I augment these findings with a case study of Ghana, and use process tracing and qualitative methods to analyze the oil find's effects on the Western Region. The relationship between a country's oil rents and its informal economic activity has not been studied to this point, and these results can help policymakers understand and prevent oil rents from creating a larger informal economy. Utilizing exogenous variation in oil revenues, I find strong support for my hypothesis.

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CHAPTER 1

INTRODUCTION

1.1 Motivation for study

Governments use revenues gained through taxation to fund various public goods. Policy decisions regarding taxation are therefore of primary significance to any government - rates as well as goods and/or services taxed must be carefully considered. Taxing a good that is too popular may result in revolution, while taxing at too low a rate may not bring in required revenues.

The informal economy represents the portion of any country's economy whereby goods and services are bought and sold; however, the government does not collect the taxes due on that transaction because it is not officially recorded. It is important to note that activity in the informal economy does not mean criminal activity; most informal activity is the legal selling of legal goods. If a country's informal economy becomes too large, the lack of tax revenues would cause immediate problems with service provision, potentially leading government to borrow money or devalue their currency to pay its bills.

For the individuals engaging in the informal economy to provide for themselves and their families, there may be quality of life issues - they may have to work longer hours or their known status as one carrying cash may make them a target for thieves. This study will stipulate the idea that people engaging in the informal economy is a better proposition than a life of crime; however, if engagement in the informal economy leads to lower government revenues and lower quality of life, this is an area of policy that should be evaluated and studied.

As to citizen well-being, it can safely be assumed that people engaging in the informal economy lack such benefits as job protection, insurance, or any other benefits provided by working in the formal economy; those in the informal economy have lower life expectancies

(Kireenko and Nevzorova, 2015), larger levels of earnings inequality (Krstić and Sanfey, 2011), especially among females (Cassirer and Addati, 2007), as well as lower wages (ILO 2002). Employment in the informal economy could then, given this evidence, suggest that policymakers ought to work to reduce such activity.

Likewise, the effects that natural resources, specifically oil, have on a country's domestic economy are also pertinent to understanding why a country may be doing relatively well or poorly. The resource curse literature seeks to explain why oil rents, instead of making a country richer and/or better, instead end up many times doing the opposite.

This work attempts to analyze the domestic and foreign determinants of the informal economy with an emphasis on the effects of oil. The natural resources literature posits that instead of making a country richer and/or better off because of the resource, it actually makes a country poorer and/or worse off.

Puzzle Informal economy sizes are quite varied, although they have started slowly converging over the past 20 years. Figure 1.1 shows average informal economy size across continents from 1950 to 2010. Of particular note is the number of outliers on the small and large side throughout Africa, as well as the large variation within Asian countries. Why is there such a large variation?

Using data taken from the World Bank, Table 1.1 compares Turkey and Tunisia, two countries similar in several respects, including remittance levels, corruption, government effectiveness, and Human Development Index scores. The last three variables especially can serve as *ceteris paribus* conditions that allow further questioning as to the effect that oil may have on the informal economy of those countries. They have a statistically significant difference in their informal economy activity as calculated by my model described in Chapter 2; they also have significantly different levels of oil rents. Results show that Turkey has lower levels of informal activity than Tunisia, yet Tunisia has a higher percentage of their GDP

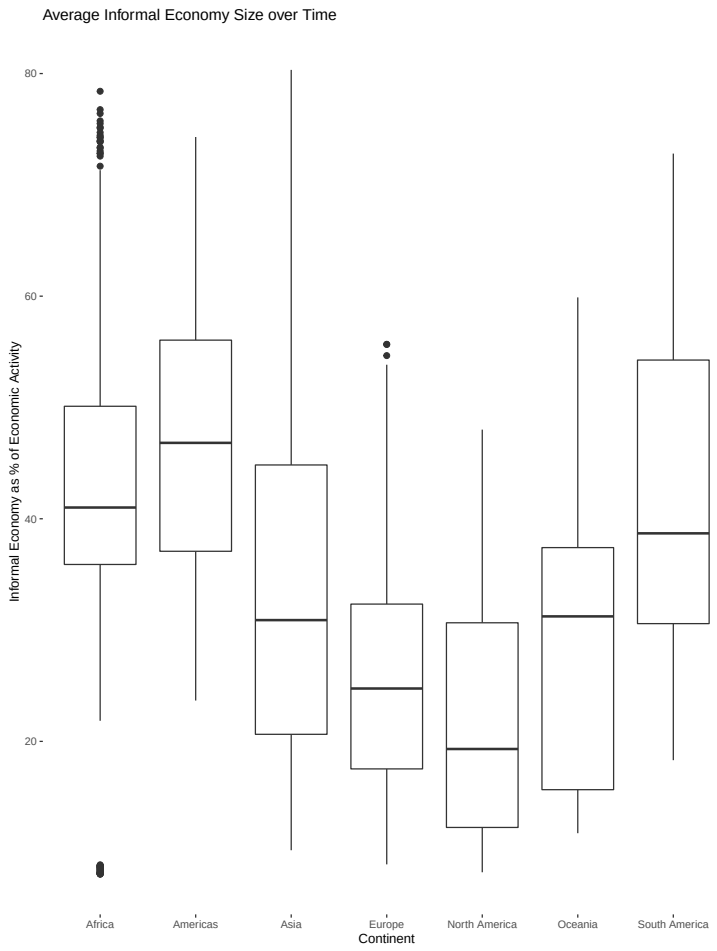

Figure 1.1. Average Informal Economy Size, 1950-2010

coming from oil rents. Given the other similarities, this incongruence begs the questions regarding the impact that oil may have on informal activity.

Table 1.1. T-test comparison between Turkey and Tunisia

Metric	Turkey	Tunisia	|t-statistic|
IE est.	-.066 (.004)	-.038 (.006)	3.68
Oil Rents (% of GDP)	.092 (.005)	3.54 (.328)	10.48
Remittances (logged)	21.27 (.104)	21.20 (.079)	.54
Corruption	-.059 (.044)	-.095 (.045)	.57
HDI	.720 (.010)	.699 (006)	1.65
Gov't Effectiveness	.209 (035)	.244 (071)	.44

1.2 Normative Significance

Informal economic activity in a country presents a challenge for policymakers along the following lines: it is difficult to quantify and its effects overall are negative. Described throughout the literature as "informal" (Gërxhani, 2004; Schneider and Enste, 2000), "underground" (Tanzi, 1999), or "irregular" (Feige, 1979), these different names underscore the various effects certain activities can have on the economy. For this study, I take Schneider and Enste (2000)'s definition; the informal economy is comprised of otherwise legal activities that if recorded and taxed appropriately, would contribute to GDP, which implies that criminal activities are outside the scope of this work.

Challenges faced by policymakers include a reduction of tax revenue as well as the well-being of their citizenry. As to the first issue, given that states require tax revenues to provide public services, any economic activity that occurs such that taxes are not collected represents a loss for the government, leading to a loss of effectiveness (Eubank 2012). Also, since government spending is a component of GDP, any downward pressure on its spending capacity would negatively impact economic growth (Schneider 2005).

However, it could be the case that there is nothing wrong with informal activity; it is preferable to starvation or outright illegal activity. Studies that suggest the positive aspects of engaging in the informal economy (La Porta and Shleifer, 2014; Webb et al., 2009; Thomas, 1999) do so along the lines of familial support: some job is better than no job, so if formal opportunities do not exist, especially for the more vulnerable members of society, then working to provide for themselves and their family, regardless of work conditions, is preferable for the state. This paper does not seek to answer the question of whether or not the informal economy is a "good" or "bad" thing, but rather a question of political economy that exists and should be dealt with in some manner.

It could possibly be the case that employment in the informal economy is not a policy problem; rather, employment in any form is preferable to not working. It could be the case

that since the informal economy is so difficult to measure, any findings ought to be compared to the counterfactual of someone not working at all. If seen in that way, Fleming et al. (2000) describe a system in which informal economic activity may be preferable, especially in the field of unregulated entrepreneurial activity (Webb et al., 2009). Along similar lines, if "measurement without theory" (Koopman 1947) can explain the state of the informal economy literature, then its study may be without accurate policy advice (Thomas, 1999).

On the other hand, engagement by people in the informal economy could be a potential warning sign to policymakers along several lines. First, since the transactions are not officially recorded and are conducted in cash, governments are not able to tax those transactions as would occur if done through official channels. Purchasing a product in a store, even in cash, would be recorded as official as taxes would be collected by the merchant; buying that same product from a neighbor would not. Second, the effects of a high informal economy can result in lower economic growth and the disintegration of social cohesion (Eilat and Zinnes, 2002); concurrently, a higher level of informal economy is related to higher levels of corruption (Buehn and Schneider, 2012). On various quality of life metrics, Kireenko and Nevzorova (2015) found that a higher informal economy has deleterious effects on a healthy life as well as access to knowledge. Also, Meyer et al. (2016) finds in a study of South African merchants that entry into the informal economy is not to explore opportunity, but rather is out of necessity. Secondly, people may be engaging in the informal economy because they believe the tax system is unfair, burdensome, or that the government is corrupt. If true, policymakers ought to address those claims and reform their policies or else the people's transactions would be driven further underground, resulting in more lost revenue. The negative impact of lost revenue on budgets should be obvious.

1.3 Theoretical Innovation

This work makes a theoretical contribution to the international political economy literature by using a strand of the natural resource literature, specifically the rentier effect strand (Mahdavy and Cook, 1970; Paler, 2013) to find it inverts one of the most consistently held findings in the informal economy literature. Namely, instead of lower tax burdens resulting in a smaller informal economy, I find that oil rents distort the domestic tax situation such that a lower dependence on taxes will lead to an *increase* in the informal economy.

In essence, introduction of oil rents lead to a lower dependence on tax revenues under the idea that governments will use the rent as a substitute for domestic taxation. After all, a government may have good reasons to not tax their own citizens. However, an ancillary effect of the oil rent windfall is that the government loses its desire to enforce existing tax laws (Polinsky and Shavell, 1992), and once people realize their government will not punish them for either tax avoidance or evasion, they may be more likely to engage in the informal economy.

Furthermore, the rentier effect argues that institutional controls may be lessened, and that democracy could even be impacted by the introduction of the oil rents. If true, we would expect accountability, defined as the government watching itself and also the people watching government activity, to go down. This results in a country with ever-increasing strains on civil society as the links which connect the social contract begin to fray.

1.4 Empirical Innovation

A large strand of the informal economy literature is devoted to estimating its size and/or effects. After all, how does one estimate a phenomena that is not measured? Informal activities by definition are not recorded; therefore, different methods of estimation have been devised, used, and critiqued throughout the years. Chief among them are direct methods such

as household or business surveys (Isachsen and Strøm, 1985; Autio and Fu, 2015). Indirect methods include the electricity demand approach (Kaliberda, 1996; Dobozi and Pohl, 1995), the currency demand approach (Tanzi, 1999; Alm and Embaye, 2013), and the structural modeling approach (Schneider and Enste, 2000; Schneider et al., 2010). All methods have strengths and weaknesses, which will be outlined and discussed further in Chapter 2.

I add to the measurement literature by using theory and measurement fit statistics to construct a latent variable using confirmatory factor analysis to create a metric of informal activity. My approach creates a parsimonious model with a solid theoretical foundation.

Furthermore, currency demand estimates traditionally used in the structural equation modeling approach use a ratio of liquid currency, M0, to either the M1 or M2 money supply. However, I specifically model currency demand based on other factors such as inflation and the interest rate to get a better estimate of currency demand.

1.5 Preview of Findings

This work tests six competing hypotheses: one, that tax rates will have a positive effect on a country's informal economy; as the rates increase, people will engage in more informal behavior to avoid those taxes (Buehn et al., 2018; Cebula, 1997). Two, as government effectiveness goes up, the informal economy will shrink since both people and entrepreneurs will abide by laws if they are enforced fairly and without discrimination (Webb et al., 2009; Alm and Torgler, 2006; Frey and Torgler, 2007). Three, that remittance levels (Martinez et al., 2015; Gupta et al., 2009) will lead to a larger informal economy since they represent another type of windfall. Lastly, the effects of imports and exports can theoretically affect the informal economy; as imports go up, the resulting dearth of cash would make for a smaller informal economy, while exports would have the opposite effect.

However, these variables do not account for a major revenue stream for many countries: natural resource rents and foreign direct investment in the oil industry. Can countries ignore

the informal economy and its subsequent effects on tax revenue if resource rents continue to fill the public coffers? This research then is an attempt at bringing two distinct literatures together: the determinants of the informal economy and the effects of natural resources on public finance. The informal economy literature ignores economic and industrial makeup and instead focuses on individuals, while the natural resource literature is divided on why some countries suffer a "resource curse" (Sachs et al., 1995) while others do not. My thesis suggests that resource revenue, both in the form of oil rents and oil foreign direct investment, plays an indirect role in the informal economy: as resource revenue gets larger, the informal economy gets larger as well. The causal mechanism regarding oil rents is through the rentier effect; governments use oil rents a substitute for tax revenues which therefore leads to deleterious effects on government accountability and a desire to enforce tax laws, leading to a belief among the people that activity in the informal economy will not be punished.

This study contains six chapters, including this introduction. Chapter 2 constructs a latent variable of informal economic activity using confirmatory factor analysis, which is used in the fields of education and psychology to estimate unobservable phenomena. Chapter 3 analyzes the domestic determinants of the informal economy and specifically tests my causal mechanism. Chapter 4 does the same to foreign determinants, and Chapter 5 is a case study of Ghana, a country in which there was no appreciable oil production from 1957 until 2010, then relatively large levels of production afterward. This case allows me to test my central claims on a within-case basis, and Chapter 6 concludes by restating the central findings of the research.

CHAPTER 2

MODELING THE INFORMAL ECONOMY

2.1 Empirical Approach

The central purpose of this chapter is to methodically ascertain which variables ought to belong as indicator variables in the construction of the latent variable that will serve as the estimate for informal activity. Questions regarding how to best estimate the informal economy persist; direct methods such as household and business surveys compete with indirect estimation methods such as electricity or currency demand. The latest approach has been to take the hidden aspect of informal activity and turn it into a strength: structural equation modeling can be used to estimate a latent variable such as informal activity.

My approach differs as I take the first component of the full SEM approach, confirmatory factor analysis, and generate a robust set of indicator variables using theory and model fit techniques to get a good construct of the variables most likely to indicate informal activity.

The central difficulty in studying the informal economy is that it is comprised of economic transactions that by definition are not formally accounted. Cash payments for goods and services without receipt as well as various types of unreported income occur in all societies; however, those are not the only informal activities that can occur. Schneider (2005) use the following table to categorize informal activities into legal and illegal as well as monetary and non-monetary arenas; this research will only focus on the lower left hand quadrant of the graphic. Since this research will be using currency demand as a principle component of the informal economy estimate, only monetary transactions will be analyzed; furthermore, one of the observable metrics that will ultimately comprise the latent construct of the informal economy will be a country's rule of law measure. The goal therefore is to see what effect oil will have informal characteristics such as unreported income and the distortions that may occur to wage and salary structures. There is no theoretical reason for oil rents, as

an example, to have an effect on prostitution or gambling, but it may have an effect on self-employment.

Table 2.1
A taxonomy of types of underground economic activities

Type of activity	Monetary transactions		Non-monetary transactions	
Illegal activities	Trade with stolen goods; drug dealing and manufacturing; prostitution; gambling; smuggling; fraud; etc.		Barter of drugs, stolen goods, smuggling etc. Produce or growing drugs for own use. Theft for own use.	
	Tax evasion	Tax avoidance	Tax evasion	Tax avoidance
Legal activities	Unreported income from self-employment; Wages, salaries and assets from unreported work related to legal services and goods	Employee discounts, fringe benefits	Barter of legal services and goods	All do-it-yourself work and neighbor help

Structure of the table is taken from Lippert and Walker (1997, p. 5) with additional remarks.

Figure 2.1. Description of Informal Economy Activities

Measuring the unobservable Challenges to studying the informal economy lie in its empirical issues. Variable choice, as well as design choice, will all play a role in estimating an activity that by definition cannot be directly measured. We expect then estimates that could vary quite wildly. For example, one can construct a latent variable of the informal economy in which currency demand was held constant at +1 (construct 1) under the assumption that an increase in currency demand is evidence of increasing informal activity. To this model GDP growth and rule of law would be added. A second model could also be constructed in which GDP growth is held constant at -1 (construct 2) on the assumption that a growing formal economy would be an indication that the informal economy is shrinking. To that model is added a rule of law metric and currency demand. A comparison of these two models is given in Table 2.1.

We can clearly see that the mean across all country-year units of analysis as well as the standard deviation are quite different. These divergent results occur from using the

Table 2.1. Summary statistics of theoretical approaches to modeling

Variable	Mean	Std. Dev.
IE construct 1	-0.042	0.224
IE construct 2	0.038	0.198
N	3411	

same indicator variables; the only difference was which one got held constant to allow for model convergence and at what value it was held. Adding other indicator variables and/or altering which one was held constant would likewise create vastly different constructs. For any given country, if the indicator variables were the same, but one was held to -1 while the other model another variable was held at +1, the resulting predictions should be similar in absolute value terms. For example, in Chapter 1 the estimate for the informal economy in Turkey when currency demand was held to +1 was -.066, while a second construct in which GDP growth was held to -1 lead to an estimate of .063. For this reason, this chapter will carefully ascertain why the given indicators should be held constant and at what value.

My construction The model I ultimately choose for this paper will include a measure of currency demand since it is a dominant factor within the literature (Tanzi, 1983; Schneider and Enste, 2000; Alm and Embaye, 2013; Dybka et al., 2018; Nchor and Konderla, 2016) and even those who adopt the structural modeling approach traditionally use currency demand as an indicator variable (Buehn and Schneider, 2012; Macias and Cazzavillan, 2010; Alañon and Gomez-Antonio, 2005; Schneider, 2005). However, each approach currency demand differently, and I will add to the literature by modeling currency demand as opposed to using a more traditional metric as $\frac{M0}{M2}$. To do this, I use as a starting point Mankiw and Summers (1986)'s model that suggests currency demand is a function of inflation, consumption, and the interest rate. Furthermore, I will construct two different confirmatory factor models by using the predicted values of the currency demand equation as one variable and then create a second by subtracting the observed currency demand from the modeled demand. This

second approach will get the level of "excess cash" in an economy that can serve as a metric for informal activity.

Second, I use a rule of law metric as the second indicator in the construction of the latent variable. This perceptions index is used as an indicator because it reflects the overall milieu in which all economic and political activity take place. For example, a person operating in the informal economy does so because they perceive a lack of property rights or unequal enforcement of theft laws. Lastly, the rate of GDP growth is used in my measurement model as an indicator of informal activity since it is likely that some informal activity will nonetheless wind up being calculated in the formal economy metric (Schneider et al., 2010); however, GDP per capita is not as useful a metric on the indicator side since it is a function of population.

This approach to measuring the informal economy is an improvement over existing models because it is a parsimonious model which will allow for maximum country-year coverage. Given that World Bank data is unfortunately incomplete for many countries (and various multiple imputation methods are unsuccessful), adding more variables to a latent construct will result in larger data loss, creating a less representative result. Furthermore, the more spread there is between the means and standard deviations of the variables will lead to difficulty, perhaps impossibility, in convergence. Also, additional variables on the indicator side lead to theoretical questions about whether they belong on the indicator or predictor side. For example, Schneider et al. (2010) constructs a model that uses GDP per capita as an indicator, yet Dreher and Schneider (2010) uses it as a predictor. The theoretical direction is ultimately unclear; therefore it should be left out. The theory of choosing currency demand as an indicator is clear. Even though excess cash may be used in the formal economy, the basis of informal economic transactions is cash since it is untraceable whereas purchases made with cards is recordable.

The remainder of the paper is organized as follows: section 2.2 reviews the various modeling approaches as well as their strengths and weaknesses, leading to an understanding

of why researching the informal economy is such an interesting and daunting task. section 2.2 discusses the inner workings of the structural equation modeling approach, and section 2.3 discusses variable choice. section 2.4 discusses the model builds and analyzes the findings, while section 2.5 concludes.

2.2 Modeling the Informal Economy - A Difficult Task

The academic literature on the informal economy has grown since the 1970s along two distinct lines of inquiry: first, how is it measured and second, what effects does it have on the formal economy? After all, turning observable something that by definition is unobservable is quite a challenge. Attempting to estimate underground economic activities has been attempted using direct surveys, modeling currency demand, modeling electricity consumption, and using latent factor analysis. While all of these approaches have strengths and weaknesses, they can be used to build a more appropriate model that can better estimate the level of informal economy.

Direct Survey Approach One attempt to estimate a phenomenon that is empirically unobservable is the survey. Isachsen and Strøm (1985) seek to understand tax evasion, and their study builds upon their theoretical model set forth in their 1980 paper. They argue that surveys are a better measure than statistical tools, but as Schneider and Enste mention in their classic paper (2000), the downward bias of an estimate of underground behavior is to be expected. In essence, Isachsen and Strøm ask people to admit engaging in informal activity. We would expect that people would be unwilling to admit to such behavior, even if legal. A more modern survey approach is used by Autio and Fu (2015) when they suggest entrepreneurs should be asked about business decisions they make based on the relative strength of the economy.

However, while the entrepreneurship literature can help us understand the various institutional factors that cause a business to go underground (Williams and Nadin, 2010; Djankov

et al., 2002), it does not offer estimates of the informal economy, nor are business size or what the employees of such firms do with their pay taken into account. Direct survey methods, following in the modern vein of IPE research, seek to leverage individual level data for a more complete picture. But in the case of the informal economy, the direct survey method can better explain *why* people enter into the informal economy, but cannot help measure the phenomena itself.

The key strength of the direct method is that it attempts to measure at a more individual level the decision to engage in the informal economy. This is after all the ostensible goal: to find why people engage in the informal economy. Asking them is a good approach to finding that information. However, it is more appropriately used in a case study context instead of a more aggregated country-year unit of analysis context. Therefore, direct survey approaches can help us better understand particular cases, but not general ones. Also, the downward bias of the estimates given by the survey approach can help give a lower-end estimate, but in all does not adequately or fully cover the extent to which the informal behavior may be occurring. Measurements using available metrics, if warranted by theory, may better serve as estimators. Indirect approaches should remove the downward bias and offer a better measurement.

Indirect Approaches

Electricity Consumption Method

If directly asking individuals if they engage in the informal economy is biased, then indirect approaches may better approximate the informal economy. A particularly novel approach to estimating the informal economy is done by the electricity consumption method. Kaliberda (1996) theorize that the informal economy can be estimated by comparing the growth of GDP and the growth of electricity consumption. If a ratio can be created between the two variables,

then any divergence of electricity consumption above what is accounted for with GDP growth must, in their estimation, be a result of the informal economy. This conclusion can be reached because the consumption of electricity and GDP growth has an elasticity of one (Dobozi and Pohl, 1995), and this result is robust for both developed and developing countries (Heath and Jones, 2013). This is a unique and "outside the box" approach to solving the estimation problem and it can help better estimate activity in developed countries; furthermore, Medina and Schneider (2018) use it to calibrate their SEM approach in creating new estimates for informal economy size.

Main critiques of this approach, detailed in Schneider and Enste (2000), are that as energy sources get more efficient, there could a reduction of usage even as informal activity increases. Furthermore, not all informal activities require electricity. This concern is especially pertinent if there is a fundamental difference in informal economic activities among countries; if a large component of a country's informal economy is daytime bazaars for example, then this method would not pick up that activity. If, on the other hand, a country's informal economy is largely a system of bartering, then the goods or services produced may be more likely to be discovered through this method. Since it is likely that the informal economy manifests itself differently in developed and developing countries, this method will result in inefficient measures.

Building upon these critiques concurrently with Schneider and Enste (2000), Lackó (2000) derives an alternate method using household production and a two equation substitution method. Her approach allows cross-country variation, and the hierarchical model allows for separation of formal and informal activities (Vorobyev, 2015). While more robust than Kaliberda (1996), the theoretical component of the informal economy is still missing.

In addition, this method suffers from data issues, especially in a cross-country context: coverage, unit of analysis, and reliability. To best estimate the informal economy, a more granular data set would be needed, as there may be more or less informal economic activity

in certain parts of a country. Studies that use the electricity method are usually focused on Europe (Kaliberda, 1996; Vorobyev, 2015; Argentiero, 2018; Lackó, 2000), including post-Soviet transition states. I am unaware of any study that uses this method to estimate the informal economy for a developing country, where data are less reliable and only available in aggregate form. Likewise, the time coverage of such studies is relatively limited. Since this work seeks to use the country-year as the unit of analysis, the electricity consumption method will not be used.

Currency Demand Approach

A second indirect approach to estimation of the informal economy is to use the amount of currency demanded compared to the amount of available currency. Increasing amounts of currency began to proliferate across the globe in response to the removal of the gold standard and the subsequent collapse of the Bretton Woods arrangement. Tanzi (1983), building off the work of Gutmann (1977), theorizes that the amount of currency not accounted for in GNP calculations is evidence of informal behavior. This model was created within the large vein of literature during the 1970s and 1980s in which scholars sought to understand the effects of taxation on wages (Burtless and Hausman, 1978; Corden, 1984), welfare (Dixit, 1975; Keen, 1987), and especially tax evasion (Clotfelter, 1983; Allingham and Sandmo, 1972; Friedland et al., 1978; Spicer and Becker, 1980). The literature of this era seemed especially prone to thinking that lower levels of taxation were best for a polity, the theoretical backing of which was public choice theory which suggested, in this case, that individuals would respond to higher tax rates by shielding that income from the authorities or by engaging in the informal economy.

Mankiw and Summers (1986) fits well in this tradition, and gives their currency demand function with the consumption as its main predictor variable. The full model is generalized as

$$lnM = \beta_0 + \beta_1 ln(P_y) + \beta_2 ln(P_c) + \beta_3 lnR + \beta_4 ln(FCE) + \epsilon \tag{2.1}$$

where M is the money supply, P_y is the GDP deflator, P_c is the consumption deflator, R is the interest rate, and FCE is the final consumption expenditure. While they particularly modeled the velocity of money in their approach, when using the currency demand method for estimating the informal economy, the assumption is the velocity of money remains constant. It likewise assumes all informal transactions are conducted in cash. From a methodological standpoint, several "heroic assumptions" (Thomas, 1999) are made, revolving mainly around a constant effect (fixed X's assumption of OLS) and that to begin the currency model, there must be a starting year in which there was no informal economy.

Furthermore, the exact variables used in the construction of the currency demand model differ across the literature. Scholars such as Tanzi (1983) suggest that predictors of cash demand include currency holdings, income tax rates, and ratios of salaries to GDP. While these different definitions can be leveraged to create different estimates of the informal economy, this lack of theoretical consensus allows for different pictures of the informal economy to emerge. Given these critiques, the field of study has shifted to more robust measurements of the phenomenon such as latent modeling (Alañon and Gomez-Antonio, 2005; Schneider and Enste, 2000; Alm and Embaye, 2013; Goel and Nelson, 2016).

The theoretical assumption that *all* underground activity can be captured by looking at one key currency over money supply ratio likewise doesn't account for breadth of individual utility preferences in an economy, especially, in the case of Tanzi (1983), one as large as the United States. Second, a key weakness of the currency approach subsequently found by Tanzi (1999) is that the estimates in subsequent studies were actually varying more, and not less as we would expect would happen as more data and approaches were made known.

Given that the currency method takes *all* excess currency usage that can't be explained by formal economic activity as evidence of informal economic activity, the opposite problem

of measurement bias is realized: If direct methods under-estimate, then currency methods are likely to over-estimate the size of the informal economy. However, modeling currency demand can lead to a better understanding of "excess cash", which is more theoretically justifiable. If *all* currency is not used in the informal economy, then perhaps the excess is. This is why I use modeled currency demand in my confirmatory factor analysis.

Method	Strengths	Weaknesses
Direct Survey	- Goes to the root of the issue: asks people directly if they engage in informal activity - Good for case studies - Good for understanding the structure of informal economies (Schneider and Enste, 2000)	- Prone to underestimate effect; asks people to admit wrongdoing
Electricity Consumption	- Novel approach - Estimates can serve to calibrate more advanced models - Does well to explain post-Soviet economies	- Electricity usage can become more efficient - Informal activities can occur in daytime and/or outside without use of electricity
Currency Demand	- Good theoretical grounding; movement of cash for transactions is potentially untraceable, so it gets at informal behavior	- Assumes all cash in economy goes to informal activity, so it tends to overestimate informal behavior - Assumes no changes to velocity of money
Structural Modeling	- Allows for different explanatory and indicator variables (Giles 1999) - Purpose is to specifically estimate unobservable phenomena	- Variable choice is largely a priori - Model construct suffers endogeneity; which variables go on which side of model?

Figure 2.2. Comparison of different estimation methods

Structural Modeling Approach

A third approach is to use the fact that the informal economy is unobservable as a benefit. Structural equation modeling of latent variables is a modern approach borne out of increases in computing power. Beginning with Frey and Weck-Hanneman (1984), but used most

notably by Friedrich Schneider, this approach uses a Multiple Indicators, Multiple Causes (MIMIC) methodology based on latent factor modeling, an approach first created by Jöreskog and Goldberger (1975). Largely used in the fields of education and psychology, the purpose of the latent variable approach is to use measurable characteristics, such as income or time spent on a task, to measure qualities that cannot be directly observed, such as determination or grit. Applying this concept to the field of informal economic activity, estimates of the informal economy can be created to serve as both independent and dependent variables across different country-year units of analysis and new determinants of interest (Schneider and Enste, 2000; Torgler and Schneider, 2009; Neck et al., 2012; Schneider and Neck, 1993; Buehn et al., 2018; Markellos et al., 2016; Schneider et al., 2010).

The inner workings of latent variable analysis allow for the covariance of each of the measurable variables to serve as an approximation for how well variables can work together to explain some unobservable measure of interest. Once created, it can then be used as a dependent variable in the full exploratory factor analysis, which will begin in the next chapter. This process is done in two steps. This first step is called confirmatory factor analysis in which various observable variables are tested together to see how well they create a latent variable; this is followed by exploratory factor analysis which, like regression analysis, seeks to use various predictor variable to explain the variance in the newly created latent variable.

The confirmatory factor analysis model, taken originally from Jöreskog and Sörbom (1981), can be written as

$$x = \Lambda\Xi + \delta \tag{2.2}$$

where x is a vector of k observable variables, Ξ is a vector of some y number of underlying or latent factors such that y<x and x$\geq$3, Λ is a k x y matrix of factor loadings, or weights, relating the observable measures to the latent factors, and δ is a vector of random measurement errors. The variance-covariance matrix for x, defined as Σ, is

$$\Sigma = \Lambda\Phi\Lambda' + \Theta_\delta \tag{2.3}$$

where Φ is the yxy covariance matrix of Ξ and Θ_δ is the diagonal kxk covariance matrix of δ. Full information maximum likelihood estimates of the model parameters can then be constructed assuming that the observations of x are independent and normally distributed (Anderson and Gerbing, 1984).

Different structural models are tested against each other using various goodness-of-fit statistics such as the chi-square likelihood ratio test (Lawley and Maxwell, 1971) and the Root Mean Square Error of Approximation. The best fitting confirmatory factor analysis model is one that has a small chi-square value (usually below 1) and a corresponding RMSEA of 0.05 is usually required for a model to be deemed a good-fitting one (Hox and Behgar, 1998).

Once the maximum likelihood equations are solved simultaneously, factor loadings are calculated to estimate the strength and direction of the effect that each of the measurable variables has on the constructed latent. Low factor loading estimates give researchers evidence that either the observable factor ought not be included in the construct or that it pairs poorly with the other factors chosen. However, theory should be the final guide as to whether or not any given variable ought to be included in a confirmatory factor analysis.

Critiques of SEM The fact that estimates can vary is the key line of critique against the SEM approach. Feige (2016) argues the key assumption of the entire approach, in which one of the observable variables in the construction of the confirmatory factor analysis model is held constant at one so that the model can converge, is not informed by the data but rather a researcher's choice. This choice however is guided by theory; holding variables at +1 or -1 will lead to different estimates, however, model fit can be used to adjudicate whenever theory is ambiguous.

He further argues that SEM modeling is a-theoretical, a point specifically granted in the literature; the model must be specified *a priori* (Gerbing and Hamilton, 1996). However, so long as the variable choice is defensible on theoretical grounds, the method used to generate estimates can be calibrated and compared to other models to gauge best fit; in this case, researchers can use the model's a-theoretical approach as a benefit similar to a vector autoregression (VAR). A VAR will specifically attempt to tease out the causal direction of potentially or theoretically endogenous variables; the same issue affects estimation of the informal economy. However, advocates of the SEM approach concede Gerbing and Hamilton (1996)'s point; no one can be sure that any *a priori* model used is the "correct" one; theory and model fit are our best guides. I attempt to address this concern with different specifications and will report accordingly.

In a similar vein, Breusch (2005) likewise finds that the MIMIC approach is "unfit for the purpose" of estimating the informal economy due to the method's pliability and subjectivity. However, the structural equation modeling approach allows a rigorous testing of the factors that are most likely to construct the latent variable. Indeed, the MIMIC approach can simultaneously consider numerous causes and indicators; once theory sets the possible list of predictors and indicators, models can be constructed to find the best fit. By treating the informal economy as an unobservable latent trait in an economy instead of treating it simply as excess cash or electricity, a fuller picture of the informal economy can emerge.

2.3 Better Theory and Model Fit for Latent Construct

These criticisms of the SEM approach, while valid, can be overcome. The informal economy literature has established plausible links between such factors as GDP growth, corruption, rule of law, and currency demand (see Gërxhani (2004) and Schneider and Enste (2000) for a thorough review of the subject) as measurement variables. That is to say, these variables are not *predictors* of the informal economy, but rather indicators of the informal economy.

Another way to think about confirmatory factor analysis is to ask: which variables are most likely *to be affected by* activity in the informal economy? When creating a latent construct, one is creating a type of independent variable which will then in turn be used as a response variable in the full regression or exploratory factor analysis model. In the variable list previously described, the most defendable on theoretical grounds are: GDP growth, modeled currency demand, and a measure of the rule of law.

GDP growth GDP growth can be used in the measuring of the informal economy for two reasons. One, it is likely that some amount of informal activity is reflected in the state of the official economy (Schneider et al., 2010). Examples include taking the cash earned in the informal economy and spending it in the formal economy, as well as the opposite. Second, the rise and fall of the official economy ought to have direct effects on the informal economy; a recession theoretically leads more people into the informal economy whereas an expansion should lead people out (Feld and Schneider, 2010).

However, it may also be the case that a country could see both economies grow concurrently. Using Belgium as a case study, Adam and Ginsburgh (1985) found that the low barriers to entry for the informal economy meant individuals could enter and exit almost at will; therefore any type of expansionary fiscal policy would result in increases to both the formal and informal economy. This results fits in with the strand of literature that suggests the informal economy is not a policy problem at all (Fleming et al., 2000; Thomas, 1999; Webb et al., 2009). Because of this mixed finding, the latent variable constructed using the GDP growth rate as an indicator should be left to float; assuming a direct relationship, positive or negative, between GDP growth and the informal economy, is not advisable under these conditions.

Currency demand Given the use of currency demand in and of itself as an estimation for the informal economy, much of the literature that uses MIMIC modeling will incorporate

some version of currency demand as an indicator of informal economy activity (see Alm and Embaye (2013); Buehn et al. (2018); DellAnno et al. (2018); DellAnno (2016)). The excess amount of cash calculated by the model, in which the ratio of M0 money supply to M2 money supply (Alm and Embaye, 2013) is a function of inflation, personal and government consumption, GDP per capita, and the interest rate (Ericsson, 1998; Mankiw and Summers, 1986), is used as an indicator variable. M0 represents the amount of cash on hand in an economy, while M2 represents all cash holdings plus any liquid cash assets in a bank. Once the panel data regression is run, observed values are subtracted from the predicted values, and the difference is considered to be "excess cash" that serves as evidence of informal economy activity.

From a theoretical perspective, as the level of "hard cash" increases, especially in developing countries, we can expect that cash would be used in the informal economy such as bazaars. Furthermore, a lowering value of any currency unit leads to faster spending, especially for essentials, many of which can be found in the informal economy. Also, as a currency loses value, people may begin to engage in bartering, another type of activity found within the informal economy. Conversely, as a currency strengthens, we would expect lower levels of informal activity would occur. Furthermore, the level of hard currency in an economy could also be affected by informal activity. Since cash is the most likely unit of exchange, people engaging in the informal economy would need higher levels of cash than those operating only in the formal employment, where credit or electronic payments could be used. Therefore, the informal activity puts an upward pressure on M0 holdings. Finally, since the relationship of currency demand and informal activity is widely understood to be positive, my model will hold currency demand to 1.

Rule of law Lastly, it is likely that political variables can also play a role in indicating informal economic activity. Specifically Buehn and Schneider (2012) construct an estimate

of the informal economy using a two-factor model where corruption is treated as a latent variable and modeled using a "bribe payers index", as well as a measure of judicial independence. They also model a covariance between this construct and their construct of the informal economy. I seek to improve this approach by using a measured rule of law index that incorporates these types of political variables. This process simplifies the model and reduces variability in results.

This variable belongs as an indicator since it contains measures that set the milieu of a country's economic activity. As defined by the World Bank's World Governance Indicators, the rule of law index

> "reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence." (World Bank)

Given this variable measures perception, we expect in this case that informal economic activity would serve as a predictor of this perception index, hence its inclusion on the measurement side as opposed to the determinant side of the structural equation model.

This variable is used instead of the control of corruption index due to concerns of bias - since I will be testing government effectiveness as a potential cause of informal economic activity later in this work, a measure such as control of corruption may bias the results, whereas the rule of law metric specifically looks at *perceptions* and therefore is a more individual belief about the state of government. Also, the correlation between the two variables is .96; therefore, the model will not suffer from misspecification. Furthermore, higher levels of corruption ought to be positively related to informal economy size. This finding, robust in the literature, finds that countries with lower levels of law development and lack of law enforcement are more likely to have corrupt officials who use laws, especially tax laws, for their own benefit. Therefore, people engage in the informal economy to hide income from officials who have too much discretion in enforcement of the tax code (Friedman et al., 2000; Dreher et al., 2008; Dreher and Schneider, 2010). I therefore expect that corruption

and the informal economy would have a positive relationship. However, the causal arrow runs from corruption to informal economic activity; the indicator side of the model needs the causal arrow to run the other way, so corruption should be used as a predictor, not an indicator.

Finally, rule of law ought to have an inverse relationship with the informal economy. As respect for the law increases, legal concepts such as property rights increase as well, putting a downward pressure on engaging in the informal economy (Gërxhani, 2004).

Other potential indicators Since the SEM approach allows for many different variables to be used as either predictor or indicator variables, other studies have used variables including GDP per capita, corruption scores, and the labor force participation rate. The endogeneity of the GDP per capita variable makes including it in a measure problematic, but while there are defensible reasons for placing it as an indicator variable, the balance of the literature argues that it belongs on the predictor side. Therefore, I will use GDP per capita as an independent variable in my model when I analyze the effects oil has on the informal economy.

I will likewise for the control of corruption metric; it is more likely from a theoretical perspective that corruption, since it measures politician behavior, will influence informal activity rather than the opposite. It can also be modeled as its own latent construct, as Dreher and Schneider (2010); Buehn and Schneider (2012) have done.

The labor force participation rate is likewise an endogenous variable; do people enter the informal economy because they lose formal employment or does existing action in the informal economy make it such that people do not seek employment in the formal sector? Several successive runs of my latent variable continually showed very poor factor loadings less than .2, and when I included it as a predictor in several model runs, it was continually insignificant by a large margin. Given the data used, labor force participation did not belong in the analysis.

Finally, it must be noted that while a three variable model can be used to construct a latent variable, the number of free parameters will equal the number of variables. Ideally, a latent construct model would contain at least four variables to generate more free parameters; however, in this case additional variables either led to model non-convergence or they were not appropriate on theoretical grounds. Therefore, I used the three variables noted above in the construction of the latent estimate.

2.4 Findings

Using data from the World Bank's World Development Indicators and World Governance Indictors for 122 countries from 2000 to 2016, I use confirmatory factor analysis to construct two measures of the latent informal economy variable.

First, I use the money demand approach outlined by Mankiw and Summers (1986) to generate a prediction of currency demand for all country-year units of analysis. Since observed currency demand is defined as $\frac{ln(M0)}{ln(M2)}$, I estimate currency demand using a beta regression estimator since the dependent variable is constrained between 0 and 1, while no observations are exactly 0 or 1 (Ferrari and Cribari-Neto, 2004). I then construct a second variable that represents the excess cash for each unit of analysis by subtracting the observed currency demand from the modeled currency demand. Summary statistics of the two variables, as well as the others used in the construction of the latent, are found in 2.2.

Table 2.2. Summary statistics, latent variable construct

Variable	Mean	Std. Dev.	Min.	Max.	N
Modeled Currency Demand	2.563	0.287	1.819	3.246	1739
Modeled - observed currency	1.669	0.261	0.940	2.285	1209
GDP growth, logged	1.316	0.892	-4.264	4.813	2888
Rule of Law	-0.012	0.998	-2.606	2.1	3162

The first confirmatory factor analysis of the informal economy latent variable is shown in Figure 2.3. Modification indices indicated no covariances, which was expected given

the variable choice. The standardized coefficient for the logged GDP growth variable is 1.4 and significant, while its factor loading is .88. These results imply that as a country's formal economy gets larger, so too does its informal economy. The model also shows that, as expected, a country's rule of law is inversely related to the informal economy with a standardized coefficient of -.21 and a factor loading of -3.9. Ancillary models which held GDP growth to 1 and allowed the currency demand variable to float led to similar results, and are not discussed or published here. The model fit the data well; the RMSEA was 0.00, as was the chi-square value, and the Bayesian Inference Criterion (BIC) was 6881.

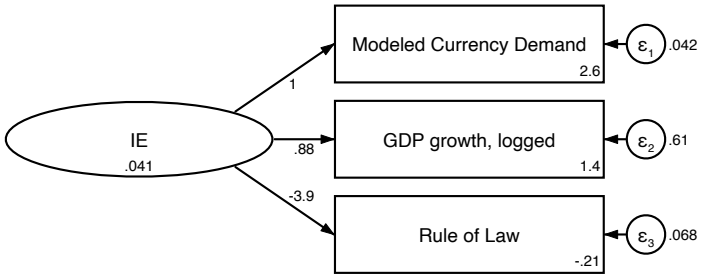

Figure 2.3. Latent variable construct 1

The second measurement model shown in Figure 2.4 uses the excess cash in the economy instead of the modeled currency demand. Here we see GDP growth again has a positive factor loading and coefficient while the rule of law metric is inversely related to the latent. This model fits the data better than 2.3 since it has a BIC of 4488.

However, this paper seeks to forward the understanding of the informal economy by taking several key variables the literature suggests can be used to measure it, then simply fitting

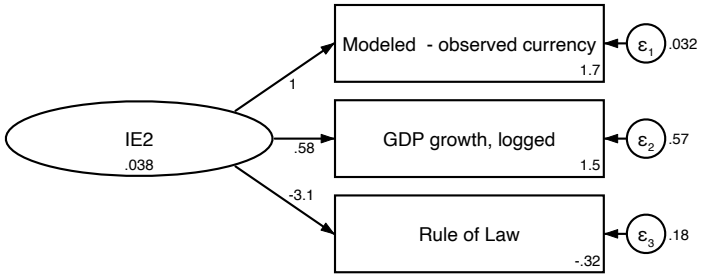

Figure 2.4. Latent variable construct 2

those data to different models along two areas: one, can the model be justified theoretically and does it have both face and construct validity, and two, does the model have better fit statistics to justify it as a "better" model than others? To do so, I ran numerous models following different approaches; some were two-factor models while others were one; once finding a good fitting model, I also re-ran them while altering which variable was constrained to positive 1.

A third model takes the rate of GDP growth, corruption, rule of law, and $\frac{M0}{M2}$ currency ratio as indicator variables, as modeled by Buehn and Schneider (2012). A fourth model was constructed as GDP growth is constrained to -1 and currency is constrained to 1. These models have a chi-square value of 2.16 and an RMSEA of 0.007, indicating a good fit; however, it seems that the fit is largely being driven by the corruption and rule of law variables. Recall that the theoretical assumption behind including corruption as an indicator variable is quite mixed; these results give further evidence of that the primary model is correct to omit corruption and instead use rule of law. Also, modification indices indicated no covariance between the errors of those variables.

The results of a two-factor model in which political variables and economic variables were split into different latent factors. Here, unemployment is added as an indicator on the economic variable side; the justification is that the unemployment level should indicate the size of the informal economy. If more people are unemployed, then they will enter into the informal economy. Also, regulatory quality is added on the political variable side; an increase in regulatory quality leads to a lower informal economy activity since institutional trust is high (Torgler and Schneider, 2009). The model fit is acceptable, with a chi-square of 30.9 and an RMSEA of 0.059. However, the idea that political and economic variables are wholly independent of each other is not accepted; therefore, they should not be modeled in this way even if the results of the maximum likelihood calculations are acceptable.

Through this iterative process, two different confirmatory factor analyses on the informal economy have been created, while others have been modeled and discarded on either theoretical or statistical grounds. The first uses beta regression predictions of currency demand, and the second uses the "excess cash" along with other theoretically acceptable variables in logged GDP growth and a Rule of Law metric. The latent construct using the excess cash metric is a better fitting model, and will be used as the primary CFA for the remainder of this work.

Comparison to other estimates The last step in gauging the appropriateness of this construct is to compare it to others. Given the numerous ways in which an estimate of the informal economy can be envisioned on theoretical grounds and constructed on empirical grounds, we would expect to see lower correlation levels and wider variances in summary statistics. Table 2.3 gives summary statistics on the two constructed estimates, the currency demand modeled off the Mankiw and Summers (1986) equation, the remainder of excess cash once the observed currency is subtracted from the modeled currency, and lastly the basic ratio of the M0 currency levels divided by the M2 broad currency levels. Table 2.4

gives the correlation results of the two CFA latent constructs, as well as the original currency demand estimates in this paper, followed by the currency demand approach used by (Bunte and Stanaland, 2020).

Table 2.3. Summary statistics

Variable	**Mean**	**Std. Dev.**	**N**
Latent Construct 1	-0.042	0.224	3411
Latent Construct 2	-0.064	0.212	3405
$\frac{M0}{M2}$	-1.97	0.802	1825
Modeled Currency Demand	2.563	0.287	1739
Excess Cash	1.669	0.261	1209

Table 2.4. Correlation Matrix of alternate informality measures

	Latent 1	Latent 2	Medina and Schneider	Bunte and Stanaland
Latent 1	1.000			
Latent 2	.9842	1.000		
Medina and Schneider	.7003	.6977	1.000	
Bunte and Stanaland	.7327	.7303	.6056	1.000

Recall that the latent variables used in this paper are constructed using only confirmatory factor analysis, while the metric used by Medina and Schneider (2018) is a full structural equation model including predictor variables, while the Bunte and Stanaland (2020) estimate is constructed using currency demand. Given the breadth of empirical strategies, these correlation values are acceptable. However, I would expect that replicating studies with these different metrics would result in different results, which is a limitation of this area of inquiry and one that researchers, including myself, hope to resolve.

2.5 Conclusion

The major goal of this paper was to use confirmatory factor analysis to find a parsimonious model of the informal economy, a phenomenon critical to understanding international political economy, yet by definition unobservable. Methodologies including the survey method,

the currency approach, and the electricity approach have all been used to estimate the size of a country's informal economy. The most recent approach has used structural equation modeling to overcome the theoretical and empirical difficulties in the other approaches; however, SEM is also not without its own critiques. I attempt to resolve these critiques by using theory and existing literature to find observable variables to serve as likely candidates for measuring the informal economy. To do this, I used variables more likely to be an indicator or effect of activity in the informal economy, not predictors of that activity. While no approach to estimating the informal economy is perfect (Schneider and Enste, 2000), the models put forward in this paper have both face and construct validity.

Next, I altered the model specifics to overcome the challenge brought by scholars such as Feige (2016) who suggest SEM is a deficient method because of the arbitrariness of constraint choice. By constraining different variables, I was able to construct four different, yet valid measures of the informal economy. Furthermore, I also constructed a theoretically justifiable and parsimonious measure that adds to the base of knowledge in the field.

More research is needed; if engagement in the informal economy leads to such things as lower wages and lower life expectancy (Kireenko and Nevzorova, 2015), (ILO 2002), then policymakers ought to seek such policies that would reduce the informal activity within a country's economy. This new measure of the informal economy can aid our understanding of the phenomena so that more work on this topic can proceed.

CHAPTER 3

DOMESTIC DETERMINANTS OF THE INFORMAL ECONOMY

3.1 Missing Domestic Context of the Informal Economy

To date, the informal economy literature has sought to explain in a domestic context what drives economic behavior underground. Gërxhani (2004)'s review of the various types of variables that ought to be considered is voluminous. They include: undeclared labor, tax evasion, government regulation, GDP, ease of entry for business, autonomy and freedom measures, and survival. These studies typically approach the issue of informal activity from a public choice theory perspective; that is to say, they expect individuals to respond to incentives, whether good or bad. For example, individuals who believe the tax system is burdensome may seek to avoid paying them. If regulations are too steep, people may begin to take actions to shield them from legal responsibility. Individuals may engage in the informal economy as a type of alternate employment or "side hustle" as a way to make extra money; these types of activities are becoming more prominently studied in the gig economy literature (Wood et al., 2019; Gandini, 2019; Abraham et al., 2017). These types of jobs have relatively easy entrance and egress, allowing for more personal autonomy. However, these types of jobs also come with no benefits and no bargaining power.

Lastly, individuals may engage in the informal economy because it is the last and/or only option they have to make money, and if they do not, their survival is at stake. The study of the causes of informal activity become all the more important once individuals in a country get to this point - engage or die. On the one hand, informal activity is preferable to death, but on the other hand, it can be argued that governments must be doing something wrong if an individual gets to that point at all.

A gap in the literature exists because studies take the domestic economy and its determinants as a given; GDP is at such a level, unemployment is at a given level, and the like.

However, external shocks to the domestic economy are not accounted for or discussed, nor is the exact makeup of the domestic economy. I seek to address this gap by analyzing the effect that oil rents have on the informal economy. I report the findings from a U/A perspective since some countries have oil in some years, but not others. Also, a simple t-test of my informal economy variable when comparing country-year units that have oil to those that do not is shown in Table 3.1

Table 3.1. Relationship between oil producing country-years

Oil rents>0	Mean	Std Err	N
0	-.048	.005	1742
1	-.036	.005	1663
Pr(diff<0) = .0574			

This is sufficient evidence to proceed with an analysis of the effects that oil may have on informal economic activity.

Puzzle Given that the informal economy literature supposes that tax rates are a key determinant in informal activity (Frey and Weck, 1983), it is puzzling that in the cases of Algeria and Tunisia, we do not see this pattern. As to systems of direct taxation, these two countries are similar: Table 3.2 shows their corporate tax rates, personal income tax rates, sales tax rates, and social security taxes.

Table 3.2. Various Tax Rates in Algeria and Tunisia

Tax Rate	Algeria	Tunisia
Corporate	26	25
Personal Income	35	35
Sales	19	18
Social Security	35	25.75

Likewise, both countries have unitary semi-presidential republics with elected parliaments and heads of state. According to the UN, they have similar Human Development Index scores, .735 for Tunisia and .754 for Algeria. While Algeria has more elitist control of

government and are also ranked by Freedom House as "not free" due to its restrictions on media access to politicians, the informal economy literature concludes that the strength of institutions is what effects the economy, and not necessarily democratic governments versus autocratic ones. Therefore, the fact that 2017 Policy IV scores for Algeria and Tunisia were 2 and 7, respectively, is of no interest here.

Given these similarities, why does Algeria have a larger informal economy than Tunisia? According to Alm and Embaye (2013), the average informal economy estimate for Tunisia was 35.98% while for Algeria it was 48.09%. With a population mean of 32.03 and a standard deviation of 9.76, we see that Algeria's informal economy is 1.24 standard deviations higher than Tunisia's. Therefore, two of the more popular explanations regarding size of the informal economy cannot explain why we see different sized informal economies in Algeria and Tunisia given their similarity. I theorize that a larger reliance on natural resources can explain the difference. The data show that since 2000, the mean oil rent as a percentage of GDP for Algeria is 16.49%, whereas for Tunisia that figure is 3.53%; the difference is significant at the 1% level.

Preview of findings Results of this paper show that oil rents do lead to larger informal economies under the condition that they lead to lower reliance or dependence on tax revenues. This is due to the rentier effect and its deleterious effect on citizen and government accountability. However, the interaction of oil rents and government effectiveness was not significant while the interactions of oil rents on tax levels was.

The remainder of the paper is organized as follows: section 3.2 reviews the extant literature on domestic determinants of the informal economy. section 3.3 theorizes why a natural resource such as oil can be reasonably expected to alter a country's informal economy. section 3.4 discusses the data sources and coverage as well as the structural equation modeling methodology used to create not only the informal economy estimates, but also their hypoth-

esized differences. section 3.5 analyzes the findings and provides several robustness checks to validate the results, and section 3.6 concludes and offers policy implications.

3.2 Current Understanding of Domestic Determinants

Effect of taxes on the informal economy Goel and Nelson (2016) demonstrate through the use of Young and Holsteen (2015)'s robust model estimator that the main determinants of the informal economy are government size, both in form (democracy vs autocracy) and influence on the economy, tax complexity, and business regulation. They also note differences between developed and developing countries; for example, the regulation of business startups was significant for developing countries, but not developed countries. The role of taxes is especially prevalent throughout the field and may indeed be the "principal cause of the informal economy."(Alañon and Gomez-Antonio, 2005). Frey and Weck (1983) likewise suggests that "the existing literature is virtually unanimous...the higher the taxes and tighter the restrictions, the larger the informal economy."

The theoretical reasoning behind such a statement is found in the public economics literature. One of the central problems a government has is that it requires revenue from other actors in the economy to function; it must tax such that revenues are gathered, but if taxes are believed by the populace to be too high or regulations too onerous, they may seek to avoid or evade paying such taxes, leading revenues to fall. The theoretical model built by Allingham and Sandmo (1972) demonstrate that if the penalty for evasion is sufficiently high and individuals expect the penalty will be carried out by tax officials, then they will not engage in evasive behavior. However, if the penalty is too low or the probability of being caught too low, then evasive behavior is more likely. However, Slemrod and Yitzhaki (2002) finds that the model constructed by Allingham and Sandmo (1972) to be based on income understatement while their findings imply that tax understatement is the actual issue. Therefore, the tax rate itself would not matter to an individual when deciding whether to

evade (Slemrod and Yitzhaki, 2002). Also at issue is whether people engage in evasion or avoidance; the first is illegal and punished (to varying degrees) while the latter is legal and represents a utility maxima: the taxpayer pays as little tax *as the law allows*. By definition, if one uses all applicable tax laws to their benefit, they are not breaking the law. Lastly, it could be that tax evasion is a function of reporting type; results from a controlled random experiment in Denmark showed evasion rates of 17.1% among self-reported income, but close to zero percent among third-party reporters (Kleven et al., 2011). This has a clear application to the informal economy; people engaging in business where taxes are self-reported may be more likely to evade taxes, hence increasing the size of the informal economy.

Overall, governments face a principal-agent problem (Gërxhani, 2004) when setting tax rates: "How can an authority - with imperfect ability to monitor - design a taxation, audit, and punishment scheme to meet its revenue objectives?" (Andreoni et al., 1998) Optimal tax theory supposes that a government will create tax policy in such a way as to maximize social welfare (Jacobs, 2013), but clearly that maximization process involves political compromise, cultural expectations, the role of markets, and what should be done about externalities. Therefore, tax rates, goods and services taxed, and enforcement should change over time, leading to potential confusion regarding payment.

Indeed, on the issue of payment, Slemrod (2007) turns the question around and asks not why people avoid (or evade) their tax burden, but rather why people pay any taxes at all. This question leads to the area of tax compliance and/or morale, a research area exhaustively studied by Benno Torgler (Torgler and Schneider, 2009; Alm and Torgler, 2006; Frey and Torgler, 2007). Factors such as institutional and regulatory quality may play a role in an individual's decision whether or not to pay taxes. If individuals have higher levels of trust in their government, then higher tax rates are bearable; however, as trust wanes, individuals begin to limit their tax exposure through legal or illegal means. Conversely, individuals may pay taxes at higher rates out of a sense of moral obligation borne by guilt or shame

(Gërxhani, 2004). The exact mechanism of why an individual will pay taxes even though a rational actor should decide to free ride (Wintrobe, 2001) is found by Torgler (2003) in the "bounded rationality" literature: if a person fears violating the law, and they are unsure as to whether or not they will get caught, they will make the decision to pay taxes.

One way to maximize this though process is to make the tax system as simple and/or efficient as possible. Adding complexity to the tax system may in theory lead to higher levels of compliance, but it could also lead to more avoidance or evasion due to simple ignorance or exasperation. Torgler (2003) finds that institutions that are fair and efficient will have a positive effect on tax morale. Here we find the first likely difference between developed and developing countries regarding the exact contours of a country's informal economy. The difference in institutional quality between developed and developing countries may lead to different levels of tax morale, and therefore tax compliance.

The optimal tax literature suggests a positive relationship between a countries' tax rates and its tax avoidance or evasion. However, the causal mechanism was not found to be bounded rationality or tax complexity, but rather the perception of what individuals were getting in return. This suggests that if individuals do not see what their tax payments are supposedly going towards, then they will have a higher probability of avoiding or evading taxes (Clotfelter, 1983).

It is at this conjunction of public choice theory and optimal taxation theory we see the dominant results in the informal economy literature, which is the positive relationship between tax rates and informal economy size. While individuals may pay taxes out of duty, guilt, shame, or fear of being caught *not* paying taxes, as the rate goes higher, they will begin to act as free riders, especially if they do not see concomitant increases in public infrastructure or other government services (Ross, 2004). For these reasons, we see the currency demand literature use this argument as its central linchpin: as taxes go up, the informal economy gets larger.

The first hypothesis to be offered in the literature therefore is

Hypothesis 1. *In comparing countries, an increase in the direct taxes will result in a larger informal economy as people engage in transactions in such a way as to avoid paying the increased taxes.*

The causal theory behind this hypothesis is straightforward: Whenever a government raises tax rates on its people, the people will reply by taking their economic activity underground so that they avoid the tax. They may increase their holdings of cash (Tanzi, 1999; Isachsen and Strøm, 1980; Alm and Embaye, 2013; Nchor and Konderla, 2016), although Mazhar and Méon (2017) suggest the government could respond by increasing inflation as way to counteract the decision to hold money, and they find inflation can better predict the informal economy than holding currency. If we assume however that a government does not want to take the drastic step of artificially inflating their currency, we would expect that *ceteris paribus* higher taxes would result in a larger informal economy. This theory does not however account for Ross (2004)'s contention that the tax argument only works in relation to the services that are provided by the government with the money gathered through taxes.

Building upon Ross' argument, the tax morale literature suggests that if people, through a combination of tax rates, grow disillusioned with the level of government services, or perceived capriciousness in the tax system, will begin to engage in the informal economy (Torgler and Schneider, 2009; Feld and Schneider, 2010; Alm and Torgler, 2006; Frey and Torgler, 2007; Lago-Peñas and Lago-Peñas, 2010). The World Values Survey is a primary data source for this work, bringing a direct survey method in attempting to establish the size of the informal economy.

Effect of government effectiveness on the informal economy Another key variable found throughout the literature as affecting the size of the informal economy is the effectiveness of government, specifically its institutions. Studies that estimate the informal economy

usually include developed, developing, and transition economies; therefore, we would expect that a large variance on strength of government would be present. Studies may focus on rule of law or other institutional variables, but type of government is not perceived to be important, rather only size (and its corresponding strength).

Buehn and Schneider (2012) "cautiously" conclude that higher levels of enforcement will lead to a smaller informal economy, arguing that a stronger government has the institutional capabilities to enforce their tax laws, leading to higher levels of compliance. A look at the United States likewise suggests that higher levels of tax audits can lower the size of the informal economy (Cebula, 1997). Bridging this gap between the panel data approach by Buehn and Schneider (2012) and the case study (Cebula, 1997) is the quality of governance approach taken by Dreher et al. (2008) who suggest that the relative effectiveness of a country's institutions can lower corruption, and therefore the informal economy. In this sense, corruption in a country's government acts as a complement to the informal economy (Buehn and Schneider, 2012). An analysis of the Russian taxi market likewise found that higher levels of enforcement, and in some cases repression, led to less informality, while financial aid policies to aid small firms most likely to fall into informality were not as successful as the policy of strong enforcement (Kluge and Libman, 2018).

It could also be the case that a country's institutions may not be what is traditionally considered (central banks, legislatures) but may also be cultural and/or social norms; Mathias et al. (2015) find that much informal activity occurs simply because the social norms of an area have more of an effect with entrepreneurs than the national laws. However, evidence from Brazil suggests that urban workers will respond more positively to better governance policies (Jonasson, 2012), indicating there may be a difference in how employers and employees view the informal economy.

However, it could also be the case that the relationship between regulations and their enforcement could lead to disparate outcomes. For example, Kus (2010) finds high levels of

regulation coupled with low levels of enforcement lead to larger informal economies, while a smaller informal economy results from a low level of regulation, stringently enforced. This finding bolsters the claim made by Buehn and Schneider (2012); however, Kus (2010) adds to the understanding of how the informal economy operates by finding that reducing the amount of regulation (a traditional neo-liberal approach) will not lead to higher levels of formality.

The second hypothesis to be offered is

Hypothesis 2. *In comparing countries, an increase in the government's effectiveness, will reduce the size of the informal economy.*

Similar to the tax literature, the causal mechanism here is direct. A country with stronger institutions can better enforce tax laws, promote commerce, secure currency stability, and protect property rights, thereby constructing a viable system in which economic transactions can take place in the formal, regulated economy. These institutions lead to a confidence in the people that tax laws are enforced fairly. It is noteworthy that type of government is not discussed, but rather institutions. When studying foreign direct investment, Moon (2015) found that autocracies will still gain from investment because investors are looking at their strength of institutions, and not how they practice politics.

3.3 Theory

The informal economy literature has sought to explain in a domestic context what drives economic behavior underground. However, the effects of industry type, specifically informal sectors like natural resources, are not discussed. The natural resource literature takes many of the same variables as informal economy analysis into account - type of government (Tsui, 2011; Andersen and Ross, 2014), effects on economic growth (Kurtz and Brooks, 2011; van der Ploeg, 2011), and tax revenues (Devarajan, 1988; Bornhorst et al., 2009). It could be that

findings regarding institutional weakness as a cause for a higher informal economy may in turn be affected by the level of natural resources in a country. Likewise, the existence of natural resources may have effects on a country's tax structure that may then affect the size of the informal economy. We can see that the same determinants found by Goel and Nelson (2016) can all be seen in the natural resource literature.

I suggest a causal mechanism in which oil rents lead to a lower reliance on domestic tax revenues, which leads to an increase in informal economic activity. This is an addition to the informal economy literature, since lower tax burdens are normally considered to lead to a smaller informal economy. However, due to the political resource curse, specifically the rentier effect, I will show that for developing countries, a lower tax burden brought about by the rentier effect will distort the informal economy because citizens will not demand accountability (Paler, 2013).

Current Understanding

$\uparrow$ taxes $\Rightarrow \uparrow$ informal economy, and vice versa

New Understanding

Oil rents $\Rightarrow \downarrow$ reliance on domestic taxation $\Rightarrow \downarrow$ taxes $\Rightarrow$ *larger* informal economy

Figure 3.1. Bounded rationality suggests lower taxes lead to higher informal activity

Relationship between rents and taxes A branch of the natural resource literature is devoted to the political resource curse in which rents lead to distortions in the country's governance. These distortions include an increase in corruption (Brollo et al., 2013; Sala-i Martin and Subramanian, 2013), especially in developing countries such as Brazil and Nigeria. Also, distortions include a reduction in democracy (Prichard et al., 2018; Wiens et al., 2014; Ross, 2004; Tsui, 2011; Andersen and Ross, 2014), as well as a rentier effect which allows leaders to use the resource wealth to reduce the domestic tax burden so they

can reduce the demands that citizens put on them (Mahdavy and Cook, 1970; Paler, 2013) and/or reduce dissent (Brautigam et al., 2008). Likewise, rulers may focus on time horizons and use the resource wealth to maximize their own time in office, including bribery or other "regime preserving activities." (Ross, 2015) Morrison (2009) finds that non-tax revenues lead to less redistribution, while Robinson et al. (2006) analyze only resource rents and finds they lead to misallocation, but not necessarily less redistribution.

Furthermore, resource rents can affect not only the tax rates, but their very collection. The traditional link between taxpayers and tax collectors is that individuals will pay taxes, and in turn receive political rights, civil society, law and order, and representation. This allows a voice in how the country is governed (Levi, 1988). However, when rents are used as a substitute for tax revenues, this link is broken and the result, shown most starkly by Chaudhry (1997) in her work on how the government of Saudi Arabia rapidly switched from a robust tax collection methodology to simply relying on their oil wealth, can be repression as well as a lack of rights and voice in society. Also, Knack (2009) finds that resource rents, more so than other forms of non-tax revenue such as foreign aid, lead to weaker tax systems and administration.

Relationship between taxes and informality The current understanding of the informal economy is that activity rises whenever there is a rise in taxes. However, the previously mentioned example of Algeria and Tunisia present a problem to this understanding of the informal economy. As demonstrated before, these countries have similar governments and tax systems, yet the informal economy in Algeria is much larger than that of Tunisia.

It could be the case that governments using resource rents as a substitute for taxes simply decide that prosecuting violators of tax laws to simply be and inefficient use of time and money, which could explain Knack (2009)'s finding regarding tax administration. Since enforcement of regulations has both a fixed and variable component, governments may decide

to fine or otherwise enforce regulations such that they see the fixed costs of enforcement (salaries, buildings) as sunk and therefore seek to limit spending on the variable costs, which would include prosecution of offenders. Polinsky and Shavell (1992) find this mechanism at work and further demonstrate that if variable costs are high, the probability of enforcement will be low. The implementation of tax law would be included in the "high variable costs" category; tax professionals who can uncover tax evasion need specialized training and would therefore command higher salaries. Likewise, the costs of prosecuting offenders, especially larger companies, would be quite expensive. In short, I argue that developing nations may simply make the calculated gamble that under the conditions where tax revenues are not required as much for the government's coffers due to the resource rent, then their institutions may have good reason to simply "look the other way" when it came to tax avoidance and/or evasion.

However, the bounded rationality argument suggests that if a person if sufficiently afraid and/or unsure regarding the legality of their tax strategy, they will decide to pay. I argue that once citizens realize that a government has neither the desire nor the capacity to vigorously and fairly enforce tax laws, then they would no longer fear punishment and will therefore stop paying them.

This theory therefore implies that the informal economy should behave differently in developing countries compared to developed countries. A simple t-test with unequal variances of the informal economy variable gives a t-statistic of over 49 when comparing developed and developing countries. Since developed countries have the institutional control and a more robust social contract arrangement, developing countries should be more susceptible to the causal mechanism I outline. For this reason, my main findings will be for developing countries.

My original hypothesis to be tested in this paper therefore is constructed as

Hypothesis 3. *In comparing countries, a higher dependence on natural resources and concomitant lower dependence on tax revenue will lead to a larger informal economy than those countries that do not depend on natural resources.*

Dutch Disease Another mechanism by which oil rents can influence the informal economy is through the Dutch Disease effect in which employment shifts from the productive sectors to the non-productive sectors of the economy, leading to lower formal economic growth. However, it could be the case that oil resources could also impact the informal economy by driving people not into other, less attractive formal employment opportunities but rather out of the formal economy altogether. If there is a resource movement effect, we would expect to see that as a country's percentage of workers in the services industry goes up, the effect that oil has on a country's informal economy should go up.

According this theory, oil rents should have a direct relationship with the informal economy only at lower levels of taxation; as tax revenue goes up, and countries depend more on them, we should see an insignificant effect or positive effect.

The traditional government response to this revenue windfall is to lower domestic taxes. The literature suggests that this should lead to a lower informal economy. However, this cannot be the full story, since Nigeria, a resource dependent country, has a lower sales tax and personal income tax rate [1] than Tunisia, yet Nigeria has a much larger informal economy. Instead, if the revenue stream from the natural resource, "unearned" as it is, it leads to a belief among policymakers that the revenue stream will continue indefinitely. Therefore, there may be a different mechanism driving the informal economy size. This reliance on natural resource rents leads to a mal-investment in domestic industries and excessive investment in the resource industry (Dutch disease) and a laxness in enforcing tax laws. Therefore, in opposition to Hypothesis 1, the tax burden may not be as predictive of a country's informal economy as its tax structure: if a country is too dependent on natural

[1] https://tradingeconomics.com/nigeria/personal-income-tax-rate

resources, then its tax system may be effected in such a way that people will engage in the informal economy because the government is so lax in its collection efforts, which causes the people to respond from a bounded rationality standpoint to engage in informal behavior since there will be no effective punishment for doing so.

If true, we would expect that countries with natural resources, once its domestic tax system has fallen into disrepair, would become dependent upon the resource for continued revenue. However, oil is a commodity where global supply and demand levels shift quickly and sometimes significantly. This fact leads to a "boom and bust" cycle in which government revenues are not stable. If inadequate and sustainable provisions for public goods like infrastructure and education are not made, institutional decay begins and people, not trusting in the services provided by government, begin to engage in the informal economy.

Therefore, there are three potential channels in which oil rents may affect the informal economy: one, a direct link in which oil rents affect the informal economy on their own due to its status as "unearned" income. Two, oil rents may indirectly affect the informal economy by undermining the role of taxation in a political economy. Third, oil rents may affect the informal economy through a reduction in government effectiveness. The following results will give evidence that the second mechanism is better justified on empirical grounds. Since that causal mechanism inverts the traditional understanding of the relationship between taxes and informal behavior, it represents a new addition to the literature.

3.4 Data Sources

Main dependent variable To test the three hypotheses, I use as my central dependent variable a latent estimate of the informal economy by using a confirmatory factor approach. Data are gathered from the World Bank's World Development Indicators and World Governance Indicators for 145 countries from 2000-2016. Figure 3.2 shows the path diagram of the best-fitting model which estimates the informal economy activity in any given country.

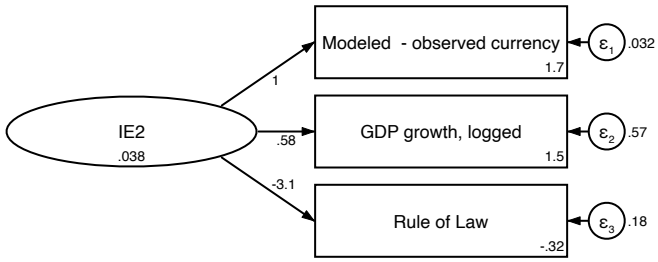

Figure 3.2. Path Diagram of Primary Latent Construct

As described earlier, this model shows that the key indicators of informal economic activity are three: one, the excess cash generated in a society, which is calculated by subtracting the observed $\frac{M0}{M2}$ currency ratio from the estimate modeled by the currency demand equation

$$lnM = \beta_0 + \beta_1 ln(P_y) + \beta_2 ln(P_c) + \beta_3 lnR + \beta_4 ln(FCE) + \epsilon \tag{3.1}$$

The second indicator variable is logged GDP growth, and the third of the World Bank's rule of law metric. To allow for model convergence, the excess cash variable was constrained to +1.

An alternate latent construct, shown in Figure 3.3, uses the modeled currency demand, logged GDP, and rule of law scores. Again, the modeled currency demand was help to +1 so that model convergence could be achieved. I will use this metric as a robustness test for the central findings.

Key independent variables I use oil rent data from the World Bank as the central independent variable. This measure captures the percentage of GDP for each country-year unit

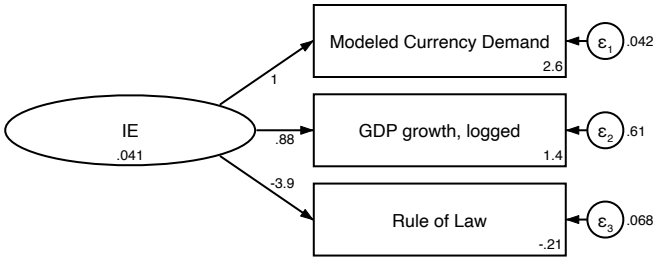

Figure 3.3. Path Diagram of Secondary Latent Construct

of analysis that comes from oil revenue. To test the effects expected from the other two hypotheses, I use World Bank data for government effectiveness measures which uses subjective measures gathered from household surveys to gauge how well a government is performing. Lastly, I use the logged values for taxes gathered from purchases of goods and services. I used this metric as opposed to direct taxes as a percentage of total taxation because the ratio of direct taxes will not accurately measure my theory whereas a measurement of the amount of taxes actually paid will. That is to say, if total taxation (the denominator) is held artificially low for the reasons I theorized, then any changes to this metric could be as a result of changes to the tax rates, or it could be because the government decided to stop collection. In either case, I can better test my theory using the amount of tax actually paid. Furthermore, taxes on goods and services is better metric than income tax payments since goods and services are a necessity for everyone, whereas income taxes may only be paid by wealthier people.

Key control variables Key control variables for this analysis will again come from various World Bank sources, and include logged GDP per capita (Schneider and Enste, 2000;

Schneider et al., 2010; DellAnno et al., 2018), urban population as a percentage of the total population (Abedian and Desmidt, 1990; Elgin and Oyvat, 2013), and corruption levels (Dreher and Schneider, 2010; Dreher et al., 2008). Work on the informal economy has shown that there is a relationship between informal activity and GDP per capita; the scholarly debate revolves around whether it should be an indicator or predictor variable, but there is agreement it should be included somewhere; however, findings regarding the exact relationship are mixed but tend toward an inverse relationship. Therefore, as GDP per capita rises, the informal economy should fall. The corruption metric must be carefully interpreted; I expect to see a negative relationship with the informal economy because the measure is a *control* of corruption. Therefore, a country that has more control over corruption ought to see a smaller informal economy. Finally, as urban population increases, we expect informal economic activity to rise as much informal activity occurs in places of high population density, where buyers and sellers of various goods are in larger supply. Table 3.3 shows the summary statistics for all variables in the model across all country-year units of analysis.

Table 3.3. Summary statistics

Variable	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
Latent Informal Economy 2	-0.064	0.212	-0.552	0.49	3405
Oil Rents (% of GDP) [WDI]	3.875	9.965	0	64.013	3200
Tax on G & S, logged	24.129	3.397	11.22	33.975	2047
Government Effectiveness [WGI]	-0.009	0.995	-2.446	2.437	3123
Corruption [WGI]	-0.016	1.004	-1.869	2.47	3123
GDP pc, logged	9.083	1.24	6.302	11.815	3197
Urban Population (% of total) [WDI]	57.276	24.384	8.246	100	3564

Modeling approach I begin with a panel data generalized least squares regression of 200 countries for the years 2000 - 2016 to test the central claims. The Hausman test (Hausman, 1978) revealed that a fixed effects model was preferable to random effects. This approach can also be used to control for omitted variable bias. Furthermore, the residuals of the model

are normally distributed with a mean of 0. However, Bell and Jones (2015) argue that many times panel data studies suffer from misspecification because Hausman test results point to a fixed effect model, which serves to eliminate the effects of time-invariant variables which they suggest could lead to erroneous conclusions. Instead, they suggest a random effects model. Since the purpose of this work is to compare countries with different time-invariant variables, it makes theoretical sense to use fixed effects.

World Bank data availability is unfortunately many times suspect, and this is likewise true for this study. Missingness of data is most likely missing at random, which suggests the data is missing but not *due to*, in this case, a country's informal economy. However, it could also be the case that countries with lower levels of institutional quality, for example, may be less likely to either collect the data accurately or report it to the World Bank (or its various sources such as the International Labour Organisation or OECD). To account for this possibility, I ran maximum likelihood models as well as models on interpolated data; the results were not significantly different from the listwise deletion approach taken here.

3.5 Findings

Table 3.4 show the results of the models as the various independent variables are incorporated. Of note is that when oil rents are significant, they have an inverse relationship, when I theorized they would have a direct relationship. Taxes were consistently significant; however, the sign flips from negative to positive. Finally, government effectiveness is consistently negatively related to informal economy activity, as suspected. The results are most likely due to the fact that the confirmatory factor analysis used in creating the latent dependent variable created predicted values that are in a narrow range thereby creating sensitivity as variables were added to the model. Interestingly, the urban population variable is never significant; it could be the U-shaped relationship discovered by Elgin and Oyvat (2013) could explain this finding.

Table 3.4. Preliminary Results

	(1) IE	(2) IE	(3) IE	(4) IE	(5) IE	(6) IE	(7) IE
Oil Rents (% of GDP)	−0.000269	−0.000114	−0.000746*	−0.000602	−0.000554	−0.000699*	−0.000665*
	(−0.42)	(−0.31)	(−2.06)	(−1.70)	(−1.63)	(−2.09)	(−1.99)
Tax on G & S, logged	−0.0151***		−0.00807***	−0.00715***	0.0122***	0.00925***	0.00854***
	(−6.50)		(−5.80)	(−5.26)	(5.90)	(4.43)	(4.01)
Govt Effect.			−0.0861***	−0.0627***	−0.0533***	−0.0559***	−0.0548***
			(−17.82)	(−11.69)	(−10.23)	(−10.44)	(−10.17)
Corruption				−0.0494***	−0.0480***	−0.0469***	−0.0462***
				(−9.19)	(−9.27)	(−8.83)	(−8.67)
GDP pc, logged					−0.0993***	−0.101***	−0.104***
					(−12.18)	(−11.75)	(−11.79)
developed						0.0138***	0.0131***
						(3.49)	(3.30)
Urban Population							0.000771
							(1.68)
Constant	0.257***	−0.0611***	0.103**	0.0845*	0.542***	0.615***	0.624***
	(4.54)	(−33.65)	(3.05)	(2.56)	(11.06)	(11.47)	(11.59)
Observations	1990	3152	1867	1867	1860	1781	1781

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Bolstering the claim that there is a difference in the informal economies of developed and developing countries, we see a significant and inverse relationship when looking only at developed countries, while there is a direct and significant relationship between oil rents and the informal economy in developing countries. The coefficients for the other variables are in the expected direction, as seen in Figure 3.4 and Figure 3.5.

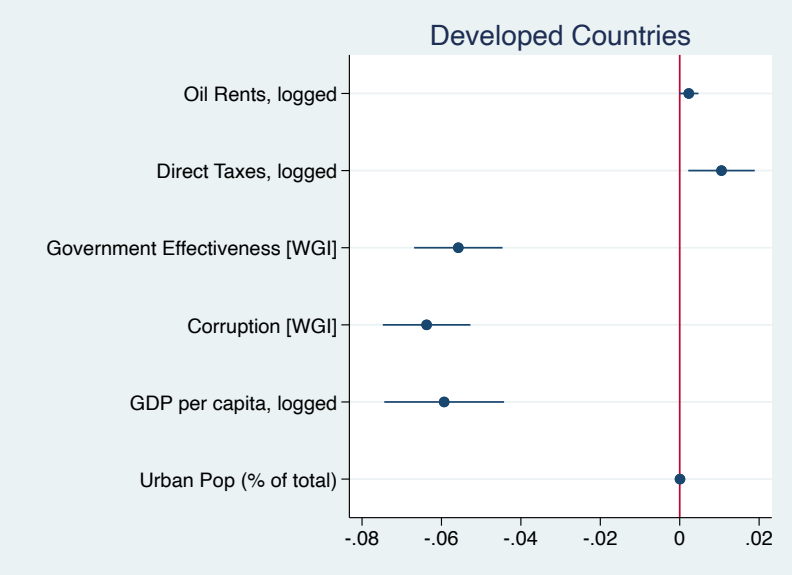

Figure 3.4. Preliminary Results, Developed Countries

Interaction effects Recall that I theorize that oil rents have an effect on the informal economy by way of a lower reliance on tax revenues. To properly adjudicate that causal mechanism, an interaction effect needs to be modeled. If correct, the results should show that oil rents lead to a higher informal economy at lower levels of taxation. Figure 3.6 shows this to be the case for developing countries. Furthermore, we see an insignificant effect at higher levels of taxation, lending further evidence to the theory.

However, it could be that the causal mechanism is not the lower dependence upon tax revenue, but rather government effectiveness. After all, the results show a significant and inverse relationship, and it makes theoretical sense that as a government becomes more

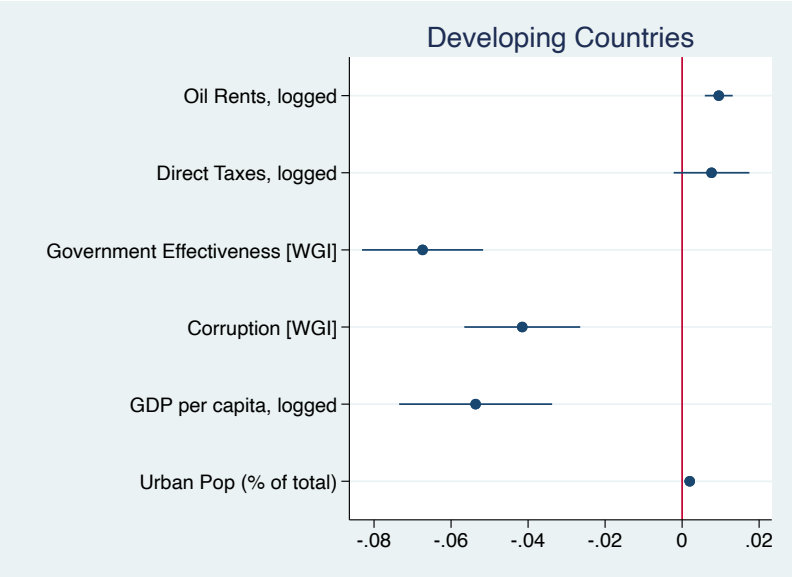

Figure 3.5. Preliminary Results, Developing Countries

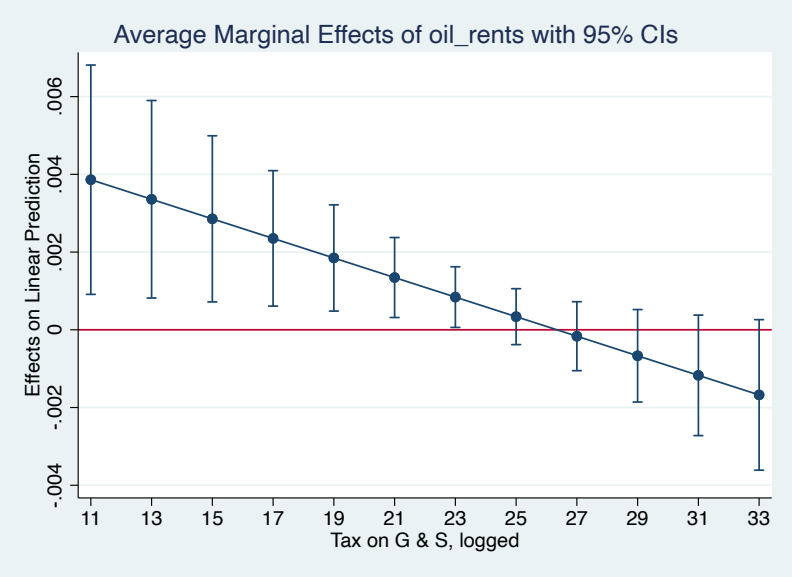

Figure 3.6. Interaction of tax rates and oil rents

effective, oil rents should have an inverse relationship with the informal economy. Figure 3.7 shows the resulting interaction effects, and there is little evidence to support the idea that oil is affecting the informal economy through changes in government effectiveness.

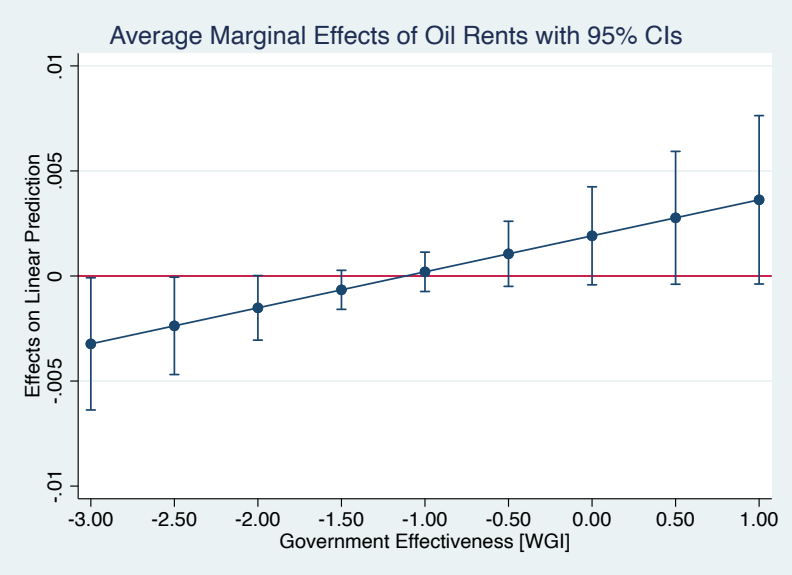

Figure 3.7. Interaction of Government Effectiveness and Oil Rents

The second proposed mechanism of how oil rents may affect the informal economy was through the resource movement effect. Under those conditions, we would expect that as a country has a higher level of employment in services, there would be a larger informal economy. Figure 3.8 shows this effect may be occurring; at lower levels of service employment, oil leads to lower informal activity, while at higher levels there is a direct effect.

Robustness tests Recall that the secondary latent estimate of the informal economy was based on the modeled predictions of currency demand, not those predictions subtracted by the observed currency demand. This allows robustness test of the central claims. Figure 3.9 shows the results of the full regression equation on the full sample; oil rents are significant and positive at the 10% level while all other variables are significant and in the expected direction.

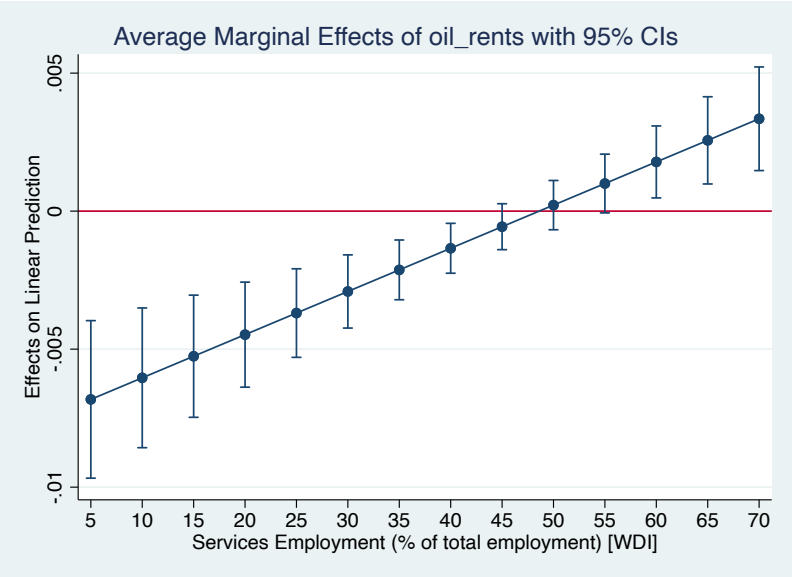

Figure 3.8. Interaction of Service Employment and Oil Rents

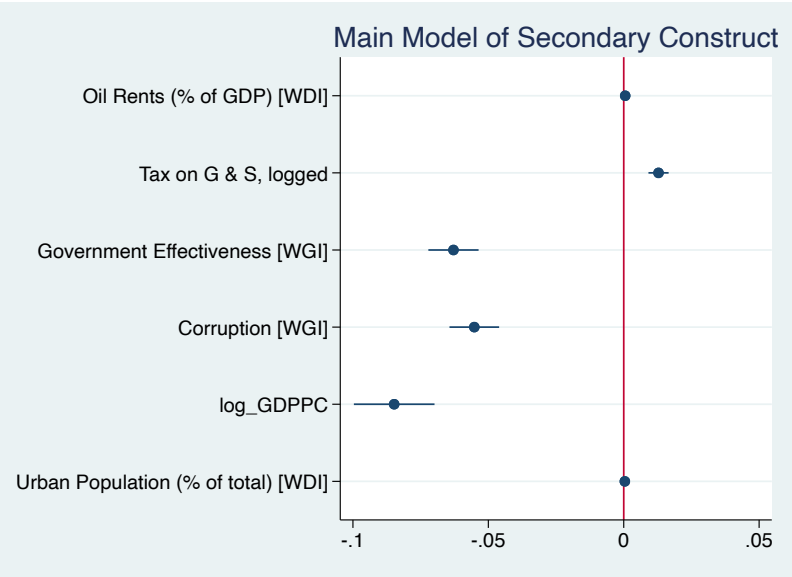

Figure 3.9. Secondary measure, full sample results

Furthermore, the interaction effect of the tax burden and oil rents is still significant when looking at developing countries and even serves as better evidence of the central claim that when tax burdens are lower, oil rents lead to a larger informal economy, and at larger tax rates, the effect of oil is insignificant.

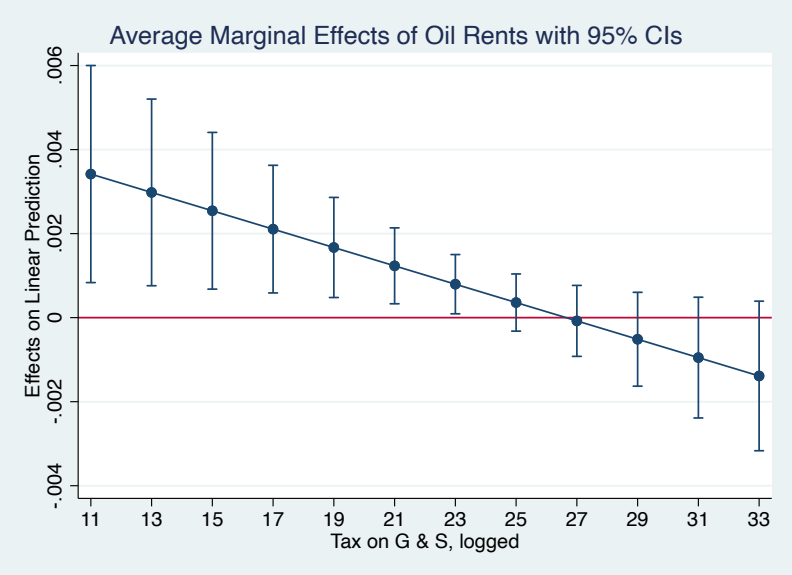

Figure 3.10. Interaction Effects, Developing Countries

Lastly, since I will testing three hypotheses regarding the foreign determinants of the informal economy, Figure 3.11 shows the results of my main finding while including the metrics used in adjudicating those hypotheses; the oil rent variable is significant at the 10% level while the interaction term between oil rents and the tax level becomes insignificant.

3.6 Conclusion and Policy Implications

Domestic determinants of the informal economy are crucial for policymakers to understand, as they can open up opportunities to engage in economic activities that, while not necessarily illegal, lead to lower quality of life. I hypothesized that oil rents and would cause a country's informal economy to grow due to the negative repercussions that government may make

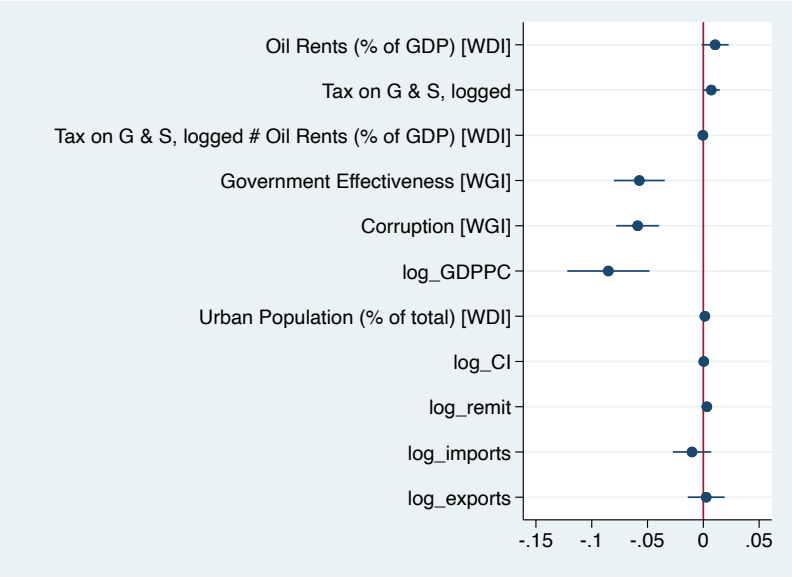

Figure 3.11. Model including foreign determinants

when they realize income that is not "earned" through taxation. In short, countries that use oil rents as a substitute are more likely to see their informal economies grow. The current understanding of the informal economy has supposed that as tax burdens rise, the informal economy should get larger. I have shown however that oil rents can cause a country to lower tax burdens, but still raise the level of informal activity. Furthermore, I have eliminated another potential causal explanation; that the oil rents are causing a change to the informal economy not through its tax burden but rather its government effectiveness. Lastly, I have shown evidence that the Dutch Disease mechanism may be at play as well by showing that oil rents lead to a larger informal economy at higher levels of service employment.

This may cause researchers or policymakers to mistake a lower tax burden to be an effective way to curb informal behavior. A policy change along those lines could lead to a lower informal economy, but if that lower tax burden is "paid for" with resource rents, the result may be the opposite of what was intended.

The deleterious effects of oil rents, especially for developing countries, is well researched and understood. I have added to the understanding of the role they play in a country's

domestic economy by showing that a reduction in a chief cause of informal activity may not actually result in lower levels of informal activity under the right conditions.

CHAPTER 4

FOREIGN DETERMINANTS OF THE INFORMAL ECONOMY

4.1 Missing Foreign Context of the Informal Economy

Up to now, this work has focused solely on the domestic determinants of informal economic behavior; however, there are good reasons to suggest that economic activities in other countries may have an impact on any given country's informal economy. If it is true that a majority of informal economic activity occurs through cash transactions, then one potential variable that ought to be discussed is that of remittances. Money sent from family members living in other countries represent an "unearned" windfall that could be easily used in the informal economy, either as a consumer or a producer. Chatterjee and Turnovsky (2018) finds that remittances can have different effects based on various details such as duration and whether they are countercyclical. It could also be the case that remittances can impact the informal economy different ways depending upon their use (Martinez et al., 2015).

Secondly, the effects of foreign trade on a country's domestic economy is well known but could lead a domestic economy to either improve or regress. First, increased trade could impact domestic industries such that local businesses reduce their labor costs to stay competitive (Goldberg and Pavcnik, 2003; Maloney, 2004). This effect could be achieved through two ways: a simple reduction in headcount or a replacement of full-time workers with part-time help. In either case, we would expect an increase in the informal economy based on this on this proposed mechanism. A second methods by which increased trade may affect the informal economy through the difference between high- and low-productivity firms. High-productivity firms will be better prepared to compete and continue exporting, even in the face of new competition, while low-productivity firms will be more hard-pressed. To remain competitive, they may incorporate more informal labor.

Puzzle Table 4.1 shows a comparison between two relatively similar countries, Uruguay and Argentina. First, key domestic variables, logged GDP per capita and taxes on goods and services have no significant difference. However, Argentina has a much larger informal economy than Uruguay; the t-statistic is over 20. Foreign determinants are also statistically significant; Argentina has more remittances and oil FDI, while Uruguay has a higher level of trade. Therefore, it could be the case that foreign determinants ought to be analyzed to ascertain whether they have an effect on the informal economic activity in a country.

Table 4.1. T-test comparison between Uruguay and Argentina

Metric	Uruguay	Argentina	|t-statistic|
IE est.	-.199 (.009)	.069 (.009)	20.66
Oil FDI, logged	.213 (.213)	4.22 (.722)	5.31
Remittances (logged)	17.67 (.602)	19.84 (.139)	3.62
Trade (% of GDP)	51.2 (2.15)	33.59 (1.78)	6.30
GDP pc, logged	9.63 (.050)	9.728 (.035)	1.55
Taxes on G & S (% of GDP)	25.02 (.142)	24.99 (.269)	.09

This paper adds more weight to the Dutch Disease literature which suggests that foreign direct investment in oil will lead to distortions in the domestic economy. The addition comes from studying a new dependent variable; instead of GDP growth (Comunale, 2017; Law and Moradbeigi, 2017) or exchange rate appreciation (Acosta et al., 2009; Magud and Sosa, 2013) as the central dependent variable, I find that a measure of excess cash in an economy is also affected by the introduction of oil FDI. The effect that FDI has on excess cash is dependent upon whether a developing country is more industrialized or more agricultural. Countries with lower levels of industrialization will have larger amounts of excess cash, while countries with lower levels of agricultural employment will have lower levels of excess cash. I theorize this is due to the effect the oil rent has on imports and exports. As the currency appreciates and imports become relatively cheaper, there should be an increase in demand for those imported goods and a concomitant rise in demand for cash. Likewise, the resource

movement effect suggests that the more expensive export industry will suffer higher levels of unemployment and lower wages, leading to a drop in demand for excess cash.

The remainder of the paper is organized as follows: section 4.2 reviews the various foreign determinants of the informal economy and theorizes why FDI, previously unmentioned as a predictor, may alter a country's informal economy. section 4.3 suggests why inward oil FDI may effect a country's informal economic activity due to the twin mechanisms of the Dutch Disease, while section 4.4 outlines the empirical approach to adjudicate the hypotheses. section 4.5 analyzes the empirical results, and section 4.6 concludes.

4.2 Review of Foreign Determinants

Trade While modeling of the informal economy incorporates only domestic variables, several international or foreign determinants may also affect a country's informal economy. Current literature suggests that a country's informal economy can be affected by exposure to trade as well as the level of inward remittances. These causal processes are direct; as a country's exposure to trade and the global marketplace increases, there could be mechanisms that drive individuals to the informal economy. Likewise, the amount of money received from family members living in other countries give the locals a source of "costless" revenue not previously available, effecting the desire to work informally.

Although it is well established that trade liberalization or openness leads to economic growth (Frankel and Romer, 1999; Krugman, 1979), the certainty that a country's informal economy will get smaller as a result of trade openness may not be as clear cut. Likewise, methods to increase trade openness such as financial openness and fungibility of money have a mixed record regarding its effects on the economy. Kim et al. (2010) finds that trade openness can lead to financial development, but only in the long run. In the short run, the change in policies has a negative effect on economic growth; Zhang et al. (2015) finds similar results when looking only at Chinese provinces. A 2010 study of the South African informal

economy found that increased trade led to a downward pressure on the informal economy but also more informal traders but fewer informal producers (Davies and Thurlow, 2010).

Trade openness may also be observed in banks, where decisions regarding credit in the newly globalized marketplace may be restricted by the increase in relative risk (Ashraf, 2018). If true, we would expect that increased availability of credit may work its way to the individual, but rather stay in the banks or go to businesses, which may not requisitely raise wages. Gries et al. (2009) find in their study of 16 Sub-Saharan African countries, financial deepening did not lead to economic growth, giving statistical heft to Ashraf (2018)'s argument.

This confounding effect of trade on the informal economy is found in Latin America (Goldberg and Pavcnik, 2003); trade sometimes had a nil effect on the size of the informal economy until including the exogenous shock of a labor market reform. Maloney (2004), also analyzing Latin America, found that a larger informal economy was evidence of an improvement in opportunity due to its labor flexibility, leading to Webb et al. (2009)'s contention that a larger informal economy is evidence of burgeoning entrepreneurism and not degradation and poverty.

Effects of Dutch Disease on trade Therefore, a closer look at the more individualized components of trade may be necessary to get a better picture of the effects it may have on the informal economy. After all, the resource movement effect supposes that an increase in a financial flow such as oil FDI will lead to local currency appreciation, which by definition should impact imports and exports differently. In that sense then, industrial and agricultural countries should see different effects on their informal economies; the rise in cheaper imports should lead to an increase in cash demand, leading to a larger informal economy, especially if those cheaper imported goods were being sold in street markets or bazaars. Elsewhere, in more industrialized countries, we should see the resource movement effect where the highly

skilled workers in export industries face lower demand due to the appreciated currency, leading to a transition to the oil sector.

The overall effect of trade on the informal economy is therefore hypothesized as

Hypothesis 4. *In comparing countries, an increase in imports will lead to a larger informal economy, while an increase in exports will lead to a reduction.*

Remittances Another micro-level financial variable, inflow remittances, or money sent from natives living in another country to their families in the home country, should theoretically have an effect on a domestic informal economy. Representing income that is otherwise unearned, remittances act as a subsidy and represent cash in hand, many times to the relatively poor. The literature on the effects this influx of cash will have splits along the lines of what will be done with the cash received: will it be invested in a local business or used for local consumption?

One approach suggests that *if* a country has poor institutions, then "venture funding" may decrease due to the lack of institutional controls, leading to a dearth of available capital to start a business. This implies that companies seeking to do business in a foreign country will consider its strength of government; if the government seems too weak, the business investment may go elsewhere. Martinez et al. (2015) find that remittances can lead to a higher informal economy because the remittances are not invested in formal business arrangements due to a desire to avoid the tax and/or bureaucracy in these countries with poor institutions. So while entrepreneurs in the home country may proliferate due to remittances, they will choose to stay in the shadows (La Porta and Shleifer, 2014). This causal mechanism is not necessarily negated by Gupta et al. (2009)'s finding that remittance inflows into Sub-Saharan African countries led to higher levels of financial development and a reduction in poverty; we see here again the potential mask the informal economy hides behind. The overall economy grows while at the same time the informal economy grows; this economic

growth then may not be a "healthy" growth in the sense that people are still left in the informal economy.

This mechanism seemingly plays out in Tonga, an island in the South Pacific with a large diaspora (Besnier, 2004). In it, many remittances are unrecorded and lead to a larger informal economy (Brown and Conneil, 1993) and a dependence upon entrepreneurs to create economic opportunity. In a study of the flea market of Nuka'alofa, Besnier (2004) finds that locals were receiving imported goods *as remittances* and were therefore undercutting other local shop owners. In either case, the "unearned" windfall of remittances clearly have effects on both the formal and informal economy.

These authors assume that the remittance revenue will be used for investment; what if the money is used as a subsidy for consumption? Acosta et al. (2009) suggest that remittances lead to a lower labor supply, leading to higher production costs in the tradable sector of the local economy, and an increase in the non-tradable, more informal, sector. The higher costs of tradable goods relative to non-tradable then increases the demand for services, and the percentage of informal activity increases. Ziesemer (2012) finds middle ground, in which remittance money is saved and invested not in business but education, which leads to a growth in GDP (formal economy). At the same time, it reduced tax revenue, which is another factor in a growing informal economy.

It could however be the case that remittances can serve to stabilize an economy and not distort it. Combes and Ebeke (2011) find in their study of developing countries that individuals use the remittance income as a bulwark against natural disasters, agriculture shocks, or exchange rate instability, while a study of Albanian households found that remittances were used for consumer durables and not necessities such as food (Castaldo and Reilly, 2015).

In any case, the unearned windfall of remittances serves as a direct cash infusion into the local economy and whether or not the money is invested or spent, the result should be a larger informal economy as developing countries are more likely to have larger marginal

propensities to consume (Tekin, 2018); however Ramcharran (2020) finds mixed evidence of this effect when looking at Latin American countries.

The overall effect of remittances would be

Hypothesis 5. *In comparing countries, an increase in the level of remittance inflows will increase informal economic activity.*

4.3 Theory

Role of Foreign Direct Investment I suggest that another international variable is necessary to better understand the informal economy: Why do international trade and financial flows have different effects on otherwise similar countries? I theorize that as international companies invest in the extraction of natural resources or in the investment of energy creating facilities, we could see an effect in the domestic informal economy.

The Dutch disease literature posits that an external financial inflow shock such as FDI in the oil sector will cause the currency to appreciate, leading to lower levels of exports and higher levels of imports. The tradable sector therefore decreases in size and labor shifts to the more lucrative resource industry, leaving only the volatile resource industry and the non-tradable sectors as the main drivers of the economy. Continued investment in the resource industry creates a "boom sector", "lagging sector", and "non-tradable sector" (Corden, 1984) which begins to shift the macroeconomics of the entire country.

Magud and Sosa (2013) demonstrates that the link between the disease and sluggish economic growth is the real exchange rate, which implies that the disease can be "defeated". They argue that Dutch Disease theorists err when they suggest that the manufacturing tradable sector is a unique driver of the economy that cannot be replaced. If, however, this assumption is too strong, then the only economic issue is a disequilibrium of the real exchange rate, which can be solved through currency depreciation or lowering interest rates.

However, these solutions speak to certain institutional strengths, namely an independent central bank, which can lead to financial development; Berdiev and Saunoris (2016) finds that a country's financial development is likely to lessen a country's informal economy. In the absence of such capability, however, the Dutch Disease seems more likely than not, especially for developing nations.

Continuing the theme of effects that natural resources can play, a potential third option, based on the Dutch Disease literature, suggests that

Hypothesis 6. *In comparing countries, increased foreign direct investment in the natural resource industry will lead to a higher informal economy conditional upon the relative amounts of industry and agriculture.*

It could be argued that there is no theoretical difference between remittances and oil FDI in the sense they are both unearned windfall sources of revenue, so they should have the same impact on a country's informal economy. However, they are substantively different. Remittances represent a highly liquid direct cash infusion that be used almost immediately by individuals for consumption or savings, whereas oil FDI cannot. Instead, FDI is used primary for infrastructure building, land rights acquisition, and other logistical concerns. Also, since oil is capital-intensive and not labor-intensive, increased wages would go to a relatively smaller number of people than remittances. Therefore, while they are both sources of "unearned" income, there are good reasons to think they would impact the informal economy differently.

It can likewise be argued that oil FDI can impact the informal economy regardless of its country of origin. That is to say, there may be no difference between domestic FDI and foreign FDI. However, there is a clear difference between the two: domestic FDI would necessarily have its genesis in domestic sources of GDP; therefore, domestic FDI would represent "earned" income regardless of which bank, corporation, or individual invested in the oil company. On the other hand, foreign FDI would represent "unearned" income. Any

infrastructure build-outs or technology transfers would also count as unearned; therefore, they would represent an exogenous shock that domestic FDI would not. Also, oil FDI is fundamentally different than oil rents because the revenues gained from oil represent a flow into the host country's coffers, while the oil FDI, as a necessary first step, would go to the oil company.

Conditional effects of oil FDI on industry and agricultural employment Given the external shock of a natural resource discovery, which is completely independent of any institutional or economic variables (i.e. the oil is either there and recoverable at a profit or it is not), we would expect FDI to enter into the country as oil companies, many of which are multi-national corporations (MNC), seek to profit from the extraction of the resource. The causal process thus begun, the country begins to see an employment shift to the resource sector and away from the manufacturing sector, leading to a dependence on the resource and non-tradable service sector, which causes an increase in the number of workers in the informal economy. I theorize that FDI funds may have more of an effect in kickstarting the Dutch disease mechanism because they represent a larger pool of potential funds than any one government has to invest on its own; a single country can only shift so much government revenue from the manufacturing sector to the resource sector, but companies' investments can have a multiplier effect on the country's capacity. Lartey et al. (2012) shows how different types of foreign financial flows affect the real exchange rate, leading to a shift from the manufacturing sector to the resource sector.

This employment shift occurs because the extraction companies can afford higher wages due to their product having a more inelastic demand curve (Wang and Sun, 2017) than the products being manufactured; individuals then leave the lower paying manufacturing jobs for the resource extraction job since the physical aspects of each job are similar (long hours, difficult conditions) as are the educational requirements. If these employment opportunities are therefore substitutes, then a rise in one should cause a drop in the other.

The increased FDI should then cause economic growth because of the increased wages. While there may be an overall benefit to the whole economy as measured by GDP because of increased FDI, those gains will go down as the prevalence of FDI on natural resources goes up (Hayat, 2018). If we recall Magud and Sosa (2013), they stipulated the Dutch Disease can be defeated only if the manufacturing sector can adapt. Technology may be able to fill that gap; if a country has technological capability, then economic growth may occur and the informal economy can be reduced. Iamsiraroj and Ulubaolu (2015) and Borensztein et al. (1998) argue a state's ability to have the "absorptive capability of advanced technologies" will lead it to economic growth.

Therefore, as a country is more industrialized, oil FDI should lead to a smaller informal economy. This is because the resource movement effect shifts industry and/or manufacturing jobs to the oil sector results in higher, formal wages which is more likely to be captured as observed currency demand. However, if a country is still largely agricultural, we would expect oil FDI to lead to a larger informal economy since the cheaper imports brought by the currency appreciation should lead to increased cash demand based on the inflation of the currency, leading to an increase in the modeled currency demand.

4.4 Empirical Approach

Any type of linear regression modeling requires that the variables be randomly distributed; that is, any one particular unit of analysis has an equal probability of having or receiving the variable in question. However, that assumption does not hold when studying oil FDI. Even if we assume that any country with natural resources will have FDI in that industry, not all countries are equally likely to have them, and countries with higher levels of natural resources would theoretically receive higher levels of FDI. The level of FDI could also be the reason why output levels are higher. I account for this difficulty by using a Heckman (1979) model to appropriately model the differences in selection probability. Heckman demonstrated that

without taking selection issues into account when modeling, estimators will be biased. He uses two different techniques to resolve the problem; first, a two-step estimator in which the factors that explain the treatment of the variable in question for selection bias, then the second stage adds the resulting inverse Mills ratio as an explanatory variable in the model.

Dependent variable Recall from Chapter 2 that the latent construct of the informal economy was created using a confirmatory factor analysis of three variables: excess cash, defined as modeled currency demand subtracted from observed currency demand, a rule of law metric, and logged GDP growth. However, there are theoretical reasons to think that GDP growth will impact FDI (Basu et al., 2003); likewise a literature exists to support the claim that a country's various regime type variables such as rule of law will likewise impact inward FDI decisions (Staats and Biglaiser, 2012; North, 1990). However, the theoretical links between inward FDI and excess cash are unclear. Therefore, for this analysis, the dependent variable will not be the latent construct used in the previous chapter, but rather the excess cash component.

Independent variables I will use the following variables to test the three hypotheses in regards to their effects on the informal economy: logged values of imports and exports as a percentage of GDP, logged levels of remittances, and FDI in the oil sector. FDI can be measured as capital expenditure (Greenfield investments) or in number of jobs. This analysis will use both. The first three variables are available for the World Bank World Development Indicators, and the FDI data source is a proprietary dataset managed by the Financial Times. Coverage is for all available countries from 2000 - 2016.

Data on imports and exports are used to separately adjudicate the effects of trade on the informal economy since there is theoretical reason to suspect they may affect the informal economy differently, especially when taking into account the effect of oil FDI. A general

measure of trade, such as the World Bank's trade as a percentage of GDP metric, would confound the two trade flows and lead to inaccurate findings.

Remittances are defined as "personal transfers and compensation of employees...consist(ing) of all current transfers in cash or in kind...received by resident households to or from nonresident households (World Development Indicators)." This measure is likewise demarcated in current US$; its validity and reliability would be the same as the trade measures since they come from the same authority.

The oil sector FDI is in current US$ and measures the amount of money spent in a year on any type of oil sector project. It is possible therefore that some of the FDI may not have gone directly to exploration or production; however, I make no theoretical claims in regards to specific oil projects. Rather, any FDI in the oil sector would impact the existing relationship between the different sectors of the economy, leading to an effect on the amount of economic activity occurring in the shadows. This measure is therefore appropriate for my study; its validity and reliability come from the idea that the Financial Times is a well-respected organization dedicated to the investigation of global financial affairs. Lastly, industry employment as well as agricultural employment as a percentage of GDP is included in the analysis since I theorize a conditional effect.

Selection variables I account for the non-randomness of receiving oil FDI by including in the Heckman selection model three variables related to the central independent variable of interest, which are logged oil rents as a percentage of GDP, corruption scores, and logged levels of reserves. Since the dependent variable in this analysis is not the latent construct of the informal economy but rather only its currency demand component, I would not expect oil rents to have a direct effect on the dependent variable; the same logic applies to the corruption variable. Lastly, the level of proven reserves should only impact the amount of potential FDI and not affect currency demand at all.

4.5 Analysis

Preliminary results Table 4.2 shows the iterative builds of the main model for all countries in the dataset. Of note is that oil FDI has a negative relationship to excess cash demand when by itself, and an insignificant relationship in the other model runs. Also, remittances are theorized to have a direct relationship with excess cash demand, but the results are consistently negative. Since most studies of remittances focus on developing countries, a secondary analysis will be done and results can be compared. More interesting are the results for imports/exports and employment type. Imports are consistently correlated with a smaller cash demand while the coefficient for exports is consistently negative. This could be due to increased demand of cheaper imports that are a direct result of the appreciating currency that oil FDI brings leading to increased currency demand. Also, industry employment has a negative and significant relationship with excess cash demand, while agricultural employment is positively related.

Table 4.2. All countries, Heckman model

	(1) Excess Cash currency	(2) Excess Cash currency	(3) Excess Cash currency	(4) Excess Cash currency	(5) Excess Cash currency	(6) Excess Cash currency
Excess Cash currency						
Capital Investment	−0.0138***	−0.00364	−0.00566*	−0.000129	−0.000288	−0.00254
	(−5.96)	(−1.21)	(−2.18)	(−0.07)	(−0.18)	(−1.93)
Remittances		−0.0382***	−0.0383***	−0.0391***	−0.0224***	−0.00903***
		(−8.84)	(−8.55)	(−12.23)	(−9.76)	(−4.36)
Imports			−0.0305	0.193***	0.178***	0.134***
			(−1.65)	(6.52)	(7.67)	(6.83)
Exports				−0.256***	−0.187***	−0.139***
				(−14.40)	(−8.06)	(−7.21)
Industry Employment					−0.0115***	−0.00265**
					(−11.07)	(−2.71)
Agricultural Employment						0.00586***
						(15.42)
Constant	2.464***	3.280***	3.386***	3.268***	2.830***	1.997***
	(50.81)	(32.85)	(22.64)	(25.34)	(43.63)	(23.78)
select						
Proven Reserves	0.0146*	0.0194*	0.0215*	0.0215*	0.0236**	0.0236**
	(2.34)	(2.38)	(2.52)	(2.35)	(3.15)	(2.82)
Oil Rents	−0.0105***	−0.0193***	−0.0195***	−0.0195***	−0.0197***	−0.0197***
	(−3.87)	(−5.07)	(−5.35)	(−5.22)	(−4.99)	(−4.70)
Corruption	−0.380***	−0.381***	−0.382***	−0.382***	−0.387***	−0.387***
	(−15.42)	(−15.51)	(−13.37)	(−13.13)	(−14.48)	(−15.37)
Constant	−0.315***	−0.376***	−0.391***	−0.391***	−0.405***	−0.405***
	(−9.53)	(−13.15)	(−10.96)	(−12.22)	(−19.72)	(−13.37)
/mills						
lambda	−0.829***	−0.850***	−0.832***	−0.642***	−0.490***	−0.292***
	(−16.23)	(−12.29)	(−12.89)	(−10.89)	(−11.99)	(−8.08)
Observations	2936	2798	2785	2785	2774	2774

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4.3 shows the full model results for developing countries only. As suspected, remittances become positively associated with higher levels of excess cash; however, oil FDI still leads to less cash demand. The results of imports and exports are the same as the full dataset, while industrial employment is insignificant and agricultural employment remains positively related with excess cash. As suspected, there is a significant difference in cash demand when comparing developed to developing countries. One area of future research would be to better formalize these findings on theoretical and more substantial empirical grounds.

Table 4.3. Developing Countries, Heckman model

	(1) Excess Cash Demand
Excess Cash Demand	
Capital Investment	−0.00426**
	(−2.64)
Remittances	0.00845**
	(3.02)
Imports	0.161***
	(7.72)
Exports	−0.161***
	(−7.98)
Industry Employment	0.00296
	(1.77)
Agricultural Employment	0.00762***
	(14.08)
Constant	1.064***
	(6.64)
select	
Oil Reserves	−0.000813
	(−0.07)
Oil Rents	−0.00605
	(−1.39)
Corruption	0.151
	(1.95)
Constant	0.0185
	(0.29)
/mills	
lambda	0.190
	(1.18)
Observations	1263

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Interaction effects These results however do not account for the causal chain proposed. Oil FDI by itself may have an inverse relationship with excess cash, but that result may be conditional on whether or not a country is more industrialized or more agricultural.

Brambor et al. (2006) argue that the marginal effects of an interaction term must be graphed so that its effects can be visualized across the entirety of the variables of interest.

Recall that the effect oil FDI has on the informal economy is conditional upon the relative levels of industry and agriculture as a percentage of GDP activity.

At lower levels of industrialization, there should be a positive and significant relationship with excess cash, while at higher levels of industrialization there should be a negative relationship. For agricultural employment, the results should be opposite: countries with lower levels of agriculture should see a negative relationship, while higher levels of agriculture should correspond with larger levels of cash demand.

We see in Figure 4.1 and Figure 4.2 mixed evidence to support the theory.

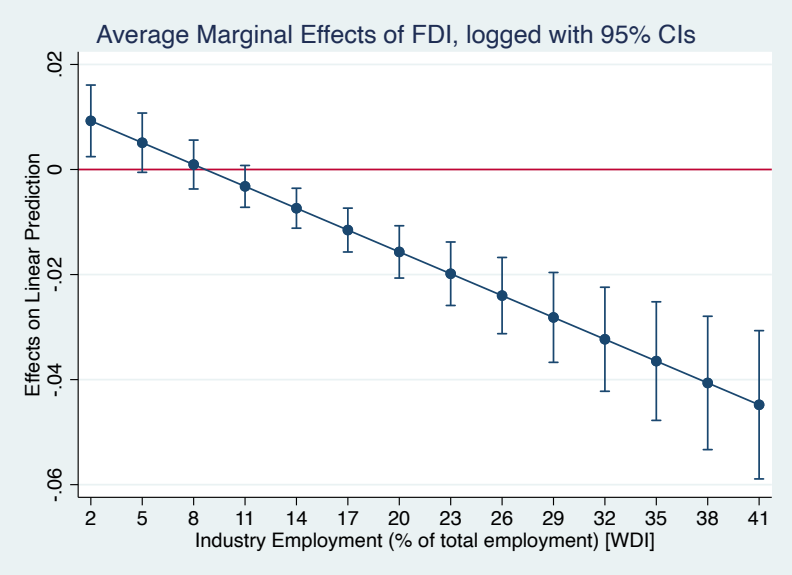

Figure 4.1. Interaction of Oil FDI and Industrial Employment

The interaction of oil FDI and industrial employment gives strong evidence that increasing industry will cause oil FDI to lower cash demand, but only at the very lowest levels of industrial development does one see a significant and negative interaction effect. For agricultural employment, significant effects only occur at lower levels; I must reject the theory that higher levels of agricultural employment will lead to larger amounts of excess cash demand.

Robustness checks The Financial Time FDI database includes inward FDI metrics regarding not only capital expenditure, but also number of jobs. Table 4.4 shows that there is

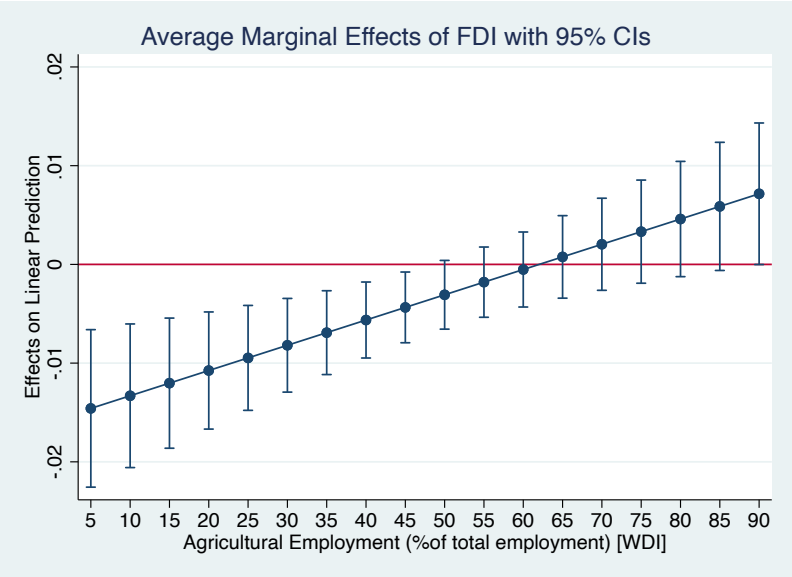

Figure 4.2. Interaction of Oil FDI and Agricultural Employment

no difference when the alternate metric is used on the full dataset, nor is there any appreciable difference for the results among only developed and only developing countries.

Likewise, as seen in Figure 4.3 and Figure 4.4, there is no appreciable difference in the interaction plots for industrial and agricultural employment in a country when measuring FDI in terms of jobs instead of capital investment. This could be because as a capital-intensive industry, oil companies hire relatively few workers, so the effects of the relative industrial or agricultural strength of a country may not be affected by oil FDI.

4.6 Conclusion

While constructs of the informal economy use only domestic determinants, I have shown that foreign factors will also influence it. Three of the most likely foreign determinants are trade levels, remittances, and oil FDI. Overall, I find for developing countries that remittances do lead to a significantly higher level of cash demand, as predicted by the extant literature. Furthermore, increases in imports consistently lead to higher levels of cash demand, while increased exports lead to lower cash demand. The effect of oil FDI as well as jobs will

Table 4.4. Full Model with FDI Jobs, Heckman model

	(1)
	Excess Cash Demand
Excess Cash Demand	
FDI Jobs	−0.00423**
	(−2.98)
Remittances	−0.00836***
	(−4.36)
Imports	0.131***
	(7.10)
Exports	−0.137***
	(−7.46)
Industry Employment	−0.00256*
	(−2.08)
Agricultural Employment	0.00588***
	(17.38)
Constant	1.987***
	(29.85)
select	
Proven Reserves	0.0236**
	(2.63)
Oil Rents	−0.0197***
	(−5.57)
Corruption	−0.387***
	(−14.86)
Constant	−0.405***
	(−12.51)
/mills	
lambda	−0.291***
	(−10.00)
Observations	2774

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

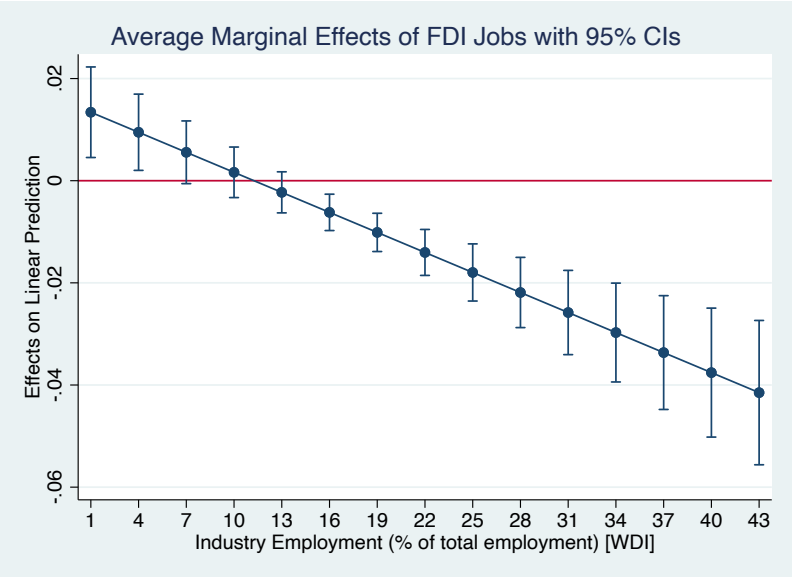

Figure 4.3. Interaction of Oil Jobs and Industrial Employment

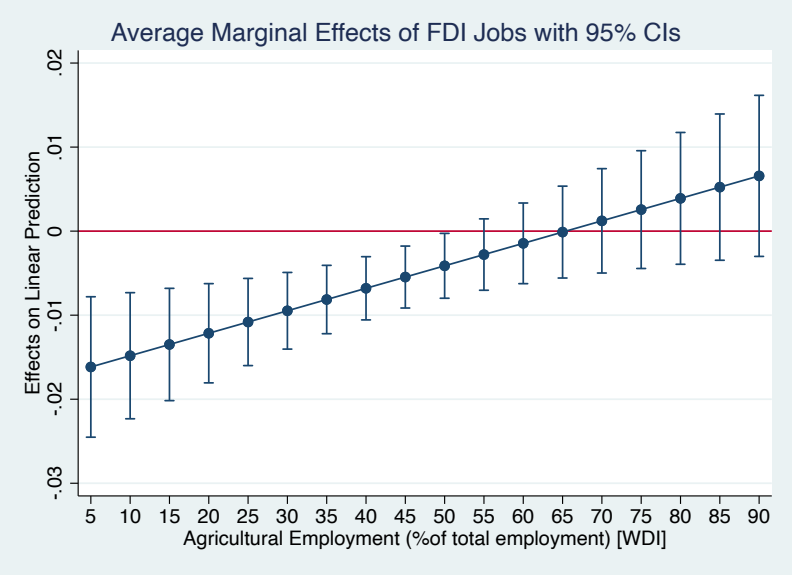

Figure 4.4. Interaction of Oil Jobs and Agricultural Employment

have an impact on excess cash demand, but that effect is conditional on the industrial or agricultural makeup of the country. As a country becomes more industrialized, the effect of oil FDI leads to lower cash demand, while in countries with high levels of agriculture, I find a positive but insignificant effect of oil on cash demand.

Given these results, if a country seeks to reduce its informal economy, they ought to pursue industrialization policies. Manufacturing jobs need not necessarily need highly skilled or highly educated workers, so other institutional pillars such as a robust public education system are not a necessary precursor to this type of policy change. Furthermore, the substantive effect of oil FDI on excess cash demand is stronger at lower levels of agriculture than at lower levels of industrialization.

Individuals in an agricultural country are more susceptible to the markets shifts brought about by oil FDI. Since they can play no role in whether or not oil exists in their country, and they can play no role in whether a foreign-owned company invests in said resource, they are, for all intents and purposes, simply along for the ride. Therefore, individuals in a country ought to try to ensure, through political mobilization and voting, that their government officials properly account for and use the FDI that enters their country so that the informal economy will not be enlarged.

CHAPTER 5

CASE STUDY OF GHANA

5.1 Why Ghana?

The final piece needed to analyze the relationship between a country's oil dependence and its informal economy is a case study. A good candidate would be a country in which there was no (or very little) oil production and revenue for some period of time, followed by the exogenous shock of an oil discovery and eventual production and revenue. If such a country could be found, a quasi-experiment could be set up so that the majority of country-level variables would be either held constant or move slowly, leading a researcher to make claims regarding the effect the oil would have on the country's informal economy by comparing the country before the oil find to the country after the oil find.

An example that fits this set of requirements would be the nation of Ghana. From its independence in 1957 until 2007, oil production was in the Saltpond field, which was managed by Agri-Petco based in Oklahoma. It yielded 4,800 barrels a day in its heyday, but by 1985 production had dropped to 580 barrels a day (Teitelbaum, 2008). For comparison, US Energy Information Administration 2019 data suggests that Chile produced roughly the same amount; Chile are ranked 79th out of 96 oil producing countries. However, in 2007 both US-based and UK-based companies discovered offshore oil within the larger Tano oilfield. As will be discussed in more detail, oil production from the Jubilee Oil Field came online in December of 2010. Figure 5.1 shows the monthly oil production data; the effects of the find are quite clear. Furthermore, the data show that once the production firms were able to get past equipment delays, excess sand, and government disagreements, the Jubilee field by 2016 saw production increase at an increasing rate.

Therefore, the fact that Ghana had little to no oil production before 2010, and a substantial amount afterward, allows Ghana to be used as a case study to test the effects of oil

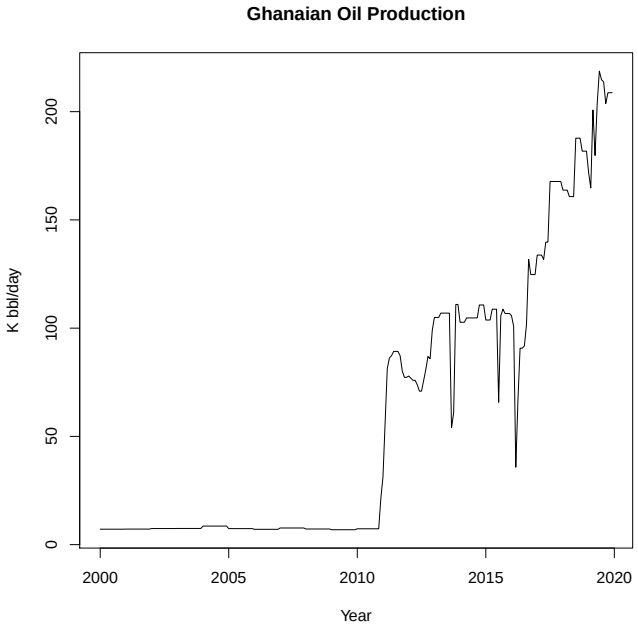

Figure 5.1. Ghanaian Oil Production

on a country's informal economy. Using process tracing as well as existing survey data, I find a plausible link between the introduction of oil revenue to the country's coffers and an increase in informal economic activity.

This chapter will proceed as follows: section 5.2 will review process tracing methodology, the qualitative technique used in this analysis, while section 5.3 will review in broad strokes the Ghanaian political economy post-independence. section 5.4 will narrate how oil came to be found, and how ownership disputes, government negotiations, and equipment breakdowns all contributed to lower than expected output levels and section 5.5 will outline the government's response to the oil find. section 5.6 will show the results of the process trace so that it can be determined whether or not the introduction of oil led to a larger informal economy in Ghana, and section 5.7 gives policy as well as normative implications for the findings.

5.2 Process Tracing Methodology

Process tracing is a qualitative methodological approach that seeks to answer "Was X a cause of Y in case Z?", which is to say it is used to locate a "general causal effect in particular cases." (Mahoney, 2012) To answer this question methodologically,

> "[t]he researcher looks for the observable implications of hypothesized explanations, often examining at a finer level of detail or a lower level of analysis than that initially posited in the relevant theory. The goal is to establish whether the events or processes within the case fit those predicted by alternative explanations." (Bennett, 2010)

Major uses of process tracing include theory-building and descriptive inference (Collier, 2011) as well as bolstering quantitative results (Mahoney, 2012). Uses within political science include work on civic organizations (Skocpol et al 2000), non-use of nuclear weapons (Tannenwald 1999), and economic development (Gerschenkron 1962).

Brady and Collier (2010) outline a process tracing structure which can help researchers in their claims. Called causal-process observations, the methodology revolves around gathering evidence on all pertinent independent, dependent, and intervening variables to tease out the proposed theory or hypothesis. Beginning with Van Evera (1997), causal tests for both "necessary" and "sufficient" evidence are established; yes or no answers to whether or not those tests were met lead to four distinct possibilities, as seen in Figure 5.2 taken from Collier (2011).

Working around the figure from top left, a *straw in the wind* test is an analysis of any proposed mechanism in which the evidence is neither necessary nor sufficient to make an inference; however, a hypothesis that passes this standard does "slightly weaken" rival hypotheses. The next two tests are the most likely in social sciences: the hoop test and the smoking gun test. Any hypothesis that passes a hoop test implies that rival hypotheses are "somewhat weakened" while passing a smoking gun test "substantially weakens" rival hypotheses. Lastly is the doubly decisive test in which all other rival hypotheses are eliminated.

Table 1

Process Tracing Tests for Causal Inference

		SUFFICIENT FOR AFFIRMING CAUSAL INFERENCE	
		No	Yes
NECESSARY FOR AFFIRMING CAUSAL INFERENCE	No	**1. Straw-in-the-Wind**	**3. Smoking-Gun**
		a. Passing: Affirms relevance of hypothesis, but does not confirm it.	**a. Passing:** Confirms hypothesis.
		b. Failing: Hypothesis is not eliminated, but is slightly weakened.	**b. Failing:** Hypothesis is not eliminated, but is somewhat weakened.
		c. Implications for rival hypotheses: **Passing** *slightly* weakens them. **Failing** *slightly* strengthens them.	**c. Implications for rival hypotheses:** **Passing** *substantially* weakens them. **Failing** *somewhat* strengthens them.
	Yes	**2. Hoop**	**4. Doubly Decisive**
		a. Passing: Affirms relevance of hypothesis, but does not confirm it.	**a. Passing:** Confirms hypothesis and eliminates others.
		b. Failing: Eliminates hypothesis.	**b. Failing:** Eliminates hypothesis.
		c. Implications for rival hypotheses: **Passing** *somewhat* weakens them. **Failing** *somewhat* strengthens them.	**c. Implications for rival hypotheses:** **Passing** *eliminates* them. **Failing** *substantially* strengthens.

Source: Adapted from Bennett (2010, 210), who builds on categories formulated by Van Evera (1997, 31–32).

Figure 5.2. Process Tracing Methodology

Process tracing through causal process observations is a deductive method meant to get to the root causes of an issue using available qualitative and quantitative data. In my case study, I have data on informal economy size, as well as various political and economic metrics. I also have qualitative studies and statements from elected officials to help eliminate rival hypotheses such as changes to the tax system, increases or decreases in government effectiveness, remittance levels, and trade. Based on these quantitative and qualitative data, the process of how oil came to impact the informal economy can be traced through and hypotheses can be tested.

The fact that large scale oil production began in Ghana in 2010 allows a test of my central claim: that oil rents lead to a larger informal economy. Furthermore, I will "examine at a lower level" (Bennett, 2010) not only by studying Ghana but more specifically the Western Region where the political economic shifts due to oil production are most likely to be seen. Since the oil find was exogenous, I can eliminate the endogeneity that frequently plagues inquiry into the informal economy; since the informal economy did not cause the oil find, if there is any relationship at all, it can be said that the oil causally affected the informal economy.

What should be seen in Ghana? If the theories established in Chapters 3 and 4 are correct, then there should be an increase in the informal economy in Ghana if and only if there was a reduction in the goods and services tax rates. If there is not a reduction in tax rates, then the rentier effect will not be observed, so we would not expect a higher informal economy. Also, 2017 figures from the CIA Factbook show that 57.2% of Ghanaian GDP is found in the services sector (CIA, 2020). According to the results in Chapter 3, the effect oil rents have on the informal economy is insignificantly different than zero. Therefore, the analysis of Ghana will need to determine if any tax policy changes were made after the oil find, and if so, can the purpose of the tax change be tied back to the oil find. If there is a tax change and it can be tied to the increase in oil rents, then the informal economy of Ghana should increase.

However, if my theory is correct that inward oil FDI will cause an effect on the informal economy conditional on its level of industrial and agricultural employment, Chapter 4 results suggest that Ghana should see a lower level of informal activity. This reduction should be seen specifically in the amount of excess cash in the economy.

Quasi-experiment conditions set The following section gives background information regarding the political economy history of Ghana. It will show that even though the political dynamics within the country changed, the overall approach to the oil find in 2007 was the same: both political parties and their leaders knew the potential pitfalls of oil rents and sought to improve the country's macroeconomic foundations. Likewise, the continuation of civilian rule as opposed to military rule made it so that the major political economic factors of Ghana remained relatively constant, so any increase (or decrease) of the informal economy can be linked to the introduction of oil.

5.3 Ghanaian Political Economy

Compared to its sub-Saharan counterparts, Ghana has enjoyed relatively high levels of peace and prosperity post-independence. As such, it is potentially in a better position to handle oil wealth than countries such as Nigeria or Angola, countries that have much higher levels of public corruption than Ghana. 2019 figures from Transparency International have Ghana ranked 80th in terms of public corruption, while Angola and Nigeria are ranked 146th out of 180 countries.

This level of relative development compared to their closest peers leads to an even stronger test of my central hypothesis: in short, if Ghana is in a very good position to defeat the resource curse, we should therefore see no effect on its informal economy as oil revenues begin to pour into the country's coffers.

System of government Set up originally as a parliamentary democracy, Ghana has nevertheless alternated between military and civilian rule. Beginning with Kwame Nkrumah, the country sought a nationalist, pan-Africanist, and non-aligned stance throughout the Cold War. While this approach was able to tamp down tribalism, as evidenced by banning of ethnic, religious, and regional parties (Bridgewater, 2007a), it allowed for increased executive power, and within three years of independence Nkrumah and his Convention People's Party created a one-party state. This led to his overthrow in 1966, and successive army generals led the country to 1970, followed by two civilian leaders, then more military leaders to round out the 1970s. The height of military power in Ghana was represented by Flight Lieutenant Jerry Rawlings, who led the country from 1981 until 2001. While democratically elected as a member of the center-left National Democratic Congress, he was nonetheless a "strongman" who engaged in extra judicial killing (Schabas and Darcy, 2005) and continued policies that led to a deterioration of the Ghanaian economy (Herbst, 1993). However, by the 1990s he began to release his grip on power, allowing a second party and a more independent judiciary.

A central irony of Ghana's political history is that while it has been beset by the constant transition between military junta and civilian rule, its relative stability is due in no small part due to Rawlings' shift to higher levels of democracy, brought by the strong hand of his autocratic leadership. Local governments were created and neoliberal economic reforms, painful when they began in the early 1980s, began to bear fruit by the 1990s (Bridgewater, 2007a).

His political opponent of the newly created New Patriotic Party, John Kufuor, took power in 2001 and began to implement center-right policies of economic liberalization and an emphasis on entrepreneurship, innovation, and good governance while attempting to build on the relatively new stability brought by Rawlings. However, economic problems persisted, and by 2007 as part of Ghana's Golden Jubilee (celebrating 50 years of independence) Kufuor gave a "hopeful but generally sober picture" and noted that "programs and projects of development take time to mature." (Bridgewater, 2007a)

It was in this social and economic milieu in 2007 that a large oil deposit was found off the western coast by Tullow Oil, a UK-based oil and gas firm. Named Jubilee due to its coincidence with the 50-year celebration, the Ghanaian government, forged in the tumultuous fires of Cold War-era African independence, was faced with a new challenge: How will the oil revenues from this new find be managed?

Economy The Ghanaian economy, like most other SSA nations, has traditionally revolved around agriculture and the non-tradable domestic industry; however, Ghana has been able to somewhat diversify its economy through natural resources, specifically diamonds and gold. Before 2010, these resources, as well as cocoa, were the most exported goods. Modern day import substitution industry (ISI) policies have led to a robust manufacturing sector, especially in electronics. [1] The post-independence economy was shaped by nationalization,

[1] https://web.archive.org/web/20150429024233/http://standard.gm/site/news/3430-Rlg-wants-create-million-jobs—Papa-Njie.html

but the oscillation between civilian and military rule led to excessive levels of government debt and a 20% drop in GDP per capita throughout the years of 1970 to 1982 (Haug, 2014).

Following Rawlings' election, the country sought to alleviate its economic problems through the IMF's Economic Recovery Program, debt restructuring, currency devaluation, and nationalization of the oil industry. This new focus was on private development as opposed to public employment. However, these policies resulted in job losses, leading to an increase in the informal sector. The Ghana Statistical Service (GSS), which uses household surveys to measure the economic output of the country, found in 2013 that 86.1% of all employment was found in the informal sector (Haug, 2014). Since informal economy estimates such as Schneider and Enste (2000) and Schneider et al. (2010) find the size of informal economic activity as a percentage of total GDP, we would not expect the GSS figures to be a like for like comparison, however the 86.1% is eye-opening and speaks to the difficulties Ghana has historically faced in developing its economy.

Existing levels of corruption, lack of economic and political development, and higher levels of inflation have all affected the informal economy in Ghana. These have been found throughout the literature to be robust determinants of informal activity. The introduction of oil can be another causal factor: as the Dutch Disease literature predicts, introduction of a natural resource will lead to employment distortions in the economy away from productive manufacturing industries and toward the non-productive resource, leading to shrinking economic growth. However, since there is little to no manufacturing in the Western Region, but rather fishing and non-tradable sector employment, the oil industry will not *per se* remove those jobs. Rather, since oil is a capital-intensive industry, it will alter the economy of the Western Region through land expropriation policies and a crowding out of local employment. In short, the introduction of gas plants, offshore rigs, and other associated infrastructure will reduce the water area locals have traditionally fished, and landowners will lose their lands for infrastructure development. Therefore, even though fishermen are already likely operating

in the informal economy, those jobs will not disappear due to oil, but rather will only become more difficult with lower yields. Furthermore, the technical nature of the capital-intensive oil jobs will preclude many locals from being employed in the industry, so more highly-skilled immigrants will perform those jobs and receive the higher wages.

5.4 Introduction of Oil

Once Kosmos Energy and Tullow Oil found the offshore reserves within the larger Tano oilfield in the summer of 2007 [2], the government of Ghana seemed to be caught a bit unprepared to answer the serious questions that would now be asked of it (Bridgewater, 2008). The existing Ghana National Petroleum Corporation (GNPC), set up under the Rawlings Administration as part of the larger ERP, really had not had much to do due to the lack of production coming from the Saltpond field. The critical weakness of the regulatory environment of the time was that the GNPC was responsible not only for operation, but also regulation. The conflict of interest becomes apparent: if the state-owned oil company is a revenue partner, what incentive does it have to regulate the industry responsible for so much potential revenue?

Citizen response Located approximately 30 miles off the coast of Ghana, the Jubilee Oil Field represented a potential for Schumpeter's "creative destruction" (Schumpeter, 1942): a generational shift in capabilities that would transform the country. The Western Region would bear the brunt of the transformation; refineries and storage tanks would soon dot the landscape, and although offshore, the revenues that would soon be coming in would directly affect the country's budgets.

Already accustomed to resource revenue through its gold and cocoa industries, Ghana had experience, as well as examples such as Angola and Nigeria, to understand the potential

[2]Figure 5.3 taken from https://gcaptain.com/tribunal-blocks-ghana-from-drilling-new-wells-in-disputed-seas-but-ten-field-development-can-move-ahead/

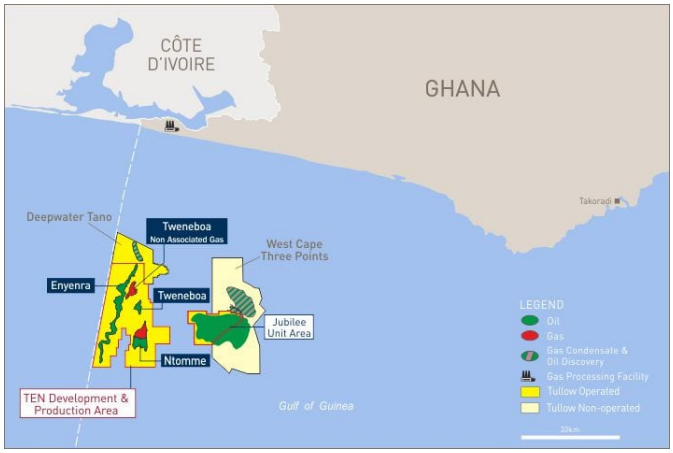

Figure 5.3. Diagram of the Jubilee Field

effects of oil revenue on its political economy. While the country's development based on the gold and cocoa resources "has not matched the promise of its resource wealth" (Gyimah-Boadi and Prempah, 2012), it also had not resulted in widespread corruption or wealth accumulation on the parts of civil servants (Bridgewater, 2007b). Furthermore, Gyimah-Boadi and Prempah (2012) found that the various civil groups within the country began to demand a stronger regulatory framework for the management of the resource. It seemed then that Ghana was, at a minimum, ready to face the challenge "head on" and try to manage the resource well and thereby avoid the resource curse.

Logistical and Political Challenges However, nothing could have prepared the central actors for the logistical problems in making the oil recoverable. In May 2008, an appraisal well and its subsequent analysis led Tullow Oil to estimate the Jubilee field could contain between 500 million and 1.8 billion barrels (Litterick, 2008). By late 2014, that number had increased to 876.6 million barrels of proven reserves (Oxford, 2015). However, the deepwater environment led to higher production costs than originally thought, leading to lower profit margins and a higher sensitivity to fluctuations in the global oil price.

The original ownership structure for the exploration and extraction of the Jubilee Oil Field was for Tullow Oil to own 49.95%, Anadarko Petroleum and Kosmos Energy at 18%,

Sable Oil & Gas 4.05%, and the government of Ghana, through the GNPC, the final 10%. Since each entity was responsible for different aspects of the exploration, disagreements soon arose, which delayed the construction of exploration equipment (Teitelbaum, 2008).

The consensus among the partners was that with no more interruptions, oil output could begin by late 2010. While too late to save the NPP's electoral chances, the NDC figurehead John Atta-Mills, elected President in 2008, ushered in a new era of Ghanaian political economy by promising that the oil revenue would not be misspent, but rather that it would be a "blessing" to the country due to the government's transparency and adherence to the rule of law (Teitelbaum, 2010b).

Between the 2008 election and the 2010 start of production, both Kosmos and Anadarko believed that the government was treating them differently than had Kufuor and the NPP. Specifically, they worried about corruption in the bureaucracy and unrealistic expectations regarding the number of Ghanaians who would be employed in the field (Teitelbaum, 2010a). Clearly, the government had reason to use the oil find to excite the population about increased revenues, and therefore increased public spending, while the companies concerned themselves with the cost of doing business as well as the cost of producing in a difficult underwater environment. Furthermore, the simmering feud between the government and Kosmos continued unabated; by early 2009, Atta-Mills sought to bring the Chinese government in as an investor to buy out Kosmos' stake in the operation (Day, 2009). When that strategy failed, the government refused to allow Exxon-Mobil to buy out Kosmos (Africa, 2010), leaving a situation in which the principal partners were leery of each other's motives. This leeriness continued well into 2009, when in November of that year the Serious Fraud office froze Kosmos' accounts as part of a corruption investigation that Kosmos officials believed was part of a larger political battle between the in-power NDC and the out-of-power NPP (Teitelbaum, 2009b). Finally, after a spill in 2010, Ghana sought a US$35M fine, while Kosmos was only willing to pay US$15M. A key reason for this discrepancy was that the law

had not "caught up" with events on the ground; as a matter of law, Ghana had no authority at all to fine Kosmos for the spill (Yeboah, 2011).

5.5 Government Response

Policy changes Given this clearly untenable position, did the government of Ghana do anything to ramp up the state apparatus to handle the incoming oil revenue? After the 2008 election in which the National Democratic Congress needed the People's National Convention (PNC) to form a coalition government, new President John Atta-Mills was forced to include members of the PNC on many boards and ministries, including the marketing board for oil (Teitelbaum, 2009a). Furthermore, the global economic issues of 2008 led to a series of economic problems for Ghana by 2009: fiscal, trade, and current account deficits, as well as a weakening currency and its concomitant high level of inflation. If the upcoming oil revenues were not managed properly, further economic distress was a likely possibility.

President Atta-Mills continued to press for accountability and transparency in the accounting of oil revenue, and told the US Assistant Secretary of State for African Affairs, Johnnie Carson, in February of 2010 that he recently introduced legislation to that effect. Furthermore, he told Carson that the oil revenue would be used for the people and not for the political and economic elites (Teitelbaum, 2010b). Likewise, in March 2010, over 110 separate civil society groups, civic organizations, and think tanks formed the Civil Society Platform on Oil and Gas, for the expressed purpose of raising awareness among the people and mobilizing support for a stronger oil policy. These efforts began to pay dividends, and by 2011, the Petroleum Revenue Management Act (PRMA) and the related exploration and production bills were passed, as was the Petroleum Commission Act (Gyimah-Boadi and Prempah, 2012). The highlights of the new laws included transparency measures and requirements that information regarding oil revenues be published and available to the people. Also, they required licenses and contracts to be awarded via a competitive bidding process

instead of direct business-to-government negotiation. Most importantly, the new law severed the regulatory aspects of oil management away from the GNPC, removing a clear conflict of interest; it also established two separate sovereign wealth funds, which Kopinski et al. (2013) argues should allow Ghana to avoid the resource curse. However, the Parliament was able to keep in the final draft of the bill an ability for the government to borrow by using future oil revenues as collateral (Gyimah-Boadi and Prempah, 2012).

Budget changes The PRMA allowed for revenues to be

> "primarily aimed toward supporting budget spending, including agriculture and infrastructure projects, but surplus revenues will be diverted quarterly into two funds - the Ghana Heritage Fund and the Ghana Stabilization Fund...the funds would be put into investment grade securities, including government bonds...the Ghana Heritage Fund would provide long-term preservation of Ghana's oil wealth along with a stream of interest revenue, while the Ghana Stabilization Fund would be used to fill short-term budget gaps..." (Reuters, 2010)

However, worries persisted that the oil revenues would never make it to the government of Ghana since they would still be collected by the GNPC. By 2012, the Ghanaian media picked up on the latest Extractive Industries Transparency Initiative (EITI) report for 2011 that suggested the GNPC may not have properly reported all revenues. The GNPC reply gives a better breakdown of where they reported the oil revenues went. Specifically, 63.7% went back to the other Jubilee partners for loans extended for field development, 14.6% went to purchasing another block within the Tano field, and the remainder went to administrative and staff costs (of Ghana, 2012). Furthermore, they argued that all monies are directly given to the state, which then allocates money back for the expenses of the GNPC. Of the US$207.96M in revenue, US$69.21M went into the Ghana Petroleum Fund (Okertchiri and Larbi, 2014).

Despite logistical challenges in the field, the next few years were good for oil revenue, with GNPC receipts going from US$541,071,322 in 2012 to US$628,580,078 in 2013 to

US$691,991,103 in 2014, according to data from the Ghana Extractive Industries Transparency Initiative. However, oil is subject to volatile swings in market conditions, and by June of 2014, increased US shale production lined up with decreased demand in China and Europe to put a downward pressure on prices, which were solidified in November of that year by OPEC when Saudi Arabia decided to maximize market share instead of cut supply (Lawler and Zhdannikov, 2014). The end result was a freefall in the price of global crude, and Ghana, which at that point in time had only been involved with oil in the boom times, now had to cope with a bust. Revenues for the GNPC in 2015 dropped to US$374,846,272 and dropped further in 2016 to US$217,116,154, a fall of 53% from 2014 levels. Furthermore, during the boom times of 2012-2014, Ghana faced the "growing pains" of bringing the oil online; numerous equipment failures led to production delays. However, the government went on a spending spree during the same time, and when the revenues were lower than predicted, a large budget deficit was the result (Nonor, 2013).

Budget data from the government of Ghana show the brutal picture: in 2014, expected tax revenue from oil companies was Gh¢411,925,576M, but the revised budget showed an *increase* to Gh¢ 582,312,974M. However, in 2015 those same figures were Gh¢ 1,652,205,048M and Gh¢ 52,451,306M, a drop of 188%. While Awunyo-Vitor and Bonney (2018) finds that oil prices do not affect long run economic growth in Ghana, their analysis does not contain the years in which Ghana was producing oil. Ghanaian GDP fell in 2014 and 2015 as oil prices hit a nadir, and began to track upward again by 2016. Figure 5.4 shows the relationship between the price of Brent crude and Ghanaian oil output since 2009.

5.6 Effects on the Informal Economy

While it is natural that oil revenues will rise and fall based on fluctuations in the global price, it is the spending of oil revenues that is most pertinent to this study. Since oil revenue represents an exogenous windfall that is not "earned" through good economic development

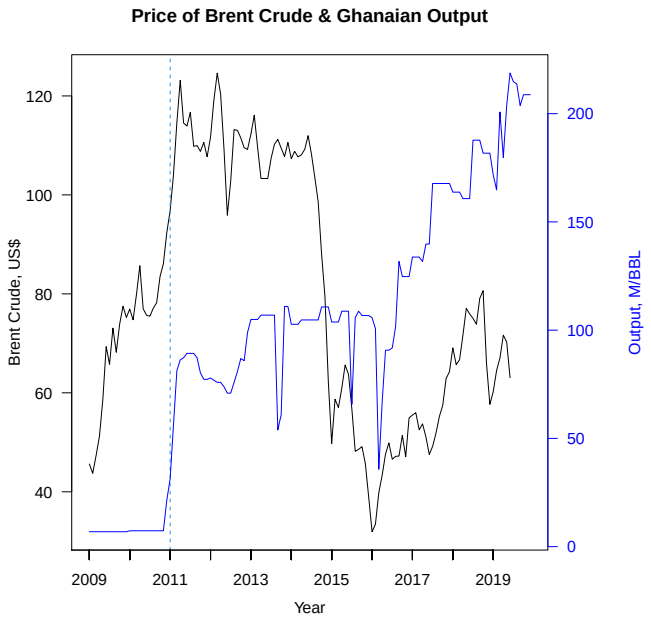

Figure 5.4. Oil Price and Ghanian Output

or tax policies but rather simply exists, a vast literature has attempted to explain why this windfall may in fact be deleterious to the country that has it. First theorized by Auty (1994), the resource curse theory suggests that countries with natural resources, which should be a boon to the country's budget, instead lead to lower economic growth and less democracy. This is the "trap" that Ghana sought to avoid, and according to Kopinski et al. (2013), they should be able to, given their relatively high level of development, as well as lack of civic strife and tribalism. Moreover, they have the object lessons in Nigeria and Angola of how *not* to manage the resource.

However, studies on how oil has affected the Ghanaian informal economy are scarce, and use survey methods in regions expected to be more affected by the oil resource than other parts of the country. This approach is a valuable contribution to the literature and can generate a better understanding than simple aggregate measures. However, to my knowledge, no study has ever used process tracing to gauge the causal mechanism for how the resource affects the country's informal economy. To begin, we describe the state of the informal

economy before the find, then use the qualitative approach to analyze what the principal actors were doing and what effects they had. The best way to go about this methodology is to begin with "a narrative or a timeline" (Collier, 2011) and then explore the ideas in the narrative.

Informal economy before oil From independence to the 1980s-era reforms under Rawlings, Ghana was a traditional economy, mainly focused around agriculture and the non-tradable sector. Gold and cocoa were the primary exports, and there was little manufacturing. Also, the Gh¢ struggled to maintain its value on the international market, leading to higher levels of inflation (Haug, 2014). These factors led to higher levels of informal activity, since gold and cocoa are labor-intensive and are therefore impervious to investment changes seeking to limit the informal economy (Stanaland and Cavallo, in progress). However, structural reforms in the 1980s brought about a reduction in public sector employment, leading to an increase in informal activity (Haug, 2014). Furthermore, while reforms did enlarge the size of the private sector, there was a concomitant increase in the population, leading to a system that could not adequately provide private sector, formal employment opportunities for the people; therefore, informal activity remained high (Osei-Boatang and Amprawum, 2011).

In short, the traditional base of the Ghanaian economy is agriculture, which is likely to be informal. Furthermore, economic reforms that arguably brought foreign competition to Ghana before it was ready led to a dearth of public sector jobs and an immature private sector unable to compete. Finally, population growth led to many people ready to enter a labor force that was unprepared to handle them, and the final result is an upward pressure on informal activity. Figure 5.5, using data taken from Elgin et al. (2012) shows the size of the country's informal economic activity as a percentage of overall economic activity from 1950 to 2010, which is in line with the amount of time before oil came online and also predates my

dataset. We see a steep drop in informal behavior, perhaps due to the 1960s-era Nkrumah reforms revolving around robust public employment. However, the rate was still relatively high. We then see an increase throughout the 1970s during junta rule and then into the 1980s as private sector reforms began.

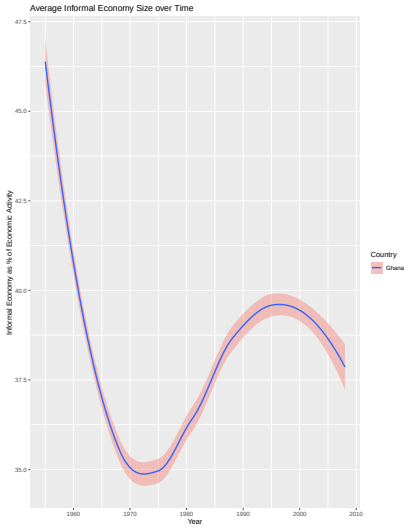

Figure 5.5. Ghana Informal Economy, 1950-2009

Lastly, World Bank data on informal firm activity taken in two waves, 2007 and 2013, can shed light on the comparison of the informal economy pre- and post-oil. For example, in 2007, 18.3% of all service-based industries responded saying they had to complete with informal firms, causing a "major constraint" to their business. In 2013, that same figure jumped to 30.1%. In retail, the numbers were 24.9% and 33.7%, respectively. In the manufacturing industries, figures are similar: 14.2% reported competition from informal firms, and in 2013 that figure rose to 28.9%. Rising informality in both sectors could be caused by the mechanism I propose: that increased oil rents lead to a lower reliance on consumption taxes, which then leads citizens to engage in the informal economy due to lack of accountability.

Process tracing the impact of oil on the Ghanaian informal economy The first step of process tracing is known as the hoop test in which it must be first established that

the proposed cause and effect events actually took place. I have established that oil fields were found in 2007 and began production in 2010. However, major structural equation modeling estimates of the Ghanaian informal economy have shown flat or shrinking levels of informal activity since 2010. I submit this is due to the fact that Ghana did improve in the traditionally used metrics in the SEM approach; Figure 5.6 shows the metrics used in the creation of the informal economy estimate improved after oil was found; rule of law scored improved, currency demand dropped, and GDP growth was uneven leading to a mixed effect on the informal economy. However, it could be that oil's effect on the informal economy cannot simply be measured this way; survey methods as well as alternative measures across different units of analysis could yield different results.

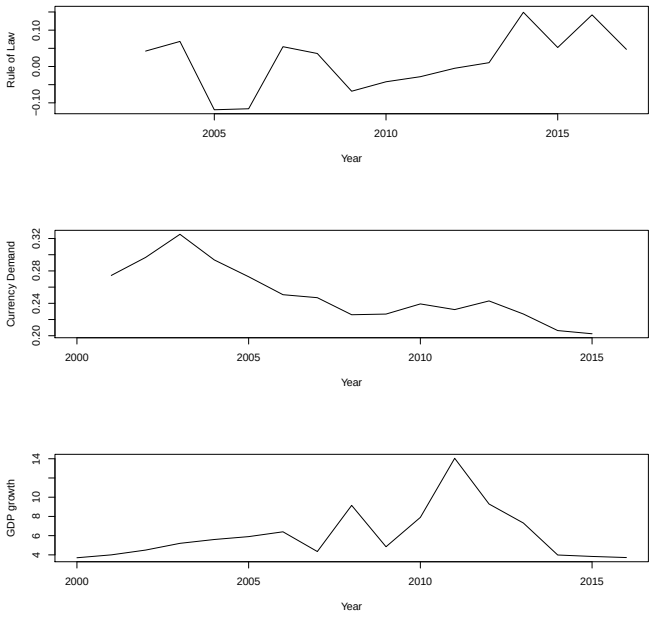

Figure 5.6. Component plots for Ghanaian informal economy

One example of alternate measures would be the data collected by the GSS, which also estimates the informal economic activity within the country; their numbers paint a different picture. They find that from 2013 to 2018, the amount of money spent in the informal

economy rose each year, as seen in Table 5.1 (GSS, 2019). 2013 levels are used as the baseline figure.

Table 5.1. Money spent in Ghanaian informal economy

Year	Amount (Millions of Gh¢)	Share of informal GDP
2013	36,120	
2014	37,086	28.1
2015	38,119	28.1
2016	39,156	28.6
2017	41,561	30.0
2018	42,648	28.6

Furthermore, we can see the share of informal GDP as a percentage growth rate. These data have a positive correlation: as oil output goes up(down), the size of the informal economy goes up(down).

Next, evidence that Ghana sought to alleviate the rentier effect does exist: they passed the Value Added Tax Act on 2013 as well as the Income Tax Act of 2015 with the goal of broadening the tax base while simultaneously shifting more of the burden to higher earners to alleviate the large levels of income inequality in the country (Adeyiga, 2013). However, there is no evidence to suggest that these laws were a result of *desiring* to alleviate the rentier effect. On the contrary, the VAT in Ghana predated the oil find and has been continually altered to reflect interest group preferences, spur domestic demand, and attempt to keep up with the Ghanaian economy as it developed. Therefore, the weight of the evidence seems to suggest that Ghana has altered its tax code not as a result of oil rents, but rather domestic political considerations. Even so, my theory would suggest a lower informal economy since they ended up (purposefully or not) reducing the rentier effect even though the current understanding of the informal economy would suggest a rise in taxes would lead to higher informal activity.

Evidence as to the effect of oil FDI can likewise be tested in the case of Ghana. After all, it was British and American companies that found the oil in 2007 and invested in the

infrastructure necessary for its production. Furthermore, we can compare the country's level of industrial and agricultural size to see the predicted effects given the theoretical mechanism outlined in Chapter 4. According to the CIA Factbook, 2017 estimates of Ghana's GDP contributions was that agricultural activity comprised 18.3% of all GDP, while industrial output made up 24.5% (CIA, 2020). At those levels on the interaction graphs in Chapter 4, we should expect to see a significantly lower level of cash demand given these figures. Figure 5.7 shows the excess cash amount as modeled by the process outlined in Chapter 2. We can clearly see a steep decline in the excess cash amounts starting in 2007. This is the year that matters for this particular analysis since this is the year oil FDI began. This gives solid, but not incontrovertible evidence that this particular mechanism is at play in the country of Ghana.

Western Region post-oil The final part of the analysis is a qualitative look at the region most likely to be affected by the oil find, which is the Western Region, a poorer region of the country that has traditionally felt neglected in the governance of the country (Mitchell, 2012). Evidence from 2011 just as oil was coming online suggests a theme similar to others heard in other resource-rich countries (rough English in the original):

> "The skills required for the oil industry is nowhere found within the communities, the kind of businesses that people are managing today in Ghana, the standards within those businesses are not the type that can fit into the oil industry. So it has become a very dicey issue that production has started and yet people are not seeing what they thought they would see," Yirrah [a civil society representative] said (VOA, 2011).

The various civil groups also found in their interviews of local Western Region people that prices were already rising, as was pollution and restrictions on fishing. In short, these are effects we would expect to lead to a larger informal economy. Rising prices lead to more bartering or other non-cash transactions, and restrictions on fishing won't eliminate fishing, but merely drive it underground.

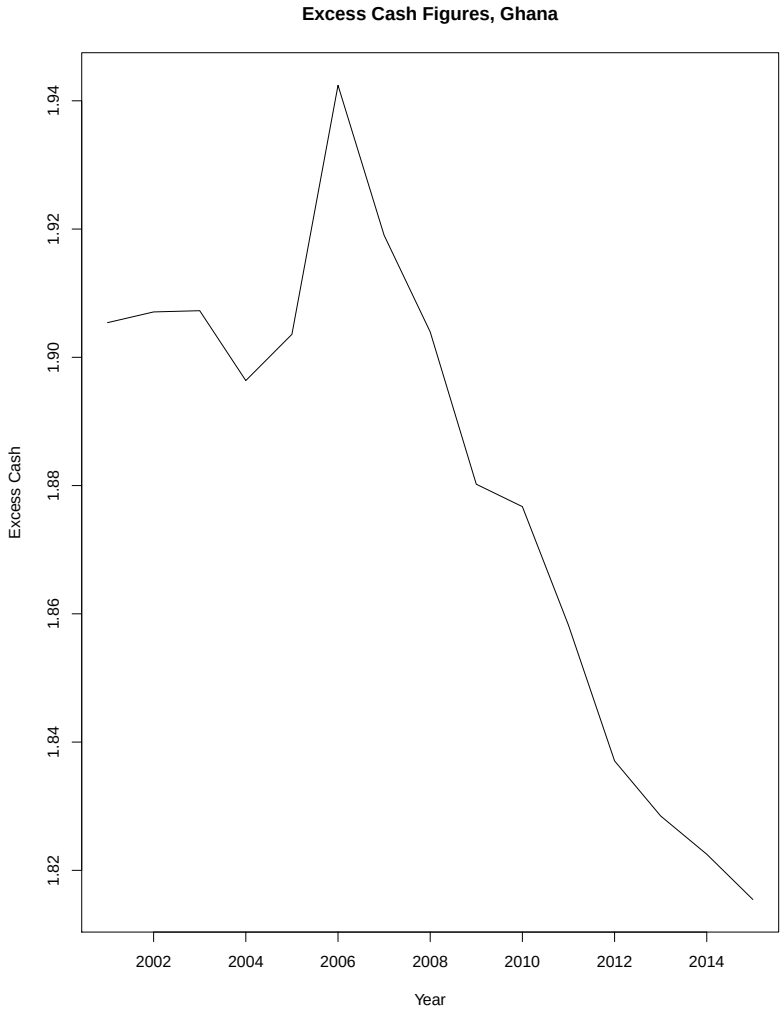

Figure 5.7. Ghanaian Excess Cash

Kaku (2018) reports in his field study of the Western Region Ellembelle district similar findings: the introduction of oil exploration and production directly led to land expropriation, high inflation, and reductions on fishing (the main source of economic activity). The people he surveyed spoke of excitement when the news first reached their district that oil exploration would be coming, and that their lives would improve as a result. Instead, they found only disappointment and shock. From a local named Nyameke, a picture of the devastation is described:

> "When I heard that Oil has been discovered in Ghana, I was very happy but became happier when I heard Gas processing plants will be built here. I thought many people here will be employed by the oil and gas companies to improve their living conditions. None of these expectations has been met. They have rather employed outsiders to work for them leaving our people. Many people have rather lost their jobs and are in economic hardships. We have no better way of living. We are suffering here." (Kaku, 2018)

As a result of the oil production, many locals in Ellembelle have attempted to reorganize their economies, with little success. Many are still employed as fishermen or farmers, while others have left for cities or other regions. Many rely on remittances, which have been established earlier in this paper as a significant predictor of larger informal activity. The clear conclusion is clear: while the region already had high levels of informal activity before oil, there was even more afterwards as a result of the removal of farms and fishing, as well as increases in inflation.

Did Ghana's Informal Economy Rise? Ghana, perhaps more than any other country, was in a good position to defeat the resource curse when oil was found in 2007. Politicians and citizens alike were already well familiar with the deleterious effects of oil as observed from their neighbor Nigeria as well as Angola. Furthermore, academics, think tanks, social organizations, and NGOs had already published numerous papers regarding the resource curse and under what conditions the curse could be turned into a blessing. In short, the leaders of Ghana had all the information they needed, plus a relatively stable political economy, to defeat the curse. However, knowing how to solve a problem in political economy does not mean it will be solved. Politicians could still decide to engage in practices that make the curse more likely. Therefore, Ghana is a good test case of my theories because it is neither a clear case of good institutions and good government (such as Norway) nor is it a clear case of mismanagement and corruption (such as Nigeria).

Unsurprisingly, overall results are mixed, but tend toward a reduction in behavior, not an increase. There is evidence that the excess cash demanded by Ghanaians dropped after

2007, indicating less informal activity. Furthermore, the levels of GDP activity found in the country's agricultural, industrial, and service based industries pointed either to a nil effect or a reduction in informal activity. Also, even though Ghanaian politicians did not pass new tax laws as a result of the oil find, they did act in the opposite way the rentier effect suggested, which is another way to defeat the curse. Likewise, their use of sovereign wealth funds is one of the best steps a government can take in regards to the long-term health of the country, which is a positive step.

Lastly however, in the places of the country closest to the oil extraction and production sites, evidence does exist of a growing informal economy. Poor people are having their land expropriated, fishing rights are being reduced, and prices are rising. These facts indicate a higher level of informal activity as jobs begin to disappear and locals are left with no other options.

5.7 Conclusion

In conclusion, this paper uses Ghana as a case study of the overall thesis: that natural resources will lead to larger levels of informal economic activity. This research fits within the larger resource curse literature, and seeks to add to the field by arguing that the resource curse may not affect only formal economic activity, but informal as well. Also, this research adds to the understanding of the informal economy by incorporating the effects natural resources play in a domestic political economy.

Ghana represents a good test case of this hypothesis because it had little to no oil production before 2010, and significant amounts thereafter. We can use within-case methods to then ascertain how the oil has impacted the size of the country's informal economy.

While the exact choice of method and metric may lead to differing conclusions, a process tracing approach, qualitative survey methods, as well as figures from the Ghana Statistical Service, all lead to the conclusion that the Ghanaian informal economy did grow as a result of

the oil find. While the government has made great gains in using the oil wealth appropriately, evidence exists that the resource has not been a "blessing" to the people. For the majority of Ghanaians, neither has it been a "curse." However, for those closest to the exploration and production zone, it has been a curse and informal activity has increased since production began.

CHAPTER 6

CONCLUSION

As politicians strive towards making policy to benefit the people whom they serve, they would do well to consider the impact their decisions have on the informal economy. While expanding greatly in size and scope and coinciding with broader trends of economic growth, the informal economy is a difficult phenomenon to wrangle from a policy standpoint. On one hand, it does provide opportunities for poorer people and allows them a chance to earn a living. However, a host of less-than-ideal realities such as longer working hours, less safety, more handling of unsecured cash, and less job security infuse the informal economy with an air of desperation and consignment. Furthermore, a country's existing level of institutional effectiveness, social mobility, and development also play a role in the pervasiveness of informal activity. For these reasons, I have sought in this work to show how oil, specifically its resource rent and inward FDI levels, can work to exacerbate what in some case is already a bad situation.

To do this, I used World Bank data on all available countries from 2000 to 2016 and added to the informal economy literature to show that analyzing domestic determinants of informal behavior does not fully capture the mechanism of informal behavior; instead, the effects of oil rents and inward FDI ought to be considered to when considering the size and influence of informal behavior. The specific mechanism I found was that, contrary to current understanding, lower reliance on goods and services taxes do not lower informal activity, but can in fact raise such activity if the rates are reduced as a result of oil rents, which distort the revenue generation function of a country away from its social contract origins. In this case, the government would lose a valuable policy tool in its efforts to reduce informal economy size.

However, oil rents will not sit unused or otherwise given away; they must be spent on something. The case of Ghana showed that the policymakers can and did use previous examples of oil mismanagement as a warning so that they would not fall to the resource

curse, but rather use it as a blessing for the benefit of the people and not the elite or well-connected. Furthermore, they acted in opposition to my theorized mechanism when they raised taxes *after* the oil find. While they did not do so to negate the substitution effect of oil revenues, they did attempt to build out a more robust tax system to augment their oil revenues, which is admirable. Finally, the government of Ghana, as a response to popular opinion, created sovereign wealth funds to better manage the incoming flows, another step in the right direction. However, evidence on the ground closest to, and therefore most likely to be affected by, the oil fields in Ghana did in fact see increases in informal activity, even though data does not currently exist at a micro- enough level for further and more detailed analysis.

Likewise, I found mixed results to suggest that inward oil FDI, calculated as both jobs and capital investment, will lead to larger informal activity in countries with low levels of industrialization. I suggest this occurs because of the spending effect; the appreciating currency leads to cheaper imports and higher demand for cash, which is more likely to be used in the informal economy, especially among developing nations where bazaars and flea markets proliferate. I found these results by properly accounting for the non-randomness of oil FDI allocation.

Next, using the fact that the informal economy is not directly measurable as a benefit, I used confirmatory factor analysis to construct a latent estimate of informal activity. To construct the latent, I added to the theoretical understanding of the field by arguing why certain variables ought to be included and why others ought to be excluded. This is an area of vigorous debate; future work can improve upon my estimates and theoretical understanding as well. Likewise, my empirical contribution was a robust testing of numerous construct combinations designed by relaxing theoretical assumptions to simply observe the story the data told. Using theory and commonly used model fit tests, I created the latent variable with can be used by future researchers in their work on the informal economy.

This work also adds evidence to the growing body of literature that suggests remittances can have a direct influence on informal activity by using a large-N statistical analysis, while the most common research design in this area is the case study or a limited country-year analysis.

Finally, policymakers ought to accept two propositions: one, that informal economic activity is likely to increase if proper precautions are not taken, and that they should care about the proliferation of informal economic behavior as a policy area in need of attention and not neglect. Especially prevalent among women and children, work in the informal economy is hardest on those most defenseless. Therefore, policymakers ought to fill that gap and ensure that informal activity in the future is safer and more protective.

REFERENCES

Abedian, I. and M. Desmidt (1990). The informal economy in south africa. *South African Journal of Economics 58*(4), 258–268.

Abraham, K., J. Haltiwanger, K. Sandusky, and J. Spletzer (2017). Measuring the gig economy: Current knowledge and open issues. *Measuring and Accounting for Innovation in the 21st Century*.

Acosta, P. A., E. K. Lartey, and F. S. Mandelman (2009). Remittances and the dutch disease. *Journal of International Economics 79*(1), 102 – 116.

Adam, M. and V. Ginsburgh (1985). The effects of irregular markets on macroeconomic policy: Some estimates for belgium. *European Economic Review 29*(1), 15 – 33.

Adeyiga, G. K. (2013). Tax reform study in ghana's tax system.

Africa, A. M. W. (2010). Jubilee oil: blessing or curse? *Africa Monitor - West Africa*.

Alañon, A. and M. Gomez-Antonio (2005). Estimating the size of the shadow economy in spain: a structural model with latent variables. *Applied Economics 37*(9), 1011–1025.

Allingham, M. G. and A. Sandmo (1972). Income tax evasion: A theoretical analysis. *Journal of Public Economics 1*(1), 323 – 338.

Alm, J. and A. Embaye (2013). Using dynamic panel methods to estimate shadow economies around the world, 19842006. *Public Finance Review 41*(5), 510–543.

Alm, J. and B. Torgler (2006). Culture differences and tax morale in the united states and in europe. *Journal of Economic Psychology 27*(2), 224 – 246.

Andersen, J. J. and M. L. Ross (2014). The big oil change: A closer look at the habermenaldo analysis. *Comparative Political Studies 47*(7), 993–1021.

Anderson, J. C. and D. W. Gerbing (1984). The effect of sampling error on convergence, improper solutions, and goodness-of-fit indices for maximum likelihood confirmatory factor analysis. *Psychometrika 49*(2), 155–173.

Andreoni, J., B. Erard, and J. Feinstein (1998). Tax compliance. *Journal of Economic Literature 36*(2), 818–860.

Argentiero, Amedeo, S. B. C. A. B. M. C. D. S. M. . P. P. (2018). Measuring unobserved economy through electricity demand. *AIEE Energy Composium*.

Ashraf, B. N. (2018). Do trade and financial openness matter for financial development? bank-level evidence from emerging market economies. *Research in International Business and Finance 44*, 434 – 458.

Autio, E. and K. Fu (2015, Mar). Economic and political institutions and entry into formal and informal entrepreneurship. *Asia Pacific Journal of Management 32*(1), 67–94.

Auty, R. M. (1994). Industrial policy reform in six large newly industrialized countries: the resource curse thesis. *World Development 22*(1), 11–26.

Awunyo-Vitor, Dadson, S. S. and E. A. Bonney (2018). Do oil prices influence economic growth in ghana? an empirical analysis. *Cogent Economics and Finance 6*(1), 1–14.

Basu, P., C. Chakraborty, and D. Reagle (2003). Liberalization, fdi, and growth in developing countries: A panel cointegration approach. *Economic Inquiry 41*(3), 510–516.

Bell, A. and K. Jones (2015). Explaining fixed effects: random effects modeling of time-series cross-sectional and panel data. *Political Science Research and Methods 3*(1), 133–153.

Bennett, A. (2010). *Rethinking Social Inquiry*. Rowan and Littlefield.

Berdiev, A. N. and J. W. Saunoris (2016). Financial development and the shadow economy: A panel var analysis. *Economic Modelling 57*, 197 – 207.

Besnier, N. (2004). Consumption and cosmopolitanism: Practicing modernity at the second-hand marketplace in nuku'alofa, tonga. *Anthropological Quarterly*, 7–45.

Borensztein, E., J. D. Gregorio, and J.-W. Lee (1998). How does foreign direct investment affect economic growth? *Journal of International Economics 45*(1), 115 – 135.

Bornhorst, F., S. Gupta, and J. Thornton (2009). Natural resource endowments and the domestic revenue effort. *European Journal of Political Economy 25*(4), 439–446.

Brady, H. E. and D. Collier (2010). *Rethinking Social Inquiry: Diverse Tools, Shared Standards*. Rowman and Littlefield.

Brambor, T., W. R. Clark, and M. Golder (2006). Understanding interaction models: Improving empirical analyses. *Political Analysis 14*(1), 63?82.

Brautigam, D., O.-H. Fjeldstad, and M. Moore (2008). *Taxation and state-building in developing countries: Capacity and consent*. Cambridge University Press.

Breusch, T. (2005). Estimating the underground economy using mimic models. *Econometrics 0507003, Econ WPA*.

Bridgewater (2007a). Ghana at 50:setting the scene - jubilee.. not jubilation. *United States Embassy*.

Bridgewater (2007b). High hopes for liquid gold. *United States Embassy*.

Bridgewater (2008). Ghana: Planning for oil and gas revenue. *United States Embassy*.

Brollo, F., T. Nannicini, R. Perotti, and G. Tabellini (2013). The political resource curse. *American Economic Review 103*(5), 1759–96.

Brown, R. P. and J. Conneil (1993). The global flea market: Migration, remittances and the informal economy in tonga. *Development and Change 24*(4), 611–647.

Buehn, A., R. Dell'Anno, and F. Schneider (2018, Jun). Exploring the dark side of tax policy: an analysis of the interactions between fiscal illusion and the shadow economy. *Empirical Economics 54*(4), 1609–1630.

Buehn, A. and F. Schneider (2012, Feb). Corruption and the shadow economy: like oil and vinegar, like water and fire? *International Tax and Public Finance 19*(1), 172–194.

Bunte, J. B. and L. Stanaland (2020). Foreign determinants of the shadow economy. *forthcoming*.

Burtless, G. and J. A. Hausman (1978). The effect of taxation on labor supply: Evaluating the gary negative income tax experiment. *Journal of Political Economy 86*(6), 1103–1130.

Cassirer, N. and L. Addati (2007). *Expanding women's employment opportunities: Informal economy workers and the need for childcare*. ILO Geneva, Switzerland.

Castaldo, A. and B. Reilly (2015). Do migrant remittances affect the consumption patterns of albanian households? *South-Eastern Europe Journal of Economics 5*(1).

Cebula, R. J. (1997). An empirical analysis of the impact of government tax and auditing policies on the size of the underground economy:. *American Journal of Economics and Sociology 56*(2), 173–185.

Chatterjee, S. and S. J. Turnovsky (2018). Remittances and the informal economy. *Journal of Development Economics 133*, 66–83.

Chaudhry, K. A. (1997). *The price of wealth: Economies and institutions in the Middle East*. Cornell University Press.

CIA (2020). World factbook - ghana. `https://www.cia.gov/library/publications/the-world-factbook/geos/gh.html`.

Clotfelter, C. T. (1983). Tax evasion and tax rates: An analysis of individual returns. *The Review of Economics and Statistics 65*(3), 363–373.

Collier, D. (2011). Understanding process tracing. *PS: Political Science & Politics 44*(4), 823–830.

Combes, J.-L. and C. Ebeke (2011). Remittances and household consumption instability in developing countries. *World Development 39*(7), 1076–1089.

Comunale, M. (2017). Dutch disease, real effective exchange rate misalignments and their effect on gdp growth in eu. *Journal of International Money and Finance 73*, 350–370.

Corden, W. M. (1984). Booming sector and dutch disease economics: Survey and consolidation. *Oxford Economic Papers 36*(3), 359–380.

Davies, R. and J. Thurlow (2010). Formal–informal economy linkages and unemployment in south africa. *South African Journal of Economics 78*(4), 437–459.

Day, B. (2009). Ghana favours china bid on jubilee oil field. *Business Day*.

DellAnno, R. (2016). Analyzing the determinants of the shadow economy with a separate approach. an application of the relationship between inequality and the shadow economy. *World Development 84*, 342 – 356.

DellAnno, R., A. A. Davidescu, and N. P. Balele (2018). Estimating shadow economy in tanzania: an analysis with the mimic approach. *Journal of Economic Studies 45*(1), 100–113.

Devarajan, S. (1988). Natural resources and taxation in computable general equilibrium models of developing countries. *Journal of Policy Modeling 10*(4), 505–528.

Dixit, A. (1975). Welfare effects of tax and price changes. *Journal of Public Economics 4*(2), 103 – 123.

Djankov, S., R. L. Porta, F. L. de Silanes, and A. Shleifer (2002). The regulation of entry. *The Quarterly Journal of Economics 117*(1), 1–37.

Dobozi, I. and G. Pohl (1995). Real output decline in transition economies - forget gdp, try power consumption data. *Transition Newsletter 6*(11).

Dreher, A., C. Kotsogiannis, and S. McCorriston (2008, Sep). How do institutions affect corruption and the shadow economy? *International Tax and Public Finance 16*(6), 773.

Dreher, A. and F. Schneider (2010, Jul). Corruption and the shadow economy: an empirical analysis. *Public Choice 144*(1), 215–238.

Dybka, P., M. Kowalczuk, B. Olesiński, A. Torój, and M. Rozkrut (2018, Jul). Currency demand and mimic models: towards a structured hybrid method of measuring the shadow economy. *International Tax and Public Finance*.

Eilat, Y. and C. Zinnes (2002). The shadow economy in transition countries: Friend or foe? a policy perspective. *World Development 30*(7), 1233 – 1254.

Elgin, C. and C. Oyvat (2013). Lurking in the cities: Urbanization and the informal economy. *Structural Change and Economic Dynamics 27*, 36–47.

Elgin, C., O. Oztunali, et al. (2012). Shadow economies around the world: model based estimates. *Bogazici University Department of Economics Working Papers 5*(2012), 1–48.

Ericsson, N. R. (1998). Empirical modeling of money demand. *Empirical Economics 23*(1), 295–315.

Feige, E. (2016). Reflections on the meaning and measurement of unobserved economies: What do we really know about the "shadow economy?". *Journal of Tax Administration 2*(1).

Feige, E. L. (1979). How big is the irregular economy? *Challenge 22*(5), 5–13.

Feld, L. P. and F. Schneider (2010). Survey on the shadow economy and undeclared earnings in oecd countries. *German Economic Review 11*(2), 109–149.

Ferrari, S. and F. Cribari-Neto (2004). Beta regression for modelling rates and proportions. *Journal of Applied Statistics 37*(7), 799–815.

Fleming, M. H., J. Roman, and G. Farrell (2000). The shadow economy. *Journal of International Affairs 53*(2), 387–409.

Frankel, J. A. and D. H. Romer (1999, June). Does trade cause growth? *American Economic Review 89*(3), 379–399.

Frey, B. S. and B. Torgler (2007). Tax morale and conditional cooperation. *Journal of Comparative Economics 35*(1), 136 – 159.

Frey, B. S. and H. Weck (1983). Estimating the shadow economy: A 'naive' approach. *Oxford Economic Papers 35*(1), 23–44.

Frey, B. S. and H. Weck-Hanneman (1984). The hidden economy as an unobserved variable. *European Economic Review 26*(1), 33 – 53.

Friedland, N., S. Maital, and A. Rutenberg (1978). A simulation study of income tax evasion. *Journal of Public Economics 10*(1), 107 – 116.

Friedman, E., S. Johnson, D. Kaufmann, and P. Zoido-Lobaton (2000). Dodging the grabbing hand: the determinants of unofficial activity in 69 countries. *Journal of Public Economics 76*(3), 459 – 493.

Gandini, A. (2019). Labour process theory and the gig economy. *Human Relations 72*(6), 1039–1056.

Gerbing, D. W. and J. G. Hamilton (1996). Viability of exploratory factor analysis as a precursor to confirmatory factor analysis. *Structural Equation Modeling: A Multidisciplinary Journal 3*(1), 62–72.

Gërxhani, K. (2004). The informal sector in developed and less developed countries: A literature survey. *Public Choice 120*(3/4), 267–300.

Goel, R. K. and M. A. Nelson (2016). Shining a light on the shadows: Identifying robust determinants of the shadow economy. *Economic Modelling 58*, 351 – 364.

Goldberg, P. K. and N. Pavcnik (2003). The response of the informal sector to trade liberalization. *Journal of Development Economics 72*(2), 463 – 496. 14th Inter-American Seminar on Economics.

Gries, T., M. Kraft, and D. Meierrieks (2009). Linkages between financial deepening, trade openness, and economic development: Causality evidence from sub-saharan africa. *World Development 37*(12), 1849 – 1860.

GSS (2019). Rebased 2013-2018 annual gross domestic product.

Gupta, S., C. A. Pattillo, and S. Wagh (2009). Effect of remittances on poverty and financial development in sub-saharan africa. *World Development 37*(1), 104 – 115.

Gutmann, P. M. (1977). The subterranean economy. *Financial Analysts Journal 33*(6), 26–27.

Gyimah-Boadi, E. and H. K. Prempah (2012). Oil, politics, and ghana‘s democracy. *Journal of Democracy 23*(3), 94–108.

Haug, J. (2014). Critical overview of the (urban) informal economy in ghana. *Friedrich Ebert Stiftung*.

Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica 46*(6), 1251–1271.

Hayat, A. (2018). Fdi and economic growth: the role of natural resources? *Journal of Economic Studies 45*(2), 283–295.

Heath, E. B. and L. R. Jones (2013). Using electricity demand to estimate state-level underground economic activity in the us. *International Journal of Business and Social Science 4*(8), 272 – 280.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica 47*(1), 153 – 161.

Herbst, J. (1993). The politics of reform in ghana, 1982-1991.

Hox, J. and T. Behgar (1998). An introduction to structural equation modeling. *Family Science Review 11*(1), 354–373.

Iamsiraroj, S. and M. A. Ulubaolu (2015). Foreign direct investment and economic growth: A real relationship or wishful thinking? *Economic Modelling 51*, 200 – 213.

Isachsen, A. J. and S. Strøm (1980). The hidden economy: The labor market and tax evasion. *The Scandinavian Journal of Economics 82*(2), 304–311.

Isachsen, A. J. and S. Strøm (1985). The size and growth of the hidden economy in norway. *Review of Income and Wealth 31*(1), 21–38.

Jacobs, B. (2013). From optimal tax theory to applied tax policy. *FinanzArchiv/Public Finance Analysis*, 338–389.

Jonasson, E. (2012). Government effectiveness and regional variation in informal employment. *Journal of Development Studies 48*(4), 481–497.

Jöreskog, K. G. and A. S. Goldberger (1975). Estimation of a model with multiple indicators and multiple causes of a single latent variable. *Journal of the American Statistical Association 70*(351a), 631–639.

Jöreskog, K. G. and D. Sörbom (1981). *LISREL 5: analysis of linear structural relationships by maximum likelihood and least squares methods;[user's guide]*. University of Uppsala.

Kaku, A. (2018). The socio-economic impact of oil and gas discovery in the ellembelle district of ghana. *University of Ghana Thesis*.

Kaliberda, Aleksander Kaufmann, D. (1996). *Integrating the Unofficial Economy into the Dynamics of Post-Socialist Economies: A Framework of Analysis and Evidence*. The World Bank.

Keen, M. (1987). Welfare effects of commodity tax harmonisation. *Journal of Public Economics 33*(1), 107 – 114.

Kim, D.-H., S.-C. Lin, and Y.-B. Suen (2010). Dynamic effects of trade openness on financial development. *Economic Modelling 27*(1), 254 – 261.

Kireenko, A. and E. Nevzorova (2015). Impact of shadow economy on quality of life: Indicators and model selection. *Procedia Economics and Finance 25*, 559 – 568. 16th Annual Conference on Finance and Accounting, ACFA Prague 2015, 29th May 2015.

Kleven, H. J., M. B. Knudsen, C. T. Kreiner, S. Pedersen, and E. Saez (2011). Unwilling or unable to cheat? evidence from a tax audit experiment in denmark. *Econometrica 79*(3), 651–692.

Kluge, J. N. and A. Libman (2018). Sticks or carrots? comparing effectiveness of government informal economy policies in russia. *Comparative Economic Studies 60*(4), 605–637.

Knack, S. (2009). Sovereign rents and quality of tax policy and administration. *Journal of Comparative Economics 37*(3), 359–371.

Kopinski, D., A. Polus, and W. Tycholiz (2013). Resource curse or resource disease? oil in ghana. *African Affairs 112*(449), 583–601.

Krstić, G. and P. Sanfey (2011). Earnings inequality and the informal economy. *Economics of transition 19*(1), 179–199.

Krugman, P. R. (1979). Increasing returns, monopolistic competition, and international trade. *Journal of International Economics 9*(4), 469 – 479.

Kurtz, M. J. and S. M. Brooks (2011). Conditioning the resource curse: Globalization, human capital, and growth in oil-rich nations. *Comparative Political Studies 44*(6), 747–770.

Kus, B. (2010). Regulatory governance and the informal economy: cross-national comparisons. *Socio-Economic Review 8*(3), 487–510.

La Porta, R. and A. Shleifer (2014, September). Informality and development. *Journal of Economic Perspectives 28*(3), 109–26.

Lackó, M. (2000). Hidden economy an unknown quantity? comparative analysis of hidden economies in transition countries, 198995. *Economics of Transition 8*(1), 117–149.

Lago-Peñas, I. and S. Lago-Peñas (2010). The determinants of tax morale in comparative perspective: Evidence from european countries. *European Journal of Political Economy 26*(4), 441 – 453.

Lartey, E. K. K., F. S. Mandelman, and P. A. Acosta (2012). Remittances, exchange rate regimes and the dutch disease: A panel data analysis. *Review of International Economics 20*(2), 377–395.

Law, S. H. and M. Moradbeigi (2017). Financial development and oil resource abundance–growth relations: evidence from panel data. *Environmental Science and Pollution Research 24*(28), 22458–22475.

Lawler, Alex, A. B. and D. Zhdannikov (2014). Inside opec room, naini declares price war on us shale. *Reuters*.

Lawley, D. N. and A. E. Maxwell (1971). Factor analysis as statistical method. Technical report.

Levi, M. (1988). *Of rule and revenue*. Univ of California Press.

Litterick, D. (2008). Tullow oil is a good long-term play with jubilee field looking like a major find. *The Daily Telegraph*.

Macias, J. B. and G. Cazzavillan (2010). Modeling the informal economy in mexico. a structural equation approach. *The Journal of Developing Areas 44*(1), 345–365.

Magud, N. and S. Sosa (2013). When and why worry about real exchange rate appreciation? the missing link between dutch disease and growth. *Journal of International Commerce, Economics and Policy 04*(02), 1350009.

Mahdavy, H. and M. Cook (1970). The patterns and problems of economic development in rentier states: the case of iran. *life 1000*(1).

Mahoney, J. (2012). The logic of process tracing tests in the social sciences. *Sociological Methods & Research 41*(4), 570–597.

Maloney, W. F. (2004). Informality revisited. *World Development 32*(7), 1159 – 1178.

Mankiw, N. G. and L. H. Summers (1986). Money demand and the effects of fiscal policies. *Journal of Money, Credit, and Banking 18*(4), 415–429.

Markellos, R. N., D. Psychoyios, and F. Schneider (2016). Sovereign debt markets in light of the shadow economy. *European Journal of Operational Research 252*(1), 220 – 231.

Martinez, C., M. E. Cummings, and P. M. Vaaler (2015). Economic informality and the venture funding impact of migrant remittances to developing countries. *Journal of Business Venturing 30*(4), 526 – 545.

Mathias, B. D., S. Lux, T. R. Crook, C. Autry, and R. Zaretzki (2015). Competing against the unknown: the impact of enabling and constraining institutions on the informal economy. *Journal of Business Ethics 127*(2), 251–264.

Mazhar, U. and P.-G. Méon (2017). Taxing the unobservable: The impact of the shadow economy on inflation and taxation. *World Development 90*, 89 – 103.

Medina, L. and F. Schneider (2018). Shadow economies around the world: What did we learn over the last 20 years? *IMF Working Paper WP/18/17*.

Meyer, N., D. F. Meyer, and K. Molefe (2016). Barriers to small informal business development and entrepreneurship: The case of the emfuleni region. *Polish Journal of Management Studies 13*.

Mitchell, M. I. (2012). Ghana's offshore oil: resource curse or blessing? *Africa Portal 44*.

Moon, C. (2015). Foreign direct investment, commitment institutions, and time horizon: How some autocrats do better than others. *International Studies Quarterly 59*(2), 344–356.

Morrison, K. M. (2009). Oil, nontax revenue, and the redistributional foundations of regime stability. *International Organization 63*(1), 107–138.

Nchor, D. and T. Konderla (2016). The underground economy of czech republic and tax evasion: The currency demand approach. *Procedia - Social and Behavioral Sciences 220*, 294 – 301. 19th International Conference Enterprise and Competitive Environment 2016.

Neck, R., J. U. Wächter, and F. Schneider (2012, Feb). Tax avoidance versus tax evasion: on some determinants of the shadow economy. *International Tax and Public Finance 19*(1), 104–117.

Nonor, D. (2013). Economy is not working. *Ghanaian Chronicle*.

North, D. C. (1990). *Institutions, Institutional Change and Economic Performance*. Cambridge University Press.

of Ghana, G. (2012). Recent media discussion on gnpc and jubilee oil. *Government of Ghana*.

Okertchiri, J. A. and C. Larbi (2014). Utilising ghana's oil revenue - part two. *Daily Guide Ghana*.

Osei-Boatang, C. and E. Amprawum (2011). The informal sector in ghana. *Friedrich Ebert Stiftung*.

Oxford (2015). New discoveries and increased investment contribute to ghana's growth in oil exporting. *Oxford Business Group*.

Paler, L. (2013). Keeping the public purse: An experiment in windfalls, taxes, and the incentives to restrain government. *American Political Science Review*, 706–725.

Polinsky, A. M. and S. Shavell (1992). Enforcement costs and the optimal magnitude and probability of fines. *The Journal of Law and Economics 35*(1), 133–148.

Prichard, W., P. Salardi, and P. Segal (2018). Taxation, non-tax revenue and democracy: New evidence using new cross-country data. *World Development 109*, 295–312.

Ramcharran, H. (2020). Analyzing the impact of workers? remittances on household consumption in latin american and caribbean countries. *Journal of Economics and Finance 44*(1), 59–77.

Reuters (2010). Ghana to propose oil-fed investment funds: draft. *defenceWeb*.

Robinson, J. A., R. Torvik, and T. Verdier (2006). Political foundations of the resource curse. *Journal of Development Economics 79*(2), 447 – 468. Special Issue in honor of Pranab Bardhan.

Ross, M. L. (2004). Does taxation lead to representation? *British Journal of Political Science 34*(2), 229?249.

Ross, M. L. (2015). What have we learned about the resource curse? *Annual Review of Political Science 18*, 239–259.

Sachs, J. D., A. Warner, A. slund, and S. Fischer (1995). Economic reform and the process of global integration. *Brookings Papers on Economic Activity 1995*(1), 1–118.

Sala-i Martin, X. and A. Subramanian (2013). Addressing the natural resource curse: An illustration from nigeria. *Journal of African Economies 22*(4), 570–615.

Schabas, W. A. and S. Darcy (2005). Truth commission and courts: The tension between criminal justice and the search for truth.

Schneider, F. (2005). Shadow economies around the world: what do we really know? *European Journal of Political Economy 21*(3), 598 – 642.

Schneider, F., A. Buehn, and C. E. Montenegro (2010). New estimates for the shadow economies all over the world. *International Economic Journal 24*(4), 443 – 461.

Schneider, F. and D. H. Enste (2000). Shadow economies: Size, causes, and consequences. *Journal of Economic Literature 38*(1), 77–114.

Schneider, F. and R. Neck (1993). The development of the shadow economy under changing tax systems and structures: Some theoretical and empirical results for austria. *FinanzArchiv / Public Finance Analysis 50*(3), 344–369.

Schumpeter, J. A. (1942). *Capitalism, Socialism and Democracy*. Routledge.

Slemrod, J. (2007). Cheating ourselves: The economics of tax evasion. *Journal of Economic perspectives 21*(1), 25–48.

Slemrod, J. and S. Yitzhaki (2002). Tax avoidance, evasion, and administration. In *Handbook of public economics*, Volume 3, pp. 1423–1470. Elsevier.

Spicer, M. W. and L. A. Becker (1980). Fiscal inequity and tax evasion: An experimental approach. *National Tax Journal 33*(2), 171–175.

Staats, J. L. and G. Biglaiser (2012). Foreign direct investment in latin america: The importance of judicial strength and rule of law. *International Studies Quarterly 56*(1), 193–202.

Tanzi, V. (1983). The underground economy in the united states: Annual estimates, 1930-80 (l'conomie clandestine aux etats-unis: estimations annuelles, 1930-80) (la "economa subterrnea" de estados unidos: Estimaciones anuales, 1930-80). *Staff Papers (International Monetary Fund) 30*(2), 283–305.

Tanzi, V. (1999). Uses and abuses of estimates of the underground economy. *The Economic Journal 109*(456), F338–F347.

Teitelbaum (2008). Ghana oil and gas primer - upstream overview. *United States Embassy*.

Teitelbaum (2009a). Ghana's new parliament sworn in. *United States Embassy*.

Teitelbaum (2009b). Kosmos energy accounts frozen in ghana. *United States Embassy*.

Teitelbaum (2010a). Oil in ghana - the good, the bad, and the ugly. *United States Embassy*.

Teitelbaum (2010b). President mills discusses oil and west african issues. *United States Embassy*.

Tekin, İ. (2018). Sensitivity of consumption to current income in developing countries: An empirical reinvestigation of absolute income hypothesis. *Journal of the Cukurova University Institute of Social Sciences 27*(1).

Thomas, J. (1999). Quantifying the black economy: 'measurement without theory' yet again? *The Economic Journal 109*(456), F381–F389.

Torgler, B. (2003). Tax morale, rule-governed behaviour and trust. *Constitutional Political Economy 14*(1), 119?140.

Torgler, B. and F. Schneider (2009). The impact of tax morale and institutional quality on the shadow economy. *Journal of Economic Psychology 30*(2), 228 – 245.

Tsui, K. K. (2011). More oil, less democracy: Evidence from worldwide crude oil discoveries. *The Economic Journal 121*(551), 89–115.

van der Ploeg, F. (2011). Natural resources: Curse or blessing? *Journal of Economic Literature 49*(2), 366–420.

Van Evera, S. (1997). *Guide to Methods for Students of Political Science*. Cornell University Press.

VOA (2011). Warning signs gather over ghana's oil fields.

Vorobyev, P. (2015). Estimating informal economy share in russian regions. *Economics Education and Research Consortium Working Paper No E15/02*.

Wang, Q. and X. Sun (2017). Crude oil price: demand, supply, economic activity, economic policy uncertainty and wars - from the perspective of structural equation modeling. *Energy 133*(1), 483 – 490.

Webb, J. W., L. Tihanyi, R. D. Ireland, and D. G. Sirmon (2009). You say illegal, i say legitimate: Entrepreneurship in the informal economy. *The Academy of Management Review 34*(3), 492–510.

Wiens, D., P. Poast, and W. R. Clark (2014). The political resource curse: an empirical re-evaluation. *Political Research Quarterly 67*(4), 783–794.

Williams, C. C. and S. Nadin (2010). Entrepreneurship and the informal economy: An overview. *Journal of Developmental Entrepreneurship 15*(04), 361–378.

Wintrobe, R. (2001). Tax evasion and trust. Technical report, Research Report.

Wood, A. J., M. Graham, V. Lehdonvirta, and I. Hjorth (2019). Good gig, bad gig: autonomy and algorithmic control in the global gig economy. *Work, Employment and Society 33*(1), 56–75.

Yeboah, S. (2011). Did kosmos energy pay fines to ghana on moral or technical grounds? *Ghana Business News*.

Young, C. and K. Holsteen (2015). Model uncertainty and robustness: a computational framework for multimodel analysis. *Sociological Methods & Research 1*(1), 1–38.

Zhang, C., Y. Zhu, and Z. Lu (2015). Trade openness, financial openness, and financial development in china. *Journal of International Money and Finance 59*, 287 – 309.

Ziesemer, T. H. (2012). Worker remittances, migration, accumulation and growth in poor developing countries: Survey and analysis of direct and indirect effects. *Economic Modelling 29*(2), 103 – 118.

BIOGRAPHICAL SKETCH

Les is a life-long learner who sought a terminal degree to enhance his opportunities for a full-time teaching position, which is his dream job. Ever since starting as an instructor when in grad school (the first time) he knew he wanted to be in a classroom. After over 10 years of experience working his craft, this degree will allows him to be an even better teacher.

He has a beautiful family who have been more than supportive throughout this journey; he can never repay the devotion and kindness they have shown these past five years. He hopes is that his children have learned through watching him pursue this degree is that they too can set high goals for themselves and succeed.

CURRICULUM VITAE

LESLIE SHAUN STANALAND

School of Economic, Political and Policy Sciences The University of Texas at Dallas e-mail: les.stanaland@utdallas.edu
800 W Campbell Road. GR 3.318
Richardson, TX 75080-30216, U.S.A.

RESEARCH INTERESTS & EXPERTISE

- International Political Economy, with a focus on the determinants of the informal economy
- Data analysis for public policy evaluation, data management, advanced regression analysis under frequentist approach, time series, panel data analysis, and multilevel modeling.
- Experience in advanced data programming, with a focus on data visualization

EDUCATION

PhD, Public Policy and Political Economy 2020
The University of Texas at Dallas (UTD), TX, U.S.
Dissertation - Black Gold or Black Hole? The Effects of Oil on the Informal Economy
This dissertation seeks to explain the domestic and international determinants of the informal economy, as well as formulate a measurement of the informal economy; finally, the work uses a case study to test its central claims
MA, Political Science 2004

Sam Houston State University; Huntsville, TX
BS, Political Science 2002
Sam Houston State University, Huntsville, TX

RESEARCH

Conference Proceedings

1. Stanaland, Les, Ross Baldick, Alvaro Cardenas, and Jennifer Holmes. "Protecting the Texas Electric Grid: A Cybersecurity Strategy for ERCOT and the PUCT". *Resilience Week 2019*

In Progress Publications

1. Bunte, Jonas B. and Les Stanaland. "Foreign Aid and the size of the Shadow Economy". Presented at the Southern Political Science Association, January 2019; *under review at International Organization*

2. Stanaland, Les, Ross Baldick, Alvaro Cardenas, and Jennifer Holmes. "Protecting the Texas Electric Grid: A Cybersecurity Strategy for ERCOT and the PUCT". *under review at Journal of National Security Law & Policy*

3. Stanaland, Les and Paulo Cavallo. "Investing in the shadows: the impact of the informal economy on FDI". Poster presentation at the American Political Science Association, August 2019; Presented at Southern Political Science Association, January 2020; *in progress*

4. Stanaland, Les. "The effects of oil FDI on the informal economy". Presented at the Western Social Science Association, April 2019; *in progress*

5. Stanaland, Les. "Estimating the informal economy". Presented at Southern Political Science Association, January 2020; *in progress*

6. Stanaland, Les. "Estimating the effects of oil rents on the informal economy". Presented at Southern Political Science Association, January 2020; *in progress*

CERTIFICATES

- Graduate Certificate Economic and Demographic Data Analysis. 2020
  School of Economic, Political and Policy Sciences.
  University of Texas at Dallas

TEACHING

Teaching Experience

GOVT 2305 - American Government	Summer 2020
PSCI 4356 - International Political Economy	Spring 2020
EPPS 2302 - Methods of Quantitative Analysis in the Social and Policy Sciences	Fall 2019

Graduate Teaching Assistant

EPPS 6316 - Applied Regression	Spring 2018
EPPS 6313 - Introduction to Quantitative Methods	Fall 2017

IPEC 3349 - World Resources and Development Spring 2017
IPEC 4302 - Political Economy of Developing Countries Spring 2016

Graduate Research Assistant
Research assistant for Dr Jonas Bunte Summer 2019
Research assistant for Dr Jennifer Holmes - Cybersecurity of the Texas Electric Grid 2018-2019 term