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DOES THE INFORMAL SECTOR THRIVE UNDER DEMOCRACY OR AUTOCRACY? THE CASE OF NEPAL

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ABSTRACT

Our paper investigates the size and development of the informal sector in Nepal using aggregate data over the period 1991 to 2009. Our estimation using the Multiple Indicator Multiple Cause (MIMIC) model shows that the average size of the informal sector has been about 44%. Nepal has been classified as having a hybrid political regime, so we show the effect that autocracy and democracy has had on the growth of the informal sector. Our results shows that a high degree of autocracy reduced the size of the informal sector by about 2% while greater direct democracy reduced the informal sector by about 10%.

JEL Classifications: C2, E26, 017

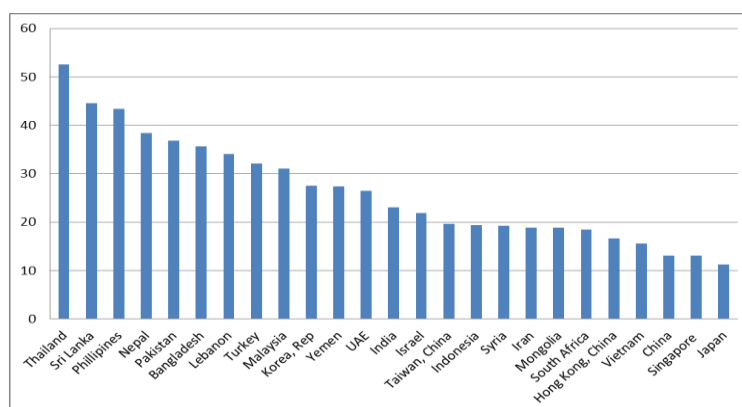
Keywords: Autocracy, Democracy, Informal Sector, MIMIC, Nepal

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INTRODUCTION

Our paper aims to achieve two objectives: First we estimate the size of the informal sector (IS) in Nepal using the Multiple Indicator Multiple Cause (MIMIC) model. Figure 1 shows that the size of the informal sector in Nepal is among the largest in Asia. Secondly, we attempt to analyse the effect that autocracy and democracy has had on the size of the informal sector.

FIGURE 1. THE INFORMAL SECTOR AS A PERCENTAGE OF GNP



Source: Schneider (2002).

Notes: This figure shows the size of the size of informal sector for a selection of Asian countries as a percentage of Gross National Product (GNP) btw 1999/ 2000.

Nepal offers a unique opportunity to study this phenomenon because it has transitioned from an autocratic rule to a democratic rule. According to the democracy index constructed by the Economist Intelligence Unit, Nepal is classified as a hybrid regime. Hybrid regimes refer to political regimes that have serious weaknesses in the functioning of government and political parties, substantial irregularities in elections, weak rule of law and civil society and harassment of the media. Table 1 shows that between 2006 and 2010, Nepal experienced an improvement in the level of democracy but no further improvement since 2010. The reason for this stagnation may be linked to the fact that people in Nepal have yet to experience the sense of empowerment, ownership and responsibility that comes with democracy¹.

TABLE 1. THE DEMOCRACY INDEX IN NEPAL

Year	2006	2008	2010	2011	2012
Index	3.42	4.05	4.24	4.24	4.16

Source: Democracy Index 2013, Economist Intelligence Unit.

Frey's theory of democratic economic policy suggests there could be a causal relationship between the freedom of political choice and the size of the informal sector. If voters believe that they do not have the power to exercise their political choice, they will exit the political system and join the informal sector as a consequence². Using Granger-Causality tests, we examine if there is a causal relationship between the freedom of political choice and the size of the informal sector in Nepal. Table 2 shows that we do not reject the null hypothesis that the freedom of political choice does not granger cause the size of the informal sector³. In other words, the causality runs one way from freedom of political choice⁴ to the size of the informal sector. This indicates a close link between democracy and the size of the informal sector.

TABLE2. TESTS FOR GRANGER CAUSALITY

Null Hypothesis	C	F-statis	P-val
Size of the Informal Sector does no Granger Cause Freedom of Political Choice		1.4	0.3
Freedom of Political Choice does n Granger Cause the Size of the Informal Sector.		3.5	0.059

** - 10% significance level, **-5% significance level, ***- 1% significance level.*

Notes: This table presents granger-causality tests between the estimates of the size of the informal sector for Nepal and the Freedom of Political Choice. Tests were carried out using Eviews.

For this reason, we develop a model to analyze the effect of democratic and autocratic regimes on the size of the informal economy because this sector makes a vital contribution to production, employment and consumption in Nepal. The rest of the paper is organized in the following manner: Section 2 summarizes key literature on the definition of the informal sector and its measurement, reviews key contributions on the impact of political regimes, and an overview of the informal economy in Nepal. Section 3 presents the model where we use calibration techniques to analyze the theory linking

autocracy and democracy to the size of the informal sector. In Section 4 we specify the estimation methodology and the data used in the analysis. The size of the informal sector is estimated using the Multiple Indicator Multiple Cause (MIMIC) model between 1991 to 2009. The first subsection of section 5 presents the MIMIC's model estimates of the informal sector in Nepal as a percentage of Gross Domestic Product (GDP). In the second subsection, these estimates are used in an OLS model to empirically investigate the impact of autocratic and democratic political regimes on the size of the informal sector. Section 6 is the conclusion.

DEFINITION AND MEASUREMENT OF THE INFORMAL SECTOR

The informal sector has been characterized by many definitions and descriptions. Some definitions characterize the informal sector in terms of its absence from national accounts. For instance, Bhattacharya (1999) describes the informal sector as the difference between the potential national income for the given currency in circulation and the recorded national income. Schneider (2003) defines the informal sector as "*...all currently unregistered economic activities which contribute to the officially calculated (or observed) Gross National Product*". Other definitions characterize the informal sector as being outside the reach of different levels and mechanisms of official governance. Feige (1990) and Loayza (1997) describe the informal economy as economic actors who operate to circumvent institutional rules. Ostrom et al. (2006) characterize the informal sector in terms of operating outside the legal framework. In this paper, we follow the definition of the former in describing the informal sector.

A number of attempts have been made to measure the size of the informal sector at the macroeconomic level. Two of the commonest approaches that have been applied are the currency demand and Multiple Indicator Multiple Cause (MIMIC) models respectively. Tanzi (1983) used the currency demand model to estimate the size of the informal sector in the U.S. owing to growing concerns that official recordings were not a good fit for the true developments in the economy. Tanzi estimated a currency demand model as a function of factors which are linked to the increase in the size of the informal sector. Some of these factors include tax burden and government regulation. The idea being that an increase in tax burden for example increases the incentive to operate in the informal sector and increases the demand for currency. Therefore the increase in the demand for currency becomes an indicator for the size of the informal sector.

The MIMIC model was developed by Joreskog and Goldberger (1975) and uses multiple causes and multiple indicators in a simultaneous equations model to estimate an unknown variable that cannot be measured directly. The informal sector is estimated as a reduced form equation which expresses the indicators as a function of the causes. A benchmarking procedure is used to generate time series estimates of the size of the informal sector as a proportion of Gross Domestic Product (GDP), Gross National Product (GNP) or the labour force. Bajada and Schneider (2002) applied the MIMIC model and currency demand model to estimate the size of the informal economy for eighteen Asia-Pacific countries to generate estimates for the year 1989-1990. Their results showed a great deal of similarity between the two estimates. Among their results, Thailand (51.9%) had by far the largest informal economy followed by Sri Lanka (43.7%), Philippines (42.6%) and Nepal (37.4%). On the other hand, Singapore and Japan had the smallest size of the informal sector with 11.2% and 10.6% of GDP respectively. Chaudhuri

et al. (2006) applied the MIMIC model to estimate the size of the informal sector for India as a whole and on a State by State basis. They estimated the size of the informal sector for India to be 20.3% of GDP between 1994/5. As part of their estimation, they compared the size of the informal sector in India with major economies in the Asia-Pacific for the same period. Their results concurred with Bajada and Schneider (2002) that Thailand had the largest informal sector while Japan had the smallest informal sector among the Asia-Pacific countries.

A Short Literature Review on the Effects of Political Regimes

According to Teobaldelli and Schneider (2012), direct democracy enables citizens to “voice out” their opinions on government performance. They showed using evidence drawn from 57 democracies that higher levels of direct democracy through referendums causes a decrease in the incentive to operate in the informal sector. The presence of an inverse relationship between direct democracy and the size of the informal sector is also supported by Thießen (2010). The study was carried out on a sample of thirty-eight OECD countries including eight eastern European countries. In this study, direct democracy was included in order to take into account the role of behavioural theories. Furthermore, previous studies had not included measures of direct democracy in a cross-section panel. The empirical study used variables such as democratic accountability, efficiency of the legal framework and impartial courts to measure direct democracy. These variables showed that better democratic accountability, more efficient legal frameworks and impartial courts contribute to reducing the size of the informal sector. These are the few studies that have attempted to show the relationship between direct democracy and the size of the informal sector.

Other studies by Pommerehne and Schneider (1978), Frey (1994), Matsusaka (1995, 2005) showed that there is a link between direct democracy and fiscal policy. Feld and Kirchgässner (2001) showed that among Swiss municipalities, budget referendums led to a reduction in public expenditure per capita. Also Matsusaka (1995, 2005) showed that democratic participation lead to a decrease in tax burden as well as a decrease in state and local government expenditure. Finally, Torgler (2005) showed using evidence from Switzerland that direct democracy increases tax morale. The use of taxes is not exclusive to democratic regimes. Cheibub (1998) discusses the various hypotheses on the relationships between taxation and political regimes. He identifies a hypothesis which suggests that democracies tend to tax more and grow less than authoritarian regimes. His empirical results show that after controlling for counterfactuals in countries experiences, the type of political regime has no impact on the level of taxation.

In Hausken et al. (2004), there is a u-shaped relationship between the level of democracy and the size of government spending. At low levels of democracy, the government chooses rents to maintain political support however public spending increases at higher levels of democracy with a tendency to over-invest. Theoretical models on non-democratic regimes tend to use rents rather than taxes as the use of rents enables the government to exploit their monopoly power by restricting access to inputs or markets for private benefits. Emerson (2006) highlights the fact that early studies on corruption used models where government agents engaged in rent seeking behaviour in order to control access to formal markets. This provided an incentive to demand bribes thereby stifling competition in the formal market. Paltseva (2010) captures the degree of autocracy by developing a theoretical model in which the regime engages in rent seeking

behaviour in order to expropriate capital for private benefits. As a result growth depends on the extent to which the regime wishes to cling to power.

In our model, we use taxes to model the effect of direct democracy and rents to model the effect of autocracy. Although, it is true that taxes and rents are not necessarily particular to any type of government, democracy is about choice while autocracy signifies a lack of choice. We use taxes to show that the agent can choose not to pay tax by operating in the informal sector. This makes taxes a natural choice for modelling the effect of direct democracy. However, in an autocracy the agent cannot voice-out opposition to the government because he cannot avoid to pay rent on investment. The government expropriates a proportion of investment before the agent begins production.

More recent studies have examined the links between political regimes and growth or pro-growth policies. Saha (2011) showed that there is a relationship between democracy measured using legislative institutions, poverty and growth. The main thrust of the paper is that democracies lead to an increase in pro-poor expenditure leading to reduction in poverty and by implication an increase in growth. This is because parliamentary competition from other parties compel a government to pay attention to alternative policies. Examples of parliamentary competition could be proposals to increase health and education or pressures to implement pro-poor policies during times of re-election. Their finding is also supported by Blaydes and Kaser (2011) who show empirically that in developing countries, democratic institutions can interact with growth in such a way that it contributes to poverty reduction.

Finally, Knutsen (2013) shows that relationship between the type of political regime and state capacity can have different implications for growth in African countries. The state capacity is defined as the ability to “implement official goals over the actions or potential opposition of powerful social groups” According to Knutsen, democracy increases growth when the state capacity is weak. This is because democracy is a substitute for weak state capacity. In the presence of weak state institutions, democracies put some constraints on political leaders thereby placing pressure on them to choose policies that are popular with the electorate. Consequently, this leads to economic development and growth.

The Informal Sector in Nepal

According to Suwal and Pant (2009), the informal sector employs about 96% of the economically active population and contributes over 50% to the national economy. The structure of the Nepalese economy is characterized by an artery of formal and informal activities that are linked through subcontracting networks and commodity chains. The informal sector has expanded over recent years owing to the presence of various taxes that poses barriers to small and medium scale enterprises respectively. For example, Pohit and Taneja (2000) point out that the use of certain tariff and non-tariff barriers prompted a large amount of informal trade from Nepal to India. Some of the consequences of the expanding informal sector are that those who work in the informal sector often become marginalized from the development agenda. They become excluded from social security, institutional or empowerment rights and many other forms of policy support (Timalsina, 2011). Although the informal sector contributes to development by providing employment opportunities to the poor; their absence from the formal sector yields a loss

in tax revenue that could be invested in public capital thereby hampering growth and development (Barro, 1990).

The relationship between policy stakeholders and the informal economy has been mostly unconstructive. For instance, the government of Nepal restricts legislative or financial support to informal workers (who are mostly the poor in Nepal). Also, the subsidy policy mainly in agriculture which has a direct influence on self-employed workers in the informal sector is mostly captured by the social elite. Consequently, few or none of the poor public benefit from the agricultural subsidy (ILO, 2004).

As a result, (Dahal, 2011) suggests that the growing democratic processes pioneered by the state and trade unions need to integrate the informal sector in to the social security system because the informal sector equally contributes to the national economy as well as mediates between the citizen and the State. This will ensure that informal sector workers are not marginalized and prevent the abuse of their civil liberties

THE MODEL

In this section, we adapt the model by Solomon (2011) to analyze the effect of democracy and autocracy on the size of the informal sector. The model is modified in two significant ways: first we assume full depreciation of physical capital stock and public capital stock. Secondly we assume that the government is a benevolent autocrat. Easterly (2011) defines a benevolent autocrat as a “non-democratic leader who receives credit for growth”. The government is a benevolent autocrat because it cares about growth in the formal sector and not just about maximizing its revenue from taxes in order to cling onto power.

Consider a small closed economy that consists of an infinitely lived agent, two sectors- formal, informal and a Government. The government can separate its power into two dimensions: autocracy and democracy. The agent is endowed with capital stock and is assumed to be both a consumer and a producer. There are no firms in the model. Furthermore, we assume that the informal sector is less capital intensive than the formal sector and labour supply is fixed.

The agent invests capital stock in both the formal sector (FS) and the informal sector (IFS). The difference between the FS and IFS is that output in the FS is taxed while output in the IFS is not taxed because its production is unobserved by the government. The IFS is also characterized by three other features: all output produced is consumed, output is not used for capital accumulation and the informal sector faces barriers to political and economic participation⁵. The agent chooses next periods capital stock in the formal and informal sectors to maximize his expected discounted value of utility subject to his budget constraint and the evolution of capital stock in the formal sector.

We assume that the government can separate its power into an autocracy and a democracy. Our basis for this assumption comes from Brown and Saving (1999) who show that the kind of power a government exercises has an impact on the demand for its services. Direct democracy is exercised according to the Lindahl rule which is used to make decisions on how much public good is provided. In this set-up, each taxpayer can vote on the amount of public good provision that would maximize his utility. This means implicitly that the government considers agent’s decisions in setting the tax rate. Government spends a proportion of tax revenue on public capital while the rest is used to finance its own consumption. The more the government considers the decisions of votes in the provision of public goods, the lower the tax rate. Therefore the tax rate becomes our proxy for the level of direct democracy.

On the other hand, the government has the incentive to extract the maximum surplus from the agent by restricting the amount of input available to the agent for production and investment. Therefore, it can charge a monopoly rent on any input⁶. The government exercises its autocratic power by charging a monopoly rent on investment in capital stock for private benefits. The greater the amount of private benefits, the greater the incentive for the government to expropriate investment through higher rent so as to hold on to power (Paltseva, 2010). Given that the government is a benevolent autocrat, we assume that private benefits to holding on to power are small because the economy is resource poor. Consequently, the rent becomes our proxy for the level of autocracy.

The agent begins the period with public capital stock (X_t) and capital stock (k_t). To the agent, public capital stock is exogenous, as well as the tax rate (τ) and monopoly rent on investment in the FS. The government spends the tax revenue obtained from production in the FS to accumulate public capital stock and finance its own consumption. We assume that the government balances its budget every period. Equation (1) expresses the agent's preferences which is derived from consuming goods from the FS and IFS. Equations (2) and (3) are the production functions in the formal and informal sector respectively. The agent produces output using capital stock and public capital stock. Equation (4) expresses capital stock as the sum of capital stock in the FS (k_{1t}) and IFS (k_{2t}). Equation (5) describes the evolution of capital stock. The accumulation of capital stock depends on the pay-off to the government from expropriating investment (D_t) shown in (6). The pay-off to the government is revenue from monopoly rent on investment less the cost of collecting the rent (ϕ) plus private benefits (b). From equations (5) and (6), it is clear that the scope for capital accumulation and growth in the FS and IS depends on the extent to which the government is willing to cling onto power i.e. the degree of autocracy. Equation (7) describes the evolution of public capital stock where we assume full depreciation of capital stock. It shows that public capital stock next period is produced from public investment where $\eta\tau Ak_{1t}^\alpha X_t^\psi$ represents the proportion of tax revenue used for public investment⁷. Finally, equation (8) is the agent's total budget constraint and shows that aggregate output is the sum of aggregate consumption in both sectors and investment.

$$E_0 \sum_{t=0}^{\infty} \beta^t U(c_{1t} + c_{2t}) \quad (1)$$

$$y_{1t} = (1 - \tau) A_t k_{1t}^\alpha X_t^\psi \quad (2)$$

$$y_{2t} = \frac{A_t k_{2t}^\lambda X_t^\nu}{\phi} = c_{2t} \quad (3)$$

$$k_t = k_{1t} + k_{2t} \quad (4)$$

$$k_{t+1} = (1 - \delta)k_t + D_t \quad (5)$$

$$D_t = rI_t - \phi r_t + b \quad (6)$$

$$X_{t+1} = (1 - \delta)X_t + \eta\tau Ak_{1t}^\alpha X_t^\psi \quad (7)$$

$$y_{1t} + y_{2t} = c_{1t} + c_{2t} + i_t \quad (8)$$

First Order Conditions

In this section, the model is solved according to the dynamic programming approach developed by Bellman (1957). The agent's objective is to choose the level of consumption in the FS (c_{1t}) and IFS (c_{2t}) that maximizes utility. However, c_{1t} and c_{2t} is solved in terms of next period's capital stock in the FS and IFS (k_{1t+1} , k_{2t+1}). This is because investment links consumption today with consumption in the next period. The agent chooses next period's capital stock in the formal and informal sectors i.e. k_{1t+1} , k_{2t+1} to maximize:

$$V(A_t, k_{1t}, k_{2t}) = \underset{k_{1t+1}, k_{2t+1}}{\text{Max}} U \left[(1-\tau)A_t k_{1t}^\alpha X_t^\psi - \frac{k_{t+1} + b}{r} - \phi + \frac{A_t k_{2t}^\lambda X_t^\nu}{\phi} \right] \quad (9)$$

$$+ \beta E_t V(A_{t+1}, k_{1t+1}, k_{2t+1})$$

The Euler equations of the model as a result of the agent choosing capital stock in the FS and IFS are presented below in (10) and (11). They show the agent's time-allocation trade-off in the marginal utility consumption. Each equation shows that a reduction in the marginal utility consumption in time t equals the expected marginal benefit of increasing consumption discounted at β . The increase in consumption is the result of capital accumulation from investment of physical capital and public capital stocks respectively.

$$U' c_t \left(\frac{-1}{r} \right) + \beta U' c_{t+1} \left(\alpha(1-\tau)A_{t+1} k_{1t+1}^{\alpha-1} X_{t+1}^\psi \right) = 0 \quad (10)$$

$$U' c_t \left(\frac{-1}{r} \right) + \beta U' c_{t+1} \left(\frac{\lambda A_{t+1} k_{2t+1}^{\lambda-1} X_{t+1}^\nu}{\phi} \right) = 0 \quad (11)$$

Each period the agents equates the after-tax marginal productivity of capital stock in the FS to the marginal product of capital stock in the IFS. This is shown in (12) below:

$$\alpha(1-\tau)A_{t+1} k_{1t+1}^{\alpha-1} X_{t+1}^\psi = \frac{\lambda A_{t+1} k_{2t+1}^{\lambda-1} X_{t+1}^\nu}{\phi} \quad (12)$$

Therefore an increase in tax reduces the accumulation of capital stock in the FS relative to the IFS as the economy converges towards steady state.

Steady-State Solutions

In this section, we derive the steady-state solutions to capital stock in the FS and IFS, public capital stock and the relative size of the informal sector. The time subscripts in (10) and (11) are set to zero in order to solve steady-state capital stock in the FS (k_1^{ss}) and IFS (k_2^{ss}) respectively.

$$k_1^{ss} = \left(\frac{\frac{1}{\beta}}{r\alpha(1-\tau)A} \right)^{\frac{1}{\alpha-1-\alpha\psi}} (\eta\tau A)^{\frac{-\psi}{\alpha-1-\alpha\psi}} \quad (13)$$

$$k_2^{ss} = \left(\frac{\frac{1}{\beta}\phi}{r\lambda A} \right)^{\frac{1}{\lambda-1}} \left(\frac{\frac{1}{\beta}}{r\alpha(1-\tau)A} \right)^{\frac{-\alpha\nu}{(\alpha-1-\alpha\psi)(\lambda-1)}} (\eta\tau A)^{\frac{\nu(1-\alpha)+2\alpha\psi}{(\alpha-1-\alpha\psi)(\lambda-1)}} \quad (14)$$

$$X^{ss} = (\eta\tau A)^{\frac{\alpha-1-2\alpha\psi}{(1-\psi)(\alpha-1-\alpha\psi)}} \left(\frac{\frac{1}{\beta}}{r\alpha(1-\tau)A} \right)^{\frac{\alpha}{(1-\psi)(\alpha-1-\alpha\psi)}} \quad (15)$$

An increase in the tax rate decreases the marginal product of capital stock in the FS relative to the IFS. Consequently, the agent accumulates more capital stock in the IFS and this increases the relative size of the informal sector as the economy converges towards steady state. On the other hand, an increase in rent on investment decreases the accumulation of capital stock in both the FS and IFS. As the IFS is less capital intensive, the relative size of the informal sector decreases as the economy converges towards the steady-state. Equation (16) shows that the relative size of the informal sector (I) is defined as the ratio of steady-state output in the IFS relative to the FS.

$$I = \frac{(1-\tau)A(k_1^{ss})^\alpha (X^{ss})^\psi}{\phi^{-1}A(k_2^{ss})^\lambda (X^{ss})^\nu} \quad (16)$$

Calibration

In this section, we calibrate the parameters to examine the impact of tax and monopoly rent respectively on I . This is because the steady-state solutions are extremely non-linear. The parameters are calibrated to match the average estimated size of the informal sector in Nepal between 1990-2010⁸. According to our estimates using the MIMIC model, this was found to be 37.17% of Gross Domestic Product (GDP).

The capital share parameter in the FS, α , and the discount factor β are set to 0.33 and 0.96 respectively⁹. The capital share parameter in the IFS, λ , is set to one-tenth the share in the FS. The barriers to economic and political participation, ϕ , is set according to an index of institutionalized autocracy. This index is obtained from the Quality of Governance (QOG) institute¹⁰. The higher the index, the higher the level of autocracy. As a result, ϕ is set to 2.00 to reflect the current level of autocracy in Nepal. The tax policy parameter is set to 0.30 to reflect the current corporate tax rate, τ , in Nepal. The

rent on capital stock, r is also set to 0.30 in order to compare it with the effect of increasing the tax rate on the relative size of the informal sector. Setting values for the share of public capital stock in the FS and IS (ψ, ν) and the proportion of tax revenue spent on public investment (η) are the most challenging because there are no direct measures for Nepal. As a result, these parameters are set to 0.05, 0.474 and 0.3 respectively to match the average estimated size of the IS in Nepal.

Policy Experiments

Table 3 compares the effect of increasing the tax rate with monopoly rent on l in the steady-state. We start by increasing the tax rate, holding the monopoly rent at the calibrated level. The second row shows that increasing the tax rate, increases the relative size of the informal sector.

Next, we increase monopoly rent, holding the tax rate at the calibrated level. The last row shows that increasing the rent decreases the relative size of the informal sector. The higher the tax rate, the less the government allows the agent to decide on the tax rate. This is because it cares less about growth in the FS relative to maximizing tax revenues. An increase in the tax rate (lower direct democracy) means that the government does not care much about the decision of the agent (voter). Consequently, the agent has less of a voice over the amount of resources that can be allocated towards consumption and investment. As the marginal returns to production in the FS decreases relative to the IFS, our policy experiment shows that the agent can choose to freely exit into the informal sector as a voice-out or vote against the democratic process. Therefore, the size of the informal sector is indirectly proportional to the level of democracy. In other words, lower direct democracy increases the size of the informal sector. On the other hand, the higher the monopoly rent (higher autocracy) charged on investment, the greater the government's control over the agent's ability accumulate capital stock next period for production in both sectors. An increase in monopoly rent the amount of capital stock available for production. Consequently, the marginal returns to production in the IFS decreases by a larger magnitude relative to the FS because the IFS depends on the FS for investment. Therefore greater autocracy decreases the size of the informal sector.

TABLE 3. EFFECT OF INCREASING THE TAX RATE VS. MONOPOLY RENTS ON THE SIZE OF THE INFORMAL SECTOR

Tax rate (τ)	0.15	0.25	0.35	0.45	0.55	0.65
l	0.23	0.34	0.48	0.66	0.93	1.38
Rent (r)	0.15	0.25	0.35	0.45	0.55	0.65
l	0.47	0.42	0.37	0.35	0.34	0.33

We now turn to discuss the estimation of the informal sector for Nepal using the MIMIC model. This is subsequently followed by a discussion of the data and the construction of the time series estimates of the size of the informal sector. These estimates will be used to empirically test the impact of democracy and autocracy on the size of the informal sector in Nepal.

ESTIMATION METHODOLOGY

The MIMIC model was developed by Joreskog and Goldberger (1975) as an approach to estimating an unobserved variable. Equation (17) is a structural equation showing that the unobserved variable y_t^* is a function of x_t observable exogenous causes subject to a structural error term ε_t .

$$y_t^* = \Gamma x_t + \varepsilon_t \quad (17)$$

where $x_{ct} = (x_{1t}, \dots, x_{ct})$ is a column vector of c exogenous causes and Γ is a $(1 \times c)$ row vector of structural parameters. Equation (18) is a measurement equation and shows that y_t^* is determined by a set of observable endogenous indicators subject to a set of measurement error $(u_{1t}, \dots, u_{dt})'$.

$$y_t = \Lambda y_t^* + u_t \quad (18)$$

Where, $y_t = (y_{1t}, \dots, y_{dt})'$ is a column vector of d observed indicators and $u_t = (u_{1t}, \dots, u_{dt})'$ of d measurement errors. Finally, Λ is a $d \times 1$ column vector of parameters that relates y_t to y_t^* .

The general properties of the structural model are that all variables are assumed to have zero expectations. The structural error term has zero expectation, a constant variance (σ^2) and is independent of x_t . For the measurement model, the error terms also have zero expectations. The measurement error terms are assumed to be independent of each other¹¹. Finally for u_t , Θ_d , is a $d \times d$ diagonal covariance matrix and contains θ which are the vector of variances along the leading diagonal. These general properties of the structural and measurement models are formalized below:

$$E(\varepsilon_t, x_t) = 0, E(\varepsilon_t, u_t) = 0, E(\varepsilon_t^2) = \sigma^2, E(u_t u_t) = \Theta_u = \text{diag}\{\theta_i\}$$

Identification

The structural parameters to be estimated are $\Gamma, \Lambda, \sigma^2, \theta$. In order to uniquely identify these structural parameters, we obtain a reduced form solution because y_t^* cannot be estimated directly. From (17) and (18) we obtain the following reduced form solution that expresses the observable indicators as a function of the exogenous causes.

$$y_t = \Lambda \Gamma x_t + v_t \quad (19)$$

where $\Lambda\Gamma$ is a $(c \times d)$ coefficient matrix and v_t is the disturbance vector given as $\Lambda\varepsilon_t + u_t$. From v_t we then obtain the reduced form covariance matrix shown below in (20).

$$E(v_t v_t') = \sigma^2 \Lambda \Lambda' + \Theta_u \quad (20)$$

From the reduced form model, there are cd elements contained in $\Gamma\Lambda$, one element (σ^2) contained in the variance of ε_t and $\frac{d(d+1)}{2}$ elements in Θ_u and we include $\frac{c(c+1)}{2}$ elements contained in the variance of x_t . The total number of reduced form parameters denoted S is $cd + 1 + \frac{d(d+1)}{2} + \frac{c(c+1)}{2}$. From the structural model, there are c elements in Γ , one element (σ^2) contained in the variance of ε_t and $\frac{c(c+1)}{2}$ contained in the variance of x_t . Furthermore, there are d elements in Λ and d elements contained in the variance of u_t . As a result, the total number of structural parameters denoted S' is $2d + c + 1 + \frac{c(c+1)}{2}$.

The necessary condition for identification is that the number of reduced form parameters should be equal to the number of structural parameters. Therefore, the total number of parameters needed to just identify the model comes from subtracting S' from S as shown below in (21)

$$\Delta = S - S' = cd + \frac{d(d+1)}{2} + 1 - (2d + c + 1) \quad (21)$$

From (21), it can be shown that we need two indicators and two exogenous causes to just-identify the structural model

A sufficient condition is required in order to identify unique solutions to the structural parameters Γ and Λ' . This is because the product of Γ and Λ' remains the same Γ is multiplied by a scalar and Λ' is divided by the same scalar. Therefore to resolve this identification problem, the unobserved variable is normalized by setting one of the coefficients in the column matrix of Λ' to a constant. One way of achieving this is to fix the coefficient of one of the indicators to one to allow for ease of economic interpretation¹². In our paper, the coefficient of narrow money is fixed to one. This implies that the trend in narrow money is indicative of the size and development of the informal sector in Nepal.

Data

In this section, we describe the variables used to estimate the size of the informal sector in Nepal using the MIMIC model between 1991 and 2009. Our sample is restricted owing

to the availability of data. For the causes we use variables such as the revenue from direct tax as a percentage of GDP, inflation rate and the empowerment rights index as a proxy for the burden of government regulation. For the indicators, the variables we use are real gross domestic product (GDP), labor force participation rates and broad money (M2). Table 4 shows for each variable the a-priory relationship with the size of informal economy.

TABLE 4. A-PRIORY RELATIONSHIP BETWEEN THE CAUSAL AND INDICATOR VARIABLES AND INFORMAL ECONOMY

<i>Causal Variables</i>	<i>A-Priory Relations</i>
1. Tax Revenue	Posit
2. Inflation rate	Positive/Negat
3. Empowerment Rights Index	Negat
<i>Indicator Variables</i>	
4. Labor Participation Rate	Negat
5. Real GDP	Negat
6. Broad Money Supply (M1)	Posit

Our motivation for our choice of causal variables are as follows: An increase in the tax rate provides a strong incentive to work in informal economy. This is because it reduces the after-tax profit from production. Consequently, people shift their capital and labour towards production in the informal sector in order to avoid paying tax. The effect of the inflation rate on the size of the informal sector is rather ambiguous. On the one hand, higher inflation can have a positive impact on the size of the informal sector as people on low income switch to the informal sector for the purchase of goods and services which are relatively cheaper. However, the effect can also be negative because inflation acts as tax on the informal economy which is mainly cash driven¹³.

Finally, the Labor empowerment rights index is an additive index constructed from summing the following indices: foreign movement, domestic movement, freedom of speech, freedom of assembly and association, workers' rights, electoral self-determination, and freedom of religion. The index ranges from 0 (no government respect for these seven rights) to 14 (full government respect for these seven rights). This qualitative information is a useful measure of the effect of government regulation on the labour force. A low number is a reflection of the level of dis-satisfaction that government regulation has among the labour force. Therefore we expect a negative relationship between the labor empowerment rights index and the size of the informal sector.

Real GDP is a measure of the value of output adjusted for inflation. The relationship between real GDP and the size of the informal sector as far as the literature is concerned is ambiguous. On the one hand, there can be a negative relationship between Real GDP and the size of the informal economy because during periods of recession, there is a greater demand for goods and services supplied by the informal sector. On the other hand, there can be a positive relationship because higher demand in formal sector spills over into the informal sector who depend on the formal sector for the supply of inputs.

Finally, narrow money (M1) indicates the amount of cash held by public. The expansion of shadow economy leads to the growth of narrow money held by the public in comparison to the demand deposits because the transactions are assumed to be made in cash payments so that the clandestine activities are undetected by the authorities. Consequently, M1 will be used to indicate the development of the size of the informal sector in Nepal.

RESULTS

This section is divided into two parts: Section 5.1 reports the results of the MIMIC models and presents the estimates of the size of the informal sector in Nepal from 1991 to 2009. Section 5.2 presents the empirical analysis of the impact of political regimes (direct democracy and autocracy) on the size of the informal sector.

The MIMIC's Model Estimates of the Informal Sector in Nepal

The size of the informal sector is estimated as a restricted linear function of structural coefficients according to equation (22). The ordinal index comes from the fitted values which are obtained by multiplying the structural coefficients. It is this index which is converted to a cardinal measures of the informal sector as a proportion of GDP. The data were filtered for stationarity by taking first differences.

$$\Delta \hat{y}_t^* = \hat{c}_{11} \Delta x_{1t} + \hat{c}_{12} \Delta x_{2t} + \hat{c}_{13} \Delta x_{3t} + \varepsilon_t \quad (22)$$

Table 5 reports the results of the MIMIC model. The p-values are reported in the parenthesis. The model consists of two indicators and four causes which means from equation (20) that our model is over-identified by two additional parameters. We focus on the sign as well as the significance of the parameters. However, what is most crucial is that we do not reject the null hypothesis that the model is over-identified. Among the indicators, the coefficient of M1 has been fixed to 1 to sufficiently identify the model. Our results show that real GDP has a positive and significant impact on the size of informal sector at the 10% level. This suggests that in Nepal there is a direct relationship between formal sector and informal sector. Among the causes, the results show that tax and inflation have a positive and significant effect on the informal sector at the 5% and 1% levels of significance respectively. Finally the labour empowerment rights index has a negative and insignificant effect on the size of the informal sector. The sign of this variable is different from a-priori expectations and could reflect the unconstructive relationship between the informal sector and policy stakeholders (policy makers and trade unions) as noted in section 2.

TABLE 5. MIMIC MODEL'S ESTIMATES

<i>Indicators</i>	
Annual Growth in Narrow Money	1.00
Annual Growth in Real GDP	0.24(1.92)***
<i>Causes</i>	
Annual Growth in Tax Revenue	0.326(2.83)**
Labour Empowerment Rights	0.005(1.07)
Inflation	0.004(1.83)***
<i>Diagnostic Results</i>	
Chi-square(2)	0.30(0.8620)
Root Mean Square	0.021
Adjusted Goodness of Fit (AGOF)	0.714

* - 10% significance level, **-5% significance level, ***- 1% significance level.

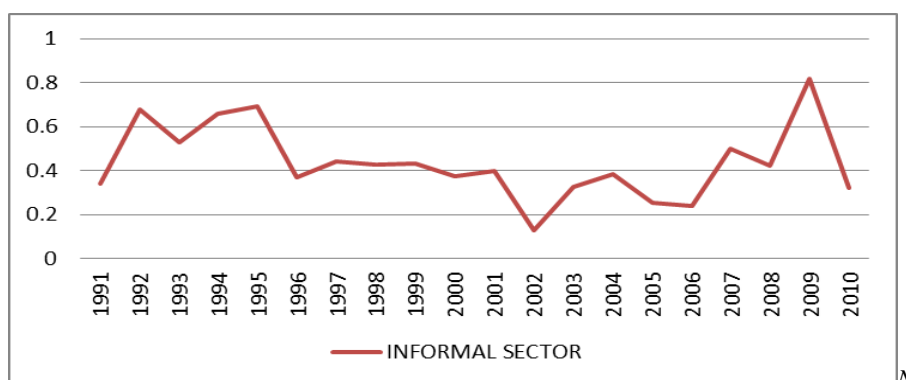
Next we turn to the diagnostics, table 5 shows that we do not reject the null hypothesis that our model is over-identified by the additional two parameters. The Root Mean Standard Error of Approximation (RMSEA) measures the discrepancy between the sample and estimated covariance matrices. An RMSEA of < 0.5 shows that the model is a good fit. Our results shows a small discrepancy of 0.021 indicating that the model is a good fit of the data. Finally, the Adjusted Goodness of Fit Index (AGFI) indicates how well the model fits the data. The index ranges between 0 and 1. Table 5 shows that AGFI index is 0.714 demonstrating that our model is a good fit of the data.

The index is then converted to a cardinal measure of the informal sector by scaling up the series using an exogenous estimate that comes from outside the model. The index is scaled to take a value of 37.4% of GDP in 2000. This exogenous estimate represents the estimated growth of the size of the informal sector between 2000 and 2001 and was obtained by Bajada and Schneider (2003). The rest of the series is adjusted by the value of this scale such that the series passes through a base value of 37.4% of GDP in 2000. The time series estimates of the size of the informal sector are reported in Table 6 followed by a line plot of the series in figure 2.

TABLE 6. TIME SERIES ESTIMATES OF THE GROWTH OF THE SIZE OF THE INFORMAL SECTOR IN NEPAL

Year	% of GDP	Year	% of GDP
1991	33.9	2000	37.4
1992	67.6	2001	39.7
1993	53.1	2002	12.7
1994	65.9	2003	32.7
1995	69.3	2004	38.6
1996	36.8	2005	25.4
1997	44.0	2006	23.9
1998	42.7	2007	46.1
1999	43.4	2008	42.1
		2009	82.0

FIGURE 2: MIMIC MODEL ESTIMATES OF THE GROWTH OF THE INFORMAL ECONOMY OF NEPAL AS A % OF GDP



Notes: This figure shows estimates of the size of the Informal Sector for Nepal between 1991 to 2010 based on the MIMIC model. Estimation was carried out using STATA.

Analyzing the Impact of Political Regimes on the Size of the Informal Sector

The thrust of our empirical investigation is to estimate the impact of two political regimes: democracy and autocracy on the size of the informal sector in Nepal. As previously indicated, the sample period for the estimation is restricted to the period between 1991 to 2009. This was due to our inability to obtain sufficient time series data after 2009.

Equation (23) presents the baseline model for estimating the impact of democracy and autocracy on the size of the informal sector for Nepal. The model is an adaptation of the empirical model from Teobaldelli and Schneider (2012) who estimated

the effect of direct democracy on the size of the informal sector. INF_t is the estimated size of the informal sector as a percentage of GDP obtained from the MIMIC model.

$$INF_t = b_0 + b_1ciri_{elecsd} + b_2p_{autoc} + b_3pwt_{gsg} + \rho_i[control\ variables]_t + \varepsilon_{it} \quad (23)$$

The data was taken from the Quality of Government (QOG) institute prepared by the University of Gothenburg, Sweden¹⁴. The first variable is *ciri_elecsd* which measures the freedom of political choice in order to measure direct democracy. This measures the extent to which people have the political freedom to change laws or the officials that govern them through free and fair elections. The scale is from 0 to 2 where 0 is no right to self-determination through free and fair elections and 2 is where political participation is very free and open. The second variable is *p_autoc* which measures the level of institutionalized autocracy defined broadly in terms of the level of political participation. We include this variable to measure the impact of autocracy/democracy on the size of the informal sector. The scale ranges from 0 to 10 where 0 is low degree of autocracy and 10 refers to a high degree of autocracy. The third variable *pwt_gsg* measures Government share as a percentage of GDP. This is included to proxy for the size of government. In order to reduce the problem of omitted variable bias we run a number of regressions using additional control variables such as *unna_grgdp* (growth rate of real GDP), education (number of years spent in secondary school), *emp_rights* (labour rights) and *pwt_open* (trade openness).

Table 7 presents summary statistics of all the data employed in this study. The average estimate of the size of the informal sector for the sample period is given as 40.6% of GDP. Our results show that there is a lot of variation in the estimates as the largest estimated size of the informal sector was 69.4% of GDP in 1995 while the smallest was approximately 12.7% of GDP in 2002. The average share of government expenditure was approximately 17% of GDP during the sample period.

TABLE 7. SUMMARY STATISTICS

	INF4	pwt_gsg	p_autoc	unna_grgdp	emp_rights	pwt_open	ciri_elecsd
Mean	44.10	17.21	1.714	4.43	7.58	50.99	1.57
Maximum	69.40	18.51	7.00	8.22	10.00	67.45	2.00
Minimum	12.70	15.20	0.00	0.12	4.00	36.44	0.00
Standard Deviation	15.50	0.97	0.99	1.89	1.64	8.31	0.65

Turning to the indices measuring autocracy and direct democracy, our data shows that in Nepal the government has transitioned from autocracy to democracy. Furthermore, it is becoming increasingly more democratic relative to its past. However, the table clearly shows that during its political history, Nepal has experienced a high degree of autocracy. The maximum and minimum statistics show that that the level of autocracy was highest in 2004. Table 8 shows granger causality tests between *ciri_elecsd* and *p_autoc* respectively and the size of the informal sector in Nepal. The results shows that direct democracy granger causes the size of the informal sector. On the other hand there is no causal relationship between autocracy and the size of

the informal sector and vice versa. This indicates the absence of reverse causality among the variables, reducing the risk of endogeneity bias.

TABLE 8. GRANGER CAUSALITY TESTS BETWEEN AUTOCRACY, DIRECT DEMOCRACY AND THE SIZE OF THE INFORMAL SECTOR

Null Hypothesis	Obs	F-statistic	P-value
Direct Democracy does not Granger Cause the Size of the Informal Sector	16	3.578*	0.060
Size of the Informal Sector does not Granger Cause Direct Democracy	16	1.418	0.300
Autocracy does not Granger Cause Size of the Informal Sector	16	0.526	0.675
Size of the Informal Sector does not Granger Cause Autocracy	16	0.855	0.855
Autocracy does not Granger Cause Direct Democracy	16	2.810	0.100
Direct Democracy does not Granger Cause Autocracy	16	1.231	0.354

* - 10% significance level, **-5% significance level, ***- 1% significance level.

The main testable assumptions are the following: (i) the higher the level of autocracy the smaller the size of the informal sector. (ii) the higher the level of direct democracy the larger the size of the informal sector. The results of all the regressions presented in table 9 show that the coefficients of the *ciri_elecsd* and *p_autoc* are both negative and significant. The negative coefficient on *ciri_elecsd* indicates that the greater the freedom to make political choices, the smaller the size of the informal sector. This means that greater/ (lower) direct democracy will lead to a significant decrease (increase) in the size of informal sector. Recall that for *p_autoc*, a higher index indicates a high degree of autocracy. Therefore the negative coefficient on *p_autoc* shows that an increase/ (decrease) in the degree of autocracy, reduces/(expands) the size of the informal sector. Therefore the results support the theoretical predictions of our model.

TABLE 9. RESULTS OF OLS REGRESSIONS

Variable	(1)	(2)
Constant	1.686*** (0.842)	1.611** (0.686)
<i>ciri_elecsd</i>	-0.095* (0.030)	-0.098* (0.031)
<i>p_autoc</i>	-0.023* (0.008)	-0.023** (0.009)
<i>unna_grgdp</i>	-0.014 (0.008)	-0.014*** (0.007)
<i>pwt_gsg</i>	-0.001*** (0.041)	-0.058 (0.048)
<i>pwt_openc</i>	0.003 (0.050)	-
<i>emp_rights</i>	0.023 (0.043)	0.032 (0.029)
<i>education</i>		-0.032 (0.036)
Diagnostics		
R ²	0.737	0.736
Adjusted R ²	0.579	0.578
F-statistic (p-value)	0.016	0.016
Durbin Watson Statistic	2.069	2.087
Ramsey Reset Tests (p-value)	0.765	0.939

* - 10% significance level, **-5% significance level, ***- 1% significance level.

The standard errors were adjusted using White's heteroskedasticity consistent standard errors and covariance. Following the results, table 8 reports some key diagnostics which are the Goodness of Fit, Durbin Watson tests for autocorrelation and the Ramsey tests for model mis-specification. The coefficient of determination (R^2) shows that the model explains 87.4% of the data demonstrating that the model is a good fit. The Durbin Watson tests shows the absence of autocorrelation and from the Ramsey tests, we do not reject the null hypothesis that the correct specification is a linear function.

CONCLUSIONS

Our paper attempts to examine the impact of direct democracy and autocracy on the size of the informal sector in Nepal. Our motivation is due to the fact that Nepal has experienced both types of regimes in its political history and has a huge informal sector. As a result, our paper set out to develop a theoretical model in order to link democracy and autocracy to the size of the informal sector. This was followed by an empirical estimation of the size of the informal sector using the Multiple Indicator Multiple Cause

Model (MIMIC). Finally, we used indices that measure the level of autocracy and direct democracy to test empirically the main predictions of our theoretical model.

Using our theoretical model, we use taxes to capture direct democracy. We argue that in a direct democracy, a higher tax rate is indicative of the fact that the government cares less about agent decisions on the amount of public good provision. Consequently, the agent chooses to operate in the informal sector as a voice-out against the government. We used monopoly rent on investment to capture autocracy. Our results show that the higher the level of autocracy, the lower the size of the informal sector because the agent has less capital stock to accumulate for production in both sectors. The size of the informal sector decreases by a greater magnitude relative to the formal sector because it depends on the latter for investment.

The size of the informal sector in Nepal was estimated using the MIMIC model from 1991 to 2009. Our results show that average size of the informal sector over the period was 43.68% of GDP. With these estimates we tested empirically the impact of democracy and autocracy on the size of informal sector. The results confirm the key predictions of our theoretical model which is that lower democracy increases the size of the informal sector while greater autocracy decreases the size of the informal sector.

We take the view the informal sector is useful in developing countries because it provides an alternative market for the production of goods and services as well as a source of employment. However, a sustained increase in the size of the informal sector is likely to be detrimental to economic growth because the informal sector is cut-off from vital public services necessary for the development of small and medium enter prices such as access to capital, technology, high level skills and protection of property rights.

Consequently, our results show that developing countries should introduce elements of direct democracy in order to increase participation of tax payers. This will contribute in reducing the size of the informal sector.

Finally, our findings also highlight the need to strengthen state capacity as developing countries become increasingly democratic. The growth of the size of the informal sector is indicative of the fact that the state capacity is weak. Strengthening the quality of state institutions as developing countries steer increasingly towards democracy will help steer government towards choosing policies that will have broad appeal thereby reducing the incentive to operate in the informal sector.

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ENDNOTES

¹ IDCR(2012)

² See Gerxhani (1999)

³ Granger-causality tests were tested using 3 lags as the optimal lag length. The optimal lag length was chosen on the basis of Akaike Information Criterion (AIC) and Schwarz Criterion (SC). We use freedom of political choice as a proxy for the level of democracy because using the latter produced an optimal lag length of zero which prevented us from carrying out Granger causality tests.

⁴ We use the freedom of political choice as an indicator of democracy obtained from the Quality of Governance Dataset. We use this measure because time series data for the democracy index in

Nepal were unavailable. The size of the informal sector comes from own estimates produced using the MIMIC model. This is discussed in section 7.2

⁵ See Kutcha-Helbring, 2000

⁶ See Olson, 1993 p.569

⁷ Some proportion of tax revenue is used for public investment while the rest is used for government consumption.

⁸ The construction of the estimates of the informal sector in Nepal is discussed in section 4.

⁹ See Parente and Prescott, 1992

¹⁰ This index is referred to as p_autoc which measures the degree of autocracy. This is discussed in detail in section 5.2

¹¹ This restriction can be relaxed.

¹² The other way is to fix the variance of the unobserved variable to one or some positive constant.

¹³ The study that inflation can also have a negative impact on the size of the informal sector was carried out as part of a doctoral thesis on the impact of government policy on the informal sector in Nigeria.

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