

Is the informal sector a window of hope? Corruption, Informal Sector and Income Inequality

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Abstract

This paper presents an occupational choice model in which a household can choose either formal or informal entrepreneurship or employment in the formal labour market. Credit market constraints and initial wealth conditions (bequest) determine a household's occupational choice. Corruption arises when bureaucrats exchange investment permits for bribes. Corruption worsens credit market constraints. Equilibrium with corruption is characterised by an increase (decrease) in informal (formal) entrepreneurship and a decrease in formal entrepreneurial wealth. Since corruption-induced credit constrained households choose informal entrepreneurship as opposed to being wage earners, the informal economy is shown to mitigate the extent of income inequality. The analysis is consistent with empirical evidence and it implies that efforts to alleviate informality should be accompanied with safety nets to facilitate the transition of households into the formal economy otherwise income inequality could potentially increase.

Keywords: Corruption, informal sector, income inequality

JEL classification: D73, O11, O31, O41.

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1 Introduction

1.1 Motivation

The overarching goal among development oriented agencies is poverty reduction. The extent and speed of poverty reduction is partly hinged on an economy attaining sustainably and robust economic growth and partly hinged on how income is distributed across households (Ravallion 1997)¹. Theoretical evidence shows that income distribution is relevant because income inequality inhibits and distorts optimal investment in human and physical capital leading to low productivity². Also, income inequality leads to social and political distress resulting in an uncertain investment climate³. By inhibiting and distorting optimal investment in human and physical capital and generating investment uncertainty, income inequality reduces an economy's growth potential. The inverse relationship between growth and inequality seems to be robust among developing economies⁴. The reduction in the economy's growth potential constrains the extent and speed in which poverty can be reduced⁵.

The sustainability of a robust level of economic growth over time depends partly on the existence of a competitive investment climate. However, developing countries are characterised by a less competitive investment climate because of missing markets which propagate corruption (Acemoglu and Verdier, 1998). Corruption which we define as the misuse of public office for private gain has generally been argued to inhibit economic growth through distorting optimal investment allocation⁶. Bribe extortion increases formal entrepreneurial investment costs leading to a reduction in returns to formal sector investment. The increase in formal sector investment costs crowds out some entrepreneurs in preference for informal entrepreneurship as they seek to evade the brazen bureaucratic machinery.⁷ There is a general

¹“At any positive rate of growth, the higher the initial inequality, the lower the rate at which income-poverty falls. . . .” Ravallion (1997:7).

²Galor and Zeira (1993); Banerjee and Newman (1993); Person and Tabellini (1994); Alesina and Rodrik (1994); Galor and Moav (2006); and Galor, Moav and Vollrath (2006).

³Alesina and Perotti (1996); Bourguignon and Verdier (2000); and Gradstein (2007).

⁴Barro (2000) and Easterly (2007).

⁵Galor and Zeira (1993), Alesina and Rodrik (1994), Person and Tabellini (1994), Alesina and Perotti (1996), Bourguignon and Verdier (2002), and Gradstein (2007).

⁶Mauro (1995), Knack and Keefer (1995), Kaufmann, Kraay and Zoido-Lobaton (1999) and Gyimah-Brempong (2002).

⁷The informal sector includes all economic activities that under normal circumstances would be captured in national accounts however, for reasons such as avoiding bureaucratic rigidities, high tax burden and corruption, entrepreneurs opt to go underground, (Schneider, 2012). The size of the informal sector is considerably significant. For instance,

consensus that corruption partly accounts for the existence of the informal sector (Shleifer and Vishny, 1993; Kaufmann, 1997; Shleifer, 1997; Johnson, Kaufmann and Zoido-Lobaton, 1998; and Friedman, Johnson, Kaufmann and Zoido-Lobaton, 2000).

The entrepreneurial choice of entry into the informal sector or completely exiting private investment has implications on household income distribution. By shutting down business, formal entrepreneurs may be condemned to income inferior employment in the formal labour market (Paulson and Townsend, 2004). However, entry into informal entrepreneurship may ensure a level of income greater than wage income although typically less than income in formal entrepreneurship. In essence, the entrepreneurial choice of entry into the informal sector may mitigate the extent of income inequality attributed to corruption. Dobson and Ramlogan-Dobson (2012a), Dobson and Ramlogan-Dobson (2012b) and Kar and Saha (2012) provide empirical evidence that the effect of corruption on income inequality is dampened in economies with high levels of informality.

This paper is a theoretical attempt to characterise the income inequality implications of a household's occupational behavioural pattern in an environment of corruption. Specifically, we show that the choice of entry into the informal sector offers a window of hope to households by availing them an alternative source of income as opposed to a potentially inferior wage income.

Since the informal sector mitigates the negative effect of corruption on income inequality, it implicitly reduces the distortionary effect of income inequality on economic growth. Policywise, this paper implies that efforts to reduce the size of the informal sector should ensure that safety nets are in place to ensure a smooth transition of households into the formal sector otherwise income inequality is bound to increase.

In what follows we present a review of the literature on corruption, informality and income inequality where we explicitly state the relevance of our research while at the same time positioning it within the related literature.

1.2 Corruption and the informal sector

Corruption arises due to the delegation of authority from the government to the bureaucrats to implement and enforce regulations aimed at abating potential externalities arising from entrepreneurial activities. Such entrepreneurial activities include: exploitation of labour, fly-by-night entrepreneur-

between the period 1999 and 2006/2007 the average size of the informal sector was estimated to be 34.5% of official GDP among 162 countries. Over the same period, the average size of the informal sector was 17.8% and 35.7% of the official GDP among OECD and 88 developing countries respectively (Schneider, Buehn and Montenegro, 2010).

ship, low quality products and pollution. The restriction of such entrepreneurial activities is aimed at improving social welfare (Djakov et al., 2001). However, the inability of the government to fully monitor bureaucratic behaviour breeds corruption as bureaucrats exploit their power to extort bribes from entrepreneurs. This could be through restricting entry into a particular sector in order to maximise their corruptible income by collaborating with incumbent firms. Or through bureaucratic rigidities such as delaying the issuance of investment permits with the intention of incentivising an entrepreneur to pay a bribe in order to fasten the bureaucratic process. Besides entry costs, entrepreneurs might have to live up with significant costs of formality such as red tape and bribe payments as they could be required to renew their trading or investment licenses, pay import taxes, and transfer property among others.

Bribe payments affect directly entrepreneurial returns, while red tape affects them indirectly through wastage of productive time. As such, some entrepreneurs might find it desirable to operate in the informal sector.⁸ Loayza (1996) in a study of Latin American economies shows that a robust and less burdensome institutional framework reduces the size of the informal sector. Specifically, a standard deviation improvement in the strength and efficiency of the institutional framework is associated with 0.42 standard deviation decrease in the size of the informal sector. Similarly, Friedman et al. (2000) using the International Country Risk Guide (ICRG) corruption index shows that irrespective of a country's level of economic activity as proxied by GDP per capita, a one-point improvement in the corruption index is associated with a 9.7% reduction in the size of the informal sector. Finally, in a study of 49 countries in Latin America, former Soviet Union and the OECD, Johnson et al. (1998) show that a one-point improvement in the Transparency International (TI) corruption index is associated with a 5.1% reduction in the informal economy. Equally, using the Global Competiveness Survey proxy for bribery, a one-point improvement in the index implies an 8% reduction in the informal sector, (Johnson et al., 1998). Clearly, irrespective of an economy's level of economic activity and the kind of corruption index used, the size of the informal sector is increasing in the level of corruption.

In a theoretical account of the interaction between corruption, growth and informality, Sarte (2000) argues that as bureaucrats seek to maximise rents, they would have an incentive to restrict the number of economic units or firms in the formal sector. This implies that agents that would have operated in

⁸Refer to Loayza (1996) for an explicit discussion on the costs to an economic unit for going informal. These among others include the inability to fully utilise the judiciary, inaccessibility to capital markets, and inability to enjoy economies of scale.

the formal sector in a free entry environment are condemned to the informal sector. Under such circumstances, the level of economic activities would be compromised in comparison to when there is free entry into the formal economy. However, the level of growth will be higher than that without the informal sector given corruption.

Besides corruption, the size of the informal sector can equally be attributed to distortionary tax regimes⁹ and voluntary choice by agents. Maloney (2004) in a survey of empirical literature on the informal sector in Latin America provides evidence of voluntary entrepreneurial entry into the informal sector. For example, resignation from the formal labour market may be attributed to the need for higher incomes and greater independence that is associated with informal entrepreneurship or self employment. Maloney (2004) using a microsurvey data from Mexico shows that over 60% of the respondents attributed their entry into informal entrepreneurship from the formal labour market to the need for greater independence and higher incomes. Similarly, using survey data from Argentina and Brazil, Maloney (2004) finds that 80% of the self-employed and over 62% of the self-employed men respectively did not want to switch jobs. The Maloney (2004) argument for voluntary informality can be seen as a complement rather than a substitute to the view that corruption exacerbates the size of the informal sector.

1.3 Corruption, informal sector and income inequality

One of the avenues through which income inequality can be increased is through corruption. For instance Blackburn and Forgues-Puccio (2007) using a dynamic general equilibrium model, show that corruption has the potential to increase income inequality. This is through bureaucrats colluding with tax payers to evade taxes thereby reducing the effectiveness of the government's redistributive policy. In support of the preceding theoretical result, empirical investigations by Gupta et al. (2002) and Gyimah-Brepong et al. (2006) posit that there is a robust positive relationship between corruption and income inequality. Specifically, a standard deviation fall in the corruption index results in a 4.4 points increase in the Gini coefficient (Gupta et al., 2002). Decreasing the level of corruption by one standard deviation is associated with a reduction in income inequality (as measured by Gini coefficient) by 0.05, 0.14, 0.25, and 0.33 among OECD, Asian, African and Latin American Economies respectively (Gyimah-Brepong et al., 2006). The positive

⁹Loayza (1996), Johnson, Kaufmann and Shleifer (1997), Johnson, Kaufmann and Zoido-Lobaton (1998) and Schneider and Enste (2000).

relationship between corruption and income inequality may be attributed to corruption reducing the effectiveness of social programmes through either outright theft of funds or altering the composition of social programs to the benefit of the rich while at the same time being disadvantageous to the poor, (Andres and Ramlogan-Dobson, 2011).

However, Chong and Calderon (2000) show evidence of an inverted-U relationship between corruption and income inequality with an inflection point at the ICRG index of 4.34. Of the 62 countries in the sample, only 26 were above the inflection point and these were mainly developed economies. However, Latin American and Sub Saharan African economies were predominantly below the inflection point, implying a positive link between corruption and income inequality in these economies. In addition, the preceding empirical result is suggestive of a potential trade-off between institutional reform and income inequality in developing countries (Chong and Calderon, 2000).

Consistent with Chong and Calderon (2000), Andres and Ramlogan-Dobson (2011), Dobson and Ramlogan-Dobson (2010) and Dobson and Ramlogan-Dobson (2012a) show evidence of a trade-off between corruption and income inequality in Latin America. Dobson and Ramlogan-Dobson (2012a) show that in Latin America an increase in corruption (using the ICRG measure of corruption) is associated with 1.714 reduction in the Gini coefficient. The trade-off between corruption and income inequality is attributed to the increase in the cost of doing business as informal firms are cajoled to operate formally as countries undertake institutional reforms. The informal economy typically employs persons who by virtue of; personal attributes, corruption, high tax burdens and bureaucratic rigidities can not partake in the formal economy. Institutional reforms would imply agents being conjoled to pay taxes and make social security contributions among others. However, agents in the informal sector could potentially find it difficult to adjust to the new institutional framework leading to business closure, unemployment and increased income inequality.

One of the arguments that has been put forward to account for the trade-off between income inequality and corruption is the size of the informal sector in a given economy. When the size of the informal sector is low (high) income inequality is increasing (decreasing) in corruption. For example, Dobson and Ramlogan-Dobson (2012a) show that where the informal economy is 12(45) percent of GDP, the marginal impact of corruption on income inequality is approximately 2.8 (-0.78). Similarly using a sample of South East Asian countries, Kar and Saha (2012) show that when the informal economy as a proportion of GDP is 10(70) percent, the effect of corruption on income inequality is positive (negative). Dobson and Ramlogan-Dobson (2012b) using a sample of developed and developing country data show that the coefficient

on the interaction term between corruption and the size of the informal sector is negative. Implying that the size of the informal sector mitigates the effect of corruption on income inequality. Specifically, using the ICRG corruption index the marginal of effect of corruption on income inequality is positive but declines as the size of the informal sector increases. However, when the size of the informal sector is at least 20 to 22 percent of GDP, the marginal impact of corruption on income inequality is negative and increasing¹⁰. Among only developing countries, the marginal effect of corruption on income inequality is positive and decreasing up to the point when the size of the informal economy is 37 percent of the GDP where the relationship turns negative and increasing when the size of the informal economy is higher (Dobson and Ramlogan-Dobson, 2012a). Kar and Saha (2012) show that among South East Asian countries, the threshold level beyond which the informal economy mitigates the effect of corruption on income inequality is when the informal economy as a share of GDP is between 10 to 20 percent. Hence, there is evidence that the existence of the informal sector may mitigate the extent in which corruption affects income inequality.

In the midst of bureaucratic rigidities negating entry into the formal sector, economic growth (income inequality) could potentially be low (high). However, the entrepreneurial choice of entry into the informal sector potentially mitigates the extent to which both income inequality and economic growth are compromised. With regard to economic growth, Sarte (2000) suggests that the crowding out of agents into the informal sector as a result of bureaucratic entry barriers into the formal sector, implies that agents that would have otherwise escaped the high costs of informality for the formal sector in a free entry and exit institutional environment would instead be caught up in informality. Under such circumstances, economic growth would be compromised in comparison to when there is free entry and exit into the formal economy. However, even though economic growth is lower, it is at least greater than that without the informal sector given corruption.

While Sarte (2000) avails a theoretical account for the relevance of the informal sector to economic growth in a corruption ridden environment, to the best of our knowledge none has been done for income inequality. As such this paper is a theoretical attempt to show how the informal sector dampens the effect of corruption on income inequality.

The following subsection positions the aforementioned research issue within the existing related literature.

¹⁰Similar results are attained using the TI corruption index although the threshold level of informality beyond which the informal sector mitigates the extent to which corruption negatively affects income inequality is when the informal sector is 18 to 19 as a percentage of GDP.

1.3.1 Related Literature

This paper falls in the same bracket as Sarte (2000), with the common ground being that informality is not entirely bad particularly in an environment of corruption. Sarte (2000) argues that the existence of the informal sector reduces the extent of the impact of corruption on economic activities. Along the same lines, our paper posits that the existence of the informal sector mitigates the extent of income inequality attributed to corruption. Therefore, the two papers conclude that informality allows for a second best in economies that exhibit widespread corruption.

This paper is also related to Banerjee and Newman (1993). They show that given inherited wealth, credit market rigidities account for household occupational decisions. In the end, household occupational decisions account for an economy's institutional structure thus affecting its economic development path. The analytical framework adopted shows that poor households have a preference for employment in the formal labour market as opposed to self-employment and entrepreneurship. Consequently, an economy's long term equilibrium can be characterised by either a high or low level of economic development. The point of convergence is that household endowment and credit market rigidities drive occupational decisions. We differ from Banerjee and Newman (1993) in one aspect: we introduce corruption as a direct fixed cost in formal entrepreneurial decisions. The reduced profitability of formal entrepreneurship due to bribe payment compromises the preference for formal entrepreneurship in favour of either informal entrepreneurship or employment in the formal labour market. Furthermore, we proceed and analyse the income inequality dynamics of the economy given corruption and available occupational choices.

The following section presents the model environment within which the linkage between corruption, informality and income inequality is analysed. In Section 3 presents the concluding remarks.

2 The Model

2.1 The basic framework

Consider a small open economy characterised by a constant population of two period lived overlapping generations of agents. Agents are divided between households and bureaucrats. For simplicity the total population of households is assumed to be equal to 1. All households are assumed to be identical except for an initial inequality in bequests that households receive from their parents. Based on period t bequests, households make occupa-

tional choices from the following options: formal entrepreneurship, informal entrepreneurship and employment in the formal labour market. There is a proportion μ and $1 - \mu$ of entrepreneurs and workers respectively. The paper characterises the occupational choice behaviour of households in an economy with and without corruption. In both economies, the paper explores the relevance of the informal sector in mitigating the extent of income inequality. In the economy with corruption, the effect of corruption is to enhance credit market rigidities. Corruption-induced credit market rigidities increases (decreases) household participation in informal (formal) entrepreneurship. The household's choice of entry into informal entrepreneurship as opposed to employment in the formal labour market given corruption-induced credit market rigidities mitigates the effect of corruption on income inequality. Otherwise, the household's occupational choice and the subsequent investment is made in period t yielding an expected income y_{t+1} upon which claims are settled, consumption c_{t+1} and bequests b_{t+1} are consequently effected.

In the model, the role of the bureaucrat is limited to bribe extortion. Otherwise emphasis is laid on the income dynamics of households given their occupational choices in an environment with and without corruption and informal sector. In what follows we present a full characterisation of the model environment.

A household's occupational decision is undertaken in order to maximise his lifetime utility U_t subject to period $t + 1$ expected income which is spent on consumption and bequests in period $t + 1$ that is;

$$Max U_t = c_{t+1}^\alpha b_{t+1}^{(1-\alpha)} \quad (1)$$

s.t

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

As in Galor and Zeira (1993) our specification of the household's lifetime utility is to simplify the algebra and ensure focused tractability of the household's behaviour. Besides the household's lifetime utility is increasing in the size of the bequest extended to their offspring as opposed to the utility their offspring receives from the bequest. The underlying assumption is that even poor parents would desire to save more in an attempt to secure the future livelihoods of their offsprings implying that they actually care about the utility of their offsprings¹¹.

¹¹The key results of our analysis would not change even if we replace the size of bequests with the actual utility that offsprings attain from the bequest.

The optimisation problem yields: $c_{t+1} = \alpha y_{t+1}$; $b_{t+1} = (1 - \alpha) y_{t+1}$; and $U_t = \alpha^\alpha (1 - \alpha)^{(1-\alpha)} y_{t+1}$. The optimal solution, $b_{t+1} = (1 - \alpha) y_{t+1}$ implies that period $t + 1$ bequest to an offspring is increasing in the household's expected income. While, the optimal solution, $c_{t+1} = \alpha y_{t+1}$ implies that period $t + 1$ consumption is increasing in a household's expected income. Clearly $U_t(y_{t+1})$ implies that occupations with higher expected incomes yield higher utility levels and will be strictly preferred.

2.2 Economy without corruption

As the bench mark model, the paper first explores an economy which is composed of formal entrepreneurs and workers. The motivation is to explore the income dynamics of such an economy. Thereafter informal entrepreneurs are introduced in order to study the effects on income dynamics.

2.2.1 Formal sector entrepreneurship

Recall that a household receives a bequest, b_t upon which he makes an occupational choice. Entry into formal entrepreneurship involves acquisition of an investment license from a bureaucrat at zero price. Also, a household requires a non-divisible capital investment, K . Given a competitive wage rate σ , each entrepreneur combines the non-divisible capital investment, K with l number of workers per formal sector firm to yield an expected gross return to investment given by, equation (3)

$$Al^\lambda - \sigma l \tag{3}$$

Where the number of workers per formal sector firm, $l = \left[\frac{1 - \mu_F}{\mu_F} \right]$ is given by the ratio of workers, $1 - \mu_F$ to entrepreneurs, μ_F . A is a measure of technology. Optimising the entrepreneur's expected gross return results in the wage payable to workers,

$$\sigma = \lambda A \left[\frac{1 - \mu_F}{\mu_F} \right]^{\lambda - 1} \tag{4}$$

From equation (4), $\sigma'(l) < 0$ implying that the wage rate is inversely related to the number of workers per firm. Using equation (4), we can express the expected gross return to investment, equation (3) as

$$(1 - \lambda) A \left[\frac{1 - \mu_F}{\mu_F} \right]^\lambda \tag{5}$$

Financial intermediation To yield the expected gross return, equation (5) the entrepreneur will borrow an amount equal to the difference between the investment cost, K and bequest received, b_t . We assume that an entrepreneur access' a loan from financial intermediary at a competitive market rate of interest r . The financial intermediary's claim on the entrepreneur's gross income amounts to $[K - b_t](1 + r)$. As such, the entrepreneur's net expected payoff is the difference between the expected gross return, equation (5) and the financial intermediary's claim on an entrepreneur's gross income, $[K - b_t](1 + r)$ that is;

$$y_{t+1}^F = (1 - \lambda) A \left[\frac{1 - \mu_F}{\mu_F} \right]^\lambda - [K - b_t](1 + r) \quad (6)$$

Following Banerjee and Newman (1993) and Blackburn and Wang (2009), we allow for the possibility of an entrepreneur renegeing loan repayment. We assume that upon a borrower defaulting, the lender establishes an inefficient monitoring technology to recoup as much income as possible. Inefficiency in the monitoring technology implies that a proportion $\delta(1 - \lambda) A \left[\frac{1 - \mu_F}{\mu_F} \right]^\lambda$ of the defaulting borrower's expected gross income is recouped by the financial intermediary. A borrower chooses to renege the loan contract if the expected net income from loan default, $[1 - \delta](1 - \lambda) A \left[\frac{1 - \mu_F}{\mu_F} \right]^\lambda$ is greater than the expected net income upon commitment to the loan contract, equation (6). Implying that the entrepreneur will choose to renege loan payment if the difference between the investment cost, K and the discounted financial intermediary's return upon the entrepreneur defaulting, $\frac{\delta(1 - \lambda) A \left[\frac{1 - \mu_F}{\mu_F} \right]^\lambda}{(1 + r)}$ is greater or equal to the agent's bequest level, b_t , that is;

$$K - \frac{\delta(1 - \lambda) A \left[\frac{1 - \mu_F}{\mu_F} \right]^\lambda}{(1 + r)} \geq b_t \quad (7)$$

From the entrepreneur's default decision rule, equation (7) we can derive the incentive compatible condition that rules out the possibility of an entrepreneur defaulting, that is;

$$b_t = K - \frac{\delta(1 - \lambda) A \left[\frac{1 - \mu_F}{\mu_F} \right]^\lambda}{(1 + r)} = \omega \quad (8)$$

From equation (8), the incentive compatible condition is increasing in the cost of capital investment, K and inversely related to the discounted financial intermediary return upon the entrepreneur defaulting. The incentive

compatible condition implies that only households with bequest level $b_t > \omega$ access investment credit. Therefore credit market rigidities restrict formal entrepreneurship to households with bequest level $b_t > \omega$.

Formal entrepreneurship yields an expected net payoff given by equation (6). Substituting for the expected net payoff in the solution of the household's maximisation problem, $U_t = \alpha^\alpha (1 - \alpha)^{(1-\alpha)} y_{t+1}$ the lifetime utility of a formal entrepreneur is given by,

$$U_t^F = \alpha^\alpha (1 - \alpha)^{(1-\alpha)} \left[(1 - \lambda) A \left[\frac{1 - \mu_F}{\mu_F} \right]^\lambda - [K - b_t] (1 + r) \right] \quad (9)$$

2.2.2 Formal sector employment (Workers)

The financial intermediary's mitigation against credit default risk implies that households with bequest level $b_t < \omega$ are crowded out of the financial market. This is consistent with empirical evidence in which Paulson and Townsend (2004) using the socio-economic and institutional survey data from the Central and Northeast regions of Thailand show that entrepreneurial activities depend on the existing financial constraints. In this case, households without access to the financial market, supply their labour inelastically to formal entrepreneurs. Employment in the formal labour market earns a wage given by equation (4). And the expected income from being a worker is,

$$y_{t+1}^E = (1 + r) b_t + \lambda A \left[\frac{1 - \mu_F}{\mu_F} \right]^{\lambda-1} \quad (10)$$

From the worker's expected income, equation (10) and the solution of the household's maximisation problem, $U_t = \alpha^\alpha (1 - \alpha)^{(1-\alpha)} y_{t+1}$ we can express the lifetime utility of a formal sector employee as;

$$U_t^E = \alpha^\alpha (1 - \alpha)^{(1-\alpha)} \left[(1 + r) b_t + \lambda A \left[\frac{1 - \mu_F}{\mu_F} \right]^{\lambda-1} \right] \quad (11)$$

Comparing equations (6) and (10), the income that accrues to entrepreneurship, y_{t+1}^F is greater than the income that accrues to employment, y_{t+1}^E by a magnitude $\left[(1 - \lambda) A \left[\frac{1 - \mu_F}{\mu_F} \right]^\lambda - K (1 + r) \right] - \lambda A \left[\frac{1 - \mu_F}{\mu_F} \right]^{\lambda-1} > 0$. This is consistent with empirical evidence in which Paulson and Townsend (2004) who show that the annual income of entrepreneurial households is twice

greater than that of non-entrepreneurial households besides being wealthier.

Recall that from the optimal solution of a household's utility optimisation problem, the household's utility is increasing in occupational income that is, $U_t(y_{t+1}^i)$ where $i = F, E$ representing formal entrepreneurship, and employment in the formal sector respectively. Therefore, for $y_{t+1}^F > y_{t+1}^E$ it follows that $U_t^F > U_t^E$.

2.2.3 Dynamics of income distribution without informal sector entrepreneurs

Following the optimal solutions to the household's lifetime utility maximisation problem, the evolution of lineage income across generations is given by, $b_{t+1} = (1 - \alpha)y_{t+1}$. Substituting for the household's expected income, we attain the following lineage wealth transition equations

$$b_{t+1} = \begin{cases} (1 - \alpha) \left[(1 + r)b_t + \lambda A \left[\frac{1 - \mu_F}{\mu_F} \right]^{\lambda - 1} \right] & \text{if } 0 < b_t < \omega \\ (1 - \alpha) \left[(1 - \lambda) A \left[\frac{1 - \mu_F}{\mu_F} \right]^{\lambda} - [K - b_t](1 + r) \right] & \text{if } b_t > \omega \end{cases} \quad (12)$$

From the lineage wealth transition equations above, we are able to establish the long run income patterns of households given their initial bequest levels and subsequent occupational choices. To that end, we graphically characterise the transition equations as seen in figure (1). The 45 degree line is a locus of points corresponding to the steady state bequest levels such that $b_{t+1} = b_t$. Households in the bequest interval $0 < b_t < \omega$ are workers and inelastically supply their labour to formal sector entrepreneurs. Their transition equation is represented by the transition curve θ with a slope $0 < (1 - \alpha)(1 + r) < 1$. The condition $0 < (1 - \alpha)(1 + r) < 1$ is adopted to ensure stability of equilibrium bequest levels. Therefore, assuming steady state equilibrium such that $b_{t+1} = b_t = b$, the steady state level of bequest $[b_E]$ among workers is given as,

$$b_E = \left[\frac{1 - \alpha}{(1 - (1 - \alpha)(1 + r))} \right] \lambda A \left[\frac{1 - \mu_F}{\mu_F} \right]^{\lambda - 1} \quad (13)$$

From equation (13), the steady state bequest, b_E is a function of the worker's wage that is, $b_E[\sigma]$. We can deduce that an increase (decrease) in the wage earned results in an outward (inward) shift of the worker's steady state bequest, b_E .

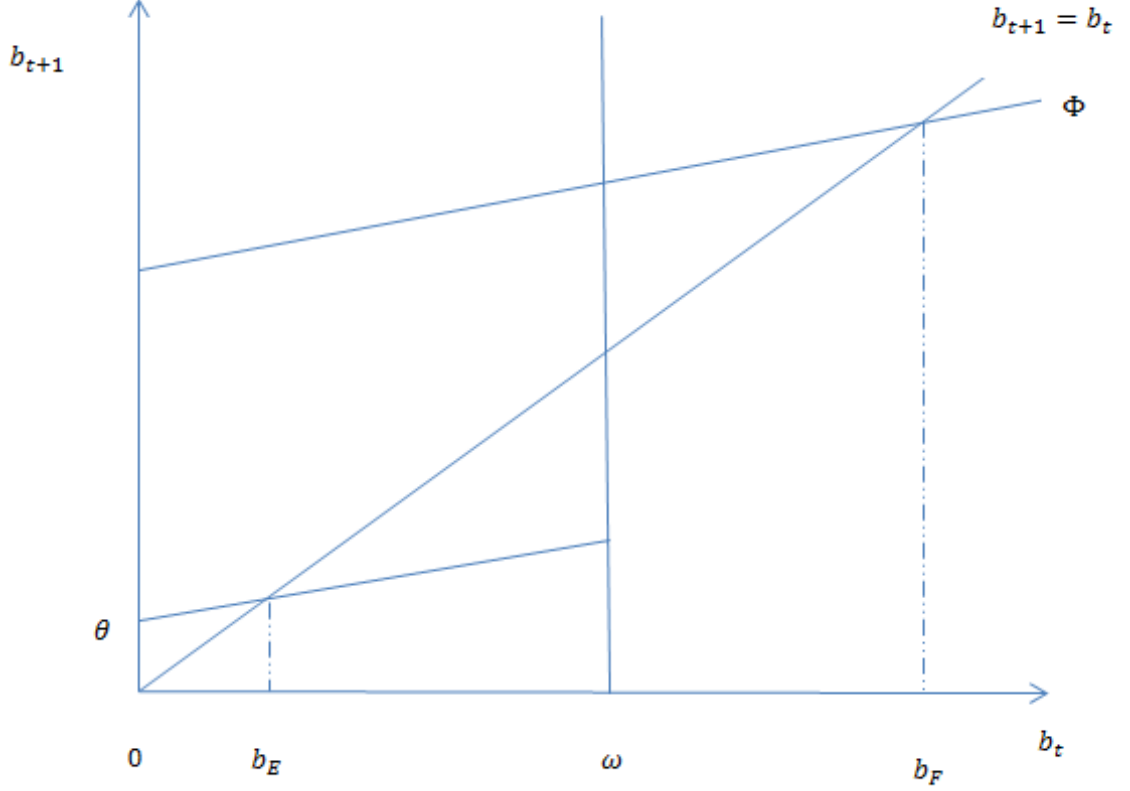


Figure 1: Economy without both corruption and an informal sector

Households with an initial bequest level $b_t > \omega$ engage in formal entrepreneurship. The transition equation of these households is captured by the transition curve Φ with the intercept and slope given by $[1 - \alpha] \left[(1 - \lambda) A \left[\frac{1 - \mu_f}{\mu_f} \right]^\lambda - (1 + r) K \right] > 0$ and $0 < (1 - \alpha)(1 + r) < 1$ respectively. Assuming a steady state equilibrium such that $b_{t+1} = b_t = b$, the steady state level of bequest $[b_F]$ among formal entrepreneurs is given as,

$$b_F = \left[\frac{1 - \alpha}{(1 - (1 - \alpha)(1 + r))} \right] \left[(1 - \lambda) A \left[\frac{1 - \mu_F}{\mu_F} \right]^\lambda - (1 + r) K \right] \quad (14)$$

From equation (14), the steady state bequest, b_F is a function of the formal entrepreneur's steady state income that is, $b_F [y^F]$. Where $b'_F [y^F] >$

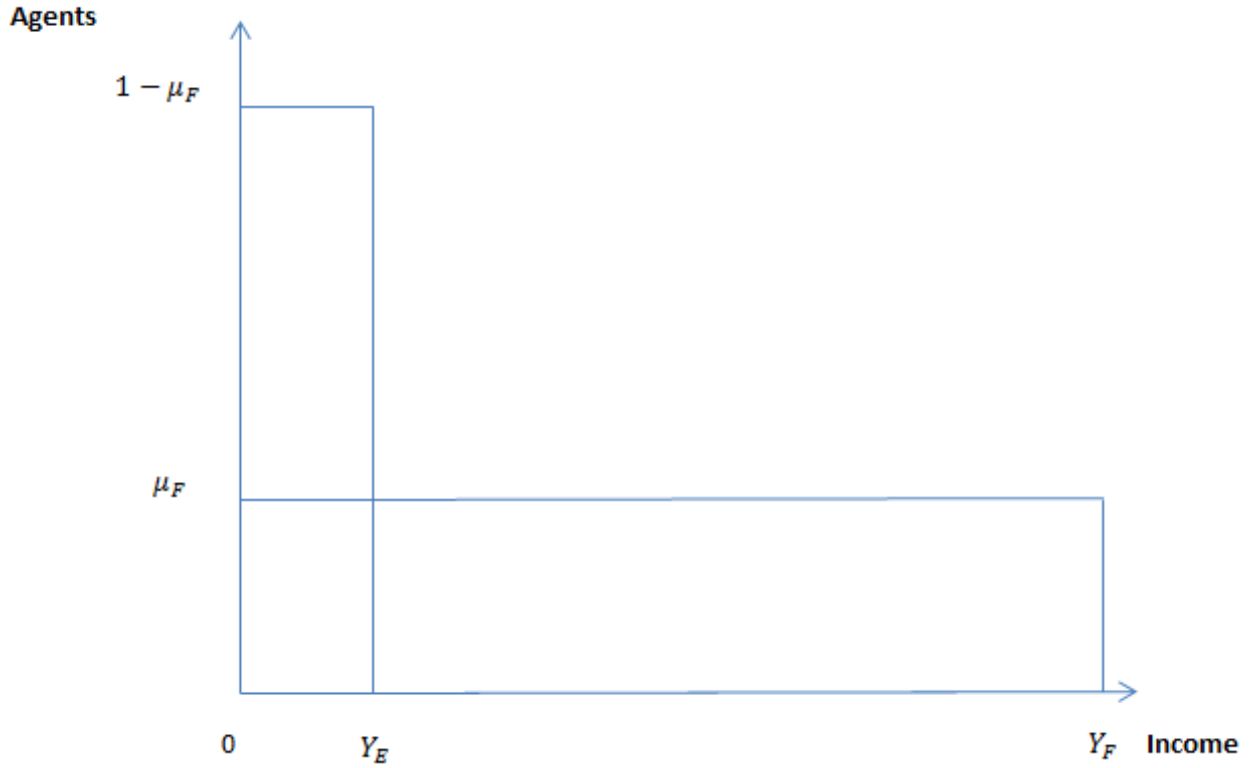


Figure 2: Income Distribution in an economy without both Informal Sector and Corruption

0 implying that an increase (decrease) in the formal entrepreneurial steady income results in an outward (inward) shift of the steady state bequest, b_F .

From the preceding analysis, we can represent the distribution of income among households at a given point in time using figure (2). From figure (2), it is evident that the distribution of income in the economy is polarised. At any point in time the economy is characterised by the relatively high income formal entrepreneurial households and relatively low income working households.

Most importantly though, the household's occupational choices and their subsequent long run wealth dynamics depends on their initial wealth distribution and the credit market rigidities.

2.2.4 Does the Informal sector entrepreneurship reduce income inequality?

The objective of introducing informal entrepreneurship is to attempt to explore whether the informal sector reduces the extent of income inequality given credit market rigidities. Recall that in the economy without an informal sector, the fraction of workers in the population is $1 - \mu_F$ while that of formal entrepreneurs is μ_F . To accommodate informal entrepreneurs, we assume that there is a fraction μ_F^{IE} of workers whose bequest level is close to ω . These workers voluntarily resign¹² from supplying their labour services to the formal sector and undertake informal entrepreneurship or self-employment¹³. The reduction in labour supply creates an excess demand for labour. As a result, the wage rate increases so as to re-establish equilibrium in the labour market. The wage rate increase reduces the gross return to formal entrepreneurship increasing the likelihood of default risk. Financial intermediaries react by increasing the threshold level of bequest beyond which an entrepreneur can access credit. We would thus expect the fraction of formal entrepreneurs to reduce and as such exert pressure on wages to fall. However, since entrepreneurship is more rewarding than being a worker, the informal sector-induced credit constrained households opt for informal entrepreneurship as opposed to joining the formal labour market. We define μ_F^{IF} as the fraction of formal entrepreneurs that are crowded out of the formal economy and undertake informal entrepreneurship. Since the entrepreneurs displaced from the formal sector go informal, the pressure for wages to decrease is avoided. Otherwise, the fraction of informal entrepreneurs, μ_I is a sum of households who opt out of employment for informal entrepreneurship, μ_F^{IE} and those displaced from formal entrepreneurship as a result of informal sector-induced credit market rigidities, μ_F^{IF} that is; $\mu_I = \mu_F^{IE} + \mu_F^{IF}$. The fraction of formal entrepreneurs given informal entrepreneurship, $\mu_{F/I}$ is the difference between the fraction of entrepreneurs in the economy without informal entrepreneurs, μ_F and the fraction of formal entrepreneurs that are

¹²Resignation from the formal labour market may be attributed to the need for higher incomes and greater independence that is associated informal entrepreneurship or self employment. Maloney (2004) using a microsurvey data from Mexico shows that over 60% of the respondents attributed their entry into informal entrepreneurship from the formal labour market to the need for greater independence and higher incomes. Similarly, using survey data from Argentina and Brazil 80% of the self-employed (men and women) and over 62% of the self-employed men respectively did not want switch jobs.

¹³Our choice of informal entrepreneurship or self-employment is because it is said to be the second largest form of employment amongst men second to employment in the formal sector in Latin America. Maloney (2004) argues that in some instance, informal entrepreneurship or self-employment is over 40% of the workforce in Latin America.

crowded out of formal entrepreneurship into the informal sector, μ_F^{IF} that is; $\mu_{F/I} = \mu_F - \mu_F^{IF}$. Finally the fraction of workers is the difference between the population of households and the fraction of households that engages in entrepreneurship, $1 - (\mu_{F/I} + \mu_I)$.

Having characterised occupational choices within the population of households upon introducing informal entrepreneurship, the number of workers per formal sector firm is given by $l_I = \frac{1 - (\mu_{F/I} + \mu_I)}{\mu_{F/I}}$. Adjusting for workers per formal sector firm in the gross expected return of a formal entrepreneur, equation (3) and re-optimising accordingly, the corresponding wage in the economy with informal entrepreneurship, σ_I turns out to be;

$$\sigma_I = \lambda A \left[\frac{1 - (\mu_{F/I} + \mu_I)}{\mu_{F/I}} \right]^{\lambda-1} \quad (15)$$

Recall that wages in this economy are higher because of the fraction μ_F^{IE} of workers who voluntarily choose to engage in informal entrepreneurship. This creates an excess supply of labour triggering an increase in wages. The increase in wages results in informal sector-induced credit market rigidities such that a fraction μ_F^{IF} of formal entrepreneurs are crowded out of the formal economy. Since the fraction μ_F^{IF} of formal entrepreneurs undertake informal entrepreneurship as opposed to supplying labour in the formal economy wages remain high. We can thus infer that the wages in the economy without the informal sector, equation (4) are lower than those in the economy with the informal sector, equation (15).

Therefore the net expected income of a formal entrepreneur is given as,

$$y_{t+1}^{FI} = (1 - \lambda) A \left[\frac{1 - (\mu_{F/I} + \mu_I)}{\mu_{F/I}} \right]^{\lambda} - [K - b_t](1 + r) \quad (16)$$

Comparing equations (16) and (6), inevitably equation (16) is less than equation (6). This is because formal entrepreneurs in the economy with informal entrepreneurship pay higher wages as a result of an excess demand for labour (reduced labour supply) attributed to the fraction μ_F^{IE} of workers becoming self employed. Hence wages increase so as to re-establish equilibrium in the labour market. However, the higher labour costs imply that the operational profits from formal entrepreneurship in the economy with informal entrepreneurship is less than that from the economy without informal entrepreneurship. The higher operational costs of formal entrepreneurship implies that there exists a certain fraction of formal entrepreneurs that would not be credit worthy.

Financial intermediation Like in the economy without informal entrepreneurship, we assume that in the event an entrepreneur declares bankruptcy, the financial intermediary would seek to wind-up the entrepreneur in an attempt to minimise its losses. However, inefficiency in the monitoring technology restricts the financial intermediary to recovering only a proportion $\delta(1-\lambda)A\left[\frac{1-(\mu_{F/I}+\mu_I)}{\mu_{F/I}}\right]^\lambda$ of an entrepreneur's expected gross revenue. An entrepreneur will choose to default if the loss in gross expected revenue from loan default is less than the loan repayment upon commitment to the loan contract, that is; $-\delta(1-\lambda)A\left[\frac{1-(\mu_{F/I}+\mu_I)}{\mu_{F/I}}\right]^\lambda > -(K-b_t)(1+r)$. From the entrepreneur's loan default rule, the incentive compatible condition which mitigates loan default is given by,

$$b_t = K - \frac{\delta(1-\lambda)A\left[\frac{1-(\mu_{F/I}+\mu_I)}{\mu_{F/I}}\right]^\lambda}{(1+r)} = \omega^I \quad (17)$$

As a result, the bequest threshold level beyond which formal entrepreneurs can access credit equally increases to ω^I as seen in equation (17). The incentive compatible condition with informality, ω^I is greater than the incentive compatible condition without informal entrepreneurship, ω . This is because ω^I has a lower discounted financial intermediary return upon an entrepreneur defaulting, $\frac{\delta(1-\lambda)A\left[\frac{1-(\mu_{F/I}+\mu_I)}{\mu_{F/I}}\right]^\lambda}{(1+r)}$. The lower discounted financial intermediary return upon an entrepreneur defaulting is attributed to the higher wages which reduce the formal entrepreneur's operational profits in the economy with informal entrepreneurship.

Given the bequest threshold level ω^I , the households in the bequest interval $\omega < b_t < \omega^I$ are deemed to be credit constrained and thus displaced from formal entrepreneurship. Therefore, besides increasing wages, informal entrepreneurship crowds out entrepreneurs from the formal sector. Formal entrepreneurship is thus undertaken by only households with a bequest level greater than ω^I . Their net expected return is given by equation (16). From the solution of the household's maximisation problem, $U_t = \alpha^\alpha(1-\alpha)^{(1-\alpha)}y_{t+1}$ the lifetime utility of a formal entrepreneur in the economy with informal entrepreneurship is given by,

$$U_t^{FI} = \alpha^\alpha(1-\alpha)^{(1-\alpha)} \left[(1-\lambda)A\left[\frac{1-(\mu_{F/I}+\mu_I)}{\mu_{F/I}}\right]^\lambda - [K-b_t](1+r) \right] \quad (18)$$

Note that the net expected return from formal entrepreneurship in the economy without informal entrepreneurship (equation, 6) is greater than the net expected return from formal entrepreneurship in the economy with informal entrepreneurship (equation, 16). This is because of the higher operational costs attributed to the informal entrepreneurship induced wage increase. Since an agent's lifetime utility is increasing in income, it follows that the lifetime utility from formal entrepreneurship in the economy without informal entrepreneurship, equation (9) is greater than the lifetime utility from formal entrepreneurship in the economy with informal entrepreneurship, equation (18).

Following empirical evidence which shows that the annual income of entrepreneurial households is twice greater than that of non-entrepreneurial households besides being wealthier (Paulson and Townsend, 2004) and that informal entrepreneurship offers higher incomes and greater independence as compared to employment in the formal labour market (Maloney, 2004) therefore, the entrepreneurs in the bequest interval $\omega < b_t < \omega^I$ choose informal entrepreneurship as opposed to supplying labour to the formal entrepreneurial sector. Since informal entrepreneurs are self employed, the pressure for wages to reduce as a result of the reduction in the number of formal sector firms is avoided. Therefore the wages received by workers remain high regardless of the reduction in the number of formal entrepreneurs.

Consequently, the expected income of a worker turns out to be,

$$y_{t+1}^{E^I} = (1+r)b_t + \lambda A \left[\frac{1 - (\mu_{F/I} + \mu_I)}{\mu_{F/I}} \right]^{\lambda-1} \quad (19)$$

From equation (19) and the solution of the household's maximisation problem, $U_t = \alpha^\alpha (1-\alpha)^{(1-\alpha)} y_{t+1}$ the lifetime utility of a worker in the formal sector given informal entrepreneurship is given by,

$$U_t^{E^I} = \alpha^\alpha (1-\alpha)^{(1-\alpha)} \left[(1+r)b_t + \lambda A \left[\frac{1 - (\mu_{F/I} + \mu_I)}{\mu_{F/I}} \right]^{\lambda-1} \right] \quad (20)$$

The income of a worker in the economy without the informal sector, equation (10) is lower than that of a worker in the economy with the informal sector, equation (19). This is because of the high wage earned by workers in the economy with informal entrepreneurship. Correspondingly, the expected lifetime utility of a worker in the economy without the informal sector, equation (11) is lower than that of a worker in the economy with the informal sector, equation (20).

The fraction μ_F^I of informal entrepreneurs is given by households in the bequest interval $\kappa < b_t < \omega^I$. These households choose to be self employed

and as such undertake a risky project whose cost of establishment is $\kappa < K$. This risky project yields a gross expected return to investment Ω . The expected net payoff to informal entrepreneurship is the difference between the sum of the expected gross return to investment and the cost of informal sector investment, $\Omega + (1 + r)(b_t - \kappa)$. The proportion of households μ_F^I that choose informal entrepreneurship do so, if the expected net payoff from informal entrepreneurship is greater or equal to the return from employment in the formal sector, that is;

$$\Omega + (1 + r)(b_t - \kappa) \geq (1 + r)b_t + \lambda A \left[\frac{1 - (\mu_{F/I} + \mu_I)}{\mu_{F/I}} \right]^{\lambda-1} \quad (21)$$

From the informal entrepreneurship decision rule, equation (21) we can derive a bequest threshold level below which informal entrepreneurship is infeasible, that is;

$$\left[\frac{\left(\Omega - \lambda A \left[\frac{1 - (\mu_{F/I} + \mu_I)}{\mu_{F/I}} \right]^{\lambda-1} \right)}{(1 + r)} \right] = \kappa \quad (22)$$

Therefore, from equations (8) and (22) we attain the condition $\kappa < b_t < \omega^I$ which determines the continuum of bequests within which households would undertake informal entrepreneurship.

Informal entrepreneurship yields a net expected income given by

$$y_{t+1}^I = \Omega - (1 + r)\kappa + (1 + r)b_t \quad (23)$$

and a corresponding lifetime utility

$$U_t^I = \alpha^\alpha (1 - \alpha)^{(1-\alpha)} [\Omega - (1 + r)\kappa + (1 + r)b_t] \quad (24)$$

Comparing the income that accrues to both formal and informal entrepreneurs, we note that formal entrepreneurs earn more than informal entrepreneurs by a magnitude $(1 - \lambda) A \left[\frac{1 - (\mu_{F/I} + \mu_I)}{\mu_{F/I}} \right]^\lambda - [\Omega + (1 + r)(K - \kappa)] > 0$. From the optimal solution of a household's optimisation problem, the household's lifetime utility is increasing in occupational income. Therefore, for $y_{t+1}^{F^I} > y_{t+1}^I$ and given that a household's lifetime utility is increasing in the expected occupational income, it follows that the lifetime utility that accrues to a formal entrepreneur, $U_t^{F^I}$ is greater than the lifetime utility from informal entrepreneurship, U_t^I . Similarly, the income from informal entrepreneurship is greater than that from working households, $y_{t+1}^I > y_{t+1}^{E^I}$ by

a magnitude $\Omega - [(1+r)\kappa + \sigma] > 0$. Since a household's optimal utility is increasing in expected occupational income, it follows that the lifetime utility from informality is greater than that from working in the formal sector. Comparing the three occupations, $U_t^{FI} > U_t^I > U_t^{EI}$ that is formal entrepreneurship strictly yields a lifetime utility greater than that from the informal entrepreneurship and employment in the formal sector. However, informal entrepreneurship yields a higher lifetime utility compared to employment in the formal sector.

2.2.5 Dynamics of income distribution with the informal sector

Following the optimal solutions to the household's lifetime utility maximisation problem, the evolution of lineage income across generations is given by $b_{t+1} = (1-\alpha)y_{t+1}$. Substituting for the household's expected income, we attain the following lineage wealth transition equations

1.

$$b_{t+1} = \begin{cases} (1-\alpha) \left[(1+r)b_t + \lambda A \left[\frac{1-(\mu_{F/I}+\mu_I)}{\mu_{F/I}} \right]^{\lambda-1} \right] & \text{if } 0 < b_t < \kappa \\ (1-\alpha) [\Omega + (1+r)(b_t - \kappa)] & \text{if } \kappa < b_t < \omega^I \\ (1-\alpha) \left[(1-\lambda) A \left[\frac{1-(\mu_{F/I}+\mu_I)}{\mu_{F/I}} \right]^{\lambda} - [K - b_t](1+r) \right] & \text{if } b_t > \omega^I \end{cases} \quad (25)$$

From the lineage wealth transition equations above, we are able to establish the long run income patterns of the households given their initial bequest levels and subsequent occupational choices in the economy characterised by no-corruption and with an informal sector. To that end, we graphically characterise the transition equations as in figure (3). Households in the bequest interval $0 < b_t < \kappa$ supply labour to formal sector entrepreneurs and their transition equation is represented by the transition curve θ^I with a corresponding intercept and slope given by $(1-\alpha)\lambda A \left[\frac{1-(\mu_{F/I}+\mu_I)}{\mu_{F/I}} \right]^{\lambda-1}$ and $0 < (1-\alpha)(1+r) < 1$ respectively. The condition $0 < (1-\alpha)(1+r) < 1$ is adopted to ensure stability of the equilibrium bequest levels. Comparing the evolution of household wealth among working households in the economy with and without informal sector entrepreneurship, as seen in figure (3) the transition curve θ^I is higher than the transition curve θ . This is because the wage rate in the economy with informal entrepreneurs is greater than that in the economy without informal entrepreneurs. From the optimal solutions, $b_{t+1} = (1-\alpha)y_{t+1}$ implying that a household's transition path shifts with

changes in expected income. Therefore, the effect of informal entrepreneurship is to shift the bequest schedule of households that remain in formal employment upwards from θ to θ^I . Assuming steady state equilibrium such that $b_{t+1} = b_t = b$, the steady state level of bequest $[b_{E/I}]$ of a worker is given as,

$$b_{E/I} = \left[\frac{1 - \alpha}{(1 - (1 - \alpha)(1 + r))} \right] \lambda A \left[\frac{1 - (\mu_{F/I} + \mu_I)}{\mu_{F/I}} \right]^{\lambda - 1} \quad (26)$$

Also, based on the higher wage in the economy with informal entrepreneurs as opposed to the economy without informal entrepreneurs, it follows that the steady state bequest of workers in the economy with an informal economy $[b_{E/I}]$ is higher than that of workers in the economy without an informal economy $[b^E]$ that is equation (26) > equation (13).

For households with the initial bequest level in the interval $\kappa < b_t < \omega^I$, they engage in informal entrepreneurship. Their transition equation is captured by the transition path ϕ with the intercept and slope given by $[1 - \alpha](\Omega - (1 + r)\kappa) > 0$ and $0 < (1 - \alpha)(1 + r) < 1$ respectively. Since the income that accrues to informal entrepreneurs, equation (23) is greater than that of workers, equation (10) it follows that the transition path ϕ is higher than the transition path θ^I . Recall that households in the income interval $\kappa < b_t < \omega$ were initially workers with a corresponding transition path θ . However, their choice of entry into informal entrepreneurship enhances their income levels. Given the optimal solution, $b_{t+1} = (1 - \alpha)y_{t+1}$ these households now have a higher bequest schedule ϕ as compared to the lower bequest schedules θ^I and θ associated with being employed in the formal sector given an informal sector and without an informal sector respectively. Also households in the bequest interval $\omega < b_t < \omega^I$ were initially formal entrepreneurs; however, because of informal sector-induced credit market rigidities they were forced into informal entrepreneurship. These households experience a reduction in income and thus a lower bequest schedule ϕ as compared to the bequest schedule Φ which is associated with formal entrepreneurs in the economy without an informal sector. Otherwise assuming steady state equilibrium such that $b_{t+1} = b_t = b$, the steady state level of bequest among informal entrepreneurs $[b_I]$ is given as,

$$b_I = \left[\frac{1 - \alpha}{(1 - (1 - \alpha)(1 + r))} \right] (\Omega - (1 + r)\kappa) \quad (27)$$

Households with an initial bequest level $b_t > \omega^I$ engage in formal entrepreneurship. The transition equation of these households is captured by the

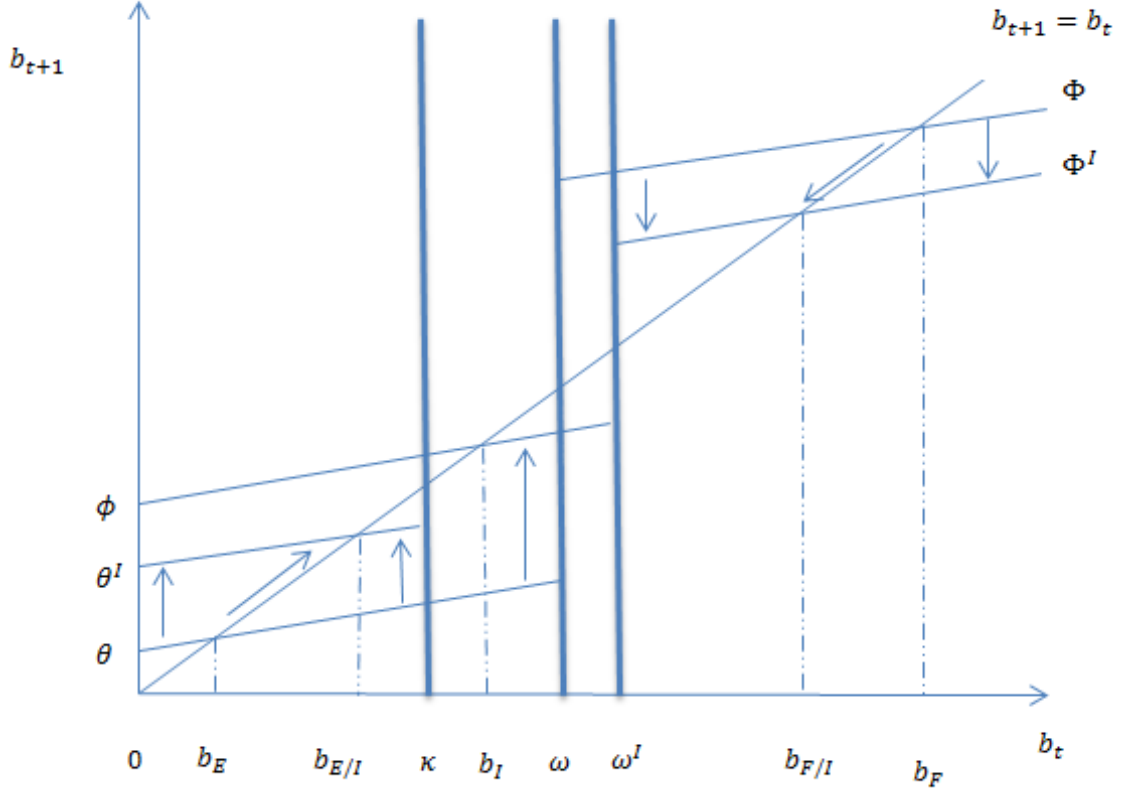


Figure 3: Effects of informality in an economy without corruption

transition curve Φ^I which is characterised by the intercept and slope given by $[1 - \alpha] \left((1 - \lambda) A \left[\frac{1 - (\mu_{F/I} + \mu_I)}{\mu_{F/I}} \right]^\lambda - (1 + r) K \right) > 0$ and $0 < (1 - \alpha)(1 + r) < 1$ respectively. Note that the effect of informal entrepreneurship is to increase wages paid to workers. As a result, formal entrepreneurs experience a reduction in their expected income. From the optimal solution, $b_{t+1} = (1 - \alpha)y_{t+1}$ and as seen in figure (3), the effect of income reduction is to shift the bequest schedule of formal entrepreneurs downwards from Φ to Φ^I . Otherwise assuming steady state equilibrium such that $b_{t+1} = b_t = b$, the steady state level of bequest $[b_{F/I}]$ among formal entrepreneurs given informal entrepreneurship is,

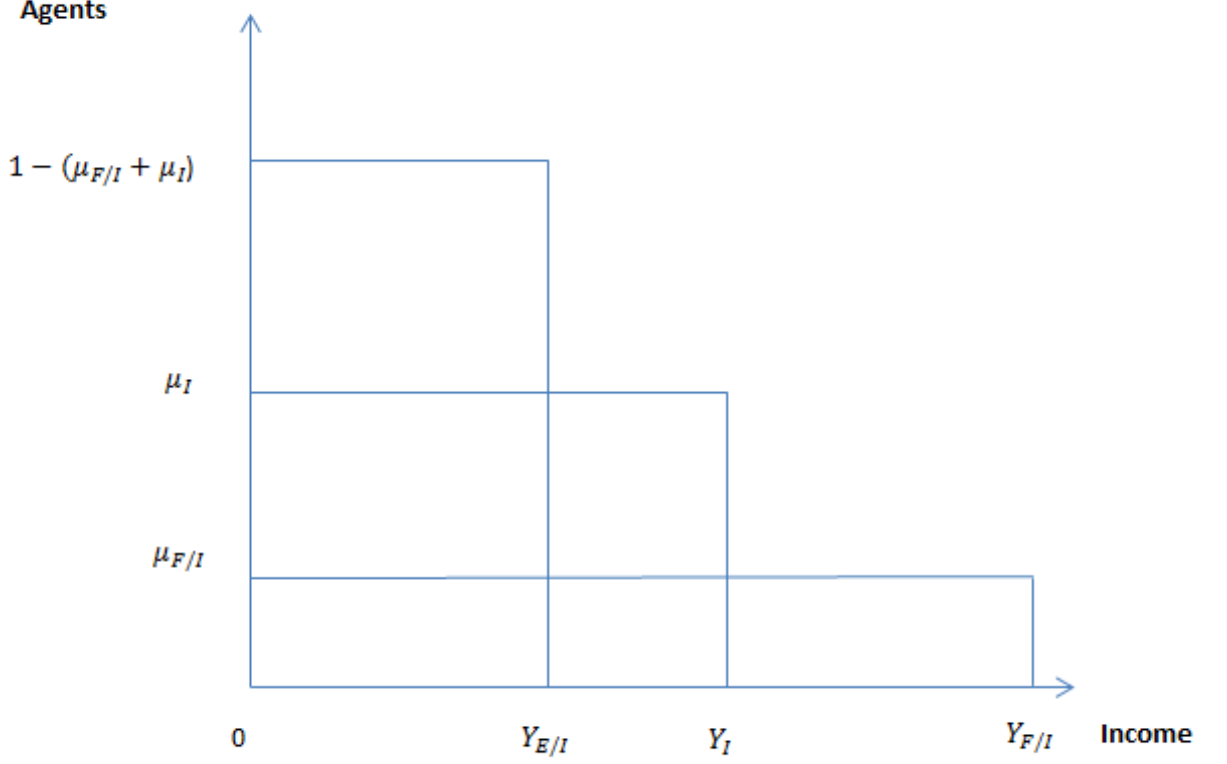


Figure 4: Income Distribution in an economy with an Informal Sector but without corruption

$$b_{F/I} = \left[\frac{1 - \alpha}{(1 - (1 - \alpha)(1 + r))} \right] \left((1 - \lambda) A \left[\frac{1 - (\mu_{F/I} + \mu_I)}{\mu_{F/I}} \right]^\lambda - (1 + r) K \right) \quad (28)$$

Since the transition curve Φ^I is lower than the transition curve Φ , it follows that the steady level of bequest in the economy with informal economy is less than that of the economy without the informal economy that is $b^{F^I} < b^F$.

Evidently, the economy with informal entrepreneurship has three income brackets: relatively high income, middle income and relatively low income households corresponding with formal entrepreneurs, informal entrepreneurs and workers in the formal sector respectively. As is evident from figure (4) and in comparison to figure (2) in the economy without an informal sec-

tor, the economy with an informal sector is seen to exhibit a more varied distribution of income. Unlike the economy without an informal economy, the economy with an informal sector reduces the divergence between the relatively high income group (formal entrepreneurs) and the relatively low income group (working households). In essence the existence of the informal sector allows for more convergence in incomes across occupations. Most importantly though is that the introduction of informal entrepreneurship has four effects: 1) it raises the income of the proportion of households that continue supplying their labour in the formal labour market; 2) it raises the income of the proportion of households that voluntarily decide to undertake informal entrepreneurship as opposed to supplying their labour to formal entrepreneurs; and 3) reduces the income that accrues to formal entrepreneurs due to higher wages; and 4) through pressuring wages upwards, it crowds out some households from formal to informal entrepreneurship. In a nutshell, the existence of the informal sector reduces the extent of income inequality in the economy without corruption; however, it compromises the level of economic activities in the formal economy.

2.3 Corruption, occupational choice and income inequality

In this section, an attempt is made to accommodate a typical developing country situation where entry into the formal sector involves bureaucratic rigidities and consequently bribe payments (B). We also consider an environment where informal entrepreneurship is already in the economy. The objective is to understand how corruption interacts with income distribution. We also seek to explore whether the informal sector has a role to play in the interaction between corruption and income inequality.

2.3.1 Formal sector entrepreneurship

With corruption, the total loan requirement for formal entrepreneurship increases by the amount of the bribe, that is; $B + K - b_t$. Regarding interest rates on loans, there is a consensus that interest rates are positively related with the quality of institutional framework in a country not to mention the level of corruption. For instance, Ciocchini et al., (2003) shows that decreasing corruption from the level prevalent in China or Ukraine to that in Jamaica leads to a reduction in spreads by about one-fifth. Also, Qian and Stahan (2007) show that stronger creditor protection is associated with lower interest rates and longer credit maturities. For instance a loan to a Mexican (British) firm where the credit rights are weak (stronger) attracts a

maturity which is 40% shorter than that of its British counterpart. Therefore, where collateral is relatively ineffective (for example in an environment of increased risk of government expropriation), financial institutions opt for loans with a shorter maturity implying higher interest rates. Furthermore, an improvement in the creditor rights by one standard deviation implies a 10% increase in loan maturity (which also implies lower interest rates). In a theoretical investigation, Blackburn and Wang (2009) show that corruption endogeneously increases interest rates as a result of the uncertainty regarding the profitability of formal entrepreneurship which increases the likelihood of entrepreneurs reporting bankruptcy. While the preceding arguments avail empirical and theoretical accounts of a positive relationship between interest rates and corruption as we shall see later, the objective of this paper can be reasonably explored without necessarily tampering with interest rates.

As shall be shown later the effect of corruption is to increase credit market rigidities. As such, the number of formal entrepreneurs reduces. Since informal entrepreneurship is strictly preferred to earning a wage income, corruption-induced credit constrained entrepreneurs switch formal entrepreneurship for informal entrepreneurship. As a result, the fraction of formal entrepreneurs given informality and corruption, $\mu_{F/C}$ is the difference between the number of formal entrepreneurs given informal entrepreneurship, $\mu_{F/I}$ and the number of formal entrepreneurs that become informal entrepreneurs because of corruption-induced credit market rigidities, $\mu_{I/C}^F$, that is, $\mu_{F/C} = \mu_{F/I} - \mu_{I/C}^F$. The fraction of informal entrepreneurs increases by the number of formal entrepreneurs who are corruption-induced credit constrained, $\mu_{I/C}^F$. Therefore the number of informal entrepreneurs given the presence of corruption and informality is the sum of informal entrepreneurs given informal entrepreneurship, μ_I and the fraction of corruption-induced credit constrained formal entrepreneurs, $\mu_{I/C}^F$ that is, $\mu_{I/C} = \mu_I + \mu_{I/C}^F$. The number of workers is the difference between the population of households and the sum of formal and informal entrepreneurs $1 - (\mu_{F/C} + \mu_{I/C})$.

From the preceding characterisation of occupational choices within the population, the number of workers per formal sector firm is $l_{IC} = \frac{1 - (\mu_{F/C} + \mu_{I/C})}{\mu_{F/C}}$. Wages in this economy remain unchanged since the proportion of corruption-induced credit constrained entrepreneurs, $\mu_{I/C}^F$ enter the informal sector as opposed to the formal labour market. Making necessary adjustments, the wage rate in this economy is given by;

$$\sigma_{IC} = \lambda A \left[\frac{1 - (\mu_{F/C} + \mu_{I/C})}{\mu_{F/C}} \right]^{\lambda-1}. \quad (29)$$

Note that since bribe payment is captured as an additional fixed cost, therefore formal entrepreneurial expected income with corruption, y_{t+1}^{FIC} is given by;

$$y_{t+1}^{FIC} = (1 - \lambda) A \left[\frac{1 - (\mu_{F/C} + \mu_{I/C})}{\mu_{F/C}} \right]^\lambda - (B + K - b_t)(1 + r) \quad (30)$$

Financial intermediation Like in the previous economy scenarios, we assume that in the event an entrepreneur declares bankruptcy, the financial intermediary would seek to wind-up the entrepreneur in an attempt to minimise its losses. However, inefficiency in the monitoring technology restricts the financial intermediary to recovering only a proportion $\delta (1 - \lambda) A \left[\frac{1 - (\mu_{F/C} + \mu_{I/C})}{\mu_{F/C}} \right]^\lambda$ of an entrepreneur's gross expected revenue. An entrepreneur will default if the loss in gross expected revenue from loan default is less than the loan repayment upon commitment to the loan contract, $-\delta (1 - \lambda) A \left[\frac{1 - (\mu_{F/C} + \mu_{I/C})}{\mu_{F/C}} \right]^\lambda > -(B + K - b_t)(1 + r)$. From the preceding loan default rule, the incentive compatible condition which mitigates loan default is given by,

$$b_t = [B + K] - \frac{\delta (1 - \lambda) A \left[\frac{1 - (\mu_{F/C} + \mu_{I/C})}{\mu_{F/C}} \right]^\lambda}{(1 + r)} = \omega^c \quad (31)$$

From equation (31), ω^c defines the bequest threshold level above (below) which a household is corruption-induced credit unconstrained (constrained). Evidently, ω^c is increasing in bribe payment. Note however that corruption has both direct and indirect effects. The direct effect is permeated through bribe payments. While the indirect effect is channelled through the positive relationship between corruption and interest rates. In this paper, we capture the direct effect of corruption in the sense that the bequest threshold level above (below) which a household is corruption-induced credit unconstrained (constrained) increases by the amount of bribe payment.

Given corruption-induced credit market imperfection, formal entrepreneurship is restricted to households with bequest levels $b_t > \omega^c$. The credit unconstrained household thus has an expected income level given by equation (30). Clearly, bribe payment as an additional fixed cost eats away formal entrepreneurial returns. From equation (30) and the household's lifetime utility maximisation solution, $U_t = \alpha^\alpha (1 - \alpha)^{(1-\alpha)} y_{t+1}$ the lifetime utility of a household in formal entrepreneurship given corruption is,

$$U_t^{FIC} = \alpha^\alpha (1 - \alpha)^{(1-\alpha)} \left[(1 - \lambda) A \left[\frac{1 - (\mu_{F/C} + \mu_{I/C})}{\mu_{F/C}} \right]^\lambda - [B + K - b_t] (1 + r) \right] \quad (32)$$

A comparison of the expected income between formal entrepreneurship without corruption but with informal entrepreneurship, y_{t+1}^{FI} and formal entrepreneurship with both corruption and informal entrepreneurship, y_{t+1}^{FIC} , y_{t+1}^{FI} is greater than y_{t+1}^{FIC} . This is because while both sets of entrepreneurs use the same quality of capital and thus incur the same capital cost besides labour costs, formal entrepreneurs in the economy with corruption incur an additional cost associated with bribe payment. Therefore $y_{t+1}^{FI} > y_{t+1}^{FIC}$ by a proportion $B(1+r) > 0$ which captures that part of would be capital investment spent on bribe payment and yet the entrepreneur has to pay it back to the financial intermediary with an interest $(1+r)$. Since the household's lifetime utility is increasing in the household's expected income it follows that the lifetime utility from formal entrepreneurship in the economy without corruption but with informality, U_t^{FI} is greater than the lifetime utility from the formal entrepreneurship in the economy with both corruption and informality, U_t^{FIC} . $U_t^{FI} > U_t^{FIC}$ by a proportion $\alpha^\alpha (1 - \alpha)^{(1-\alpha)} [B(1+r)]$.

2.3.2 Informal sector entrepreneurship

The choice of entry into the informal sector remains the same since none of the households is required to purchase bureaucratic investment licences as such no bribe payments are involved. However, since the lifetime utility from informal entrepreneurship, U_t^{IC} is greater than the lifetime utility from employment in the formal sector, U_t^{E} ¹⁴ it follows that households in the bequest interval $b_t \in [\omega^I, \omega^c]$ strictly prefer informal entrepreneurship. Consequently, the ultimate effect of corruption induced-credit market rigidities is to increase the size of informal entrepreneurship or the bequest interval within which households prefer to undertake informal entrepreneurship. This result is supported by Johnson et al., (1998) and Friedman et al., (2000) empirical investigations where they established that the size of the informal economy has a significantly robust positive relationship with the level of corruption.

While entrepreneurs with bequest levels $b_t > \omega^c$ might choose to go informal as an escape route from bureaucratic corruption in the formal sec-

¹⁴Note that the since wages remain unchanged, the income accruing to workers does not change as well. Also, the income accruing to informal sector entrepreneurship is unchanged and so are the corresponding the utility levels.

tor, however the inability to fully exploit their entrepreneurial potential would water down incentives to go informal. This is because: 1) The expected gross return from formal entrepreneurship, $(1 - \lambda) A \left[\frac{1 - (\mu_{F/C} + \mu_{I/C})}{\mu_{F/C}} \right]^\lambda$ is greater than the gross expected return from informal entrepreneurship, Ω ; 2) From 1) the lifetime utility from formal entrepreneurship, U_t^{FIC} is greater than the lifetime utility from informal entrepreneurship, U_t^{IC} by a proportion $\alpha^\alpha (1 - \alpha)^{(1 - \alpha)} \left((1 - \lambda) A \left[\frac{1 - (\mu_{F/C} + \mu_{I/C})}{\mu_{F/C}} \right]^\lambda - \Omega + (1 + r) [B + K - \kappa] \right) > 0$. 3) If $\kappa > K$ then such a project is likely to be conspicuous hence increasing the likelihood of bureaucratic attention. Thus, households with bequest level $b_t > \omega^c$ have a strict preference for formal entrepreneurship as opposed to informal entrepreneurship even in the midst of corruption.

2.3.3 Dynamics of income distribution with corruption

Following the optimal solutions to the household's lifetime utility maximisation problem, the evolution of lineage income across generations is given by $b_{t+1} = (1 - \alpha) y_{t+1}$. We can thus attain the following lineage wealth transition equations

$$b_{t+1} = \begin{cases} (1 - \alpha) \left[(1 + r) b_t + \lambda A \left[\frac{1 - (\mu_{F/C} + \mu_{I/C})}{\mu_{F/C}} \right]^{\lambda - 1} \right] & \text{if } b_t < \kappa \\ (1 - \alpha) [\Omega + (1 + r) (b_t - \kappa)] & \text{if } \kappa < b_t < \omega^c \\ (1 - \alpha) \left[(1 - \lambda) A \left[\frac{1 - (\mu_{F/C} + \mu_{I/C})}{\mu_{F/C}} \right]^\lambda - [B + K - b_t] (1 + r) \right] & \text{if } \omega^c < b_t \end{cases} \quad (33)$$

Using the transition equations, we can graphically characterise the income dynamics of households given their initial incomes and subsequent occupational choices as in seen in figure (5). The lineage wealth of workers is represented by the transition curve θ^I with its steady state equilibrium being established at $b_{E/I} = \left[\frac{1 - \alpha}{(1 - (1 - \alpha)(1 + r))} \right] \left[\frac{1 - (\mu_{F/C} + \mu_{I/C})}{\mu_{F/C}} \right]^{\lambda - 1}$. $b_{E/I}$ is left unchanged because working households do not interact with bureaucrats as opposed to households in formal entrepreneurship. Besides, since the informal sector absorbs the corruption-induced credit constrained formal sector entrepreneurs, it shields the labour market from experiencing an excess labour supply. As a result, wages remain unchanged.

In light of households engaged in informal entrepreneurship, their long run dynamics of wealth is represented by the transition curve ϕ with the intercept represented by $(1 - \alpha) [\Omega - (1 + r) \kappa]$. This transition path however now includes households in the bequest interval $\omega^I < b_t < \omega^c$. These households were initially formal entrepreneurs however because of corruption-induced

credit market rigidities they are crowded out of the formal sector for informal entrepreneurship. Recall that informal entrepreneurial income, equation (23) is less than formal entrepreneurial income in the economy without corruption but with informal sector, equation (16). Therefore, from the optimal solution, $b_{t+1} = (1 - \alpha) y_{t+1}$, it follows that the households in the bequest interval $\omega^I < b_t < \omega^c$ experience a shift downwards in the bequest schedule from Φ^I to ϕ . Where the bequest schedule Φ^I (ϕ) is associated with formal entrepreneurs in the economy without corruption but with informal entrepreneurship (informal entrepreneurs in the economy with or without corruption). Overall, the steady state bequest b_I for households in the informal sector remains the same as that in the economy with an informal sector but without corruption, that is;

$$b_I = \left[\frac{1 - \alpha}{(1 - (1 - \alpha)(1 + r))} \right] (\Omega - (1 + r) \kappa) \quad (34)$$

With regard to households that remain in the formal sector, their bequest transition path is represented by Φ^{IC} with an intercept at $(1 - \alpha) \left[(1 - \lambda) A \left[\frac{1 - (\mu_{F/I,C} + \mu_{I/C})}{\mu_{F/I,C}} \right]^\lambda - [B + K] (1 + r) \right]$. Note that corruption has two effects in the formal sector: 1) It increases the bequest threshold upon which one can access credit from ω^I to ω^c . Implying that households in the wealth interval $\omega^I < b_t < \omega^c$ who in the economy without corruption were engaged in formal entrepreneurship are now credit constrained. These households are crowded out of formal entrepreneurship for informal entrepreneurship; 2) Bribe payment shifts the transition path of formal entrepreneurs downwards from the transition path Φ^I to the transition path Φ^{IC} . Recall that the first effect arises from corruption increasing the cost of investing which reduces the return to formal entrepreneurship. The reduction in returns to formal entrepreneurship increases the likelihood of credit default. Financial intermediaries react by increasing the threshold level of collateral above which one can acquire credit. The high threshold level of collateral crowds out some households from formal entrepreneurship. In our model, households in the bequest interval $\omega^I < b_t < \omega^c$ are frozen out of formal entrepreneurship. With regard to the second effect, recall that the optimal solution, $b_{t+1} = (1 - \alpha) y_{t+1}$ implies that a household's transition path shifts with changes in expected income. Since corruption reduces the formal entrepreneurial expected income and as seen in figure (5), the transition path of formal entrepreneurs shifts downwards from Φ^I to transition path Φ^{IC} . The downward shift in the transition path is by the amount of bribe plus interest

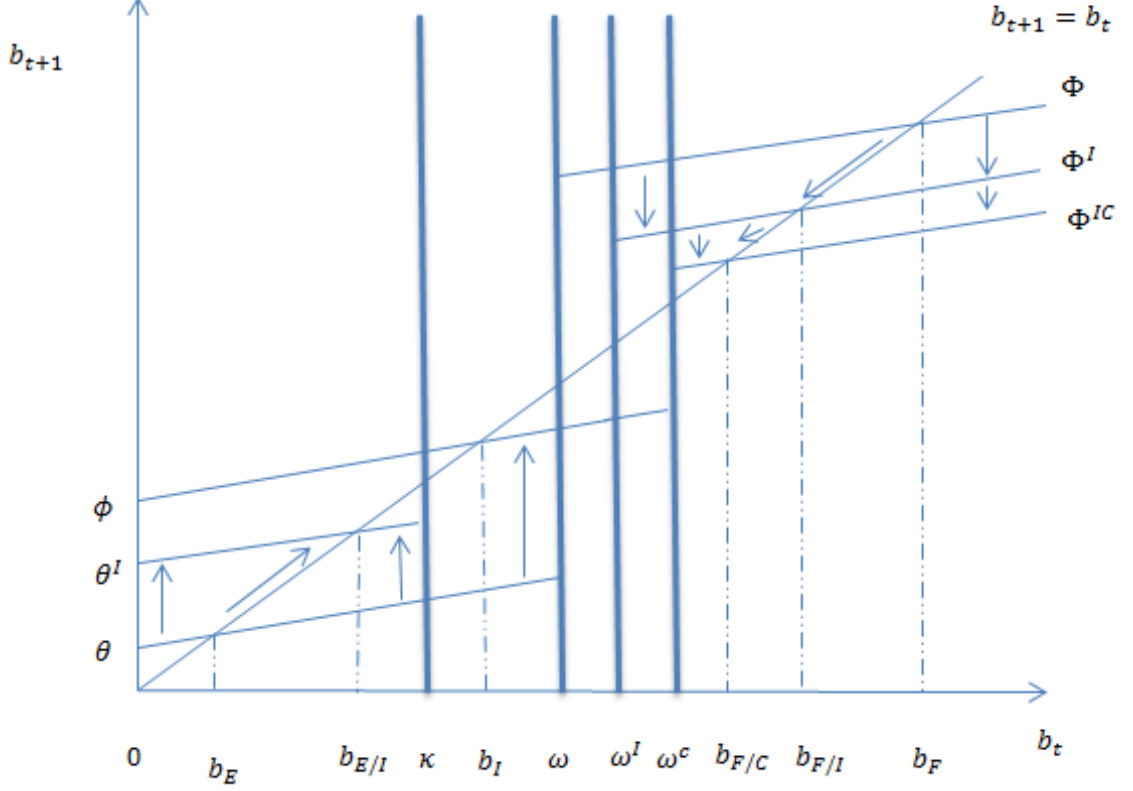


Figure 5: Effects of corruption in an economy with informality

paid on the bribe¹⁵, $(1+r)B$.

Assuming that in equilibrium $b_{t+1} = b_t = b$, the corresponding steady state bequest level of formal sector entrepreneurship shifts inwards from $b_{F/I}$ to $b_{F/C}$, where;

$$b_{F/C} = \left[\frac{1-\alpha}{(1-(1-\alpha)(1+r))} \right] \left((1-\lambda)A \left[\frac{1-(\mu_{F/C} + \mu_{I/C})}{\mu_{F/C}} \right]^\lambda - (1+r)[B+K] \right) \quad (35)$$

and that $b_{F/I} > b_{F/C}$. Since the bequest level determines how much one can borrow to finance private investment, the lower steady state bequest level

¹⁵This is because part of the money borrowed from financial intermediaries is used to pay bribes to bureaucrats

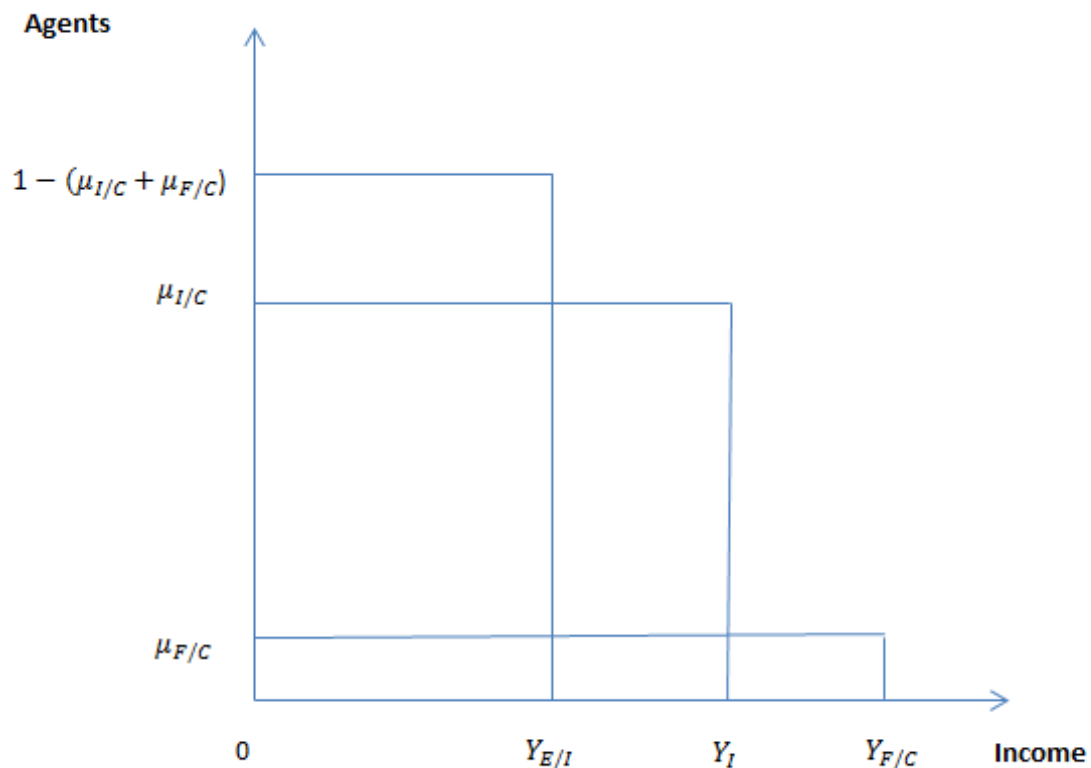


Figure 6: Income distribution and corruption in the economy with an Informal Sector

$b_{F/C}$ as a result of corruption implies that the level of economic activities in the economy is lower. This is because, the lower steady state bequest level $b_{F/C}$ implies a lower level of collateral at the disposal of households. Therefore the credit accessible to entrepreneurs in the steady state is equally lower as compared to when the economy is at steady state bequest level $b_{F/I}$. Thus, the level of economic activities is lower with corruption than without corruption.

Like the economy without corruption but with informal sector entrepreneurship, the economy with corruption-induced credit market rigidities has three income brackets; relatively wealthy, middle income and relatively low income households corresponding with; formal entrepreneurial, informal entrepreneurial, and working households respectively. However, with corruption, the occupational choice of households and their subsequent long run wealth dynamics are hinged on both the initial wealth distribution and the extent of corruption-induced credit market rigidities. Furthermore, without

the informal sector, the household's frozen out of formal entrepreneurship would have opted for employment in the formal labour market. Potential entry into the formal labour market would have had two effects: 1) income inequality would have increased as they would be relatively more low income households. This is because the income to workers is lower than that of formal entrepreneurs. 2) Wages would be pushed wages downwards since with more workers and less formal entrepreneurs implies an excess supply of labour hence the reduction in the wage rate to re-establish equilibrium in the labour market. The lower wages would of course increase the return to formal entrepreneurship but at the sametime increase income inequality. However, the entry into informal entrepreneurship of corruption-induced credit constrained formal entrepreneurs enables the economy avoid the pressure for wages to fall. Besides, in as much as the income of corruption-induced credit constrained formal entrepreneurs is now lower, their income is at least the middle ground between the incomes of working and formal entrepreneurial households. Hence, the informal sector reduces the extent of income reduction and therefore income inequality. This is shown in figure (6), where the ultimate effect of corruption in the economy with an informal sector is to enhance more convergence in the distribution of income as compared to the economy without corruption but with informal sector entrepreneurship, figure (4) and the economy without both corruption and informal entrepreneurship, figure (2) where there is greater variance in income.

Therefore, there is an apparent trade-off between corruption and income inequality with the informal sector playing a significant role. This conclusion is in agreement with the empirical finding by Dobson and Ramlogan-Dobson (2012a), Dobson and Ramlogan-Dobson (2012b) and Kar and Saha (2012) in which they show that the marginal effect of corruption on income inequality is mitigated with an increasing size of the informal sector.

Income inequality has been argued to retard economic development in developing countries. Specifically, Barro (2000) argues that income inequality is seen to negatively (positively) interact with economic growth in economies with per capita GDP below US\$ 2070¹⁶ (GDP above US\$ 2070). Also, Easterly (2007) shows evidence of a causal relationship between income inequality and development outcomes. Inequality as measured by both the Gini Coefficient and the share of income accruing to the top quintile is associated with a lower level of per capita income, inadequate and improper institutional structures, and low levels of educational attainment. A standard deviation increase in income inequality would lead to 1.1, 1.0, and 1.3 standard deviation reduction in per capita income, institutional quality and schooling

¹⁶1985 U.S. Dollars

attainment respectively. Introducing an IV¹⁷ in the model, the relationship is even more robust perhaps suggesting the OLS understates the interaction between income inequality and development outcomes. Furthermore, even after controlling for ethnic fractionalisation, tropical location or better still regional dummies and legal origin the negative effect of income inequality on development outcomes is still robust¹⁸.

In light of the theoretical literature, under imperfect credit market conditions and fixed costs related to individual investments poor households are crowded out of high yielding capital investments thereby leading to lower productivity in the economy (Galor and Zeira 1993; Banerjee and Newman 1993; Galor and Moav 2006; and Galor, Moav and Vollrath 2006). Furthermore, political economy models argue that in the midst of high income inequality levels¹⁹ there is a likelihood of the income poor (median voter) agitating for income distributive policies such as public education, progressive tax systems, and direct income transfers among others. However, such policies are distortionary to economic growth as they compromise the investment potential in physical and human capital. This is because such private investments are hinged on the ability of individuals to rightly recoup the returns to their investments. As such, redistributive policies are argued to deter the process of economic growth (Person and Tabellini 1994; and Alesina and Rodrik 1994). The models on social-political unrest argue that income inequality is a catalyst for social and political instability. That as opposed to engaging in productive activities the poor might waste time in planning for criminal activities. Furthermore, the income and asset rich might as well redirect investible resources into building defence mechanisms at the expense of productivity enhancing investment. Also, because of the potential of political upheavals income inequality thus increases property rights insecurity hence deterring private investment (Alesina and Perotti 1996; Bourguignon and Verdier 2000; and Gradstein 2007).

The preceding empirical and theoretical investigations show that income inequality retards economic development. Consistent with empirical evidence, this paper theoretically shows that in an environment of corruption the existence of the informal sector mitigates the extent of income inequality.

¹⁷Agriculture endowments (that is the relative abundance of land suitable for wheat as opposed to sugarcane) as an instrument for income inequality. This has an added advantage of reducing the potential of measurement error in inequality Easterly (2007).

¹⁸This is in contrast to what Forbes (2000) argues that "... many estimates of a significant negative effect of inequality are not robust. When any sort of sensitivity analysis is performed, such as additional explanatory variables or regional dummies are included, the coefficient on inequality becomes insignificant (although it remains negative)."

¹⁹Particularly in democracies

Therefore, the informal sector can be argued to mitigate the distortionary effect of income inequality on economic development in an economy with widespread corruption. Hence the informal sector offers a window of hope .

3 Conclusions

This paper sought to characterise the relevance of the informal sector in reducing the extent of income inequality in a corruption riddled economy. In our model, the effect of corruption was shown to increase the cost of borrowing to the extent that a certain proportion of households are crowded out of formal entrepreneurship. However, a household's entry into the informal sector as opposed to seeking for employment in the formal sector ameliorates income inequality. Following Barro (2000) and Easterly (2007), this result potentially implies that the extent of decrease in economic growth, per capital income and educational attainment are mitigated.

Our analysis suggests that the informal sector is a window of hope in an economy plagued by corruption. However, because activities in the informal economy are underground, they compromise the ability of governments to collect tax revenue and consequently finance public service provision. As Friedman et al., (2000) point out, the inability to provide efficient public services reduces incentives to pay taxes thereby propagating a corruption-informality trap. Besides, our model shows that in the economy without corruption, the informal sector also crowds out formal entrepreneurship. Since formal entrepreneurial firms typically pay taxes unlike informal firms, the government's inability to mobilise revenue would be exacerbated. Thus, policy makers would have an incentive to reduce the size of the informal economy. In an environment of corruption which typically depicts many developing economies the trade-off from such a policy initiative would be an increase in income inequality as households will end up receiving a potentially inferior wage income. Since income inequality retards economic development, policy measures to decrease the size of the informal economy should ensure that safety nets are in place to facilitate a transition of informal entrepreneurs into the formal economy.

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