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Essays on Institutions and Economic Outcomes

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Essays on Institutions and Economic Outcomes

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Abstracts

Paper 1 discusses the impact of tenure insecurity on land-related investment and the policy currently in place to promote tenure security. The empirical results, based on the Ethiopian Rural Household Survey panel dataset, show that tenure insecurity has a significant effect in discouraging land-related investments, and that this effect varies with region and type of investment. To address the problem of tenure insecurity, the Ethiopian government has introduced land registration and titling schemes. Despite the positive impact of this intervention, its sustainability is in question. This paper argues that there is a high likelihood of reversal and discusses the necessary constraints to assure the continuity of the policy.

Paper 2 examines the role of governance for agricultural productivity using household survey data from rural Ethiopia. The paper argues that the impact of governance is household specific and identifies some governance indicators accordingly. Political trust, competence of civil servants, and political connection are used as governance indicators. A stochastic frontier production function is specified and estimated to capture the effects of governance on productivity or technical efficiency of agricultural households. The results show that good governance could cut technical inefficiencies significantly and therefore could increase productivity.

Paper 3 tests for nonlinearity in households' income dynamics using a decade-long rural household panel survey dataset from Ethiopia. The paper argues that non-linearity in income dynamics could arise from the historical dynamics of institutions, and supporting evidence is provided from

Ethiopian history. The empirical results support non-linearity in income dynamics and hence the existence of poverty traps. The comparative static analysis of the empirical results shows the importance of policy interventions in terms of breaking out of the poverty trap.

Paper 4 proposes that ethnicity coupled with ethnic nepotism may reduce interpersonal generalized trust. We use the 2001 wave of the World Values Survey data for eight African countries to test this claim, and show that while ethnicity and ethnic nepotism are each important in affecting generalized trust levels, their interaction has a self-reinforcing and negative effect on trust levels. The results underscore the importance of institutions in controlling ethnic nepotism and thus partly in mitigating the adverse effects of ethnicity on trust.

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Summary of the Thesis

This thesis consists of four self-contained essays, each of which is summarized below.

1 Land Rights and Investment in Ethiopia

With a lack of structural transformation in the Ethiopian economy and a growing rural population, scarcity of arable land and landlessness has become apparent. The landlessness problem necessitated reallocation of land, which has led to periodic land redistribution and as a consequence to tenure insecurity among rural farmers. The first objective of this paper is to revisit the effect of perceived tenure insecurity on land-related investment using better panel data and different land-related investment indicators, and accounting for regional variations in responses to tenure insecurity.

The second objective stems from the government's policy response effort to reduce tenure insecurity among the rural farmers. As in many other developing countries, land registration and titling have been taken as a panacea for tenure insecurity and low levels of land-related investments in Ethiopia. Accordingly, more than 20 million parcels obtained land title certificates in a five-year period (Deininger, Ali and Alemu, 2008). Preliminary evidence shows that there is a strong demand for certification as demonstrated by the positive willingness to pay for a certificate, and higher input use intensities among certificate holders have also been reported (Deininger et al.,

2008). For this immediate positive impact to be sustained, the policy must be credible (in the sense that it will not be reversed easily in the future) and hence reduce the expected risk of expropriation. The second objective of this paper is, thus, to assess the conditions under which the policy will not be reversed, and the constraints necessary to avoid policy reversal and hence guarantee the policy's credibility.

The empirical results, controlling for household and plot specific characteristics, suggest that except for investment in manure, the impact of tenure insecurity is region and investment-type specific. At the aggregate level, tenure insecurity affects both investments in manure and tree cultivation significantly while its effect on investment in soil conservation is insignificant. The results largely suggest that tenure insecurity has a negative bearing on land-related investments, and the effect varies with the investment indicators, displaying clear regional variation. One of the values added to the empirical literature is the treatment of endogeneity in the investment equation using a panel bivariate probit model specification and estimation method.

The analysis on the possibility of policy reversal shows that there is a strong incentive for policy reversal; and this is especially so in the case of Ethiopia. The model of the government decision problem shows that the incentive for policy reversal is an increasing function of political power monopoly. This implies that greater institutional constraints that diffuse political power monopoly and make policy reversal very costly are required for the land titling policy to be sustained.

The policy implication of the empirical results is that land tenure security is an important component in stimulating land-related investment and hence the current land registration and titling policy is a timely intervention in the right direction. However, without checks and balances in the working of the government, this policy would be sustainable as long as it maximizes the net benefit of the ruling class. Thus, institutional reforms that constrain the political power of the ruling class and hence restrict policy reversal should

be an integral part of strengthening land rights.

2 Governance and Productivity: Microeconomic Evidence from Ethiopia

Evidence on the role of governance in explaining economic performances is abound. In their empirical study, Kaufmann, Kraay, and Zoido-Lobaton (1999) showed that there is a causal relationship from better governance to better development outcomes. Khan's (2006) review of the empirical literature also supports the positive role of good governance for economic performance. In the context of Ethiopia, Geda et al. (2008) reported that the required growth rate to achieve MDGs in Ethiopia could be one percentage point lower with slightly better institutional factors.

As the aggregate governance indicators could be blunt tools for policy analysis at a country level as specific aspects of governance may be important in different countries, this paper adopts a micro data analysis approach to look at the effect of governance on agricultural productivity using household survey data from rural Ethiopia. The point of departure of this paper is that even though households are under the same governance structure, the effects of governance can be household specific depending on the transaction cost each household faces. Some households may face high transaction costs due to bad governance while others may not. For instance, political capital in the form of contact with the local bureaucrats may cut transaction costs significantly even when the overall governance is bad, suggesting that the effect of governance can in fact be household specific.

A stochastic frontier production function is specified and estimated to capture the effects of governance on household productivity. In addition, an alternative specification based on Hall and Jones (1999) is provided to check the robustness of the results. The major finding of the paper is the determinative effect of governance on productivity. Improvement in governance

can cut inefficiency of farmers by 10-15%. With good governance, output can be increased significantly without additional input. This underscores the importance of good governance for growth and development, especially in the case of resource-constrained poor countries. The main policy implication of the empirical results is that promotion of good governance should be a major objective in development planning.

3 Poverty Traps and Institutions in Ethiopia

Economic stagnation is one of the most salient features of the majority of the developing world - especially the sub Saharan African region. Many theoretical models have thus been provided to explain the different channels through which economic stagnation or poverty trap could arise, e.g., Galor and Zeira's (1993) human capital explanation of poverty traps, Dasgupta's (1997) childhood under nutrition led poverty trap model, the rent-seeking model of Murphy et al. (1993), and the political economic factors caused poverty traps models of Bourguignon and Verdier (2000) and Acemoglu and Robinson (2002). Azariadis and Stachurski (2005) presented a detailed discussion of many of the poverty trap models.

This paper contends that the source of economic stagnation cannot be explained by a single factor. Nevertheless, if it is possible to single out a persistent stagnating force, it can be considered as the "structural" cause of stagnation. In the literature, past historical events are recognized to have a persistent long-term economic effect even after those events are long gone (see Acemoglu, 1995; Nunn, 2007). One of the contributions of the present paper is thus to provide a historical account of institutional dynamics that may explain the underlying causes of a poverty trap in Ethiopia. The Ethiopian case provides a good opportunity as predatory institutions have persisted since the fourth century.

Based on the historical analysis, the Lokshin and Ravallion (2004) type of non-linear income dynamics is specified and estimated to test for the

possibility of a poverty trap in rural Ethiopia.

In this framework, when household income dynamics follows a stationary linear autoregressive process, households can recover from adverse shocks over time and hence current poverty need not be entrapping. Conversely, when income dynamics exhibits non-linearity, adverse shocks may be entrapping. In addition, local polynomial estimates and macro level poverty trap test a la Easterly (2006) are provided as robustness checks.

The empirical results, using a decade-long (1994-2004) rural household survey panel dataset, give some support for the existence of a poverty trap in the Ethiopian rural economy. The poverty trap hypothesis is not rejected at the macro level either, as the Easterly's (2006) type of test for a poverty trap in the agricultural sector could not reject the hypothesis. Two comparative static policy experiments are considered following Matsuyama's (1997) suggestion on the policy relevance of results from multiple equilibria models. The policy experiments (i.e., encouraging investment in land improvement and supporting asset accumulation) results show the potency of these policies in lifting households out of the poverty trap.

As predatory institutions dominated the country from the fourth century until recently, their effect on the growth of the agricultural sector has been quite deleterious. The long adverse influence of predatory institutions on the incentive to invest, accumulate assets, and innovate facilitated conditions that favor production only at a subsistence level. It is thus important to understand the productive capacity rift created by the early institutions in order to address the problem of low equilibrium trap. Policy interventions should be informed by the depth of the rift, as marginal action may be ineffective in breaking out of low equilibrium trap. Sachs' (2005) suggestion for a massive expenditure boost seems to be predicated on this reasoning.

4 Does Ethnicity Matter for Trust? Evidence from Africa

Generalized interpersonal trust plays an important role in shaping economic and social outcomes. In ethnically heterogeneous societies, however, generalized interpersonal trust appears to be low compared to homogenous societies. This is especially so in African countries as they are among the most ethnically diverse in the world.

When people associate themselves with a certain group, be it ethnic or non-ethnic, and limit their interaction within their own group, they may develop a particularized trust for the group they belong to. However, higher particularized trust may not necessarily lead to lower generalized trust as it is possible to have high particularized and generalized trust simultaneously (Bahry et al., 2005). Given that the relationships among the different ethnic groups are free of tension and domination, trust among different ethnic group members could flourish. On the other hand, tensioned ethnic relationships discourage generalized trust in favor of particularized trust. Among other reasons, ethnic nepotism is one of the most important causes for tensioned ethnic relationships. The prevalence of ethnic nepotism may create an environment that is marred by suspicion among individuals and thus could reduce generalized trust levels.

In this paper, we argue that ethnicity lowers trust levels in the sense that the more people identify themselves with a subset of a society instead of with the society as a whole, the lower the generalized trust levels in that particular society. However, we recognize that ethnicity per se may not have an impact on interpersonal trust in situations where ethnic nepotism is not a problem. Accordingly, we posit that ethnicity coupled with ethnic nepotism could reduce generalized interpersonal trust. This hypothesis is tested using the World Values Surveys data of eight African countries. Our contribution to the social trust literature can be seen from at least two perspectives. Firstly, while country level ethnic diversity data is used in most previous

studies, we use an attitudinal definition and measurement of ethnicity at the individual level. By so doing, we can identify the association between ethnicity and generalized trust at the individual level. Secondly, we use country level data on ethnic nepotism. This is particularly important given our focus on African countries where politics is mainly run along ethnic lines and hence ethnic nepotism could be more of a norm than an exception.

Controlling for many socio-economic characteristics, our results show that while ethnicity and ethnic nepotism are both crucial in separately determining generalised interpersonal trust levels in Africa, their interaction has a self-reinforcing and negative effect on trust levels. That is, the presence of ethnic nepotism magnifies the negative effect of ethnicity on interpersonal trust. In particular our results suggest that ethnicity by alone may not have a significant impact in affecting trust levels in situations where the degree of ethnic nepotism is low. The implication of our findings is that policy interventions that reduce the extent of ethnic nepotism could be an important instrument in downplaying the adverse effects of ethnicity on trust.

Land Rights and Investment in Ethiopia

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Abstract

This paper discusses the impact of tenure insecurity on land-related investment and the policy currently in place to promote tenure security. The empirical results, based on the Ethiopian Rural Household Survey panel dataset, show that tenure insecurity has a significant effect in discouraging land-related investments, and that this effect varies with region and type of investment. To address the problem of tenure insecurity, the Ethiopian government has introduced land registration and titling schemes. Despite the positive impact of this intervention, its sustainability is in question. This paper argues that there is a high likelihood of reversal and discusses the necessary constraints to assure the continuity of the policy.

JEL Classification: Q12, Q15, D13, D23

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Contents

1 Introduction

The issue of land rights has received considerable attention in the policy and academic arenas, especially in the context of developing countries. For a typical rural economy, "land is not only the primary means for generating a livelihood but often the main vehicle for investing, accumulating wealth, and transferring it between generations" (Deininger and Binswanger, 1999: 247). As a result, the effects of decisions regarding land transcend the agricultural sector, affecting the performance of the overall economy. This has resulted in a proliferation of empirical studies on the link between land rights and economic outcomes. Though the empirical results are inconclusive, strengthening land rights through land registration and titling appears to be an important agenda for rural development (see Easterly, 2008, for a brief discussion and Pande and Udry, 2005, for a comprehensive summary of the empirical results).

In the case of Ethiopia since the advent of the 1975 land reform, private ownership of rural land has been abandoned and farmers are granted usufruct rights to land. Proclamation No.31 in 1975 nationalized all rural lands throughout the country, and rural lands then became public property. Peasant associations were delegated to undertake the land reform in their localities on equality basis. A lack of structural transformation in the Ethiopian economy and a rising rural population has resulted in scarcity of arable land and landlessness. The landlessness necessitated reallocation of land, which led to periodic land redistribution and consequently to tenure insecurity among rural farmers. The extent to which tenure insecurity affects land-related investments in rural Ethiopia is examined by, among others, Holden and Yohannes (2002), Gebremedhin and Swinton (2003), Ayalew et al. (2005), and Deininger and Jin (2006). In addition, Alemu (1999) and Holden and Yohannes (2002) looked at underlying factors affecting perceived tenure insecurity.

The present paper raises two interrelated issues and hence has two modest objectives. The first objective is to revisit the effect of perceived tenure

insecurity on land-related investment using better panel data and different land-related investment indicators, and accounting for regional variations in terms of responses to tenure insecurity. One of the values added to the empirical literature is the treatment of endogeneity in the investment equation. Using panel bivariate probit specification and estimation methods, the possibilities for endogeneity are explicitly accounted for.

The empirical results, controlling for household and plot-specific characteristics, suggest that except for investment in manure, the impact of tenure insecurity is region and investment-type specific. At the aggregate level, tenure insecurity affects both investments in manure and tree cultivation significantly while its effect on investment in soil conservation is insignificant. The results largely suggest that tenure insecurity has a negative bearing on land-related investments and that this effect varies with the investment indicators, displaying clear regional variation. Our results can be compared broadly with some of the related works by Gebremedhin and Swinton (2003), Deininger and Jin (2006), Ayalew, Dercon and Gautam (2005), and Hagos and Holden (2006) in the context of Ethiopia.

The second objective stems from the government's policy response to reduce tenure insecurity among rural Ethiopian farmers. As in many other developing countries, land registration and titling have been taken as a panacea for tenure insecurity and low levels of land related investments in Ethiopia. Accordingly, more than 20 million parcels obtained land title certificates in a five-year period (Deininger, Ali and Alemu, 2008). Preliminary evidence shows that there is a strong demand for certification, as shown by the positive willingness to pay for a certificate and higher input use intensities among certificate holders (Deininger et al., 2008). For this immediate positive impact to be sustained, the policy must be credible (in the sense that it will not be easily reversed in the future) and hence reduce the expected risk of expropriation. The second objective of the present paper is, thus, to develop a model of the government's policy decision problem. The model assesses the conditions under which the policy will not be reversed and the constraints necessary to avoid policy reversal, which in turn guarantee the

policy's credibility.

The prediction from the model of the government's decision problem shows that there is a strong incentive for policy reversal especially in the case of Ethiopia. The model also shows that the incentive for policy reversal is an increasing function of political power monopoly. This implies that greater institutional constraints that diffuse political power monopoly and make policy reversal very costly are required for the land titling policy to be sustained.

The rest of the paper is organized as follows. Section 2 briefly summarizes the literature on why and how land rights matter. Section 3 presents the historical evolution of land administration institutions from the social conflict theory of institutional development perspective. The main thrust of this section is to show that the institutions are extractive and shaped to serve the ruling class interest, which in effect has resulted in inefficient institution and hence tenure insecurity. This is reflected in the survey data used in this paper, as more than half of the sample households are uncertain about their future tenure status. Section 4 presents the empirical findings on the effects of such tenure insecurity on land-related investments. Section 5 discusses the policy response to strengthen land rights through land registration and titling and reflects on the necessary conditions for the sustainability of this policy. The last section concludes the paper.

2 The Literature: Why Land Rights Matter?

Besley (1995) presented three arguments for a positive relationship between land rights and investment in land. The first concerns strengthening freedom from expropriation. According to this argument, investment will decline if its return does not accrue to the owner because of expropriation. However, critics have identified that the right to recover an investment need not be

related to the right to retain land (Sjaastad and Bromley, 1997: 553). According to them, in cases where the owner is compensated for any investment made in the land, perceived tenure insecurity cannot be directly translated into disincentive for investment. They further argue that tenure insecurity may encourage investment in land when the investment is regarded as a means of acquiring more secured land rights. Similarly, Banerjee and Ghatak (2004) show that tenure insecurity in the form of eviction threat can be an incentive for tenants to invest more. Kassie and Holden (2007) provide some empirical support for this hypothesis.

The second argument relates to the credit market. With better rights, land can be used as collateral in the credit market, easing constraints on investment funding. The last argument has to do with gains from trade. That is, improved transfer rights facilitate land sales and rental activities, which in turn encourage investment.

Deininger and Jin (2006) identified a subtle effect of land rights that transcends the agricultural sector. Using survey data of Ethiopian rural households, they found that the perceived risk of expropriation is higher among farmers with off-farm employment as land rights depend on the physical presence of farmers in the village. To cope with the increased perceived risk, farmers withdraw themselves from off-farm activities. This has a negative impact on the off-farm sector as well as on the overall efficiency of resource allocation. It may also indirectly affect agricultural investment by hampering households' savings from the off-farm activities.

While the positive impact of tenure security on land-related investment is well established theoretically, the empirics are at best inconclusive. Brasselle, Gaspart, and Platteau (2002) discussed some of these findings. On one hand, the results from Kenya (Migot-Adholla, Place, and Oluoch-Kosura, 1994), Somalia (Roth, Unruh, and Barrows, 1994) and Niger (Gavian and Fafchamps, 1996) suggest no correlation between investment and land rights; on the other hand, in some regions of Ghana (Migot-Adholla et al., 1994; Besley, 1995) and Rwanda (Migot-Adholla et al., 1991), land rights promote

investment. In the case of Uganda (Roth, Cochrane, and Kisamba-Mugerwa, 1994), improvement of land rights does not affect the long-run investment, although it has a positive impact in the short-run.

As noted by Brasselle et al. (2002), much of the empirical evidence suffers from endogeneity bias, with the exception of the work by Besley (1995) and Baland et al. (1999). Land rights can be strengthened by investing in the land, and hence the observed positive relationship between land rights and investment can be due to this endogeneity bias. Controlling for this bias, Brasselle et al. found that land rights do not matter for investment, but that the causality rather goes the other way round - i.e., investment in land strengthen land rights. The importance of endogeneity bias is also reflected on in Besley's work. Using the same data as Migot-Adholla et al. (1994a), Besley (1995) found the opposite result after controlling for endogeneity.

In addition to the econometric problems, there are some other explanations for the mixed results. First, the households in the study areas are faced with different institutional arrangements that determine the return on investment. Rodrik (1999) noted that what matters for the investment decision is control over the return on investment rather than the form of ownership per se. That is, there may not be a significant difference among agents with and without private ownership once the security of the returns on investment is equalized across the property right regimes. Thus, in such a case, the effect of land rights on investment may not be observed. However, it becomes important when the returns on investment vary with type of land rights.

Second, with the exception of a few recent studies - e.g., Jacoby, Li, and Rozellel (2002), Holden and Yohannes (2002), and Ayalew, Dercon, and Gautam (2005) - the impact of the perceived risk of losing land is not directly examined. Rather, many of the studies have attempted to capture the risk indirectly by arguing that deviation from freehold is associated with a higher risk of losing land. These studies have proceeded by comparing investment levels across different land rights arrangements, such as between

indigenous tenure and freehold. The results from these studies would, however, be flawed in cases where the perceived risk of losing land is similar across different land right holders.

For instance Gavian and Ehui (1999), using data from 477 plots in the Ethiopian highlands, reported that differences in land rights are not reflected in agricultural productive efficiency. They compared productive efficiency among three informal and less secure land contracts (rented, share-cropped and borrowed) relative to land held under formal contract with the Ethiopian government (Gavian and Ehui, 1999: 37). However, in the face of the threat of government expropriation, there is no evidence that tenure insecurity is lower under a formal than under an informal contract as the contracting parties may deal explicitly on the terms of the contract in the later case. In the case of rural Ethiopia, under formal contracts with the government, farmers do not have explicitly stated terms of agreement, which in effect makes their future tenure status uncertain. This may result in a higher perceived risk of government expropriation. As a result, it may be precarious to associate tenure insecurity with the forms of contract. This casts doubt on the results of Gavian and Ehui (1999) as their tenure insecurity variable may be flawed since it does not capture the risk factors that farmers consider in their decision-making.

Third, the land rights variable measured as differences in land rights may not necessarily indicate the factors that farmers consider in making their investment decision. F]ormal (de jure) rights might have very little to do with the ability to exercise these rights (de facto) (Besley, 1995: 905).

In the Ethiopian context, Gavian and Ehui (1999, Gebremedhin and Swinton (2003), Deininger and Jin (2006), Ayalew, Dercon, and Gautam (2005), and Hagos and Holden (2006) looked at the impact of land rights on agricultural productivity and investment. The results, with the exceptions of Gavian and Ehui (1999) and Hagos and Holden (2006), suggest that land rights are an important determinant in shaping the behavior of farmers toward agricultural investment.

3 Perceived Tenure Insecurity and Institutions

In the present paper, tenure insecurity is defined as the perceived risk of losing land in the future. The survey data contains the perceived risk of expropriation among rural farm households. To understand the sources of the perceived risk, it is important to examine the institutional arrangement that has governed land rights. North (1990: 3) characterized institutions as the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction. The important question is, then, how do societies come up with different institutions? Addressing this question motivates the discussion of the government's policy decision problem (Section 5) in addition to illustrating the dynamics of institutional reform.

In the literature, there are different theoretical explanations of how institutions develop. Here, the social conflict view of institutional development is adopted to characterize the institutional dynamics in Ethiopia. According to this view, institutions are not always chosen by the whole society but by the groups that control political power at the time of institutional choice. These groups will choose institutions that maximize their payoff even though the institutions are sub-optimal for society as a whole (see Acemoglu, Johnson, and Robinson, 2005). Among others, Bates (2005) used a similar approach to explain the political economy of agrarian development in the context of Kenya.

3.1 Land Right Institutions from the Social Conflict Point of View

To analyze the land rights institutions, we identified three periods of analysis: the pre-1974 period (imperial period), the socialist period of 1974-1991, and the post-1991 period. In the imperial pre-1974 period, the rist system, in which a farmer obtains a usufruct right to land based on kinship, dominated the land holding system in the northern part of the country. This

system had been sustained for a long time as it is incentive compatible for the state. This arrangement was the most cost effective way of collecting taxes given the underdevelopment of the state apparatus. As the land is registered in the name of the "founding father", taxes are collected from each right holder by the representative of the "family" and delivered to the state officials. This arrangement cut transaction costs significantly apart from enhancing the effectiveness of tax collection. However, for the peasants, the frequent litigations over their rights by other descendents based on closer ties to the "family" ancestors and the periodic redistribution of land among the "family" members resulted in tenure insecurity and a high cost of litigation (Dessalegn, 1984).

Parallel with the rist holding system, state land holding was another important feature during the pre-1974 period. The state holds all uncultivated land and grants use rights to the church, nobility, and government officials with different privileges. As long as the alliance with the ruler is intact, the land right with the various privileges of tax exemption can be maintained. In principle, the state has control over all politically derived land rights. As a result, these rights can be utilized to patronize the nobility and the local chiefs in cases where there is a conflict of interest. It can also be used to reward loyalty and alliance to the state.

The land holding system in the southern part of the country was structurally different from the system in the north. In the mid 19th century, Emperor Menelik expanded his control to the southern part of the country and subjugated it through military force. Following the conquest, all the land was declared state property. The expropriated land was distributed to various groups based on services rendered during the conquest or in compensation for continued service, and to the clergy and settlers who migrated to the region (Markakis, 1974). Rights to land were also continuously linked with service to the state.

The overall institutional arrangements were geared toward maximizing the tax collected from the peasants and strengthening the control over political

power by making land holding contingent on service to the state. The landlords supported this institutional arrangement as it maximized their payoff. For instance, in the 1960s and 70s, a number of plans of land reform that aimed to grant better land rights for peasants were repeatedly blocked by the (then) parliament (Chole, 2004), which disproportionately represented the interest of the landlords. As a result, the peasants' land rights remained generally unsecured.

During the socialist period of 1974-1991, the interest classes and the institutional setup were changed to conform to socialist ideology. In 1975 there was a major land reform policy that nationalized all land, and this was followed by a redistribution that entitled the peasants usufruct rights to land. However, the state started extracting economic rents from the peasants using the socialist ideology along with the establishment of the peasant associations. Forced quota supply at a price as low as 22% of the market price[1] (see Chole, 2004: 131) was introduced during this period. Failure to comply with the quota requirement may result in loss of the usufruct right of land. In order to protect their land right in the event of failure to supply the quota requirement, there were cases where farmers bought grain at the free market price to fulfill their quota requirement (Chole, 2004). Similar to the previous regimes, land rights were used by the state as a mechanism to extract economic rents. Moreover, the power vested in peasant association to redistribute land resulted in higher tenure insecurity among the rural farmers.

In the post-1991 period, the property right regime has not been significantly different from its predecessor. Farmers have been granted only usufruct rights with no option of selling their land or using it as collateral as indicated in the country's constitution. Though land certification has been proposed to promote tenure security, the usufruct right of land still cast uncertainty on economic agents apart from being open to being used in promoting the political interest of the ruling class. Pausewang (2004) noted that L]ocal of-

[1] Bates (1981) noted a similar phenomenon in the case of other African countries such as Ghana and Nigeria.

ficials, who are always representatives of the ruling party coalition EPRDF, assume the right to decide on the distribution of land, including the authority to withdraw land from peasants who violate their orders. They claim authority to do so, based on the provision of 'government property' over all land (Pausewang, 2004: 2). Eviction threats, even if the actual act is not very common, have been used as an instrument to strengthen political power.

In line with the social conflict view, regardless of the regime considered, the land right institutions were geared towards maximizing the benefits - either economic or political - of the ruling class. As a result, the institutions promoted weak property rights for land. This cast uncertainty on the future tenure status of farmers. As Greif (1994, 1995) showed, with the path dependent nature of institutions, expectations about past equilibria are good predictors of the expectation following an exogenous change in the rules of the game. Thus, given that the institutions had been historically extractive, it can be discerned that the perceived risks of expropriation are the result of past and present institutional dynamics.

3.2 Perceived Tenure Insecurity

According to the 1999 survey data, around 28% of the households expected their land size to fall within the next five years while around 32% were uncertain about their land tenure status in the next five years. Overall, more than half of the surveyed households were faced with tenure insecurity either in the form of an expected fall in their holding or uncertainty about their future land holding. A similar pattern is observed in the 2004 survey, though the proportion of households expecting a decrease in their land size fell to around 17%. In terms of the uncertainty regarding the future land size, around 34% of the households did not know what their land size be five years down the road. This implies that around 51% of the households were faced with tenure insecurity. In terms of the reasons for expecting a fall in land size, land redistribution by local administrations accounted for around

24% and 25% of the cases in 1999 and 2004, respectively (see Table 1).

Table 1: Expectation about Future Land Redistribution

In the next five years, what do you think will happen to the size of your holding?		
	1999	**2004**
Decrease	28.3	16.5
Don't know	31.7	34
No change	22.6	36.3
Increase	17.3	13.3
If you expect increase/decrease in land size, what are the reasons?		
Decrease due to land redistribution by local administration	24.3	24.8
Decrease due to land sharing among family members	36.3	23.2
Increase due to land redistribution by local administration	24	12.4
Increase through inheritance	6.9	3.2
Share cropping	**	22.9
Other	8.5	13.5

Source: Author's computation from the survey data described in Section 4.3

4 Tenure Insecurity and Investment

4.1 The Model of Land Rights and Investment

The households' land improvement investment decision can be viewed as the result of the maximization problem of the agents with missing markets. The households' problem would be to maximize utility as a function of expected profit and other household characteristics owing to the missing market assumption as in Udry (1996) and de Janvery, Fafchamps and Sadoulet (1991). We formulated the problem similarly to Gebremedhin and Swinton (2003), but allowed for the possibility of missing markets as in Hagos and Holden (2006):

$$
\begin{aligned}
& \max_{I} U(E[\pi_T], H) \\
& \textit{subject to} \\
E[\pi_T] &= \sum_{t=1}^{T} \delta^t (pq_t E(A_t) - rI_t) \\
q_t &= q(I_t, w_t) \qquad\qquad . \qquad (1)
\end{aligned}
$$

The maximization problem states that households maximize their utility, which is a function of lifetime expected profit and other household specific characteristics. The expected life time profit $E[\pi_T]$ is given as the discounted net return. The return from crop sales is given by the term $pq_tE(A_t)$, where p is price, q is output per a unit of land, $E(A_t)$ is expected land size, and rI_t is the cost of investment in land. Output q_t is specified to depend on the level of the investment I_t and other factors w_t.

Return from crop sales depends on the expected land size, which in turn depends on tenure status. We assume that households attach probability[2] d to losing k proportion of their land due to land redistribution. That is, the expected land holding is given as: $E(A_t) = (1-d)A_t + d(1-k)A_t$.

The expected profit can thus be given as $E[\pi_T] = \sum_{t=1}^{T} \delta^t (pq_t[(1-d)A_t + d(1-k)A_t] - rI_t)$ where $1-d$ is the probability of surviving from land redistribution.

The optimization problem above can be presented as the unconstrained problem in equation (2).

$$
Z = U\left(\sum_{t=1}^{T} \delta^t (pq_t[(1-d)A_t + d(1-k)A_t] - rI_t); H_t\right) \qquad (2)
$$

[2] We implicitly assume that farmers are not compensated at the time of expropriation for any investment made in their land. Even with compensation, the compensation may not be enough for cost recovery as some investments in land such as in manure are unobservable.

The first order condition is given as

$$\frac{dZ}{dI_t} = \frac{\partial U}{\partial \pi_t}\frac{\partial \pi_t}{\partial q_t}\frac{\partial q_t}{\partial I_t}[(1-d)A_t + d(1-k)A_t] - \delta^t r = 0$$

$$\frac{\partial U}{\partial \pi_t}\frac{\partial \pi_t}{\partial q_t}\frac{\partial q_t}{\partial I_t}[(1-d)A_t + d(1-k)A_t] = \delta^t r \qquad . \tag{3}$$

The optimality condition shows that the marginal benefit of the cumulatively added yield is equal to the cumulative discounted marginal cost. Expectation about land redistribution at time t is an important component of the optimality condition. When land redistribution is expected with probability $d > 0$, the optimal level of investment will be lower than when there is no redistribution expectation, or $d = 0$. That is, the optimal level of investment increases as a lower probability is attached to the likelihood of land redistribution. The optimal level of investment without the risk of land redistribution corresponds to $d = 0$ where the marginal benefit is equated with the marginal cost and the optimal level of investment reaches its maximum.

A testable hypothesis arising from the above formulation is that the probability of investing in land declines when land redistribution is expected. This hypothesis is evaluated with the Ethiopian rural household panel data in the next section.

4.2 The Empirical Model

The empirical model tests the above hypothesis controlling for other factors affecting investment decisions using rural Ethiopian panel household survey data. Investment in land (I_{it}) is specified as a function of the expectation about redistribution (ET_{it}), household characteristics (H_{it}), land quality (L_{it}) and land topography (S_{it}). Subscripts i and t are household and time identifiers, respectively.

The literature identifies the possibility of endogeneity in cases where farmers invest more to strengthen their tenure security. When this is so, ET_{it} and ε_{it} will be correlated and lead to biased estimates. The endogeneity of ET_{it} can be modeled in line with Murphy and Topel's (1985) two stage procedure. First, ET_{it} is estimated as a function of household characteristics (H_{it}), land quality (L_{it}), land topography (S_{it}), tenure length (T_{it}), and past experience of land redistribution (R_{it}) using maximum likelihood. Then, its predicted value can be used to estimate the investment equation. This approach may, however, lead to inefficiency as it does not account for the correlations of the disturbances in the two equations. Greene (1998) thus derived an efficient maximum likelihood estimator for a binary model with a dummy endogenous variable in a bivariate probit framework.

Letting x_1 and x_2 represent the right hand side variables of the investment and expectation equations, except for ET, respectively, yields

$$\begin{aligned} I_{it} &= \beta x_{1it} + \gamma ET_{it} + \varepsilon_{1it} \\ ET_{it} &= \alpha x_{2it} + \varepsilon_{2it} \qquad . \end{aligned} \tag{4}$$

Under the assumption that ε_{1it} and ε_{2it} follow a bivariate normal distribution with $E(\varepsilon_{1it}) = E(\varepsilon_{2it}) = 0$, $V(\varepsilon_{1it}) = V(\varepsilon_{2it}) = 1$, and $Cov(\varepsilon_{1it}, \varepsilon_{2it}) = \rho$, the model parameters can be estimated by maximum likelihood (see Greene, 1998 and 2005; Maddala, 1983). The sample loglikelihood function is given by

$$l = \sum_{i=1}^{N} \left[d_{11} \ln P_i^{11} + d_{10} \ln P_i^{10} + d_{01} \ln P_i^{01} + d_{00} \ln P_i^{00} \right] \ ,$$

where $d_{11} = I_{it} ET_{it}, d_{10} = I_{it}(1 - ET_{it}), d_{01} = (1 - I_{it}) ET_{it},$

$d_{00} = (1 - I_{it})(1 - ET_{it}),$

$P_i^{11} = Prob(I_{it} = 1, ET_{it} = 1) = F(\beta x_{1it} + \gamma, \alpha x_{2it}, \rho),$

$P_i^{10} = Prob(I_{it} = 1, ET_{it} = 0) = F(\beta x_{1it}, -\alpha x_{2it}, -\rho),$

$P_i^{01} = Prob(I_{it} = 0, ET_{it} = 1) = F(-\beta x_{1it} - \gamma, \alpha x_{2it}, -\rho),$

$P_i^{00} = Prob(I_{it} = 0, ET_{it} = 0) = F(-\beta x_{1it}, -\alpha x_{2it}, \rho),$

and F is the bivariate normal cumulative distribution function.

For panel data, the bivariate probit model can be estimated in a random parameter framework as fixed effects estimators are not yet available for such models (Greene, 2007). A significant correlation between ε_{1it} and ε_{2it} (i.e., significant ρ) means that ET_{it} is endogenous in the investment equation. Lack of significant correlation suggests that the investment equation can be estimated using a standard probit model.

In the Ethiopian case, the endogeneity of ET does not seem to be a plausible scenario as land redistribution could take place regardless of the level of investment. Holden and Yohannes (2002) noted this scenario in relation to the 1997 land redistribution in the Amhara region where even land with trees was redistributed without compensation. However, the endogeneity of ET remains to be an empirical question.

The major challenge in estimating the investment equation is to obtain a type of investment that has a long gestation period[3] to be affected by the

[3] There are also some studies that tested the impact of tenure insecurity on investments with short term-return (see, e.g., Holden and Yohannes, 2002).

perceived risk of tenure insecurity. In the literature, soil conservation (Gebremedih and Swinton, 2003; Hagos and Holden, 2006), manure applications (Jackoby et al., 2002) and tree planting (Besley, 1995; Deininger and Jin, 2006) are considered to assess the impact of land tenure system on the adoption and intensity of these investments. The present paper assesses the impact of tenure insecurity on all of these investment types, although investment in manure is emphasized as a main investment indicator.

Investment in manure is emphasized for the following reasons. First, the Ethiopian Agricultural Census shows (see Table 3) that around 48.3% of farmers use fertilizer, and the use of natural fertilizer dominates with 66.5% of all fertilizer users relying on it. Of natural fertilizers, the application of manure ranks first, accounting for 63% of all natural fertilizers used. Manure also comes first when compared with all types of fertilizers - natural and chemical - as it is used by 44% of the farmers who apply fertilizer, implying that it is one of the most important types of fertilizers. Second, turning to non-users of fertilizer, almost 50% of all cases of non-use are due to financial shortage. This may show that fertilizer application - both natural and chemical - requires a substantial amount of financial resources and suggests that the activity is a costly investment that requires a serious appraisal of the associated risks. More importantly, given that the return from natural fertilizers accrues over an extended period of time, it would have a higher risk premium in cases where the future tenure status is dubious. In addition, the riskiness of investment in manure is higher due to its lack of observability (compared to other soil conservation investments for instance) in the event of land expropriation with compensation.

4.3 Data

A household panel survey dataset covering 15 rural villages in Ethiopia with a total of 1470 households in 1994, 1995, 1997, 1999 and 2004 is used to study the impact of tenure insecurity on different land-related investment indicators. The data collection started in 1989 with six villages and was

expanded in 1994 to include 15 villages. The data was collected by the Department of Economics at the Addis Ababa University in collaboration with Center for the Study of African Economics at Oxford University and the International Food Policy Research Institute, Washington.

The surveys were conducted in six rounds - two in 1994, and the remaining in 1995, 1997, 1999, and 2004. In each village, households were selected randomly and in proportion to the population of the village (for a detailed discussion of the sampling framework see Dercon and Hoddinott, 2004). The attrition rate was as low as 3% mainly because of low mobility as households cannot acquire land when moving to other places. Table 2 presents descriptive statistics on the variables used.

Our analysis was dictated by the availability of tenure security indicators in the survey data. Though the panel survey was conducted in six waves, only the last two (1999 and 2004 waves) contain questions on perceived tenure insecurity and hence only the data from these two waves is considered. Regarding the investment variables, there is complete data on adoption but not on the intensity of the investment activities for both waves. Thus, the analysis is based on a probability model using the adoption data.

Table 2: Descriptive Statistics

Variables	Mean	Standard deviation
Plot size in hectare	0.372	0.477
Education	2.777	3.037
Household size	6.438	3.091
Tenure length (in years)	20	13

	Percentage
Investment in Land	
Manure application in %	54.7
Soil conservation in %	38.3
Tree planting in %	70.3
Land quality	
Good soil fertility in %	58.5
Medium soil fertility in %	29.5
Poor soil fertility in %	12
Topography	
Flat	77.8
Sloppy	20.4
Steep slope with ravines	1.8

Source: Author's computation from the survey data described above.

4.4 Results

Table 4 presents the test results for the endogeneity of ET in the investment equation. Endogeneity of ET is implied on the significance of the correlation between the disturbances of the investment and ET equations, which is given by Rho. The results show that the null of $\rho = 0$ is rejected in the case of the manure investment equation, implying the endogeneity of ET. However, the null cannot be rejected for both soil and tree investment equations, suggesting that endogeneity of ET is not a problem there[4].

[4]The simulation results of Monfardini and Radice (2008) show that the Rho test outperforms other types of tests though it has a tendency to over reject the null. In our case,

As endogeneity arises due to measurement errors, omitted variables, and reverse causalities, the validity of the bivariate model does not necessarily show that the endogeneity is due to inverse causality. Noting that the logic of land redistribution in Ethiopia does not support the possibility of inverse causality, the observed endogeneity in the manure investment equation may be due to some omitted variables in the bivariate probit model that derives both "investments in manure" and "redistribution expectation" variables. For instance, plot distance from household's residence may have such an effect.

Given that the specification of the bivariate model is at the household level and that most households operate on more than 1 plot (the average is 3.2 plots per household), it is not possible to measure the "distance" variable at the household level without running into serious measurement errors. Consequently, it is omitted from the bivariate probit model. However, a plot's distance from the household's residence may matter for both manure investment and tenure insecurity. On one hand, since transportation of manure to farther away plots is difficult, manure application may be limited to nearby plots. On the other hand, farther away plots may be easy targets for redistribution as it seems appropriate to allocate such lands to the nearby land-scarce households.

We tested the relevance of the above argument using the 1999 wave of the household survey, which contains detailed plot level data. The results from the fixed effects Tobit model at the plot level show that a plot's distance from the household's residence is a significant variable in determining both the probability and intensity of manure application (see Table 6). The endogeneity in the manure investment equation may thus be partly attributed to the omitted "distance" variable. Since the bivariate probit model gives better results in the presence of endogeneity regardless of its source, we proceed to discussing the bivariate probit results for the manure investment equation.

---

as the null is not rejected except for the manure investment equation, over rejection does not pose a problem for the test.

4.4.1 Investment in Manure

The results in Table 5 suggest that the bivariate specification is valid as ρ is significantly different from zero. Controlling for household characteristics, livestock ownership,[5] and survey site variations, the result shows that the risk of expropriation has a negative bearing on investment in manure. Application of organic manures results in increased soil organic matter content, water holding capacity, porosity, infiltration capacity, hydraulic conductivity, and water stable aggregation, and decreased bulk density and surface crusting (Haynes and Naidu, 1998). These characteristics of organic fertilizers make application of organic materials a long-term investment that maintains soil structure. Moreover, the benefit of the application may take relatively long to appear, as the accumulation process of the soil organic materials to recover to a "usable" stage is quite slow. Thus, when agents are tenure insecure the probability of investing for the long-term falls. Agents may substitute high-risk investments such as manure with low-risk ones including chemical fertilizers.

The plot level results reported in Table 6 also indicate the importance of tenure insecurity for investment in manure. Controlling for household fixed effects and plot characteristics, both the probability and intensity of manure application are significantly lower in the sharecropped and rented plots on which the farmers have limited land rights. This result is, however, contrary to the finding of Pender and Fafchamps (2006).

The auxiliary regression results from the bivariate probit model indicate that tenure length and experience of past redistribution are significantly correlated with redistribution expectation. While longer tenure term gives a sense of security and decreases households' perceived risk of expropriation, past experience of land redistribution elevates the perceived risk of expropriation. The results show that the probability of redistribution expectation

[5] Given that manure can be used for other competing purposes including as a substitute for firewood, "investable surplus" manure may be determined by the size of livestock owned.

increases with land size, supporting Alemu's (1999) claim that large farms have higher levels of tenure insecurity as they are prone to future redistribution. Using household data from southern Ethiopia, Holden and Yohannes (2002) also found some support for this claim.

Regional Variations Disaggregating the data at the regional level, the validity of the bivariate model of investment in manure is rejected in the case of the Amhara and Oromia Regions; hence a panel probit model is estimated. For the rest of the regions, i.e., Tigray and Southern Region, the bivariate probit model was found to be a valid estimator. The results are presented in Tables 6 and 7.

The results show that regardless of the region, tenure insecurity significantly lowers the probability of investing in manure. Owing to the mid 1990s experience of land redistribution in the Amhara Region, expectation of future expropriation appears to be an important decision variable in the region. In the Amhara Region, the probability of investing in manure would fall by 6.4% due to tenure insecurity. In the case of Oromia, more often than not, farmers face eviction threats for opposing the incumbent government on the pretext that they are allied with the "illegal" opposition party – OLF[6] (Oromo Liberation Front).In this region, the probability of investing in manure is lower by 12.4% among tenure insecure farmers. Similarly, tenure insecurity lowers the probability of investing in land in both Tigray and the Southern Region.

4.4.2 Investment in Tree and Soil Conservation

Table 9 shows the impact of expectation of expropriation on soil conservation and tree planting. For both investment indicators, the bivariate specification is rejected and hence we resort to the panel probit estimation method. On

[6] OLF boycotted the 1994/5 election on the ground that there is no equal grounds for the election contest. Thereafter, it has been labeled as an illegal terrorist group by the government. However, OLF is believed to have many sympathizers among the Oromos.

the aggregate level, the results show that tenure insecurity is insignificant in influencing the probability of undertaking soil conservation measures while it significantly and negatively influences the probability of tree planting. The insignificant result for investment in soil conservation may be due to the fact that soil conservation measures are mostly undertaken at the village level, and hence the investment decision may not depend on the agent's level of tenure security.

Regional Variations The results for investment in trees are mixed when the data is disaggregated at the regional level. As Table 10 shows, the coefficient of tenure insecurity is negative and significant for the Amhara and Southern Region and insignificant for the rest. The rejection of the bivariate specification at both the aggregate and regional level may imply that tree cultivation does not take place to promote tenure security. However, in the case of Tigray, tenure insecurity has a positive impact on tree cultivation though it is statistically insignificant. Once "investing to strengthen tenure security" is ruled out, the result suggests that households may shift to tree planting when faced with higher tenure insecurity as the investment in trees can easily be recovered in contrast to investment in manure or other soil conservation schemes.

In the case of investment in soil conservation, though tenure insecurity is insignificant in affecting investment in soil conservation at the aggregate level, tenure insecurity attenuates the probability of investing in soil conservation by around 17% in the Oromia Region, as shown in Table 11. For the other regions, tenure insecurity does not have any significant effect on investment in soil conservation.

4.4.3 Other Correlates

The other correlates of land-related investments include land size, land quality,[7] topography, household size, age of the household head, livestock ownership, and wealth proxied by value of asset. At the aggregate level, for all investment types, larger household size increases the probability of investing in land, implying that the activities are labor intensive, though it is only significant in the tree investment equation. The impact of land size differs across types of investment. While it positively affects the probability of investing in manure and soil conservation (probably due to the scale effect), it negatively affects the probability of investing in trees. The results show that the probabilities of investing in soil conservation increase with the slope of the land, which may be attributed to the motive of curbing erosion. Livestock ownership is particularly important in the investment in manure equation as the supply of manure depends on the number of livestock owned.

5 Land Titling and Tenure Security

In the context of developing countries, land registration and titling have been taken as a panacea for tenure insecurity and low levels of land investment though the empirical evidence is inconclusive (Easterly, 2008; Bromley, 2008). A process of land registration and titling was adopted in Ethiopia in 2004, thereafter more than 20 million parcels obtained certificates in a five year period (Deininger, Ali, and Alemu, 2008). In addition, the land use proclamations of the Amhara[8] and Oromia regions banned future land redistribution in order to strengthen tenure security. Preliminary evidence shows that there is a strong demand for certification, as demonstrated by the positive willingness to pay for a certificate and higher input use intensities among the certificate holders (Deininger, Ali, and Alemu, 2008). Holden,

[7] See Appendix 2 for computation of the land fertility index.

[8] The Amhara region land use proclamation, however, allows land redistribution if it is requested by at least 80% of the holders of the specific area (kebele).

Deininger, and Ghebru (2007) also reported a land market stimulating effect of the program.

It is important to note that land certification is a de jure step towards strengthening land rights. However, land rights might be determined by some de facto institutional arrangement. That is, though land rights are granted by law through certification, it could easily be violated for political and other reasons. Thus, for land certification to be an effective instrument, the policy should be credible in protecting titleholders against arbitrary expropriation of their land both at present and in the future. Credibility at present shows trust in that the government enacts what it legislates while credibility in the future implies policy non-reversal in the future. Both elements are important in defining the parameters for investment decisions and allocation of investible resources into short and long-term investments.

5.1 Credibility at the Status Quo

Adenew and Abdi's (2005) study on the Amhara land registration process reveals some interesting findings. First, though 35.5% of the surveyed households responded that the land registration would promote tenure security, only 1.4% of the respondents believed that it would reduce the likelihood of future land redistribution (Adenew and Abdi, 2005). This may suggest agents' lack of trust in the land administration institution given that these institutions had historically been extractive. As a result, land titling may not be expected to reduce the perceived risk of land expropriation through redistribution immediately.

Second, the above study notes the resistance of local political authorities against the registration process on the grounds that the process may reduce their control over smallholder farmers, who then may become less loyal, less willing to attend meetings or accept orders (Adenew and Abdi, 2005:24). These observations suggest a lack of commitment to implement the policy and show the strength of the incentive for policy reversal at various levels of

the government. In such an environment, the policy may miss its objective of promoting investment in land.

However, another recent observation shows that the policy's appeal for the rural households is getting stronger over time (Adal, 2008). This indicates that credibility develops over time. Policy non-reversal is, thus, a main requirement to keep this momentum and reduce the perceived risk of expropriation. The next section discusses the incentives for policy (non)-reversal and the necessary constraints to avoid policy reversal.

5.2 Credibility over Time: Policy Non-Reversal

The government decision on whether or not to reverse its policies is based on the net returns of the alternative decisions. Improved tenure security through land certification and a ban on land redistribution may lead to higher investment and agricultural output, which would generate higher tax income for the government. Higher tax income enables the government to strengthen its power, either through better delivery of public goods or by strengthening its repression machinery (Collier, 2009).

On one hand, promotion of tenure security may weaken the ability of the government to use land allocation as a political power instrument. Conversely, reversal of the land certification policy and practicing land redistribution would be costly in terms of the tax income sacrificed due to the disincentive impact on investment and output. However, controlling land allocation has a political payoff since it can be used to manage rural landlessness that may otherwise lead to riot or insurgency, loss of vote control, and emergence of a strong class that threatens political power of the incumbent.

Thus, the strategies of the government are either to stick to its policy and follow a non-expropriation regime or reverse its policy and continue expropriation. We denote the decision to expropriate E; and $E = 1$ when expropriation is exercised and $E = 0$ otherwise. The strategies of the state denoted σ are, thus, $(E = 1)$ and $(E = 0)$.

The government collects economic rent under a non-expropriation regime ($E = 0$) while under an expropriation regime ($E = 1$) it maximizes the rent derived from the greater political power that results from the control of land allocation[9] apart from the normal economic rent. At any point in time, the government's actions to either follow a non-expropriating or expropriating regime depend on the net returns from the strategies. Thus, the government chooses its strategies (σ, i.e., $E = 0$ or $E = 1$) by solving the following Bellman equation:

$$V = \max_{\sigma} \left\{ G\left(\sigma\left(E = 0\right)\right) + \beta \sum_{t+1}^{n} G\left(\sigma\left(E = 1\right)\right) \right\} . \tag{1}$$

$G\left(\sigma\left(E = 0\right)\right)$ and $G\left(\sigma\left(E = 1\right)\right)$ are the gains from the strategies of non expropriation and expropriation, respectively. β is the discount factor and n is the planning horizon of the government.

The equation is a simple Bellman equation that expresses the net present discounted benefit of the government. The problem the government faces is to come up with a strategy σ that solves equation [1].

Suppose that the strategy that solves [1] is policy reversal and continue expropriation ($E = 1$). In this case, expropriation entails cost. A certain fraction of the investment in the land may become dysfunctional, which in turn leads to reduced output and tax revenue[10]. This implies that the government loses $\tau\varphi Y$, where φ is the proportion of output lost, Y is output, and τ is the tax rate. However, expropriation also has a benefit in terms of stronger political control. We can re-write our Bellman equation to show

[9] The EU's Election Observation Mission to Ethiopia report (2005) illustrates this motive very clearly. Peasants were compelled to sign a commitment to vote for the incumbent party (EPRDF) and were threatened by land dispossession or deprivation of free rations. See pg. 4:
http://europa.eu.int/comm/external_relations/human_rights/eu_election_ass_observ/ethiopia/pre_stat_17-05-05.pdf

[10] The government loss may also include other macroeconomic disturbances, e.g., inflationary pressure and lower export earnings resulting from reduced output. The focus on tax receipt loss is only for brevity.

the return from expropriation as

$$V(E=1) = \tau(1-\varphi)Y + \beta W(E=1) \quad , \tag{2}$$

where $\tau(1-\varphi)Y$ is tax revenue after the fall in output and $\beta W(E=1)$ is the discounted gain in the coming periods from the increased political power due to expropriation, which was given as $\beta \sum_{t+1}^{n} G\left(\sigma\left(E=1\right)\right)$ in equation [1].

Now, suppose that the optimal strategy that solves the Bellman equation is to stick to the policy and practice non-expropriation. In this case, the government's return would be

$$V(E=0) = \tau Y + \beta W(E=0) \quad , \tag{3}$$

where τY is tax revenue and $\beta W(E=0)$ is the discounted future rent to be collected under non-expropriation as given in the second term of the Bellman equation.

The decision whether to reverse the policy or not depends on the gap between the returns under the two strategies, i.e., reversal [2] and non-reversal [3].

What factors put constraint against policy reversal?

Case 1:

Let us assume that the output loss depends on the level of investment undertaken – i.e., $\varphi(I)$ where I is land-related investment. This is not an unrealistic assumption as much of the empirical literature suggests a positive correlation between the level of output and land-related investments[11].

[11] See the survey article by Birkhaeuser et al. (1991) for a detailed presentation of the empirical results regarding the effect of investment (in the form of agricultural extension) on agricultural output.

That is,

$$V(E=1) - V(E=0) = -\varphi(I)\tau Y + \beta(W(E=1) - W(E=0)) \quad . \qquad (4)$$

Policy reversal is more profitable when $V(E=1) - V(E=0) > 0$ and $W(E=1) - W(E=0) > \frac{\tau Y \varphi(I)}{\beta}$; and vice versa. Thus, there is some critical level of $\varphi(I) = \hat{\varphi(I)}$ where the government would be indifferent between policy reversal and non-reversal; i.e., $V(E=1) = V(E=0)$ and

$$W(E=1) - W(E=0) = [\tau Y \hat{\varphi(I)}]\frac{1}{\beta} \quad .$$

In cases where $\varphi(I) > \hat{\varphi(I)}$, we can see from equations [4] and [5] that there would be no incentive for policy reversal as its cost would rise. Given that φ is an increasing function of investment, the incentive for policy reversal declines at a higher level of investment. Thus, a higher level of investment serves as a constraint against policy reversal.

Case 2:

Policy reversal is more likely when the government's future economic gains depend on the level of political control and power. When the future economic gains depend on the level of political control, the gains under an expropriation regime (policy reversal) dominate those of a non-expropriation regime (non-reversal). In such a case, $V(E=1) - V(E=0) > 0$ as the gap between the future gains under expropriation and non-expropriation is greater than the discounted tax revenue loss. That is, $W(E=1) - W(E=0) > \frac{\tau Y \varphi(I)}{\beta}$ and policy reversal would be quite attractive.

Case 3:

Institutional constraints that restrict the political gains from the control of land would discourage the attractiveness of the policy reversal. In such a

case, the future gains under the policy reversal may be lower than those of non-reversal as political gains are restricted and economic gains are lower with the policy reversal. That is, $W(E = 1) < W(E = 0)$ and under this condition equation [4] shows that $V(E = 1) < V(E = 0)$. Policy reversal is no more an incentive compatible strategy.

5.3 On the Likelihood of Policy Reversal in Ethiopia

Land title is "a promissory note issued by a government indicating that it stands ready to protect the title holders (the owner) against the predatory actions of others" (Bromley, 2008: 21). As such a land title does not protect its holders from government predation. Thus, other institutional constraints are required to protect title holders from the government itself. But when the government has absolute power, there is no third party to invoke the institutional constraints. With monopoly of political power, commitments for future actions are wide open for violation while democratic systems with shared power enforce commitment for future action (for a detailed discussion, see Acemoglu, Johnson, and Robinson, 2005).

The political environment in Ethiopia is closer to political power monopoly than democracy. The recent report of the Economist Intelligence Unit of the *Economist* described the situation in Ethiopia as:

"*... despite this shift to federalism, power remains highly concentrated within a small elite leadership*" (EIU, 2008: 5).

"*The federal constitution provides for an independent judiciary and the devolution of legal powers, but in practice the executive branch of government is virtually all-powerful. The judiciary is subservient.... The EPRDF continues to dominate all the formal institutions of the federal republic.*" (EIU, 2008:9-10)

With the absence of checks and balances, and the prevalence of political power monopoly, policy reversal would be an easy venture as long as the

net gain of the policy reversal dominates that of non-reversal. At any time when the political power derived from the control of land is required,[12] the commitments for better tenure security can be violated with no or little effort or resistance. The fact that land belongs to the public facilitates the violation of the commitment as the government has the final say in the allocation of land. In addition, such a political environment is open for coercion in the form of eviction threat in order to consolidate political power. As a result, though policy reversal does not take place, the main objective of the policy, i.e., better tenure security by reducing the risk of expropriation, may not be met.

Generally, policy reversal is possible as long as the net benefit of doing so is positive. Policy reversal implies a positive risk of expropriation in the future that discourages farmers' incentive to invest. Thus, for the land titling to reduce the perceived risk of future expropriation and encourage investment, greater institutional constraints that make policy reversal incentive incompatible are required. To guarantee the long-term benefits of land titling, other institutional reforms that limit the degree of resource control for political power consolidation are required. This essentially necessitates the system of checks and balances in the working of the government.

6 Conclusions

The empirical results of this paper indicate that tenure insecurity matters for the investment behavior of agents. The results suggest that tenure-insecure agents tend to cut their investment in risky land-related activities. The responses for tenure insecurity also differ widely depending on region and investment type. The policy implication of the empirical results is that land tenure security is an important component in stimulating land-related investment and hence the current land registration and titling policy

[12] Rural landlessness that may lead to riots or insurgency, loss of vote control, and emergence of a strong class able to threaten the political power of the incumbent may lead to policy reversal.

is a timely intervention in the right direction. However, without checks and balances in the working of the government, the policy will only be sustainable as long as it maximizes the net benefit of the ruling class. As such, the likelihood of policy reversal is an increasing function of political power monopoly. Institutional reforms that constrain the political power of the ruling class and hence restrict policy reversal should be an integral part of strengthening land rights.

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Appendix 1. Tables

Table 3: Pattern of Fertilizer Use

Pattern of Fertilizer Use		
		Percent
Fertilizer Use	Yes	48.3
	No	51.7
Type of Fertilizer Used	Natural	66.5
	Chemical	29.9
	Both	3.5
Type of Natural Fertilizer	Manure	62.6
	Humus	7
	Both	17.7
	Other	12.7
Reason for Not Using Fertilizer	Not aware	12.9
	Too expensive	10
	No money	49.3
	Not available	5
	Not good	3.4
	Other	19.6

Source: Computed from Central Statistics Authority: Agricultural Census, 2002

Table 4: Testing for Endogeneity of Expectation

Equation	ρ	$prob\ (null\colon\ \rho = 0)$
Manure	0.839	0.000
Soil	0.347	0.171
Tree	-0.027	0.942

Note: When $\rho = 0$, expectation would be exogenous in the investment equation.

Table 5: Panel Bivariate Probit Model of Investment in Manure

VARIABLES	Investment Equation	*Tenure Security Equation*
	Dependent: Manure Invt	*Dependent: Expectation*
Tenure Insecurity (Expectation)	-1.448***	..
	0.000	..
Land Area	0.0473**	*0.029*
	0.0215	*0.1214*
Land Quality Index	-0.241***	*-0.012*
	0.000	*0.8236*
Land Slope	0.187**	*-0.109**
	0.011	*0.108*
Access to Credit	0.222	..
	0.000	..
Household Head Education	-0.0014	*-0.00993*
	0.9023	*0.398*
Household Size	0.00543	*-0.026****
	0.6087	*0.0092*
Household Head Sex	0.119	*0.0435*
	0.152	*0.5891*
Household Head Age	0.008***	*0.0083****
	0.0006	*0.0001*
Off-Farm Income (Dummy)	0.349***	*0.0425*
	0.0000	*0.4846*
Livestock Ownership (TLU)	0.059***	..
	0.0000	..
Experience of Past Land Redistribution	..	*0.399****
	..	*0.0000*
Tenure Length	..	*-0.017****
	..	*0.0000*
Region 1 Dummy	0.205	*0.414****
	0.1183	*0.0017*
Region 3 Dummy	-0.556***	*0.316****
	0.0000	*0.0004*
Region 4 Dummy	-0.2000**	*-0.064*
	0.0203	*0.4529*
Rho	0.839***	
	0.0000	
Number of Observations	2746	
p values in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

Note: The reported estimation result is without imposing correlation between the random terms. Assuming correlated errors does not change the result significantly. The results are based on simulated maximum likelihood method using Halton draws in LIMDEP 9. The significance of ρ supports the validity of the bivariate probit specification.

Table 6: Fixed Effects Tobit Model of Plot Level Manure Investment

Dependent Variable: Quantity of Manure Applied	
VARIABLES	Marginal Effects
Land Size	-5.806
	0.2246
Plot Distance from Residence	-1.122***
	0.000
Intercrop Dummy	10.14**
	0.0338
Land Quality	15.382***
	0.002
Land Slope	-1.903
	0.4701
Irrigation Dummy	-3.197
	0.7613
Extension Participation Dummy	-9.707
	0.1695
Rented In Plot Dummy	-18.702*
	0.0638
Shared In Plot Dummy	-28.654***
	0.000
Observations	4999
p values in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

Note: The result is based on LIMDEP 9's brute force method. Honore's (1992) semi parametric estimator had been the only available procedure.

Table 7: Panel Bi-Probit Models of Manure Investment for Tigray and Southern Regions

	Tigray		South	
VARIABLES	Investment Equation	*Tenure Security Equation*	Investment Equation	*Tenure Security Equation*
	Dependent: Manure Invt	*Dependent: Expectation*	Dependent: Manure Invt	*Dependent: Expectation*
Tenure Insecurity (Expectation)	-1.341***		-1.442***	
	0.0000		0.0000	
Land Area	0.635**	*0.741**	0.057	*0.072**
	0.0434	*0.0591*	0.2225	*0.0606*
Access to Credit	0.0793	..	0.356***	
	0.5607	..	0.0009	
Household Head Education	0.026	*0.054*	-0.013	*-0.029*
	0.7883	*0.5654*	0.4368	*0.1277*
Household Size	-0.029	*-0.024*	-0.017	*-0.038***
	0.432	*0.5522*	0.355	*0.0363*
Land Quality Index	-0.117	*0.001*	-0.379***	*0.276****
	0.4286	*0.9936*	0.0053	*0.005*
Land Slope	0.154	*-0.070*	-0.134	*-0.029*
	0.284	*0.6175*	0.276	*0.8151*
Household Head Sex	-0.233	*0.121*	0.569**	*0.22*
	0.3667	*0.6312*	0.0398	*0.311*
Household Head Age	0.002	*0.0002*	0.013***	*0.0035*
	0.7609	*0.9799*	0.0044	*0.4203*
Livestock Ownership (TLU)	0.056	..	0.07***	
	0.1501	..	0.0043	
Experience of Past Land Redistribution	..	..	..	*0.952****
	..	..	..	*0.0001*
Tenure Length	..	*-0.075****	..	*-0.011****
	..	*0*	..	*0.0032*
Rho	0.999***		0.899***	
	0.0000		0.0000	
Number of Observations	289		837	
*** p<0.01, ** p<0.05, * p<0.1				
p values in parentheses				

Notes: The reported estimation result is without imposing correlation between the random terms. Assuming correlated errors does not change the result significantly. The results are based on simulated maximum likelihood method using Halton draws in LIMDEP 9. The significance of ρ supports the validity of the bivariate probit specification.

Table 8: Random Effects Probit Models of Investment in Manure: Amhara & Oromia Regions

	Amhara	Oromia
VARIABLES	Coefficient	Coefficient
Tenure Insecurity (Expectation)	-0.162*	-0.334***
	0.108	0.003
Land Size	0.151***	0.0550*
	0.004	0.075
Access to Credit	0.111	0.356***
	0.275	0.003
Household Head Education	0.00701	0.0108
	0.809	0.545
Household Size	0.0449*	0.0450***
	0.067	0.008
Land Quality Index	0.0653	0.236**
	0.495	0.018
Land Slope	0.718***	0.555***
	0.000	0.001
Household Head Sex	0.116	0.439***
	0.429	0.004
Household Head Age	0.00514	0.00451
	0.168	0.31
Livestock (Tropical livestock unit)	0.0731***	0.00963
	0.000	0.535
Constant	1.606***	0.622
	0.000	0.192
Observations	696	598
*** p<0.01, ** p<0.05, * p<0.1		
p values in parentheses		

Notes: The bivariate probit specification is rejected for manure investment equation in Amhara and Oromia regions.

Table 9: Random Effects Probit Models of Investment in Trees and Soil

VARIABLES	Tree	Soil Conservation
	Coefficents	Coefficients
Tenure Insecurity (Expectation)	-0.176***	-0.0834
	0.001	0.211
Land Area	-0.0297*	0.0406**
	0.096	0.034
Access to Credit	-0.0837	0.0801
	0.164	0.248
Household Head Education	0.0418***	0.00459
	0.003	0.712
Household Size	0.0446***	0.0118
	0.001	0.359
Land Quality Index	0.0749	0.129**
	0.158	0.026
Land Slope	0.160**	0.772***
	0.038	0.000
Household Head Sex	0.00541	-0.0964
	0.953	0.307
Household Head Age	0.0114***	-0.00163
	0.000	0.485
Value of Asset	0.0690**	0.119***
	0.030	0.001
Number of Oxen	-0.000735***	-0.101***
	0.000	0.003
Region 1 Dummy	-0.428***	2.677***
	0.008	0.000
Region 3 Dummy	-0.886***	1.474***
	0.000	0.000
Region 4 Dummy	-0.919***	1.054***
	0.000	0.000
Constant	-0.284	-2.604***
	0.321	0.000
Observations	1953	1934
*** p<0.01, ** p<0.05, * p<0.1		
p values in parentheses		

Notes: The bivariate probit specification is rejected for the soil and tree investment equations.

Table 10: Random Effects Probit Models of Investment in Trees by Region

	Tigray	Amhara	Oromia	South
VARIABLES	Coefficient	Coefficient	Coefficient	Coefficient
Tenure Insecurity (Expectation)	0.195	-0.217*	-0.0307	-0.520***
	0.472	0.082	0.741	0.002
Land Area	0.326	0.0697	0.0444*	0.091
	0.422	0.281	0.097	0.203
Access to Credit	0.179	0.207*	0.0139	0.251
	0.505	0.094	0.887	0.314
Household Head Education	0.0831	0.048	0.0154	0.0502
	0.427	0.2	0.756	0.169
Household Size	0.041	0.0421	0.0283*	0.0683*
	0.531	0.197	0.081	0.073
Land Quality Index	0.497*	0.109	0.125**	0.0829
	0.0656	0.326	0.044	0.671
Land Slope	0.0391	0.313*	0.192	0.392
	0.847	0.090	0.148	0.244
Household Head Sex	0.0297	0.0974	0.0845	0.498
	0.935	0.601	0.649	0.302
Household Head Age	0.00189	0.00926**	0.00903*	0.0375***
	0.846	0.045	0.083	0.004
Livestock (Tropical Unit)	0.106	0.0632***	0.00668	0.141**
	0.274	0.001	0.450	0.022
Value of Asset	0.00230**	0.000368**	0.0000247	0.000184
	0.034	0.027	0.619	0.425
Off Farm Income	0.00163*	0.000559**	0.000599**	0.0000359
	0.058	0.032	0.022	0.839
Constant	1.560*	0.77	0.907*	0.664
	0.064	0.11	0.076	0.486
Observations	150	475	456	362
*** p<0.01, ** p<0.05, * p<0.1				
p values in parentheses				

Table 11: Random Effects Probit Models of Investment in Soil by Region

	Tigray	Amhara	Oromia	South
VARIABLES	Coefficients	Coefficients	Coefficients	Coefficients
Tenure Insecurity (Expectation)	0.268	0.107	-0.488***	0.0795
	0.487	0.373	0.000	0.723
Land Area	1.104**	0.0704	0.0451	0.102
	0.037	0.220	0.206	0.239
Access to Credit	0.259	0.147	0.577***	0.121
	0.505	0.233	0.000	0.565
Household Head Education	0.471	0.0127	0.0139	0.0507*
	0.112	0.711	0.597	0.073
Household Size	0.109	0.0666**	0.0148	0.0694**
	0.201	0.019	0.452	0.023
Land Quality Index	0.143	0.0242	0.227	0.0666
	0.644	0.834	0.105	0.669
Land Slope	4.490***	0.613***	1.249***	1.050***
	0.005	0.004	0.000	0.000
Household Head Sex	0.14	0.429**	0.313*	0.478
	0.778	0.014	0.063	0.272
Household Head Age	0.00699	0.00141	0.00373	0.00836
	0.642	0.741	0.437	0.274
Livestock (Tropical Unit)	0.0543	0.00523	0.0327	0.121**
	0.657	0.737	0.185	0.025
Value of Asset	0.000579	0.000311*	0.000124	0.000437
	0.578	0.063	0.297	0.241
Off Farm Income	0.000329	0.0000173	0.000266	0.000875
	0.674	0.951	0.397	0.358
Constant	4.061**	0.336	1.344**	4.283***
	0.0395	0.52	0.022	0.000
Observations	149	463	452	357
*** p<0.01, ** p<0.05, * p<0.1				
p values in parentheses				

Appendix 2. Note on Land Fertility Index

On average, households own more than one plot of land with different characteristics. The survey asks households to identify their plots as fertile (Lem), somewhat fertile (Lem-Teuf), or infertile (Teuf). To capture the characteristics of the total land owned by a household, the land fertility index (LFI) is computed as:

$$LFI = \sum_{i=1}^{n} f_i w_i \quad ,$$

where w_i is the ratio of each type of land to the total land owned; and f_i is the land fertility indicator. f_i takes the value 3, 2 and 1 for fertile (Lem), somewhat fertile (Lem-Teuf), and infertile (Teuf), respectively. Thus, the LFI ranges from 1 to 3, where a higher values indicates better land quality.

Governance and Productivity: Microeconomic Evidence from Ethiopia

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Abstract

This paper examines the role of governance for agricultural productivity using household survey data from rural Ethiopia. The paper argues that the impact of governance is household specific and identifies some governance indicators accordingly. Political trust, competence of civil servants, and political connection are used as governance indicators. A stochastic frontier production function is specified and estimated to capture the effects of governance on productivity or technical efficiency of agricultural households. The results show that good governance could cut technical inefficiencies significantly and therefore could increase productivity.

Key Words: Governance, Agricultural Productivity, Efficiency, Political Trust, Ethiopia

JEL Classification: D13, D24, Q12

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Contents

1 Introduction

Evidence on the role of governance in explaining economic performance is abound. In their empirical study, Kaufmann, Kraay, and Zoido-Lobaton (1999) showed that there is a causal relationship from better governance to better development outcomes. Khan's (2006) review of the empirical literature also supports the positive role of good governance for economic performance. In the context of Ethiopia, Geda et al.et al. (2008) reported that the required growth rate to achieve MDGs in Ethiopia could be one percentage point lower with slightly better institutional factors.

One of the common features in the empirical literature is the overlap between the studies on governance and institutions. Most of the governance indicators are also used as indicators of institutional quality, though the two concepts are not necessarily the same. Therefore, the risk of expropriation by the government, government effectiveness, constraints on the government, political stability, and freedom from graft are some of the variables commonly used to build institutional indexes. Using variants of these indicators, many studies, e.g., Hall and Jones (1999), Rodrik et al. (2004), Acemoglu et al.et al. (2001, 2002), Dollar and Kraay (2003), and Easterly and Levin (2003), have examined the empirical link between institutions and growth.

Nevertheless, the empirical results have not passed without serious scrutiny. Glaeser et al. (2004) discussed the validity of the empirical results in detail. First, they noted that the usual measures of risk of expropriation and government effectiveness rise with economic development. That is, the causality may run from growth to these measures as opposed to the other way round. Second, the measure of constraints on the executives is volatile especially in developing countries, implying that it cannot be considered to show durable institutions. Besides, the perception-based indicators may be influenced by recent measures of growth, political events, and herd effects and hysteresis (Haque et al., 1996; Brewer and Rivoli, 1990; and Soverville and Taffler, 1995, respectively; all cited in Aron, 2000). Third, Glaeser et al. (2004)

argued that most of the instrumental variable estimation results are flawed.

Aggregate governance indicators could also be blunt tools for policy analysis at the country level as specific aspects of governance may be important in different countries (Kaufmann, Kraay, and Zoido-Lobaton, 2006). Moreover, as Pande and Udry (2006: 2) concluded, "this literature (using the aggregate governance indicators) is essentially complete" as the number of available instruments is limited, on top of the coarseness of the instruments, which prevents the analysis of how institutions affect growth. They continued by calling for micro data analysis to push the literature further. The present paper, therefore, takes the micro data analysis approach to look at the effect of governance on agricultural productivity using household survey data from rural Ethiopia.

The main contribution of this paper is that it allows for within-country heterogeneity in governance across communities and individuals. This is important as aggregate formal sector-based governance indicators are unlikely to capture the quality of governance faced by the average person in a developing country (see Pande and Udry, 2006, for a detailed discussion). The micro approach adopted in the present paper also contributes to the existing literature in two ways. First, it circumvents the need for aggregating attributes to construct governance indicators. As Kaufman and Kraay (2002) noted, aggregation may lead to incorrect inference as good performance on some dimensions does not imply good performance on others, and hence the aggregated indicator may not convey the right picture. Second, as most of the existing empirical literature depends on cross-country data, the results are prone to the problem of endogeneity between governance and economic growth with the resultant inaccuracy of instrumental variable estimates (see Glaeser et al., 2004). At a micro level, this problem is less of a concern as the causation from good individuals' economic performance to better governance is unlikely given the limited potency of individual agents in influencing the governance structure (see Weymouth and Broz, 2006, for a similar point).

Some studies have looked at how governance affects productivity at the cross-country level (see, e.g., Meon and Weill, 2005, Jayasuriya and Wodon, 2005, and Lio and Liu, 2004). However, the author is not aware of any study on how governance affects productivity using micro data. This paper thus attempts to fill this gap. The point of departure of this paper is that even though households are under the same governance structure, the effects of governance can be household specific depending on the transaction cost each household faces. Some households may face high transaction costs due to bad governance while others may not. For instance, political capital in the form of contact with the local bureaucrats may cut transaction costs significantly even when the overall governance is bad, suggesting that the effect of governance can in fact be household specific.

A stochastic frontier production function is thus specified and estimated to capture the effects of governance on household productivity. Unlike most cross-country studies that do not distinguish between inputs and factors facilitating production, the stochastic production frontier approach makes a clear distinction between these factors. An alternative specification based on Hall and Jones (1999) is also provided to check the robustness of the results.

Following Kaufmann, Kraay, and Zoido-Lobaton (1999) classification of governance indicators, the rule of law and effectiveness of government indicators are constructed at the household level. Political trust (trust in the government) is used as the rule of law indicator while households' perception of the competence of civil servants is used as an indicator for government effectiveness. In addition, in line with Rothstein and Toerell's (2008) emphasis on the primacy of impartiality as a measure of governance quality, political connection is used as an impartiality indicator.

The major finding of the present paper is that governance matters for productivity. Improvement in governance can cut inefficiency among farmers significantly. In general, the results suggest that transition from bad to

good governance[1] cuts the average farmer's inefficiency by 10- 15%. With good governance, output can be increased significantly without increasing input. This underscores the importance of good governance for growth and development.

The next section discusses the link between governance and productivity. Then Section 3 discusses the setting, the governance indicators, and the data. To address the issue at hand empirically, a stochastic frontier production function is adopted, and both the frontier production function and determinants of inefficiency are estimated simultaneously. The empirical model is presented in Section 4 along with the empirical results. Section 4 also contains a discussion on measurement errors and presents alternative specification as a robustness check of the frontier production function results. Section 5 concludes the paper.

2 Governance and Agricultural Productivity

2.1 Governance

There are many alternative definitions of governance. A broader definition is that it is the exercise of economic, political, and administrative authority to manage a country's affairs at all levels. It encompasses the role of public authorities in establishing the environment in which economic operators function and in determining the distribution of benefits as well as the relationship between the ruler and the ruled.[2] Kaufmann, Kraay and Zoido-Lobaton (1999: 1) define governance as "the traditions and institutions by which authority in a country is exercised. This includes (1) the process by which governments are selected, monitored, and replaced, (2) the capacity of the government to effectively formulate and implement sound policies,

[1] Note that the governance indicators are dummy variables. See Section 3.2 for the detailed description of the indicators.

[2] www.oecd.org/dac

and (3) the respect of citizens and the state for the institutions that govern economic and social interactions among them."

As identified by Rothstein and Teorell (2008), the definitions of governance do not say much about how its quality should be measured. This is because the definitions are too broad to distinguish between accesses and exercise of power, and between content of specific policy programs and the governing procedures. In addition, attempts to be more specific by defining good governance as "good for economic development" create another problem in measuring the quality of governance, as it is impossible to do so without first measuring the effect of governance on economic development (Rothstein and Teorell, 2008).

Rothstein and Teorell (2008) suggested using impartiality in access to political power and exercise of public authority to measure quality of governance. Impartiality entails equal access to politics; in the sphere of exercise of public authority, it implies enactment of laws and policies irrespective of the identity of the person in consideration, i.e. rule of law. Impartiality in administrative practices entails merit-based recruitment to civil service as opposed to personal contacts, bribes, ethnic identity, political leaning, and the like. It also rules out corruption, clientism, patronage, political favoritism, and nepotism.

However, impartiality alone may not capture the whole range of good governance (see Longo, 2008, and Wilson, 2008) and hence a range of criteria should be used. Longo (2008) identified effectiveness and efficiency as important elements of good governance. Bovaird and Loeffler (2007: cited in Longo, 2008) list accountability, transparency, citizen and stakeholder engagement, and fair and honest treatment of citizens as a set of desirable governance principles.

2.2 Governance and Agricultural Productivity

The importance of governance and institutions for agricultural productivity is echoed by Hayami and Rutan (1985). After examining the empirical evidence, they concluded that "... the basic factor underlying poor (agricultural) performance was neither the meager endowment of natural resources nor the lack of technological potential... The major constraint limiting agricultural development was identified as the policies that impeded rather than induced appropriate technical and institutional innovations" (Hayami and Rutan, 1985: 416). The 2008 World Development Report also supports the role of institutions for agricultural growth. "In China 60 percent of the dramatic expansion of agricultural output and 51 percent of the reduction in rural poverty from 33 to 11 percentage points between 1978 and 1984 have been attributed to institutional reforms..." (World Bank, 2008: 40).

Governance affects agricultural productivity through various channels. In the present paper, productivity refers to technical efficiency of farmers. Technical inefficiency denotes the failure to achieve a maximum level of output for a given technology and specific amount of inputs. In the context of developing countries, some of the most important components of governance include public service delivery, tax collection, conflict resolution, government effectiveness, and land tenure security. Lack of transparency and weak accountability give way for the proliferation of corrupt behavior that compromises the provision of public goods and services. Agricultural extension services, education, health and infrastructure projects suffer the consequences of corruption. In addition, lack of transparency and accountability gives incentive for arbitrary taxation. It also makes conflict resolution (e.g., through police and court) prone to corruption, which may result in a lengthy and costly conflict resolution process.

Bad governance in the form of non-meritocracy recruitment to the civil service leads to inefficient and ineffective bureaucracy. As much of modern agricultural inputs (e.g., fertilizer, pesticides, and improved seeds) and credit supply go through the government bureaucracy, the inefficiency of

the bureaucracy will be transferred to farmers in terms of costly access to agricultural input and credit. This results in lower rate of return on modern inputs and hence discourages their use. Given the complementarity between modern and other inputs (such as land, labor and capital), a lower level of modern input use leads to reduced productivity.

Another important channel is the impact of governance on agricultural technology adoption. Bad governance precludes participatory policymaking and hence policies flow from the top down as illustrated in Easterly (2008). This may result in imposition of inappropriate and incentive-incompatible technologies on the farmers, and with inappropriate technologies come inefficiencies.

Patronage, clientism, political favoritism, and nepotism are also characteristics of bad governance that affect agricultural productivity. In cases where political dissents are penalized through administrative means, uncertainty, such as in the form of eviction threat, prevails. Uncertainty may lead to lower productivity through its effect of hindering optimal use of resources.

Good governance that maintains security of land rights could affect agricultural productivity through its positive effect on critical land-related investments that determine overall farm productivity. When land rights are insecure, the expected return on land investment is lower, resulting in a slack in investment, which adversely affects the productivity of the other complementary inputs. In addition, with secure and properly defined land rights, land can be used as collateral to finance agricultural investments.

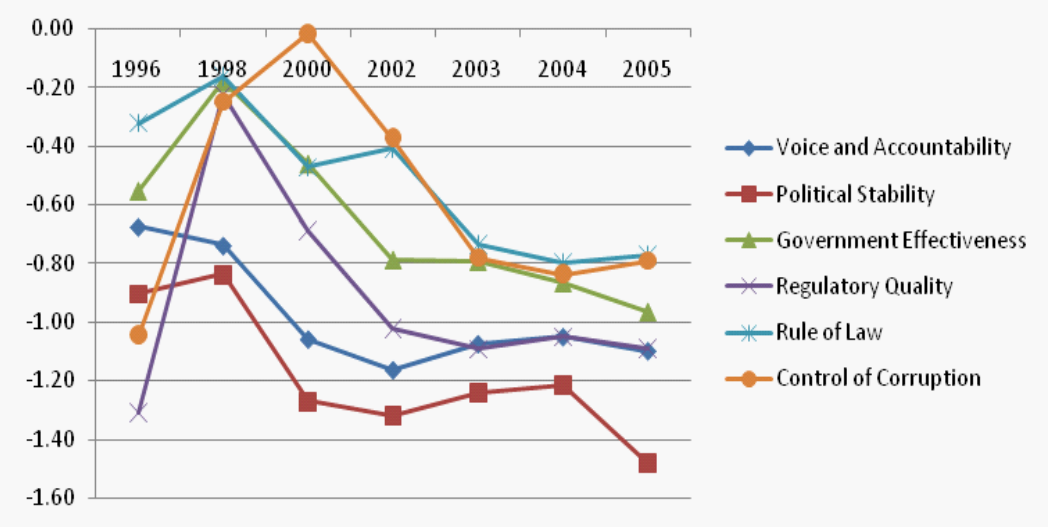
In general, bad governance reduces agricultural productivity through its adverse impact on the use and delivery of complimentary inputs. Bad governance in the form of arbitrary taxation and lengthy litigation processes leads to diversion of investable resources and to production inefficiencies. On the other hand, good governance cuts transaction costs, facilitates provisions of public good, makes markets more efficient, and therefore promotes agricultural productivity.

3 The Setting, Governance Indicators, and Data

3.1 The Setting: Governance in Ethiopia

The macro picture of governance in Ethiopia is daunting. According to the political rights and civil liberty indicators of Freedom House, the country is classified as "partly free." In terms of the African Research Program democracy and liberty indices, Ethiopia's average scores for the period 1960-2004 are 0.09 and 0.125, respectively, while the comparable scores for the SSA are 0.24 and 0.29, respectively. Transparency International's 2006 corruption perception index ranks the country 130th out of 163 countries. World Bank's governance indicators show a similar picture. The country is far from achieving good governance and the trend in Figure 1 shows that the quality of governance actually deteriorated during the 1996-2005 period.

Figure 1: Ethiopian Governance Indicators 1996 - 2005



The indicators range from -2.5 to 2.5, with higher values corresponding to better governance.Source: WB Aggregate Governance Indicators 1996 - 2005

Olowu's (2000) characterization of governance in Africa applies to Ethiopia

and may therefore shed light on the reasons for the deterioration of the quality of governance in Ethiopia.

> "Political life in Africa as in other Third World regions is characterized by patron-client relationships. The public sector becomes an instrument for building public support for factions that are competing for power.... The public sector is therefore dysfunctional in serving the public, but critical to the survival and sustenance of those who wield executive power....as a result... the public services lack even the basic meritocracy features of efficiency, productivity, and other universal values." (Olowu, 2000: 162)

Although the formal institutions have de jure political power, important political decisions are made outside of the formal institution by informal power networks behind the facade that hold de facto power (see EIU, 2008). Many positions from the federal to the local (kebele) level are filled by political loyalists. In rural Ethiopia, power groups are weakened and uprooted through land redistribution owing to the state ownership of all land. The ideology of the ruling party, i.e., revolutionary democracy, aims at collective mobilization of the people, led from above by the party (Abbink, 2006). As a consequence, transparency, meritocracy, and accountability are compromised, resulting in widespread corruption and inefficient government bureaucracy.

The public sector, organized in line with patronage and political favoritism, serves the interest of the ruling party even when it is at the expense of the welfare of the society. Consequently, the principles of impartiality and hence "the rule of law" are violated. Political dissents are penalized administratively through denial of public services, face threats of eviction from their land, and in extreme instances end up in prison (see Abbink, 2006; European Union, 2005).

Political freedom is seriously restricted especially in rural Ethiopia. In recent years, the government has strengthened its control over everyday life of households by stretching the reach of the local administration (kebele) even further. Under what used to be the lowest administrative unit (kebele), smaller administrative units (e.g., so-called gotts and garees the Oromia region) are created. Though the official purpose of these units is to undertake "developmental" activities, they are engrossed into closely supervising the activities and political stances of households. Expressions of opposing points of view are reported to higher authorities for possible administrative actions. This has seriously undermined people's freedom of speech, political freedom, and right to participate, resulting in lack of voice (see Human Rights Watch, 2005).

Due to lack of voice and accountability, inappropriate organizational schemes and policies are imposed on rural households. For instance, households are involuntarily organized into small groups for the purpose of "developmental activities" without having any say about the necessity of this organization, the developmental activities, and their role in the group. Households are obliged to participate in the developmental activity and contribute unpaid labor as requested by the group. Noncompliance leads to strictly enforced financial penalties without any due process.

Inapt agricultural inputs and practices are also imposed on farmers due to lack of accountability. In rural Ethiopia, extension agents put pressure on farmers to adopt a certain extension package as their performance evaluation is measured by in the number of adoptee farmers (Gebremedhin et al., 2006). Consequently, farmers are forced to adopt incongruous packages in order to get access to other essential modern inputs. While proper accountability restricts extension agents' power to impose a certain package, the misguided evaluation scheme and weak accountability actually promotes it.

In the context of rural Ethiopia, the quality of governance can affect farmer efficiency in many ways. Though it is difficult to list all possible ways, the following three are some of the most important channels. First, the

inefficiency of the public sector arising from the non-meritocracy recruitment into the civil service is transferred to farmers as a higher cost of distribution of modern inputs. As a higher input cost reduces the rate of return on the particular input, farmers may cut back their investment in such inputs. However, the dearth of modern inputs may impose constraint on the optimal use of other inputs, leading to higher inefficiency.

Second, top down imposition of organizational structure and extension packages due to lack of voice and accountability may lead to distorted resource allocation and hence higher inefficiency. While forced labor contribution to "developmental activities" diverts labor from agricultural activities, adoption of inapposite extension packages to get access to other inputs increases the cost of inputs and hence discourages their use. Third, for lack of impartiality of the local administration, which is organized in line with political favoritism and patronage, political dissents may be denied access to public services and face threats of eviction from their land. The resulting shortfall of public services and tenure insecurity may constrain the optimal use of resources and hence lead to higher inefficiency.

3.2 Governance Indicators

3.2.1 Political Trust

Political trust and its correlates are widely discussed in the political science literature (see Miller, 1974; Levi, 1998; Hetherington, 1998; Chanley et al., 2000; Anderson and Tverdova, 2003; Rahn and Rudolph, 2005). "Political trust happens when citizens appraise the government and its institutions, policy making in general and/or the individual political leaders as promise-keeping, efficient, fair and honest" (Blind, 2006:3-4). Rahn and Rudolph (2005) categorized the most common determinants of political trust into (1) quality of policy outcomes, (2) policy congruence, (3) procedural considerations, and (4) attributes of officeholders. The quality of policy outcomes is judged by the effectiveness of the government to formulate and implement

sound policies. Policy congruence refers to the policy preference of elected officials coincides with one's own policy preference. Procedural consideration and attributes of officeholders refer to procedural fairness and competence of the civil servants, respectively.

Overall, the literature suggests that higher political trust is correlated with indicators of good governance (see, e.g., Levi, 1998; Blind, 2006). Political trust is thus used as a proxy for the overall quality of governance. As a broad indicator, political trust may signal predictability of the government's future actions. A positive outlook of the government's future actions reduces the perceived investment risks, which in effect stimulates investment and increases productivity to the extent that input productivity depends on some complementary investments.

Trust in the government is used as an indicator of political trust. The survey asks households to indicate to what degree they believe the government does what is right for the people (on a 1-7 scale where 7 means high confidence). To minimize measurement errors, the trust variable is recoded into 0 and 1 where 1 indicates trust on government (slightly agree to strongly agree with "The government/government officials does/do what is right for the people") and 0 means lack of trust (strongly disagree to indifferent).

3.2.2 Competence of Civil Servants

Following Kaufmann, Kraay, and Mastruzzi's (2006) measure of government effectiveness by the quality of the civil service, among other indicators, households' perception of the competence level of civil servants is used as an indicator of government effectiveness. In rural Ethiopia, the government is the major supplier of fertilizer, extension packages, and credit. These goods and services are delivered to the rural farmers through government's local bureaucracy. The local bureaucracy is also in charge of land allocation, dispute settlement, and organization of voluntary labor contribution. Thus, the effectiveness of civil servants and local officials is an important element

for the efficient distribution of government-provided goods and services, land allocation, and settlement of disputes.

In rural Ethiopia, however, the responsiveness of the civil servants to address the local needs is questionable due to the incentive incompatibility of the political economic environment created by the government. Vaughan and Tronvoll (2003) noted that

> "The government has created a class of local administrators and civil servants who have benefited enormously from educational and administrative opportunities provided from above by the state/party/government. In addition to education, the government has recently provided markedly increased local government salaries. The loyalty and concern of administrators and civil servants is, unsurprisingly, focused sharply upwards towards the system which has benefited them, rather than downwards in the public service of their constituents, who may often seem largely irrelevant to their rise to influence." (Vaughan and Tronvoll, 2003:44)

The resulting lack of incentive to respond to local needs could affect the perceived competence of the civil servants adversely. However, it is important to note the government's initiative to improve governance through different capacity building programs[3] targeted to upgrade the competence of civil servants.

The survey asks households to rank their confidence (on a 1 to 7 scale where 7 means high confidence) in the competence of civil servants to do their job. To reduce measurement error, the responses are recoded into 0 and 1 where 1 indicates confidence in the qualification of civil servants (slightly

[3] The National Capacity Building Program (2001), Capacity Building for Decentralized Service Delivery (2002), and the Public Sector Capacity Building Program (2003) are some of the capacity building initiatives.

agree to strongly agree) and 0 shows lack of confidence (strongly disagree to indifferent).

3.2.3 Political Connection - Connection with local officials

Cronyism, arising through political connections, is a feature of bad governance as it violates the principle of impartiality in governance. Politically connected agents may disproportionately benefit from the preferential treatment they receive from politicians and policy makers. The empirical evidence in Fisman (2001), Johnson and Mitton (2003), and Faccio (2006) supports the positive role of political connection on firms' performance. Good governance that promotes impartiality is, however, expected to reduce the role of political connections. As such, better performance due to political connections can be the result of cronyism and hence bad governance. When cronyism rules, lack of political connection may limit performance due to restricted access to resources and public services. Political connection is thus used as an indicator of the quality of governance.

Following the empirical literature on the measure of political connection, households are labeled to have political connection with the local authority if: (i) the household head's parents are kebele officials; (ii) the household head is a kebele official; or (iii) the household head has close associates in his keble. This is closely related to Faccio's[4] (2006: 370-371) characterization of political connection.

In Ethiopia, some anecdotal evidence suggests the importance of connection with local authorities (kebele). For instance, according to Human Rights Watch (2005: 28-29): "... people who had good relations with kebele officials were allowed to carry massive amounts of fertilizer debt from year to year while for others repayment obligations were strictly enforced." In

[4] Faccio (2006: 370) measured political connection using the definition that "... a company is connected with a politician if one of the company's large shareholders or top officers is: (a) a member of parliament (MP), (b) a minister or the head of state, or (c) closely related to a top official."

addition, empirical evidence from the survey data of the same villages as in the present study shows that the rich, powerful, and connected individuals benefit disproportionately from the provision of public services such as extension package (Getachew, 2003).

Connection with kebele officials may lead to better access to credit supplied by the public institutions such as cooperatives, local organizations, and government sources. The descriptive statistics in Table 3.1 reveal that around 23.4% of kebele officials secured loans from government sources including kebeles while 15.4% of other households had access to government credit. On average, it appears that kebele officials have better access to credit from the government. Similarly, access to government loans is around 5.5 percentages points higher among households with a parent working as kebele official. The differences are statistically significant. The overall picture shows that access to credit is an increasing function of political connection. The pattern of chemical fertilizer use is similar to that of access to credit. That is, chemical fertilizer use is uniformly higher among politically connected farmers.

Table 3.1: Source of Credit and Fertilizer Use

	Kebele Member		Kebele Relationship		Parents are Kebele officials	
Source of Loan (in%)	Yes	No	Yes	No	Yes	No
Cooperatives	12.3	6.0	10.6	5.0	8.3	7.1
Local organizations	7.8	3.4	4.3	4.3	5.0	4.2
Bank	1.9	0.7	0.7	1.1	0.8	1.0
Government	23.4	15.4	18.2	16.2	21.7	16.2
Microcredit	13.6	11.6	11.6	12.4	14.2	11.5
Fertilizer use per hectare in kg (among users only)	52.9	44.9	50.2	44.3	49.7	46.2

Source: Author's computation from the survey data described in Section 3.3

3.3 Data

The data comes from the sixth round of the Ethiopian Rural Household Survey conducted in 2004. The total sample contains 1,372 households in 17 peasant associations in 15 districts (woredas). Following Croppenstedt and Muller (2000), only cereal-producing farmers with ox-plow technology are considered to focus on a specific technology. This leaves 937 households for the analysis. The descriptive statistics are provided in Tables 3.2 to 3.4.

The overall picture presented in Table 3.2 shows scarcity of land (1.86 hectare per household); a low level of household head's education (1.3 years); a rain-fed nature of agriculture (only 27% of households have irrigated land); and scarcity of farm animals (an average holding of 1.1 oxen per household).

The governance indicators showing the mean levels of trust in the government, government officials, and kebele officials range from 4.31 to 4.68 on a 1 to 7 scale. Disaggregating the trust measurements into the different categories, Table 3.3 shows that about a quarter of the households are skeptical toward the claim that the government maximizes social welfare in the form of "doing what is right for the people". The combined proportions of households who do not trust and who neither trust nor distrust the government and the kebele (local authority) officials are 42.3% and 47.3%, respectively. This implies that about half of the households either do not trust or have low levels of trust in government and kebele officials.

Table 3.2: Descriptive Statistics

VARIABLES	Mean	Standard Deviation	Range
Value of output	899.74	869.54	104 - 8986
Land size (in hectare)	1.86	1.5	0.125- 21
Household size	4.83	2.3	1-15
Working age household members	2.86	1.47	1-11
Number of oxen owned	1.1	1.08	0 - 9
Access to credit (dummy 1=yes; 0=no)	0.76	0.43	0 -1
Household head education	1.33	2.49	0 - 14
Age	50.3	15.05	18 – 99
Sex of the household head (dummy 1= male; 0=female)	0.74	0.44	0 -1
Irrigated land (dummy 1= yes; 0=no)	0.27	0.44	0 -1
Land Fertility Index	1.65	0.75	1-3
Lack of oxen at pick season (dummy 1= yes; 0=no)	0.34	0.47	0 -1
Poverty Status: Self reported (dummy 1= Poor; 0=Non-poor)	0.30	0.46	0 -1
GOVERNANCE INDICATORS			
Trust in Government	4.68	1.58	1-7
Trust in Government Officials	4.49	1.63	1-7
Trust in Kebele Officials	4.31	1.67	1-7
Kebele membership of the household head (dummy 1= yes; 0=no)	0.23	0.42	0 -1
Trust in government at village level	4.7	0.43	3.7 - 5.3
Trust in government officials at village level	4.5	0.44	3.5 - 5.2
Trust in kebele officials at village level	4.3	0.41	3.3 - 5.0
Perceived transfer rights (dummy 1= yes; 0=no)	0.76	0.43	0 -1

Source: Author's computation from the survey data described in Section 3.3

In terms of regional variation, the levels of trust in the government and government officials are the highest in Tigray and the lowest in Oromia (see Table 3.4). Given that Ethiopian politics is organized along ethnic lines and that the executive power is dominated by the Tigrians (Abbink, 2006), Tigray's high level of trust in the government is well justified. The lowest levels of trust in Oromia may be attributed to the widespread political and administrative repression, as elaborated in the Human Rights Watch (2005) report on Ethiopia, aimed to control political dissents.

Table 3.3: Trust

Percentage of Households:	Political Trust: Trust on Government	Competence of	
		Government Officials	Kebele Officials
Strongly disagree	2.9	4.7	5.5
Disagree	14.4	15.6	18.2
Slightly disagree	7.5	9.7	12
Neither agree nor disagree	10.2	12.2	11.5
Slightly agree	25.4	23.4	23.4
Agree	34.7	30.4	26
Strongly agree	5	3.9	3.4

Table 3.4.: Trust on Government by Region

	Trust on		
Region	Government	Government officials	Kebele officials
Tigray	4.87	4.80	4.63
Amhara	4.69	4.46	4.36
Oromia	4.36	4.25	4.03
South	4.77	4.35	4.04

Source: Author's computation from the survey data described in Section 3.3

4 Empirical Framework and Results

4.1 Empirical Framework

Agricultural production in rural Ethiopia is characterized by multiple crop production. On average, the sample households each own around five plots and in most cases each plot is used to grow different crop types. This calls for a multiple output distance function approach. The distance function is proposed by Shephard (1953, 1970) and used, e.g., by O'Donnell and Coelli (2005) and Brummer, Glauben, and Lu (2006) to characterize multi-output production technology.

In practice, an important problem in estimating an output distance function arises when the output mix is so diverse that only a few farmers produce similar combinations of crops. In such a case, a significant proportion of the observations will be lost (see Appendix 2 for a detailed discussion). Given that this is true for the data at hand„ a single output stochastic production approach is adopted where all crop outputs are aggregated using the appropriate prices.

The Aigner, Lovell, and Schmidt (1977) type of a Cobb Douglass production frontier function is given as [1]

$$\ln Y_i = \beta_0 + \beta \ln X_i + u_i + v_i \ , \tag{1}$$

where Y is the total value of output divided by a Laspeyres price index[5], X is the vector of agricultural inputs, v is the symmetric error term, and u is the inefficiency term.

Following Battesse and Coelli (1995), truncated normal distribution[6] is as-

[5] The price index is obtained by taking a weighted average of the price faced by each household; the weights are the respective proportions of the crops in total value of output (see Croppenstedt and Muller, 2000).

[6] Empirical evidence shows that neither ranking nor decile composition of inefficiency is sensitive to the distributional assumption (see Kumbhakar and Lovell, 2000).

sumed for $u_i = |U_i|$ where $U_i \tilde{} N\left[\mu, \sigma_u^2\right]$. The inefficiency equation is given as

$$\mu_i = \sum_g \delta_g Z_g \ , \tag{2}$$

where $\mu_i = E(\exp(u_i/\varepsilon_i))$ *and* $\varepsilon_i = v_i + u_i$, Z_g are the determinants of technical inefficiency, which include indicators of governance and household characteristics, and δ_g are the marginal effects of determinant Z_g.

Technical efficiency of production of household i is given by $TE_i = E\left[\exp\left(-u_i\right)/\varepsilon_i\right]$.

As estimating [1] and [2] individually may lead to biased results (see Kumbhakar and Lovell, 2000), the maximum likelihood method is used to estimate the stochastic production frontier and the inefficiency effects simultaneously.

4.2 Empirical Results

Table 4.1 presents the results from the maximum likelihood estimation of the stochastic production frontier [1] and [2]. Table 4.2 presents tests on whether the stochastic production frontier model with inefficiency component is a valid specification. That is, in decomposing the error term into random disturbance and an inefficiency effect, the existence of an inefficiency effect is assumed. Table 4.2 presents the test results on the plausibility of this assumption. In all specifications of the frontier model, the tests reject the null hypothesis that the deviation from the frontier is only due to random noise, which support the existence of inefficiency effects and hence the relevance of the stochastic frontier model.

The results show that land, labor, oxen, and land fertility are the important variables in explaining output. The site and regional dummies are also significant, suggesting different levels of frontier for each locality considered.

The returns to scale, considering land, labor, and oxen, range from 0.53 to 0.56, suggesting decreasing returns to scale. This result is comparable with the ones reported by Weir and Knight (2000) and Croppenstedt and Muller (2000), which range from 0.56 to 0.67. The average efficiency ranges from 56% to 64% depending on the specification.

The stochastic production function is estimated by introducing the governance indicators in the inefficiency equation first sequentially and then jointly. The second column of Table 4.1, Model 1, shows that political trust measured by trust in the government matters in explaining inefficiency. The coefficient on the trust in the government is negative and significant suggesting that households who trust the government are less inefficient by around 14%. That is, by improving governance, mean efficiency could increase from 61% to around 70%.

Table 4.1: Stochastic Frontier Production Function with Household Level Governance Indicators

Production Frontier Model						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Log (Land Area)	0.336***	0.332***	0.333***	0.331***	0.335***	0.327***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Log (Oxen)	0.177***	0.171***	0.167***	0.175***	0.173***	0.172***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Log (Labor)	0.0457**	0.0468**	0.0409*	0.0403*	0.0421*	0.0410*
	(0.05)	(0.04)	(0.08)	(0.08)	(0.07)	(0.07)
Land Fertility Index	0.0219**	0.0227**	0.0215**	0.0212**	0.0216**	0.0217**
	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.03)
Sex of the Household Head	0.159**	0.152**	0.138*	0.143**	0.157**	0.139**
	(0.02)	(0.03)	(0.05)	(0.04)	(0.03)	(0.05)
Age of the Household Head	-0.00400**	-0.00406**	-0.00335**	-0.00352**	-0.00378**	-0.00359**
	(0.02)	(0.01)	(0.05)	(0.04)	(0.02)	(0.03)
Constant	7.244***	7.212***	7.272***	7.275***	7.272***	7.259***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Inefficiency Model						
Political Trust	-0.143***			-0.147***	-0.138***	-0.0729
	(0.00)			(0.00)	(0.01)	(0.28)
Competence of Civil Servants		-0.150***				-0.105
		(0.00)				(0.11)
Political Connection (Kebele Membership)			-0.114*	-0.120**		-0.121**
			(0.05)	(0.04)		(0.04)
Political Connection (Kebele Relationship)					-0.0951*	
					(0.05)	
Education of Household head	-0.0279***	-0.0272**	-0.0244**	-0.0244**	-0.0253**	-0.0239**
	(0.01)	(0.01)	(0.03)	(0.02)	(0.02)	(0.03)
Access to Credit	-0.0227	-0.0243	-0.0185	-0.0242	-0.0282	-0.0263
	(0.68)	(0.66)	(0.73)	(0.65)	(0.60)	(0.63)
Lack of Oxen	0.218***	0.228***	0.224***	0.213***	0.218***	0.218***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Poor household	0.229***	0.226***	0.237***	0.233***	0.230***	0.231***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Mean Efficiency	0.61	0.60	0.57	0.63	0.64	0.64
Observations	794	794	794	794	794	794

p-values in parentheses; *** significant at 1%, **significant at 5%, *significant at 10%

Notes: Regional dummies are included in all of the specifications to capture differences in production frontier across the regions. The inefficiency term is assumed to be distributed as truncated normal.

Table 4.2: Testing for an Inefficiency Effect

	Null Hypothesis $H_0: \sigma_u = 0$		
	Log (Likelihood)	$\chi^2 = (1)$ values	$Prob > \chi^2$
Model 1	-770.82	6.22	0.006***
Model 2	-772.88	6.46	0.006***
Model 3	-784.38	7.76	0.003***
Model 4	-771.85	6.14	0.007***
Model 5	-764.65	6.07	0.007***
Model 6	-764.78	5.87	0.008***

Note: The frontier production function assumes that the deviation from the frontier can be decomposed into a random error component (v) and an inefficiency effect (u). However, this is a testable hypothesis with the null hypothesis H_0: σ_u=0: i.e., no inefficiency effect. The test results for all the specifications in Table 4.1 reject the null hypothesis in support of significant inefficiency effects.

This result can be interpreted considering the use of "the political trust" variable. Political trust is a broad indicator of governance, and it emerges when individuals appraise the government and its institutions as promise-keeping, efficient, fair, and honest (Blind, 2006). Political trust thus implies that individuals are faced with a governance structure that promotes predictability and reduces transaction cost. In this context, good governance that maintains predictability, efficiency, and fairness would boost technical efficiency of households. A possible channel for this to happen may be through a reduction in insecurity and transaction costs that promotes investment and facilitates the optimal use of existing resources.

Improvement in the competence of civil servants and controlling cronyism at the local administrative levels could cut inefficiencies in the agricultural sector. Improved civil service can be revealed as enhanced efficiency in public service delivery while limiting cronyism works by facilitating equal

access to public goods and services. The empirical results in Table 4.1 show that the competence of civil servants has a significant and negative effect on inefficiency. Given that individuals' perceptions of the competence of civil servants are derived from their experiences in dealing with the civil servants, households with experiences of competent civil servants exhibit a 15% fall in inefficiency (Model 2). For instance, agricultural extension agents are mandated to serve a certain number of households in a given village. Given heterogeneity in the competence of the extension agents, households interact with extension agents that have varying levels of competence. Households' evaluation of the competence of civil servants will thus be shaped by the type of extension agents they have interaction with. When households are faced with competent extension agents, they are likely to acknowledge the competence of the agents, and may also exhibit higher levels of productivity as competent agents deliver better extension services.

Political connection (kebele membership) also has a significant and negative effect on inefficiency: political connection implies an 11% fall in inefficiency (Model 3). The symmetric implication of this result is that lack of political connection is associated with higher inefficiency as political connection leads to cronyism, which disproportionately benefits the politically connected and hurts the unconnected. This result is consistent with Goldstein and Udry's (2005) finding in the case of Ghana. They found that farmers who lack local political power under-invest and therefore produce lower output because of the uncertainty of their land tenure status.

The political connection variable, measured by "membership in the local authority", may cast some doubt if better-off households are elected into the local authority. In this case, the observed correlation between political connection and productivity cannot be attributed to the effect of political connection. To test for this channel, we used the panel nature of the data to examine whether historical income predicts the probability of membership in the local authority by the end of the survey period. The test shows that neither the average nor the levels of income during the period 1994–2000 affect the probability of being part of a local authority in 2004. Though this

channel is not supported by the data, the variable "relationship with kebele officials" is introduced in Model 5 to account for the possibility of this effect. The result is similar to the previous one although the coefficient is lower.[7]

The governance indicators are introduced in combinations in Models 4 to 6. The coefficients of political trust and political connection remain significant and negative. When the political trust and civil servants competence variables are combined as in Model 6, political trust becomes insignificant and its effect on inefficiency drops by almost half from around 14% to 7%. The coefficient on the competence of civil servants remains negative and significant at 11%. This is mainly due to the strong correlation between political trust and civil servants competence. .

Other correlates of inefficiency include lack of oxen, level of education, and access to credit. Lack of oxen at harvest time increases the mean inefficiency by around 21% while education appears to be a significant variable in cutting inefficiency. The result shows that one more year of schooling would cut inefficiency by 2.5-3%. Access to credit also has a negative effect on inefficiency though it is statistically insignificant.

It is important to note the possibility of endogeneity of the perception-based governance indicators in the productivity equation. When access to credit, inputs, and public services depends on political connection, individuals may exhibit higher trust in the government along with higher productivity, leading to the problem of endogeneity. To account this, the individual level governance indicators are substituted by village level average governance indicators as these are not causally correlated with political connection.

Table 4.3 introduces the governance indicators at the village level. Consistent with the earlier results, the coefficients of the village level governance indicators are negative and significant. This suggests that improvements

[7] This variable may not solve the problem if there are cases where households deliberately invest in political capital through establishing a relationship with the local authority as Ehrlich and Lui's (1999) theoretical model suggests. However, the panel data rejects this possibility as past income does not predict the probability of being politically connected.

in the quality of governance at the village level would cut inefficiency significantly. However, this result should be viewed with the caveat that the variation in the governance indicators at the village level is limited by the number of survey sites, i.e., 17 villages.

The empirical result can be extended to highlight the dynamic effects of governance. Governance at time determines the economic outcomes at time and ahead. Consider an individual who is impoverished due to the adverse effects of the governance structure at time . At time , the individual may not have enough resources to invest in her land, which will make her less efficient. That is, bad governance in the past may affect outcomes at present and in future periods. The coefficient of the poverty status indicator in the inefficiency model may collaborate with this story. In all the specifications, the results show that poor households are less efficient than the non-poor; their difference in inefficiency being around 23%.[8]

Overall, the results suggest that improvement in governance would cut inefficiency significantly. With good governance, output can be increased significantly without additional input. This underscores the importance of good governance in the process of growth and development.

[8] No inference is made from the results regarding whether poverty causes inefficiency or vice versa. Nevertheless, once bad governance has made households inefficient and hence impoverished, they are likely to remain poor as poverty and inefficiency reinforce each other.

Table 4.3: Stochastic Frontier Production Function with Village Level Governance Indicators

Production Frontier Model			
VARIABLES	(1)	(2)	(3)
Log (Land Area)	0.429***	0.430***	0.428***
	(0.00)	(0.00)	(0.00)
Log (Oxen)	0.214***	0.213***	0.213***
	(0.00)	(0.00)	(0.00)
Log (Labor)	0.0592*	0.0589*	0.0603*
	(0.10)	(0.10)	(0.09)
Land Fertility Index	0.0203**	0.0206**	0.0207**
	(0.02)	(0.02)	(0.02)
Manure Application (Dummy)	0.0188	0.0181	0.0202
	(0.67)	(0.68)	(0.65)
Constant	6.956***	6.958***	6.944***
	(0.00)	(0.00)	(0.00)
Inefficiency Model			
Political Trust	-0.182***		
	(0.00)		
Competence of Civil Servants		-0.194***	
		(0.00)	
Competence of Kebele (local) Officials			-0.207***
			(0.00)
Political Connection	-0.680***	-0.677***	-0.675***
	(0.00)	(0.00)	(0.00)
Education of Household head	-0.0431	-0.0427	-0.0433
	(0.16)	(0.17)	(0.16)
Access to Extension	-0.0514	-0.0512	-0.0551
	(0.77)	(0.77)	(0.75)
Access to Credit	0.145	0.154	0.165
	(0.35)	(0.32)	(0.29)
Soil conservation	-0.122	-0.117	-0.105
	(0.38)	(0.40)	(0.45)
Lack of Oxen	0.420***	0.425***	0.426***
	(0.00)	(0.00)	(0.00)
Observations	898	898	898

p-values in parentheses; *** significant at 1%, **significant at 5%, *significant at 10%

Notes: Village dummies are included in all of the specifications to capture differences in production frontier across the villages.

4.3 Measurement Errors in the Governance Indicators

As is common with proxy variables, the governance indicators may be measured with error if political trust and perceptions of civil servant competence (trust in general) are based on factors that are unrelated to quality of governance, such as allegiances and preference (as in Anderson and Tverdova, 2003) and preference for a certain type of institution because of its distributional consequences (as in Acemoglu et al., 2005). That is,

$T = Trust = f(G, W)$ where G is governance and W is other factors.

In terms of the inefficiency equation (eq. 2),

$IE = Inefficiency = f(T(G, W), Otherfactors)$.

The effect of governance on inefficiency is given as

$\frac{\partial IE}{\partial G} = \frac{\partial IE}{\partial T}\frac{\partial T}{\partial G}$.

In the absence of random measurement error and when trust is completely determined by governance, $\frac{\partial T}{\partial G} = 1$ and $\frac{\partial IE}{\partial G} = \frac{\partial IE}{\partial T}$. That is, the inefficiency equation estimated with the trust variables captures the effect of governance correctly. Otherwise, $\frac{\partial T}{\partial G} \neq 1$, $\frac{\partial IE}{\partial G} \neq \frac{\partial IE}{\partial T}$, and the effect of governance will be either over or underestimated. When the magnitude of $\frac{\partial T}{\partial G}$ is known, the estimated parameters of the trust variables need to be adjusted by this magnitude to obtain a better picture of the effect of governance on inefficiency.

Given the data at hand, the above magnitude cannot be determined. However, the 2007 wave of the World Values Survey for Ethiopia enables us to obtain a rough estimate. Using this data, trust in government is regressed on the only two governance indicators in the survey question (respect for civil rights and democratic governance) and other controls (see Appendix 3 for the results and definitions of the variables used). The results show

that the governance indicators are significant in affecting trust in government. Using the OLS standardized beta coefficients,[9] the value of $\frac{\partial T}{\partial G}$ is computed to 0.73. Assuming that this approximation is acceptable, scaling the estimated parameters of the trust variables in the inefficiency equation by this magnitude may give a better picture of the effect of governance on inefficiency.[10]

The presence of random measurement error in the trust variable, $Trust_i = \gamma_0 + \gamma_1 G_i + \varepsilon_i$ where ε_i is the random error, will bias the coefficient toward zero when the random error is additive and independent of the true value of G. In this case, the above adjustment does not give the correct picture and the estimates will suffer from attenuation bias. However, given that the recoding of the trust variables into 0 and 1 minimizes the random measurement errors, the scaling effect may be much more important than the random error.

Considering the measurement error in the governance indicators under the assumption that random errors are not so important, the estimated governance parameters need to be multiplied by the magnitude of $\frac{\partial T}{\partial G} = 0.73$. For instance, the adjusted effect of governance, measured by trust in the government, on inefficiency will fall in absolute value from -0.143 (in Model 1) to -0.102.

4.4 Alternative Specification

The additional parametric restriction on the composite error term and the possibility of correlation between inefficiency and input use may cast some doubt on the estimates of the stochastic production function. As it is difficult to address these issues without panel data, an alternative specification based

[9] The marginal effects from the ordered probit model are not manageable for such an analysis as the marginal effects vary depending on the outcomes of the dependent variable.

[10] This is by and large true in the case of an OLS model. In the case of maximum likelihood estimation, there is an additional non-linear effect along with the scale effect (Levine, 1985). Here the non-linear effect is disregarded.

on Hall and Jones (1999) is provided to check the robustness of the results. The Hall and Jones (1999) type of the Cobb-Douglass production function is specified as:

$$y = ASk^{1-\alpha}H \ , \tag{3}$$

where y is per capita output, A is exogenous technology, S is social technology, k is capital per labor, and H is human capital.

The empirical counterpart of the above specification is given as:

$$\ln y_i = \beta_0 + \beta_1 \ln S_i + \beta_2 \ln k_i + \beta_3 \ln H_i + \beta_j \sum_{j=1}^{n} X_j + \varepsilon_i \ , \tag{4}$$

where $\beta_0 = \ln A$, X_j is a vector of other control variables, and ε_i is a random iid error term.

Social technology is the socially provided way of organizing production activities. It is the constraint imposed by society in managing economic activities. In this sense, it represents the state of governance faced by the economic agents. Ideally, the social technology or governance is supposed to facilitate economic activities and reduce risks. However, bad governance adversely affects the economic agents as it represents a regress in social technology. Bad governance may make agents' operating environment very costly and hence reduce the return on investment. The effects of governance on productivity would thus depend on the operation condition it creates for economic agents. As in the previous section, governance/social technology is measured by political trust, civil servant competence, and political connection.

An important problem on the empirical side is the possibility of endogeneity of perceptions of agents (trust in the government and government officials). In cases where clientism and patronage play an important role in access to inputs and public goods, beneficiary agents from such an arrangement may

exhibit higher productivity and positive perceptions of the government and government officials. If these factors are not captured, the empirical results will suffer from endogeneity bias due to omitted variables. Relationships with the local authority and access to credit and extension services are thus included to minimize the omitted variable bias. The estimated results are provided in Table 4.4.

Table 4.4: OLS Estimates of A Simple Production Function

Dependent: Log(Output/Labor)	(1)	(2)
Political Trust	0.106**	0.0970**
	(0.02)	(0.03)
Household's head relation with Kebele		0.158***
		(0.00)
Access to Extension		0.0899
		(0.12)
Log (Land Area)	0.404***	0.399***
	(0.00)	(0.00)
Log (Oxen)	0.280***	0.262***
	(0.00)	(0.00)
Log (Labor)	-0.969***	-0.961***
	(0.00)	(0.00)
Land Fertility Index	0.0215*	0.0212*
	(0.08)	(0.08)
Age of the Household Head	-0.00319**	-0.00267*
	(0.03)	(0.07)
Sex of the Household Head	0.0538	0.0448
	(0.36)	(0.43)
Education of Household head	0.0263***	0.0228**
	(0.01)	(0.02)
Access to Credit	-0.0253	-0.0170
	(0.58)	(0.71)
Off-farm Employment Dummy	-0.00710	-0.0194
	(0.88)	(0.68)
Manure Application Dummy	0.0341	0.0205
	(0.48)	(0.67)
Soil Conservation Dummy	-0.0443	-0.0580
	(0.35)	(0.22)
Illness during harvest time	-0.0807	-0.0881
	(0.15)	(0.12)
Crop Failure	0.0239	0.0221
	(0.61)	(0.64)
Constant	5.330***	5.290***
	(0.00)	(0.00)
Observations	831	831
R-squared	0.64	0.65

Robust p-values in parentheses; *** significant at 1%, **significant at 5%, *significant at 10%

Notes: Village dummies are included in all of the specifications to capture differences in production frontier across the villages.

The qualitative conclusions of the results in Table 4.4 are consistent with the stochastic frontier estimation results. Good governance, measured by political trust (trust in the government), is positive and significant in explaining productivity. Consistent with others' findings, land area cultivated, number of oxen owned, and education level of the household head affect productivity significantly and positively.

5 Conclusion and Some Implications

This paper approaches the issues of how governance affects economic performance from a microeconomic perspective. The main hypothesis is that the effects of governance are household specific. Accordingly, governance indicators at the household level are developed in line with the cross-country studies on governance indicators. Political trust, civil servant competence, and local level political connections are used as governance indicators.

The empirical results suggest that transition toward good governance would cut the average level of farmers' inefficiency by 10-15%. With good governance, output can be increased significantly without additional input. This underscores the importance of good governance for growth and development.

The main policy implication of the empirical results is that promotion of good governance should be a major objective in order to achieve higher levels of output and reduce poverty. Maintaining rule of laws that cut transaction costs, improving the competence of civil servants, and promoting impartiality to reduce cronyism should be prioritized when reforming the governance structure. The synergic impacts of improving the competence of civil servants in keeping rule of laws should also be examined.

Despite the importance of good governance, its realization is not obvious. The political economy of reforming governance follows a complicated path as it involves many groups with conflicting interests. Among others, Acemoglu and Robinson (2001) looked into this issue. In the case of Ethiopia, for

instance, while decentralization is believed to promote good governance, the central government lacks an incentive to push its own decentralization agenda fully due to fear of eroding its political power base (see Vaughan and Tronvoll, 2003, and Chanie, 2007). Understanding the political economy of reform in governance of a specific country could thus be one future area of research in order to enrich the knowledge on how good governance could be achieved.

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Appendix 1. Note on Land Fertility Index

On average, households own more than one plot of land with different characteristics. The survey asks households to identify their plots as fertile (Lem), somewhat fertile (Lem-Teuf), or infertile (Teuf). To capture the characteristics of the total land owned by a household, the land fertility index (LFI) is computed as:

$$LFI = \sum_{i=1}^{n} f_i w_i \quad ,$$

where w_i is the ratio of each type of land to the total land owned; and f_i is the land fertility indicator. f_i takes the value 3, 2 and 1 for fertile (Lem), somewhat fertile (Lem-Teuf), and infertile (Teuf), respectively. Thus, the LFI ranges from 1 to 3, where a higher values indicates better land quality.

Appendix 2. Output Distance Function

The output distance function represents the maximum vector of outputs, $Y = (Y_1 ... Y_j)$, that can be produced for given vector of inputs, $X = (X_1 ... X_j)$, and technology. For the output set, $P(X)$, the output distance function is defined as

$$D_0(X, Y) = \min \{\alpha : \alpha > 0, (X, Y/\alpha) \in P(X)\} \quad , \tag{1}$$

where α is the scalar distance by which the output vector can be deflated. The output distance function is non-decreasing, positively linearly homogenous, convex in Y, and decreasing in X. If Y is an element of the feasible production set, $P(X)$, then $D_0(X, Y) \leq 1$; and $D_0(X, Y) = 1$ if Y is located on the production frontier (O'Donnell and Coelli, 2005).

A Cobb-Douglas output distance function defined over M inputs and J outputs can be written as

$$\ln D = \beta_0 + \sum_m \beta_m \ln X_m + \sum_j \gamma_j \ln Y_j \ . \tag{2}$$

For the case of two output ($j = 2$) , M inputs, and imposing the linear homogeneity in outputs ($\sum_j \gamma_j = 1$), equation [2] can be rearranged as

$$-\ln Y_2 = \beta_0 + \sum_m \beta_m \ln X_m + \gamma_1 \ln(\frac{Y_{1i}}{Y_{2i}}) - \ln D \ . \tag{3}$$

This can be generalized for j number of outputs by dividing the distance measure and the $j-1$ outputs by the $j-th$ output variable. That is,

$$\ln(D/Y_j) = \beta_0 + \sum_m \beta_m \ln X_m + \sum_{j=1}^{j-1} \gamma_j \ln(Y_{j-1}/Y_j) \ . \tag{4}$$

Equation [4] can be written as

$$-\ln Y_j = \beta_0 + \sum_m \beta_m \ln X_m + \sum_{j=1}^{j-1} \gamma_j \ln(Y_{j-1}/Y_j) + u \ , \tag{5}$$

where $u = -\ln D$ is a non-negative term that captures the inefficiency effect. As the distance from the frontier can be due to either inefficiency or noise, the stochastic frontier approach proposed by Aigner, Lovell and Schmidt (1977) is adopted. Accordingly, a symmetric error term, v, is introduced to capture the noise. Therefore, the stochastic frontier and the inefficiency equations are given as

$$-\ln Y_j = \beta_0 + \sum_m \beta_m \ln X_m + \sum_{j=1}^{j-1} \gamma_j \ln(Y_{j-1}/Y_j) + u + v \ . \tag{6}$$

In practice, an important problem in estimating the output distance function is when the output mix is so diverse that only a few farmers produce similar combination of crops. For instance, consider the production of four crops. Farmers produce different crops with different combinations and not all farmers produce all four crops. Assume that 50%, 35%, 30% and 45% of farmers produce crop 1, 2, 3, and 4, respectively. In addition, 35%, 15% and 10% of the farmers produce crop 1 and 2, crop 2 and 3, and crop 3 and 4, respectively. Normalizing the distance function with output of crop 1, the distance function can be written as

$$-\ln Y_j = \beta_0 + \sum_m \beta_m \ln X_m + \gamma_1 \ln(Y_2/Y_1) + \gamma_2 \ln(Y_3/Y_1) + \gamma_3 \ln(Y_4/Y_1) + u + v \ . \tag{7}$$

The distance function in [7] cannot be estimated with the assumed production structure as there is no observation to estimate [7] given that farmers produce either one or two outputs with different combinations. However, it is possible to estimate [7] for the case of two outputs, say crops 1 and 2. In this case, 65% of the observations will be lost since only 35% of farmers produce crops 1 and 2.

Appendix 3. Determinants of Political Trust

VARIABLES	Political Trust: Trust in Government		
	OLS		Ordered Probit
	Coefficients	Standardize Beta Coefficients	Coefficients
Civil Right	0.360***	0.37***	0.668***
	(0.00)	(0.00)	(0.00)
Democracy	0.133***	0.36***	0.247***
	(0.00)	(0.00)	(0.00)
Sex	-0.153***	-0.09***	-0.314***
	(0.00)	(0.00)	(0.00)
Age	0.00626***	0.07***	0.0123***
	(0.00)	(0.00)	(0.00)
Education	0.0136	0.03	0.0276
	(0.13)	(0.13)	(0.11)
Size of Town	-0.00533	-0.001	-0.0458
	(0.88)	(0.88)	(0.47)
Ethnic Dummies: Reference Group- Amhara			
Tigre	0.286***	0.11***	0.416***
	(0.00)	(0.00)	(0.00)
Oromo	-0.0581	-0.03	-0.110
	(0.21)	(0.21)	(0.22)
Shankella	-0.109	-0.01	-0.114
	(0.59)	(0.59)	(0.76)
Gurage	0.125	0.02	0.237
	(0.20)	(0.20)	(0.22)
Gamo	-0.0198	-0.001	-0.0161
	(0.81)	(0.81)	(0.93)
Somali	0.0446	0.01	0.189**
	(0.27)	(0.27)	(0.01)
Other	0.165***	0.06***	0.324***
	(0.00)	(0.00)	(0.00)
Constant	0.572**		
	(0.03)		
Observations	1232	1232	1232
R-squared	0.53		Pseudo R2 = 0.2971
Robust p-values in parentheses; *** significant at 1%, **significant at 5%, *significant at 10% .			
Note: Based on the 2007 World Values Survey Data for Ethiopia			

Variables and Definitions

Variable	Definition
Trust in government	1= Not at all; 2= Not very much; 3= Quite a lot; 4= A great deal
Civil rights: How much respect is there for individual human rights nowadays in this country?	1= No respect at all; 2=Not much respect; 3= Fairly much respect; 4= A great deal of respect
Democracy: How democratic is the way in which the country is governed today?	1=Not at all democratic; 10= Completely democratic,"
Sex	1= Female; 0= Male
Age	Age of the respondent
Education	1=No formal education; 2=Incomplete primary school; 3=complete primary school; 4=Incomplete secondary school: technical; 5=Complete secondary school: technical; 6=Incomplete secondary school: university preparatory; 7=Complete secondary school: university preparatory; 8=Some university-level education, without degree; 9=University education, with degree
Size of Town	1=2,000 and less; 2= 2,000-5,000; 3= 5,000-10,000; 4= 10,000-20,000; 5=20,000-50,000; 6= 50,000-100,000; 7= 100,000-500,000; 8=500,000 and more

Poverty Traps and Institutions in Ethiopia

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Abstract

This paper tests for nonlinearity in households' income dynamics using a decade-long rural household panel survey dataset from Ethiopia. The paper argues that non-linearity in income dynamics could arise from the historical dynamics of institutions, and supporting evidence is provided from Ethiopian history. The empirical results support nonlinearity in income dynamics and hence the existence of poverty traps. The comparative static analysis of the empirical results shows the importance of policy interventions in terms of breaking out of the poverty trap.

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Contents

1 Introduction

In the last four decades, poor economic performance, and, at times, even economic stagnation, has been one of the most salient features of the majority of the developing world, especially the sub Saharan African region. Evidence shows that while some parts of the world did transit to prosperity, the rest remained poor or became even poorer (see Azariadis and Stachurski, 2005; Collier, 2007). Many cross-country studies have examined why this is (see, e.g., Landes, 1990; Olson, 1996; Pritchett, 1997; and Canova and Marcet, 1995). The observed economic stagnation and poverty are considered to be self-reinforcing in the sense that poverty at one point in time results in poverty in the future (see, e.g., Sachs, 2005). As such, current poverty may entrap countries at low income levels.

A number of theoretical models have been used to explain different channels through which economic stagnation or a poverty trap could arise[1]. The formalization in Murphy et al. (1989) of the Rosenstein-Rodan technological poverty trap model shows that coordination failure results in the absence of increasing returns to scale technologies, which in turn would lead to low level equilibrium trap. Banerjee and Newman's (1993) occupational choice model shows that initial wealth distribution determines agents' choices to be workers, self-employed, or entrepreneurs. With low initial wealth, the ratio of workers to entrepreneurs will be high, wages will be low, and the economy will be trapped at a low-level equilibrium.

Galor and Zeira's (1993) human capital explanation of the poverty trap shows that high costs of education relative to low income and a low skill premium lead to stagnation with low human capital. Dasgupta (1997) argued that a poverty trap may arise due to childhood undernourishment. The line of thinking is that childhood undernourishment can lead to permanent reduction in a person's physical capacity to function and hence to lower adulthood income.

[1] See Azariadis and Stachurski (2005) for a detailed presentation of poverty trap models.

The rent-seeking model of Murphy et al. (1993) laid out the conditions in which predatory institutions lead to stagnation. Bourguignon and Verdier (2000) and Acemoglu and Robinson (2002) discuss the political economic factors that lead to stagnation through imposition of inefficient policies that disproportionately benefit those with political power. Nunn's (2007) multiple equilibria model, which is in line with the model in Murphy et al. (1993) model, discusses how early colonial institutions could explain the current underdevelopment in Africa.

Collier (2007) identified four macro level mechanisms for poverty traps: the conflict trap, the natural resource trap, the trap of being landlocked, and the bad governance trap. These factors entrap countries through their adverse effect on capital accumulation, political and economic institutions, international trade, and economic policies. The mechanisms share the characteristics of Murphy et al.'s (1993) rent-seeking model and the political economic models of Bourguignon and Verdier (2000) and Acemoglu and Robinson (2002). The empirical counterpart of Collier's analysis shows that, as of 2006, around 980 million people live in countries trapped by one or more of these factors.

In general, traps can arise due to both market and institutional failures (Azariadis and Stachurski, 2005). This complicates the identification of the main causes of stagnation as many factors may operate concurrently. However, there are some empirical studies that test specific routes for poverty traps, and the results are, at best, mixed (see, e.g., Barret et al., 2001; McKenzie and Woodruff, 2003; and Dercon and Christiaensen, 2007). In addition, these types of empirical studies disregard the underlying causes of poverty traps and focus on characterizing households in persistent poverty in terms of their risk-taking ability or access to credit. Though such characterization is important in discerning the correlates of poverty traps, it does not illuminate the reasons why households are trapped to begin with.

The alternative approach to the direct testing of the specific route is testing for non-linearity in household income dynamics as in Lokshin and Ravallion

(2004). In this framework, when household income dynamics follows a stationary linear autoregressive process, households can recover from adverse shocks over time and hence current poverty need not be entrapping. Conversely, when income dynamics exhibits non-linearity, adverse shocks may be entrapping. The present paper follows this route to test for a poverty trap in Ethiopia.

This paper contends that the source of economic stagnation cannot be explained by a single factor. Nevertheless, if it is possible to single out a persistent stagnating force, it can be considered as the "structural" cause of stagnation. In the literature, past historical events are recognized to have a persistent long-term economic effect even after those are long gone (see Acemoglu, 1995; Nunn, 2007). One of the contributions of the present paper is thus to provide a historical account of institutional dynamics that may explain the underlying causes of a poverty trap in Ethiopia. The Ethiopian case provides a good opportunity as predatory institutions[2] have persisted since the fourth century.

Predation and rent seeking have been landmarks of Ethiopian history. The documented history of soldiers' predatory acts goes back as far as to 325 AD – 350 AD (see Caulk, 1978). Farmers and traders bore the cost of predation as soldiers were granted free provision of goods and services. This continued for a long time with increasing intensity until it ended in the mid-20th century. The rural peasant farmers were also subjected to another type of predation by the rent-seeking landlords until the advent of the 1975 land reform. Though the land reform obliterated landlord predation, in the 1980s the state assumed the role of a predator by introducing a compulsory grain delivery system that coerced farmers to sell a certain proportion of their output at a fraction of the market price. Although the regime change in 1991 halted the state predation, the incidence of poverty still lingers around the same level.

[2]The significance of predatory and rent-seeking institutions in explaining economic malaise in Africa is also supported in detailed case studies of twenty-five African countries (see Ndulu et al., 2007 & 2008).

The present paper considers the above historical dynamics of institutions to motivate an empirical test for a poverty trap. Predatory institutions adversely affect saving, accumulation, and investment, which in effect lowers output and income. Such low levels of output and income serve as initial conditions at the start of a non-predatory era, and hence determine the level of investment and output from then on. Better initial conditions could lead to higher future incomes, while bad initial conditions could result in stagnation due to lack of adequate investible resources. The institutional dynamics can thus lead to non-linear household income dynamics. The empirical section tests for existence of non-linearity in household income dynamics using the decade-long (1994-2004) Ethiopian Rural Household Survey panel dataset. The empirical results give some support for the existence of a poverty trap in the Ethiopian rural economy. The poverty trap hypothesis is not rejected at the macro level either, as Easterly's (2006) type of test for a poverty trap in the agricultural sector could not reject the hypothesis.

Following Matsuyama's (1997) suggestion on the policy relevance of results from multiple equilibria models, two policy experiments are considered in view of past institutional dynamics. An important observation of the dynamics of Ethiopian institutions is that the early institutions were built on predation and rent seeking, which discouraged investment and asset accumulation. It is thus worth examining the impacts of policy interventions aimed to battle the adverse effects of early institutions by encouraging investment in land improvements and supporting asset accumulation. The comparative static results show that these policies could lift households out of the poverty trap. At a higher level of asset value and better land fertility, the income dynamics do not show any evidence of a poverty trap.

The rest of the paper is organized as follows. The next section gives some background on the Ethiopian economy and the historical evolution of Ethiopian institutions. Section 3 lays out the empirical framework to test for a poverty trap. Section 4 contains the empirical tests for the existence of a poverty trap and some experiments on the likely impacts of policy intervention in lifting households out of a poverty trap. Section 5 concludes the paper.

2 The Setting

The Ethiopian economy shows the characteristics of a stagnant economy given that per capita income had been almost constant for the last four decades. The PCI[3] of 474 USD in 1950 increased to USD 671 in 1983 before it fell to USD 446 in 1992 and then rose to USD 631 in 2000. The real per capita agricultural output fell from USD 173 in 1961 to USD 96.4 in 2003, implying an annual growth rate of -1.1%. Though the total agricultural output has shown some growth during the post-1991 period, the 2003 level of real per capita agricultural output was lower than in the 1960s as it was only 55.7% of the 1961 level.

In terms of welfare indicators, the incidence of consumption poverty did not decline from 1990 to 2004- i.e., even after 15 non-predatory years (World Bank, 2005). Shimeles (2006) reported that 41% of rural Ethiopian households are sustained with a per capita consumption level that is below the poverty line. Abebe and Nijamu (2006) reported a high rate of persistence in poverty from 1994 to 2000. In addition, Bigsten and Shimeles' (2008) results based on the Ethiopian rural and urban survey data for the period o 1994–2004 showed high rates of re-entering into poverty among both urban and rural households and a low probability of exit.

The institutional dynamics are also daunting. Historically Ethiopia can be considered as a militarist state. Geda (2008) summarized the historical heritage as

> "Ethiopia's modern history reflects the institutional legacy of centuries of internal conflict and external threat. Internally, religion, regional location, ethnicity, and nationality have each, at various times and in varying combinations, served as focal points in the contest for power and control over economic resources. ...

[3] Source: Penn World Tables. The PCI is given by a Laspeyres index of real GDP per capita at a constant price.

> Externally, although the country was never colonized, hostile and powerful colonial forces encircled it from the last quarter of the 19th century and rendered its independence a besieged one. The country fought three times with the Egyptians, four times with the Dervishes, five times with the Italians and once with the British in the period from 1868 to 1896."

This had resulted in a buildup of a huge military force that is financed by extracting peasants' surplus through looting and predation.

As far back as 325-350 AD, "Professional armies in Ethiopia have usually been predators living off their lords' other subjects while raiding his enemies for booty" (Caulk, 1978: 460). Not so much changed until the mid-20th century. Up until this period, the Ethiopian army can be labeled as a disorganized force lacking proper organizational channels for basic supplies. As a result, the army was sustained by voluntary and involuntary support of peasant farmers even during peacetime. Farmers' produce and live animals were subjected to open looting to feed the army. The predation strongly discouraged farmers from producing more than to cover their subsistence need. In addition, as predation became more attractive, many farmers joined the army. In this context, Gebrehiwot's (1912) observations deserve a full quotation.

> "In our country, it is shameful to earn your bread by the sweat of your brow... The highest prestige is attached to being called a soldier, carrying an old gun, and following the chief like a dog...They call themselves soldiers, but they spend their time loitering in the streets, living like parasites on the produce of the peasantry. In civilized societies, a soldier is someone who protects the peasant... In our country, however, we are nearer to the truth if we define the soldier as the sworn enemy of the peasant. Hence, our fertile land lies fallow. And hence our poverty." (Gebrehiwot, 1912; cited in Bahru, 2002)

This observation indicates how entrenched the predatory institutions are in Ethiopia. As the army was at the core of the power and resource struggle, institutions that supported rent-seeking were tolerated and hence sustained.

The land tenure institutions of the pre-1974 period also strengthened the rent-seeking activities. Specifically, when Emperor Menlik expanded to today's southern part of Ethiopia in the mid-19th century, all land was declared state property. The expropriated lands were distributed to various groups based on services rendered during the conquest or in compensation for continued service, and to the clergy and settlers who migrated to the region (Markakis, 1974). The peasants lost their indigenous rights and become tributaries of the state and its beneficiaries. This transformed the peasants into tenants obliged to surrender a quarter to a third of their produce to the landholder as a tribute, and a tenth of their produce as a tithe. The tenants were also required to provide labor services to the landholders.

The 1974 socialist revolution abolished the land tenure system and the related rent-seeking activities. A major land reform policy that nationalized all land took place followed by land redistribution that entitled the peasants to a piece of land. However, the extraction of rents from the peasantry continued in a new form. The socialist ideology along with the establishment of the peasant associations enabled the state to extract economic rents from the peasants. The government introduced a system of forced quota supply of output to the public organization at a price as low as 22% of the market price (see Chole, 2004: 131), which squeezed the households' savings in favor of the rent-seeking public sector.

In another wave of regime change, the state predation ended in 1991 and many economic and institutional reforms took place. As the new regime did not address issues related to land tenure insecurity, investment in land improvements did not take place at the desirable rate (see, e.g., Deininger and Jin, 2006). In addition, investment in land improvements has been quite low due to the crippling initial level of poverty. Coupled with population pressure, this has resulted in significant land degradation. Shiferaw and

Holden (2000) estimated the productivity loss due to soil erosion in the northern highlands of Ethiopia to be around 2.2% per year. The negligible growth of the agricultural productivity (see World Bank, 2005) attests to this fact.

3 Empirical Framework and Data

3.1 Empirical Framework

In line with the rent-seeking model of Murphy et al. (1993) and the dynamic extension in Acemoglu (1995), it is possible to show that the predatory and rent-seeking institutions in Ethiopia could lead to a non-linear dynamics in household income. Akin to the theoretical work of Murphy et al. (1993), the rural society is classified into peasants and rent-seekers. Peasants are further classified as surplus producers and subsistence producers. A priori, it is assumed that all peasants prefer to be surplus producers. However, due to the predatory institutions, surplus production is not attractive and hence a certain proportion of peasants turn to subsistence production. Moreover, depending on the relative attractiveness of the rent-seeking activity, some peasants may switch to rent-seeking. With severe expropriation, subsistence production becomes the basin of attraction and hence the economy bends up in a poverty trap.

From an intergenerational perspective, the following generation inherits subsistence technology with low or no accumulated wealth. Assuming that surplus production requires a certain level of wealth and capital, the new generation can choose between subsistence production and rent-seeking. As a result, the economy stabilizes at the subsistence level of output with sizable rent-seekers. This mechanism would thus lead to non-linear income dynamics where the future trajectory of income is determined by the initial level of income.

The main prediction of the rent-seeking model is that predatory institutions

discourage savings, accumulation, and investments as expropriation transfer surplus to the rent-seekers. The extent of the fall in savings and investments depends on the proportion of rent-seekers in the society (or the magnitude of rent extracted). With a high enough proportion of rent-seekers, the economy would gravitate toward a subsistence level of income as the entire surplus would be absorbed by the rent-seekers.

Using the historical dynamics of Section 2, it can be shown that the proportion of rent-seekers and the magnitude of rent extracted are high enough to lead to stagnation at the subsistence level of income in Ethiopia. First, until the mid-20th century, the army, which survived on looting the peasants, was very large. Pankhrust (1963) documented that, by 1853, the regular armies assembled under chiefs reached about 200,000 men excluding the large number of followers that is estimated to be about half a million. For a population of 10 million and a labor force of around 5 million, the conservatively estimated more than 1 million soldiers (rent-seekers) constitute a quite large proportion that is able to absorb the entire surplus of the peasant economy. Second, the magnitude of rent extracted by the landlords is quite excessive even in times of distress (Markakis, 1974). Third, the quota supply system introduced during the military period (1974-91) levied a very high quota requirement on peasants, and failure to comply led to denial of land rights. The quota requirement was so high that there were cases that peasants sold their assets and livestock to be able to fulfill their quota requirement (Chole, 2004). Thus, the predatory institutions and the accompanying high intensity of rent extraction can certainly explain the Ethiopian economic stagnation.

Once an economy stabilizes at the subsistence level, innovation and technical progress become retarded, investment in human and physical capital are held up, and investment in land improvements may not take place. Such an economy is characterized by a low level of technical progress, a low level of education, shortage of skilled labor, a low level of capital accumulation, and a high level of land degradation. Moreover, with a rising population level and subsistence level of output, malnutrition is a natural outcome. These factors perpetuate the low-equilibrium trap either individually or by arising

simultaneously.

Following the regime change in 1991, the predatory institutions came to an end. However, the initial condition in the post-1991 period is characterized by a low or no saving, asset, and capital stock; degraded land due to intensive farming without adequate investments in the land; land tenure insecurity due to periodic land redistribution; and retarded agricultural technology with limited potential for surplus production. Even in the absence of expropriation, these initial conditions are certain to limit agricultural investment due to lack of investible resources and technical knowledge. The financial market cannot adequately supply the required finance owing to the apparent lack of savings in the economy. In addition, farmers' access to credit is limited as a consequence of lack of collateral, and land cannot be used for this purpose since the land policy prevents such practice. Under such initial conditions, past levels of output are good predictors of the current level of output as current investment depends on own past income. In the absence of predatory institutions, relatively better initial condition could lead to higher future incomes, while bad initial conditions could result in stagnation due to lack of adequate investible resources.

Thus, in the absence of predatory institutions, households' current income-generating process can be specified as the nonlinear difference equation $Y_{it} = f(Y_{it-1}, \ X_{it})$, where Y_{it} is household $i\prime s$ current income, Y_{it-1} is household $i\prime s$ lag income, which depends on the past predatory institutions, and X_{it} is exogenous household characteristics. f is assumed to be continuous and vanishing for $Y < Y_0$ and the function is increasing and concave in Y_{it-1} for all $Y > Y_0$, where Y_0 is the threshold income which must be reached for households to be productive in the future. For the function f to give two equilibria in a positive quadrant, a quadratic specification would suffice. However, a third degree polynomial would give better flexibility in allowing the curvature to switch (Lokshin and Ravallion, 2004). Thus, the third

degree polynomial specification for a T year panel dataset is given as

$$Y_{it} = \gamma_0 + \sum_{m=1}^{3} \alpha_m Y_{i,t-1}^m + X_{i,t}\beta + \eta_i + \varepsilon_{i,t} \qquad (t = 2, ...T) \quad , \qquad (1)$$

where α, β and γ are unknown parameters to be estimated, η_i is household specific effects, and $\varepsilon_{i,t}$ is the error term. Due to the presence of the lagged dependent variable in the set of the explanatory variables, $\varepsilon_{i,t-1}$ is correlated with Y_{it-1}, leading to a problem of endogeneity. As a result, we used the Arellano-Bond (1991) and Arellano-Bover (1995)/Blundell-Bond (1998) difference GMM and system GMM dynamic panel estimators.

To address this concern, we can first difference [1] to eliminate the individual effects to get

$$Y_{it} - Y_{it-1} = \sum_{m=1}^{3} \alpha_m (Y_{i,t-1}^m - Y_{i,t-2}^m) + \beta(X_{i,t} - X_{i,t-1}) + \varepsilon_{i,t} - \varepsilon_{i,t-1} \quad ,$$

where $(\varepsilon_{i,t} - \varepsilon_{i,t-1})$ is MA(1) with unit root. As this transformation does not remove the correlation between the lagged dependent variable and the error term, we need valid instruments to get consistent results. For period T, $(Y_{i1}, Y_{i2}, \ldots, Y_{iT-2})$ would be the set of valid instruments for $(Y_{iT} - Y_{iT-1})$ since they are not correlated with $(\varepsilon_{i,T} - \varepsilon_{i,T-1})$ as long as the $\varepsilon_{i,t}$ are not serially correlated. However, the instrumental variable estimation does not account for the MA nature of $(\varepsilon_{i,T} - \varepsilon_{i,T-1})$. Arellano-Bond (1991) derived their GMM estimator utilizing the moment conditions between the instrumental matrix Z and $\Delta\varepsilon_{i,t}$-i.e. $E(Z_i \Delta\varepsilon_i) = 0$.

For $T > 3$, the model is overidentified and a Sargan test can be used to test the overidentifying restrictions. Moreover, the key identifying assumption that $\varepsilon_{i,t}$ disturbances are not serially correlated can be tested by testing for no second-order serial correlation in the first-differenced residuals (Bond,

2002).

One important problem that should be addressed in relation to the validity of the Arellano-Bond GMM estimation is the issue of measurement errors. In the absence of non-correlated measurement errors, the Arellano-Bond GMM approach gives consistent estimates of a linear dynamic panel model. Yet with our non-linear specification, this approach may give inconsistent estimates even if the measurement errors are not correlated (Antman and McKenzie, 2007; Dercon and Shapiro, 2007) unless we assume independence between income and measurement errors. This can be seen by rewriting equation (1) without the other control variables as

$$Y_{it} = \alpha_1 Y_{it-1} + \alpha_2 Y_{it-1}^2 + \alpha_3 Y_{it-1}^3 + \varepsilon_{it} \ . \tag{2}$$

The observed income $Y_{it} = Y_{it}^* + \eta_{it}$, where Y_{it}^* is the true income and η_{it} is the measurement error, and equation (2) is modified as

$$Y_{it} = \alpha_1(Y_{it-1} - \eta_{it-1}) + \alpha_2(Y_{it-1} - \eta_{it-1})^2 + \alpha_3(Y_{it-1} - \eta_{it-1})^3 + \varepsilon_{it} + \eta_{it} \ . \tag{3}$$

Expanding and rearranging equation (3) gives

$$Y_{it} = \alpha_1 Y_{it-1} + \alpha_2 Y_{it-1}^2 + \alpha_3 Y_{it-1}^3 + \mu_{it} \ , \tag{4}$$

where $\mu_{it} = \varepsilon_{it} + \eta_{it} - \alpha_1 \eta_{it-1} - \alpha_2(2\eta_{it-1} Y_{it-1} - \eta_{it-1}^2) - \alpha_3(3\eta_{it-1} Y_{it-1}^2 - 3\eta_{it-1}^2 Y_{it-1} + \eta_{it-1}^3)$.

In this case, due to the structure of the error term μ_{it}, the further lags of income cannot be valid instruments for lagged income unless we assume independence between income and the measurement errors. Our estimation of equation (1), thus, imposes this assumption.

As measurement error in income cannot be ruled out and the assumption of independence may be a strong one, we used a nonparametric local polynomial estimation method to further test for nonlinearity in income dynamics. Dercon and Shapiro (2007) noted that the Nadaraya-Watson type bivariate kernel regression method that has been used in the literature (e.g., by Lybbert et al., 2004) is sensitive to discontinuities and hence may lead to biased results.[4] As a result, a local polynomial estimator, which is not sensitive to discontinuities and outliers (Härdle et al., 2004), is used. This estimator is also the best smoother among all linear smothers (Fan, 1992). Thus, local polynomial of order three is estimated for ΔlnY_{t+10} (*i.e.*, $lnY_{2004} - lnY_{1994}$) as a function of lnY_t (lnY_{1994}) using a Gaussian kernel function.

Another alternative to address the problem of measurement error is to use instrumental variable estimation technique where the lagged income is instrumented by some other variable; not by its further lags. Dercon and Shapiro (2007) used the lag of rainfall interacted with household specific variables[5] as an instrument for lagged income and found robust results using data from India. In our case, the interacted rainfall instruments appear to be weak instruments for lack of correlation with income. This may be partly because the effect of rainfall on income does not vary with household specific characteristics and hence the interacted variable does not capture income variability.

[4] "In the case of Nadaraya-Watson estimates we typically observe problems due to the one-sided neighborhoods at the boundaries. The reason is that in local constant modeling, more or less the same points are used to estimate the curve near the boundary. Local polynomial regression overcomes this by fitting a higher degree of polynomial here." (Härdle et al., 2004: 97)

[5] Such as land and household size to generate some variability in the instruments as rainfall is measured at village level and hence fixed within the villages. Interacting rainfall with household characteristics assumes that the effect of rainfall on income depends on household characteristics.

3.2 Data

We used data from a survey of 15 rural Ethiopian villages covering 1,470 households during 1994, 1995, 1997, 1999, and 2004.[6] The data collection was initially started in 1989 with six villages and expanded in 1994 to 15 villages. The data was collected by the Department of Economics at the Addis Ababa University in collaboration with the Center for the Study of African Economics at Oxford University and the International Food Policy Research Institute, Washington.

The surveys were conducted in six rounds- two in 1994 and the remaining in 1995, 1997, 1999, and 2004. In each village, households are selected randomly and in proportion to the population of the village (for a detailed discussion of the sampling framework, see Dercon and Hoddinott, 2004). The attrition rate is as low as 3% mainly because of low mobility as households cannot acquire land when moving to other places. Table 3.1 in the appendix presents descriptive statistics on the variables used in the analysis.

[6] Given the dynamic specification, the time gap in the data may pose practical problems for estimation. However, since the gap between two periods is quite small because of the nature of the rural economy, it may be valid to assume $y_{it-1} \approx y_{it-p}$ as in Dercon et al. (2006).

4 Results

4.1 Testing for Non-Linear Income Dynamics

4.1.1 GMM Results

Table 4.1 below gives the estimates of the nonlinear dynamic equation. As the Sargan overidentification test shows, while both the 1-step and 2-step difference GMM pass the Sargan overidentification test, the system GMM specification does not. However, in all specifications, the AR (2) test does not detect second order autocorrelation in the residuals as required for validity of the GMM estimation.

The estimated parameters of the control variables show that gender of the household head, land fertility, and the type of crop the household produces significantly affect income levels. The result shows that male-headed households are better off than female-headed households. Households with fertile land and those who produce *teff* and coffee tend to enjoy higher long-run income. Large households and households with older heads tend to have lower long-run income though the results are not statistically significant. Education of the household head, land size and number of oxen seem to have a positive effect on income, though they are statistically insignificant.

Table 4.1: GMM Estimation Results

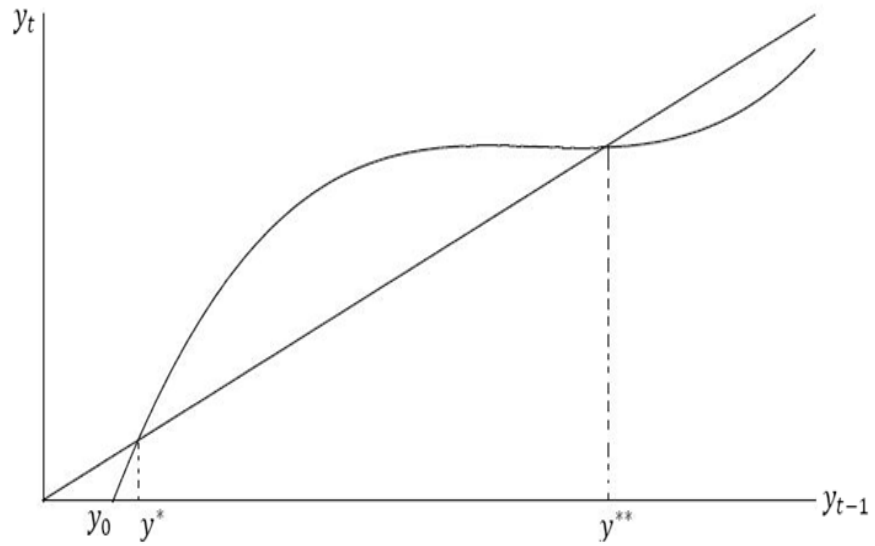
	Difference GMM		
	One-Step	Two-Step	System GMM
y_{it-1}	5.591*	6.551*	1.585**
	(0.0829)	(0.0976)	(0.0446)
y^2_{it-1}	-0.885*	-1.059*	-0.291**
	(0.0929)	(0.0949)	(0.0283)
y^3_{it-1}	0.0462*	0.0564*	0.0179**
	(0.0956)	(0.0852)	(0.0143)
Age of the Household Head	-0.007	-0.006	0.004
	(0.394)	(0.582)	(0.439)
Gender of the Household Head	0.524*	0.500***	0.511**
	(0.0882)	(0.000)	(0.0232)
Household Size	-0.001	-0.006	0.0154
	(0.966)	(0.751)	(0.288)
Education Level of the Head	0.005	0.006	0.009
	(0.844)	(0.730)	(0.629)
Land Size	0.02	0.023	0.048**
	(0.417)	(0.223)	(0.0103)
Land Fertility	0.109**	0.0954*	0.0968***
	(0.024)	(0.051)	(0.008)
Number of Oxen	0.026	0.0207	0.0343
	(0.412)	(0.398)	(0.160)
Crop Type: Teff	0.365***	0.420***	0.352***
	(0.000)	(0.000)	(0.000)
Crop Type: Coffee	0.373***	0.382***	0.323***
	(0.004)	(0.001)	(0.000)
Crop Type: Chat	0.229	0.184	0.313***
	(0.130)	(0.199)	(0.006)
Value of Asset	0.002**		
	(0.019)		
Round Dummy:r2	-0.382***	-0.369**	-0.301***
	(0.001)	(0.0105)	(0.000)
Round Dummy:r3	-0.139	-0.116	-0.134*
	(0.163)	(0.176)	(0.0559)
Round Dummy:r4	-0.183**	-0.165**	-0.173***
	(0.0410)	(0.0312)	(0.006)
Constant	-5.568	-6.739	2.860*
	(0.375)	(0.370)	(0.069)
Observations	2198	2225	3486
Sargan Test: Chi-Square (Prob)	7.004 (0.6366)	12.03 (0.2116)	57.03 (0.000)
AR(2) Test: Prob	0.2971	0.2775	0.2007

p values in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

Note: Both the Sargan and the second order autocorrelation tests support the GMM results.

To interpret the results of the nonlinear dynamics, the parameters of the 1-step difference GMM are used and the roots of the polynomial are solved. That is, we take $Y_{it} = 5.591Y_{it-1} - 0.885Y_{it-1}^2 + 0.0462Y_{it-1}^3 - 5.568$; set all the other exogenous variables at their mean, and derive the roots of the polynomial. The polynomial has one real root and two complex roots. Plotting this relationship (Figure 4.1) shows that there are two stable equilibria, at y_0 and y^{**}, while there is one unstable equilibrium, at y^*. The result supports the classic poverty trap case where households with income below y^* are trapped in poverty while households with incomes greater than y^* converge to a higher level of long-run income.

Figure 4.1: Income Dynamics



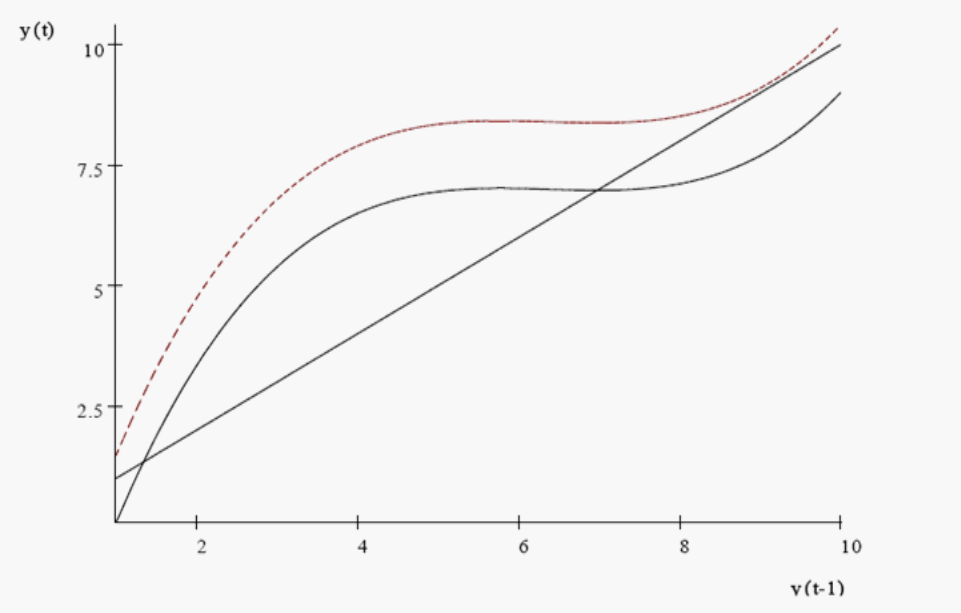
An important question at this point concerns the role of institutions. We noted that the early predatory institutions discourage asset accumulation and investment in land improvement. Two policy interventions that address the adverse effects of the early institutions, i.e., increase in the value of asset and increase in land fertility, are considered under the income dynamics presented in Table 4.1. Given the income dynamics, setting the mean asset

value to its maximum results in the income dynamics (the broken line) shown in Figure 4.4. As the income dynamics lie above the 45^o line, there is no evidence of a poverty trap at this level of asset value. Similarly, setting the mean value of the land fertility indicator at its maximum gives a higher level of equilibrium income.

The comparative static results also show that policy interventions that support land fertility- enhancing mechanisms and facilitate household's asset accumulation have a positive impact on breaking out of the poverty trap. In the case of Ethiopia, strengthening land tenure security is found to be a significant factor in influencing investment in land improvements (see Ayalew, Dercon and Gautam, 2005; Deininger and Jin, 2006, among others). Given that land fertility is a positive function of land investment, policies that strengthen tenure security may be good candidates for lifting households out of the low-equilibrium trap. A related area of intervention may be access to credit. Investment in land improvements requires substantial investments that subsistent producers cannot finance. Access to credit eases the financial constraints and hence facilitates investment in land improvements.

Supporting asset accumulation has two effects: a credit effect and a shock absorbing effect. It serves as collateral for credit and absorbs adverse shocks. Government intervention to support asset accumulation could thus have a broad impact. For instance, one form of intervention may be public spending on animal disease control and eradication. This would reduce households' risk of livestock holding and hence encourage asset accumulation, especially when livestock is the main asset.

Figure 4.2: Income Dynamics with Positive Asset Shock

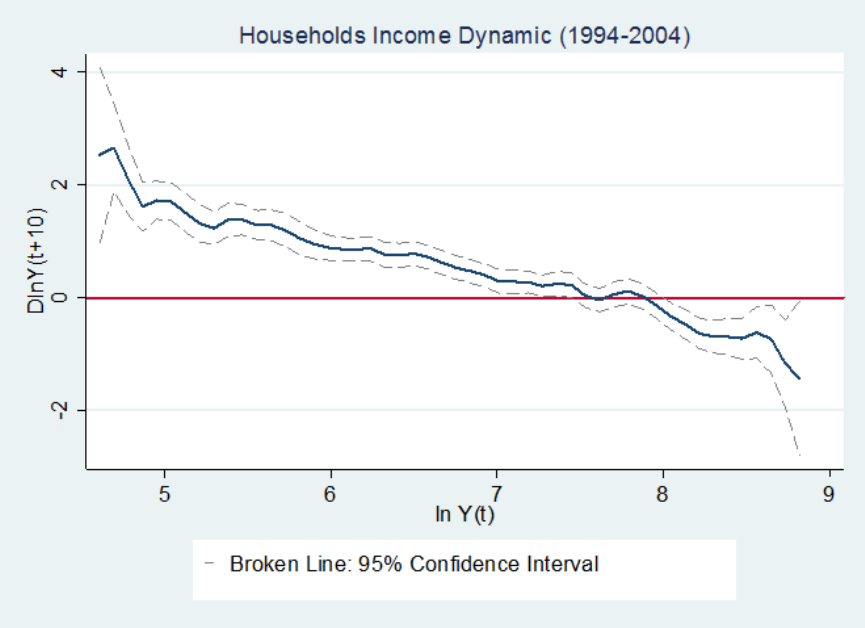


4.1.2 Local Polynomial

The results of the local polynomial estimation are shown in Figure 4.3. The dynamics of income in 1994-2004 supports the existence of some non-convex income dynamics.[7] The income dynamics curve crosses the zero growth line twice from above and once from below. The two points where it crosses the zero growth line from above constitute two stable equilibrium points while the other crossing point is the unstable equilibrium point. The result is consistent with the findings of Lybbert et al. (2004), who showed the existence of non-convex wealth dynamics among the pastoralists of southern Ethiopia.

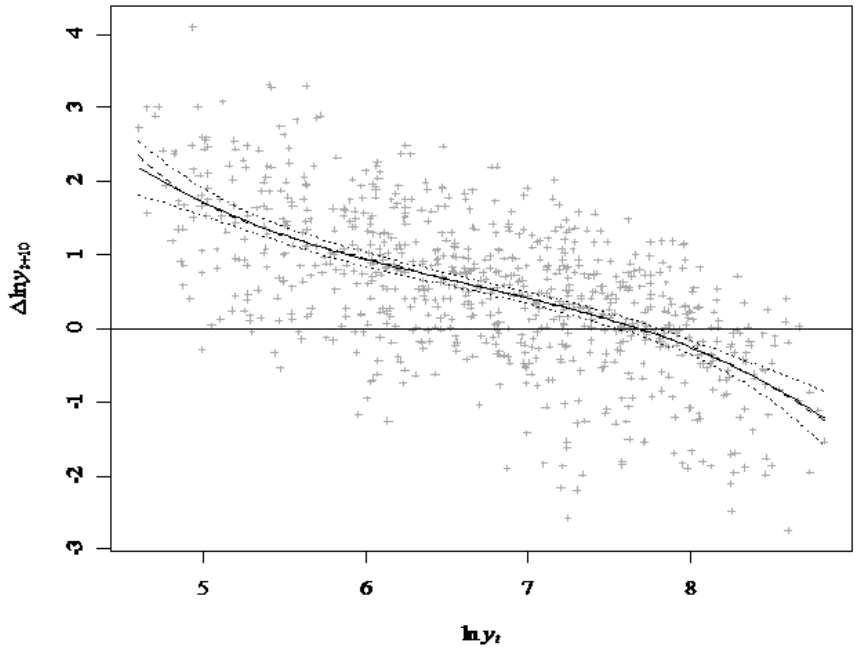
[7] It is, regrettably, difficult to see the crossings clearly in the figure presented due to its low resolution.

Figure 4.3



However, the above result is sensitive to the bandwidth of the kernel function. For instance, doubling the bandwidth over smoothes the function and gives only one equilibrium point at around *log* 7.8 (see Figure 4.4). In this case, there is no evidence of a poverty trap. Rather, there appears to be convergence toward a lower equilibrium household income of around 2,440 birr (USD 355) per year. For an average household of five, the equilibrium per capita income becomes 488 birr (USD 71), which is much lower than the per capita income at the national level. This may indicate that households converge to different equilibrium points depending on their income levels. Following Kruger (2009), the income dynamics is estimated for different quantiles of income growth.

Figure 4.4: Household Income Dynamics (1994 to 2004) Smoothed

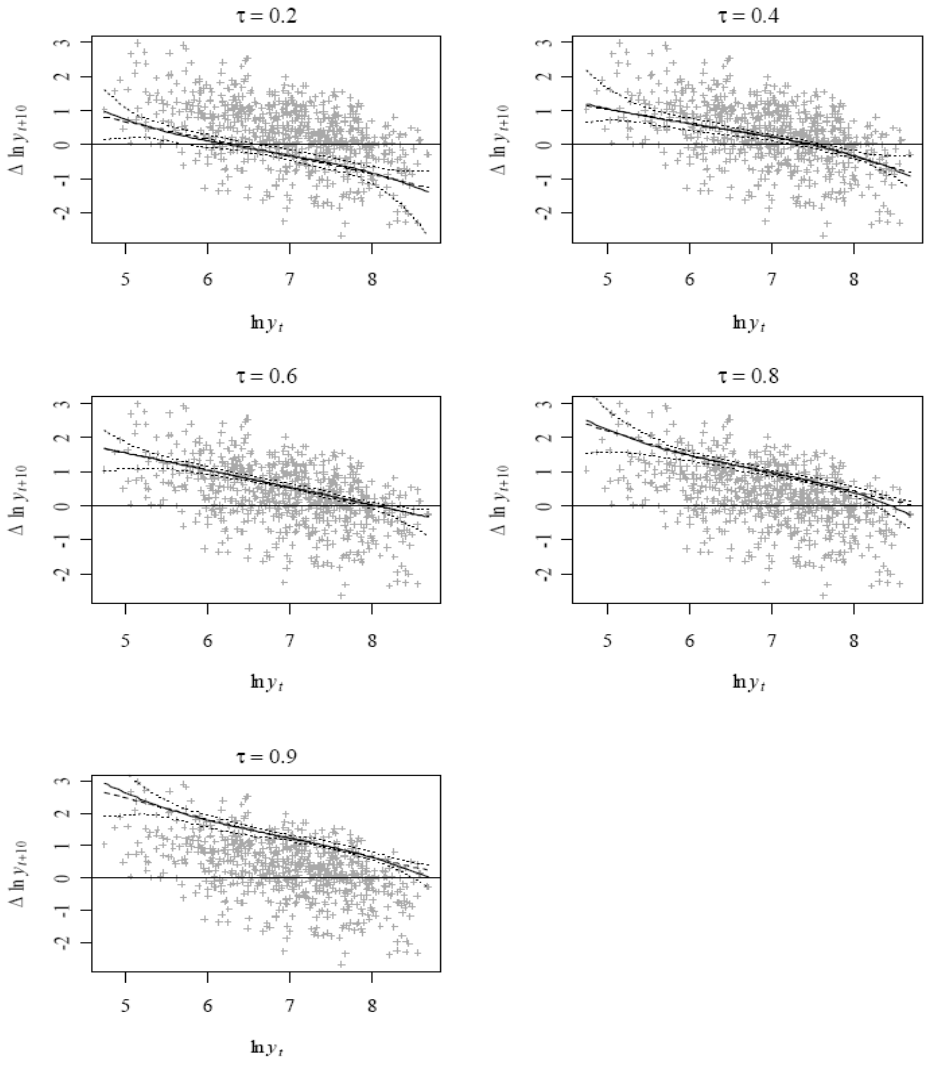


The nonparametric quantile regression of $\Delta \ln Y_{t+10} = f(lnY_t, lnY_t^2, lnY_t^3)$ is estimated using a nonparametric quantile regression with splines smoothing as suggested in Koenker et al. (1994). The results for different quantiles (0.2, 0.4, 0.6, 0.8, and 0.9) are given in Figure 4.5. The dotted lines indicate bootstrapped 95% confidence intervals from 10,000 bootstrap repetitions of the quantile fit while the solid line is the third degree polynomial fit of the nonparametric quantile estimates. The results suggest that convergence to a lower equilibrium point is a feature observed in the lower growth quartiles (0.2 and 0.4), and the equilibrium income seems to be rising with the higher growth quartiles. At the highest quantile (0.9), there is neither evidence of a poverty trap nor a convergence to low level equilibrium income.

The overall result of the nonparametric quantile regression supports the existence of poverty traps in the sense that households with low initial incomes converge to a low equilibrium income while households with higher initial income converge to a higher equilibrium income. That is, initial conditions

matter and hence, even after the factors that triggered stagnation are no longer present, households may still be trapped at a lower level of income due to the dynamic effects of the initial factors that once led to stagnation.

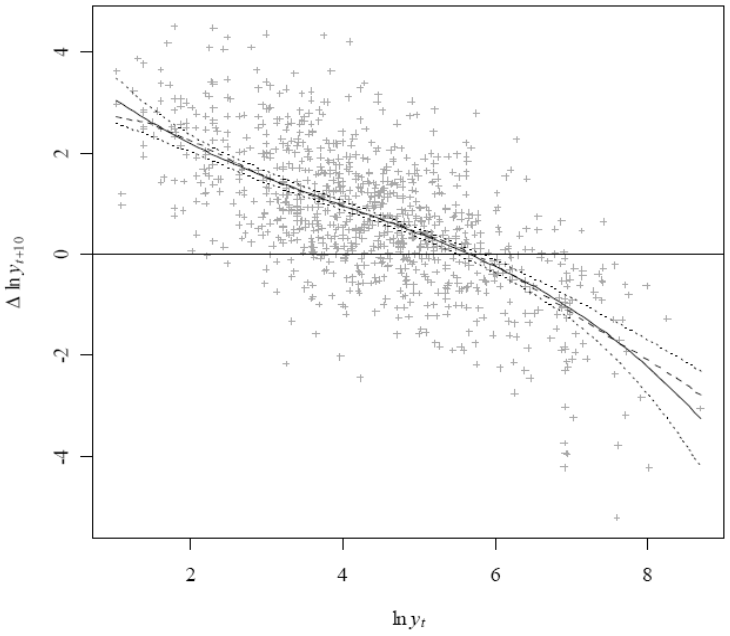
Figure 4.5: Nonparametric Quantile Regression Results



4.2 Asset-Based Test for a Poverty Trap

As a robustness check of the results, an asset-based[8] approach is used to test for a poverty trap. Carter and Barrett (2006) suggested an asset-based approach because of its desirable features. They argued that the asset-based approach is more suited to differentiate between transitory income shocks and structural changes. While transitory income shocks that leave the asset base intact would not lead households into poverty trap, structural changes that degrade the asset base would. We followed this approach and used a local polynomial estimation of asset dynamics to test for non-linearity.

Figure 4.6: Asset Dynamics 1994-2004



Despite the problems related to this approach,[9] the local polynomial esti-

[8] Asset is measured as the total value of a household's asset at a constant price. Household assets include items such as furniture, farming equipment, jewelry, and firearms.

[9] "First, not only is the relationship potentially highly non-linear, but also the dynamic asset poverty threshold is an unstable equilibrium, away from which households move

mation results show convergence to a low level equilibrium (see Figure 4.6). Dercon (2003) estimated that 75 to 137.5 percent[10] of this equilibrium asset value is required to start profitable nonagricultural business activities to supplement the low agricultural income. However, the equilibrium asset value is too low to serve as collateral for loans or to finance the working capital required to enter into such profitable activities.

4.3 Macro Approach: Testing for Stagnation of the Agricultural Output Per Capita

As a further examination of the poverty trap hypothesis, a macro level test of the hypothesis is provided following Easterly (2006). The theory of a poverty trap predicts that agricultural output per capita would be stationary with no drift term in the presence of a trap in the sector. One important problem in testing for stationarity is the presence of structural breaks since the unit root tests are sensitive to breaks. As the data (1960/61 to 2002/3) covers three different regimes with different agricultural policies, structural breaks are expected to be an important feature of agricultural output per capita. To address the issue of structural breaks, the Clemente, Montañés and Reyes (1998) tests for unit root are used. These tests allow for two structural breaks and also account for both innovative outliers and additive outliers.

The test results presented in Table 4.2[11] suggest stationarity of agricultural output per capita, supporting the existence of a trap in the agricultural sector. That is, agricultural ouput per capita is a mean-reverting process

over time. This means that we would expect few observations in the neighborhood of the threshold itself in any data set and an unstable equilibrium can easily be mistaken for heteroskedastic errors (Barrett, 2005). The second problem is that most households possess a portfolio comprised of multiple assets. Estimation of asset dynamics must somehow deal with this dimensionality problem." (Carter and Barrette, 2006: 193).

[10] 300 to 550 birr

[11] The Clemente, Montañés and Reyes (1998) unit root tests accommodate both additive outliers (AO) and innovational outliers (IO). The results presented in Table 4.2 are based on the IO model; but the AO model gives similar results.

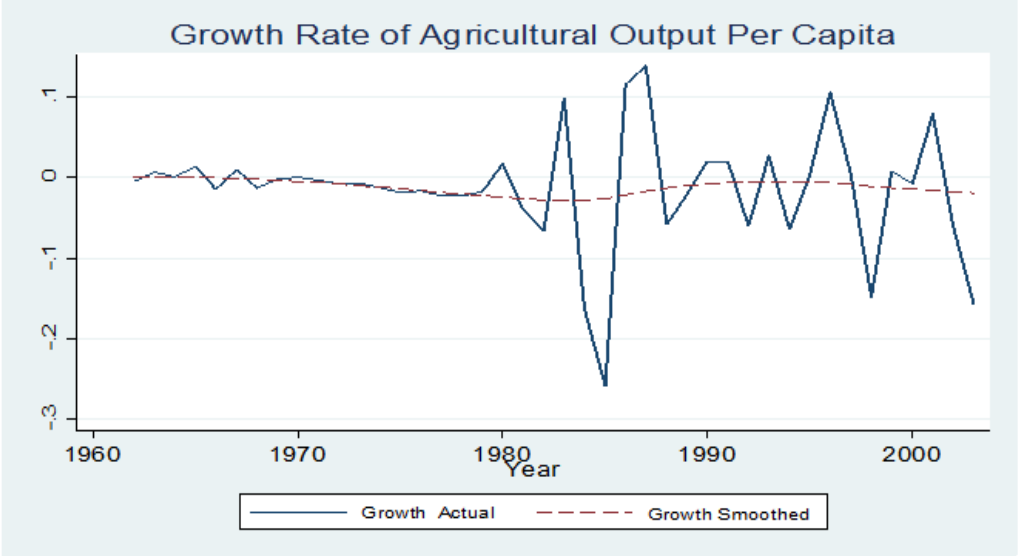
that fluctuates randomly around a certain stationary level, implying that its growth is zero over a long period of time. Figure 4.7 shows the trends in the growth of the actual and smoothed levels of agricultural output per capita. Once the structural breaks and the erratic fluctuations are filtered out, the growth in agricutral output per capita flattens out as shown by the broken line. This is consistent with the results in Table 4.2.

Table 4.2: Testing for a Poverty Trap: Macro Approach

Clemente-Montañés-Reyes unit-root test of real per capital agricultural output				
Log of Agricultural output per capita	T = 39	optimal breakpoints : 1975/6 , 1982/3		
AR(1)	du1	du2	(rho - 1)	const
Coefficients:	-0.17	0.18	-1.65	-0.02
t-statistics:	-3.593	3.672	-10.88	
P-values:	0.001	0.001	-5.490 (5%	crit. value)
The null of unit root is rejected.				
Note: The test is based on double mean shifts innovative outlier model.				

Another interesting result is that the structural breaks tally with the regime change in 1975/76 and the period just after the policy changes, i.e., 1982/83, that introduced incentive non-compatible policies such as compulsary grain delivery and socialization of production in the form of producers' cooperation. However, though the major regime shift in 1991 resulted in many pro-agricultural policies, the tests do not show any structural break following the regime change (see Figure 4.8 in the appendix). This indicates an absence of a persistent innovative shock that changed agricultural output per capita substantiallyin the post-1991 period. The results may suggest that ending rent-seeking institutional arrangement is not enough to get out of stagnation unless its adverse hangover effects are addressed.

Figure 4.7



5 Conclusions and Implications

Economic stagnation and persistent poverty define most of the developing world. The current paper looks at whether the existence of a poverty trap can explain this phenomenon, taking Ethiopia as a case. Using a rural household survey panel dataset, the paper examines households' income dynamics during 1994-2004 period. The empirical results suggest the existence of a low-level equilibrium trap. At the macro level, the stationarity of agricultural output per capita also supports this result. In addition, the comparative static policy experiment results show that interventions that support land fertility-enhancing mechanisms and facilitate asset accumulation among households may have a significant effect in unlocking the low-equilibrium trap.

Though the post-1991 reforms have facilitated surplus production, the observed low-equilibrium trap may indicate a severe slack in productive ca-

pacity, which requires long time to fill. Easterly's (2002) evaluation of the post-1991 (1992-2002) Ethiopian economy reached a similar conclusion. The main findings of Easterly (2002:2) allude that

> "...increases in Ethiopia's growth potential would require a second generation of reforms that address some of the poor initial conditions... (due to the binding nature of the initial conditions) Ethiopia's current predicament fits well with theoretical and empirical descriptions of a 'poverty trap'. Only a significant 'big push' in the fundamentals through a program of institutional reform... would make possible an acceleration of growth..."

The poverty trap hypothesis states that initial conditions determine the future income trajectory. In the words of Hoff and Stiglitz (2001: 394), "It is not necessarily true that the impact of past events erodes over time. Those events may set the preconditions that drive the economy to a particular steady state." We, thus, consider the case of Ethiopia and posit that predatory institutions may be the initial cause for stagnation. As predatory institutions dominated the country from the fourth century until recently, their effect on the growth of the agricultural sector has been quite deleterious. The adverse influences of predatory institutions on the incentive to invest, accumulate assets, and innovate facilitated conditions that favor production only at a subsistence level. As a result, agricultural investment and technical progress are limited to meet only the subsistence level of output.

With centuries-old slack in agricultural investment, lag in technical progress, and low levels of wealth accumulation due to the subsistence nature of production, institutional reforms alone may not be enough to transit out of a poverty trap. The slack in productive capacity dwarfs the positive roles of the institutional reforms by serving as the starting condition in the post-reform era. To the extent that bridging the centuries-old slack takes time, the observable effects of institutional reforms can be expected to accrue over

a long period. Easterly (2002) also notes that it takes time to implement reforms; hence, their effect are observable long after their completion.

Briefly, in order to address the problem of the low-equilibrium trap, it is important to understand the productive capacity rift created by the early institutions. Policy interventions should be informed by the depth of the rift, as marginal action may be ineffective in breaking out of low equilibrium trap. Sachs' (2005) suggestion for a massive expenditure boost seems to be predicated on this reasoning.

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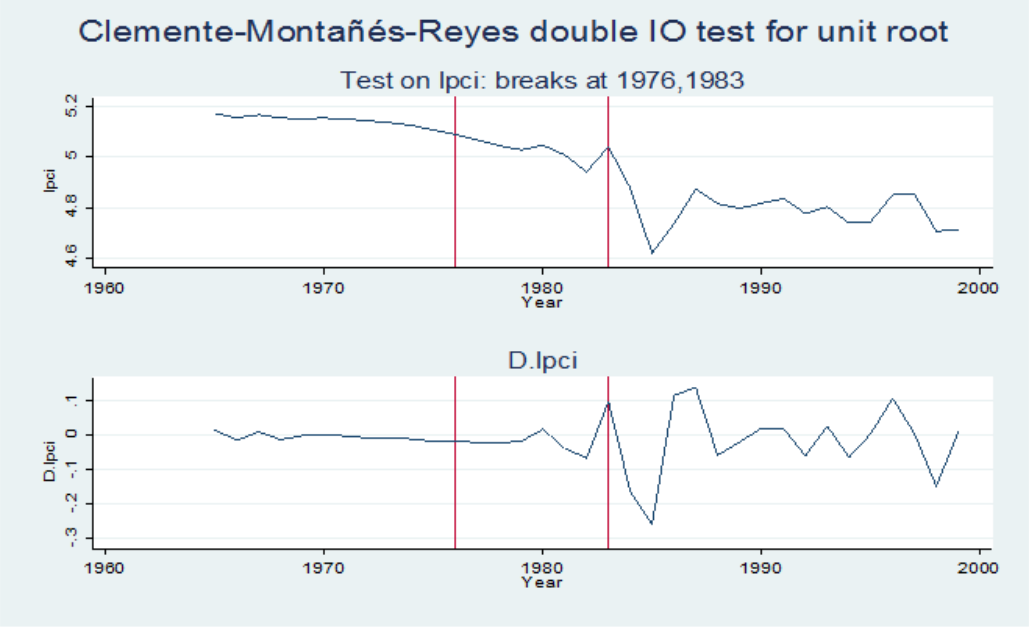
Appendix 1. Tables and Figures

Table 3.1: Descriptive Statistics

Year	1994		1995		1997		1999		2004	
N=1015	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
Farm Income	1551	2119	1806	2283	2300	2744	2001	2055	2239	2819
Off Farm Income	51	155	61	280	53	194	67	246	57	170
Household Head Age	46	16	47	16	49	15	50	15	53	15
Household Size	6.5	3.0	6.4	3.0	7.9	3.3	7.8	3.3	5.0	2.3
Land Size	2.03	2.29	2.04	2.05	2.12	2.01	1.22	1.05	2.12	2.01
Land Fertility Index	2.2	0.66	2.3	0.67	2.2	0.72	2.4	0.64	2.4	0.64
Number of Oxen	0.30	0.77	0.31	0.78	1.03	1.14	1.09	1.10	.92	1.09
Value of Asset	209	425	271	515	260	394	310	423	313	480
Illiterate Household Head	0.67	0.47	0.67	0.47	0.67	0.47	0.66	0.47	0.59	0.49

Figure 4.8



Appendix 2. Note on Land Fertility Index

On average, households own more than one plot of land with different characteristics. The survey asks households to identify their plots as fertile (Lem), somewhat fertile (Lem-Teuf), or infertile (Teuf). To capture the characteristics of the total land owned by a household, the land fertility index (LFI) is computed as:

$$LFI = \sum_{i=1}^{n} f_i w_i \quad ,$$

where w_i is the ratio of each type of land to the total land owned; and f_i is the land fertility indicator. f_i takes the value 3, 2 and 1 for fertile (Lem), somewhat fertile (Lem-Teuf), and infertile (Teuf), respectively. Thus, the LFI ranges from 1 to 3, where a higher values indicates better land quality.

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Does Ethnicity Matter for Trust? Evidence from Africa

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This paper proposes that ethnicity coupled with ethnic nepotism may reduce interpersonal generalised trust. We use the 2001 wave of the World Values Survey data for eight African countries to test this claim, and show that while ethnicity and ethnic nepotism are each important in affecting generalised trust levels, their interaction has a self-reinforcing and negative effect on trust levels. The results underscore the importance of institutions in controlling ethnic nepotism and thus partly in mitigating the adverse effects of ethnicity on trust.

JEL classification: *D02, Z13*

1. Introduction

Generalised interpersonal trust plays an important role in shaping economic and social outcomes. Generalised trust is a reflection of the 'bond that people share across a society and across economic and ethnic groups, religions, and races' (Rothstein and Uslaner, 2005, p. 45). It eases exchange without a need for a strict means of enforcement and thus reduces transaction costs (Zak and Knack, 2001), promotes investment efficiency and is the foundation of cognitive social capital which has been argued to be important in a country's institutional and economic development (Knack and Keefer, 1997). In particular, Zak and Knack (2001) and Knack and

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Keefer (1997) show that a one-standard deviation increase in the trust index raises economic growth by more than one-half of a standard deviation. Reid and Salmen (2000) find that trust is a key determinant of the success of agricultural extension in Mali. Another case study by Fafchamps and Minten (2001) suggests that cognitive social capital, in the form of trust emanating from personal contacts, increases incomes of agricultural traders and their families.

In ethnically diverse societies, however, generalised interpersonal trust appears to be low compared with in homogenous societies. Using data from US localities, Alesina and LaFerrara (2000) find that racially diverse communities experience lower levels of trust than homogenous ones, which reduces the efficiency of public service delivery. This is further echoed by Lassen (2003), who shows that ethnic diversity decreases tax compliance by reducing trust levels, and thus frustrates public sector performance. According to Zak and Knack (2001), the main argument for this inverse relationship between interpersonal trust and social distance is that when people share the same ethnic background, their social distance is reduced and thus trust is strengthened. This argument gains particular relevance in African countries as they have among the highest levels of ethnic diversity in the world. Collier (1998) shows empirically that high ethnic diversity lowers the level of trust, although his measure of ethnic fractionalisation is only marginally significant.

Long before ethnic diversity was introduced into the economics discipline, Marcson (1945) noted that ethnic diversity leads to antipathy between unlike groups. He argued that antipathy is socially conditioned. Unlike groups may coexist either in harmony or conflict depending on the initial social stimuli specific to the groups as opposed to individual experiences. This suggests that the group to which an individual belongs influences his/her identity formation and hence his/her trust behaviour.

Furthermore, when people associate themselves with a certain group, ethnic or non-ethnic, and limit their interaction within that particular group, they may develop particularised trust for that group. Particularised trust implies 'deeper ties to a closer circle such as family members, friends, and others with similar background' (Bahry *et al.*, 2005). Interestingly, such behaviour can have a negative bearing on generalised trust; the overall levels of

trust in society decline as trust becomes particularised, i.e., limited within a specific group. This is what is referred to as a 'similarity argument' in the social trust literature. People develop trust among themselves on the basis of their similarity.

It is important to note that a high level of particularised trust may not necessarily lead to low levels of generalised trust, as it is possible to have high particularised and generalised trust simultaneously (Bahry *et al.*, 2005). Given tension- and domination-free relationships among different ethnic groups, trust among different ethnic group members could flourish, suggesting the presence of both high particularised and generalised trust levels. On the other hand, tensioned ethnic relationships discourage generalised trust in favour of particularised trust. Ethnic nepotism is one of the most important causes of tensioned ethnic relationships; its prevalence may create an environment marred by suspicion among individuals, which in turn may reduce generalised trust levels.

Ethnic nepotism is a form of extended nepotism that capitalises on the divisions of people into separate ethnic groups based on race, nationality, language, tribe, religion or caste. Evolutionary theories of inclusive fitness and kin selection postulate that members of an ethnic group favour their group members over non-members because they are more related to their group members than to outsiders (Vanhanen, 1999; Silverman and Case, 2001). This disposition to favour kin over non-kin becomes important especially when people or groups of people have to compete for scarce resources.

Ethnicity, defined as associating oneself with a certain ethnic group as opposed to the society as a whole, and ethnic nepotism may reduce generalised trust levels. However, it is important to recognise the bi-directional relationship between the two. For instance, ethnicity may lead to ethnic nepotism when people organise themselves along ethnic lines and compete with others to get more resources. It is also possible that ethnic nepotism fuels ethnicity as disadvantaged or discriminated ethnic group members associate themselves more with their ethnic groups. Ethnicity and ethnic nepotism may, thus, be self-reinforcing. This makes it difficult to identify whether the effect on trust is due to ethnicity or ethnic nepotism alone or to both.

Ethnic nepotism could also lead to other forms of nepotisms such as corruption, political injustice and rising income inequality.

You (2005) uses these as 'fairness' indicators in explaining social trust, using data from the World Values Survey (WVS). His results suggest that these factors significantly reduce social trust. In addition, Rothstein and Uslaner (2005) show that economic equality and equality of opportunities are important foundations for building social trust. Ethnic nepotism is a potent force in eroding these foundations and therefore in eroding generalised trust.

Using WVS data for eight African countries, this paper examines whether ethnicity and ethnic nepotism affect generalised interpersonal trust. Our contribution to the social trust literature could be seen from at least two perspectives. First, while country-level ethnic diversity data are used in most of the previous studies, we use an attitudinal definition and measurement of ethnicity at the individual level. Hence, we can identify the association between ethnicity and generalised trust at the individual level. Second, we use country-level data on ethnic nepotism. This is particularly important given our focus on African countries where politics is run mainly along ethnic lines and hence ethnic nepotism could be more of a norm than an exception.

We argue that ethnicity lowers trust levels in the sense that the more people identify themselves with a subset of a society instead of with the society as a whole,[2] the lower the generalised trust levels in that particular society. However, we recognise that ethnicity *per se* may not have an impact on interpersonal trust in situations where ethnic nepotism is not a problem. We therefore posit that ethnicity coupled with ethnic nepotism could reduce generalised interpersonal trust.

Our results show that ethnicity constitutes a potent force in attenuating trust levels. Our results also show that the presence of ethnic nepotism may propagate the adverse effects of ethnicity on trust levels. The implication of our findings is that policy interventions that reduce the extent of ethnic nepotism could be an important instrument in minimising the adverse effects of ethnicity on trust. As such, the implication of our finding is consistent with an argument raised by Johnson (2005) where constitutional and fundamental organisational reforms are pointed out as viable long-term solutions in managing the undesirable outcomes of ethnicity.

[2] In this case, an ethnic group could be tribal or racial depending on the most natural and convenient definition in that particular country. And the whole society is represented by country in our analysis.

The following section briefly describes the data and provides some descriptive statistics. The estimation framework and results are discussed in Section 3. Section 4 concludes the paper.

2. Data and Descriptive Statistics

This paper uses attitudinal measures of trust and ethnicity for eight African countries from the 2001 wave of the WVS. The existing literature in the case of Africa uses indices of ethnic heterogeneity, measured nationally to capture ethnicity while the trust levels are captured at the individual level (see, for example, Collier, 1998). In contrast, this paper attempts to analyse how ethnic inclinations at the personal level affect trust levels, also at the personal level. This is important, as ethnicity and ethnic heterogeneity are different concepts; i.e., ethnically homogenous countries could show high ethnicity and vice versa. For instance, in our sample of countries, Egypt and Tanzania present these patterns. While Egypt is relatively ethnically homogenous, it scores the highest in terms of our ethnicity indicator. On the other hand, though Tanzania is highly ethnically fractionalised, it has one of the lowest proportions of respondents identifying themselves with a certain ethnic group compared with the country as a whole.

The concept of ethnic group and thus ethnic identity is such that there can be many ways to specify ethnic groups in a country (Fearon, 2003). Ethnic identity is not exclusively racial, cultural, religious or even political. Instead, it is best understood as a dynamic, constantly evolving property of both individual identity and group organisation. While ethnicity can be viewed as a product of actions undertaken by ethnic groups as they shape and reshape their self-definition and culture, it is also framed by external social, economic and political processes and actors as they shape and reshape ethnic categories and definitions (Nagel, 1994). In this paper we define ethnicity at the personal level as a case where an individual identifies him/herself with a subset of a society instead of the society as a whole. Helliwell (1996) and Bahry *et al.* (2005) use similar ways of defining ethnicity in studying the cases of the USA and Canada, and Russia, respectively.

In the WVS, respondents were asked whether they identified themselves primarily as nationals and secondarily as members of some ethnic groups. For example, respondents in South Africa

could choose between identifying themselves as 'Zulu (a local tribe there) before being South African' or as a 'South African first'. We argue that an individual who best describes him/herself as a Zulu (or any of the other tribes or ethnic groups) before being South African has an ethnic orientation, and we construct a dummy variable to capture this. Our measure of ethnicity can best be interpreted as ethnic identity. It captures how individuals describe and hopefully feel about themselves. In this sense, our measure of ethnicity is close to what Fearon and Laitin (2000) refer to as a social category that an individual either takes a special pride in or views as a more-or-less unchangeable and socially consequential characteristic.

The use of the WVS trust questions is not without scrutiny, however. One problem is the difficulty in interpreting the responses. Variations in responses may arise because of 'differences in beliefs about the trustworthiness of a common set of people; differences in interpretation of who comprises "most people"; differences in interpretation of what it means to be able to trust someone; or differences in the ability to elicit trustworthy behavior from other people' (Glaeser *et al.*, 2000, p. 815). The second problem is the warm glow effect; i.e., respondents may respond positively to the trust questions while their actual behaviours indicate something different (Alesina and La Ferrara, 2000). This may lead to an upward bias in measuring trust. However, this does not seem to be a problem in our sample, as only about 20% of the respondents responded affirmatively. In addition, measurement errors in our trust variable may not bias our results, assuming that the errors are not correlated with the explanatory variables. Under this scenario, measurement errors may lead to the loss of efficiency without biasing the estimates.

Glaeser *et al.* (2000) raise another problem in the use of the WVS trust question. In their experimental study, they found that positive responses for the trust attitude questions are correlated more with being trustworthy than with a trusting behaviour. This points to the divergence between a trusting attitude and behaviour. They conclude that such questions are more suitable to capture the overall trustworthiness in a society than to predict an individual's level of trust. As such, the WVS trust questions may only show trust attitudes, which may be different from trust behaviour. However, the overall trustworthiness in the society could affect

trusting behaviour, i.e., when fewer people are trustworthy, fewer people would be trusting (Hardin, 1992, cited in Knack and Keefer, 1997). Nevertheless, the WVS is the best available data on trust in the context of African countries. We thus proceed using the attitudinal measure of trust as the best indicator of trust behaviour.

2.1. Descriptive Statistics

African countries are the most fragmented societies in the world, especially when using the concept of Ethno-Linguistic Fractionalization (ELF), which measures the probability that two randomly selected individuals in a given country will not belong to the same ethno-linguistic group (Easterly and Levine, 1997). The sample contains both Egypt, one of the least fractionalised countries in Africa with an ELF of 0.04, and Tanzania, the most fractionalised with an ELF of 0.93. At the same time, we have countries with moderate ELF indices (about 0.5): Zimbabwe with 0.54, South Africa with 0.49 and Morocco with 0.53. All the countries in the sample have ethnic minorities as captured by ELF indices greater than zero for all eight countries. Just over half the countries in the sample have English as the official language (Nigeria, Tanzania, Uganda, South Africa and Zimbabwe), while the rest use Arabic. Similarly, just over half of the countries have a predominantly Muslim population (Algeria, Morocco, Egypt, Tanzania and Nigeria), while the rest have predominantly Christian populations. In terms of race, just over half are predominantly black African (Nigeria, South Africa, Uganda, Tanzania and Zimbabwe), while the rest are Arab nations. Table 1 presents descriptive statistics of all the variables used in the ensuing econometric analysis.

Almost half of the respondents are male and about 44% are Muslim. The overall picture is that attitudinal trust levels are low in Africa, with more than half of the countries having less than 20% of the respondents believing that most people can be trusted. However, 72% identify themselves with an ethnic group before the nation as a whole, revealing high levels of ethnicity or ethnic identity as we define it here.

Figure 1 gives an overview of the relationship between the trust and ethnicity variables across the eight countries. The overall picture is that attitudinal trust levels are low in Africa, with more

Table 1: *Descriptive Statistics*

Variables	Description	Mean	Standard deviation
Dependent variable			
Trust	Generalised trust (1 = if respondent thinks most people can be trusted, else = 0)	0.2036	0.4027
Socio-economic			
Ethnicity	Ethnic identity (1 = if respondent identifies herself with an ethnic group first, else = 0)	0.7267	0.4457
Married	Marital status of the respondent (1 = married, else = 0)	0.0325	0.1773
Education	Years of formal education	3.5544	2.211
Age	Age of respondent	35.2536	13.8899
Sex	Sex of respondent (1 = male, 0 = female)	0.4917	0.4999
Protestant	Whether the respondent is a protestant or not (1 = if protestant, else = 0)	0.2342	0.4235
Orthodox	Whether the respondent is orthodox or not (1 = if orthodox, else = 0)	0.0345	0.1824
Catholic	Whether the respondent is Catholic or not (1 = if Catholic, else = 0)	0.0767	0.2661
Evangelist	Whether the respondent is evangelist or not (1 = if evangelist, else = 0)	0.0335	0.18
Muslim	Whether the respondent is Muslim or not (1 = if Muslim, else = 0)	0.4425	0.4967

No religion	Whether the respondent belongs to no religious denomination or not (1 = no religious denomination, else = 0). Used as a reference group here.	0.0248	0.1554
Low class	Lower income class (1 = if lower income class, else = 0).	0.3616	0.4805
Middle class	Middle income class (1 = if middle income class, else = 0). Used as a reference group here.	0.3026	0.4594
Upper class	Upper income class (1 = if upper income class, else = 0)	0.3358	0.4723
Language at home	Whether the respondent speaks the country's common language at home (1 = yes, 0 = no)	0.6514	0.4765
Town size	Size of the town the respondent lives in (in terms of population)	2.9616	1.6096
Fractionalisation Indices[a]			
Ethnic fractionalisation	Ethnic fractionalisation	0.5588	0.2584
Linguistic fractionalisation	Linguistic fractionalisation	0.5723	0.3321
Nepotism indicators			
Interest	Whether the respondent feels that the country is being 'run by a few big interests'or 'run for all people' (1 = run by a few big interest, 0 = otherwise)	0.6799222	0.466525
Ethnic nepotism[b]	Score of the prevalence of ethnic institutional conflict	35.8753	29.3246

[a]Alesina, *et al* (2003).
[b]Vanhanen (1999).

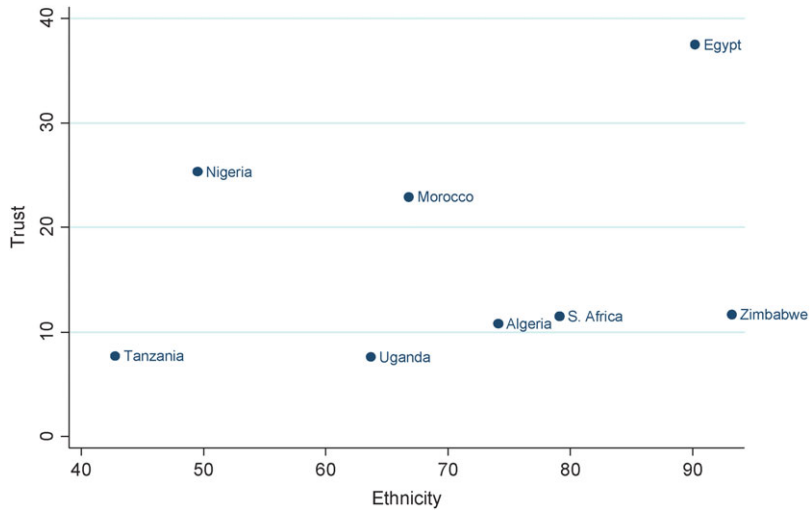

Figure 1: *Trust and Ethnicity*

than half of the countries having less than 20% of the respondents believing most people can be trusted. Egypt has the highest percentage, while Uganda has the lowest. An interesting observation is that the predominantly Muslim countries Algeria, Egypt, Morocco and Nigeria have higher trust levels compared with the predominantly Christian countries Uganda, South Africa and Zimbabwe.

Table 2 shows each country's interpersonal trust level and perception of ethnic identity (ethnicity), as well as an objective measure of the country's level of ethnic fractionalisation. The measure of ethnic fractionalisation is from Alesina *et al*. (2003).

Ethnicity is of strongest concern in Zimbabwe, where about 93% of the respondents identify themselves first with an ethnic group and then with the country, while Tanzania, at 43%, shows the least concern about ethnic affiliations. Egypt, on the other hand, presents an interesting case: it has considerably strong concerns for ethnicity yet the highest level of trust. At a glimpse, this could suggest that the role of ethnicity in explaining trust is insignificant. This observation can also be arrived at when we consider the case of Tanzania, which has the least concern for ethnicity but the lowest trust levels.

The puzzle presented by Egypt and Tanzania could indicate the presence of other mechanisms influencing the impact of ethnicity

Table 2: *Trust, Ethnicity and Ethnic Fractionalisation*

Country	Trust	Ethnicity	Ethnic fractionalisation
Egypt	37.5	90.2	0.18
Nigeria	25.3	49.5	0.85
Morocco	22.9	66.8	0.48
Zimbabwe	11.7	93.2	0.39
South Africa	11.5	79.1	0.75
Algeria	10.8	74.1	0.34
Tanzania	7.7	42.8	0.74
Uganda	7.6	63.7	0.93

on trust. We argue that institutions are one such mechanism, and we single out the presence of ethnic nepotism in particular. Thus, in the case of Egypt, it is possible that ethnic nepotism (presence or absence of it) may affect the relationship between trust and ethnicity. In Section 3, we attempt to address this issue by controlling for the presence (or absence) of ethnic nepotism as proxied by Vanhanen's (1999) measure of institutional ethnic conflict.

As a precursor to our empirical analysis, Figure 2 presents the Lowess estimates of trust and institutional ethnic conflict where the latter variable is used as an indicator of ethnic nepotism.

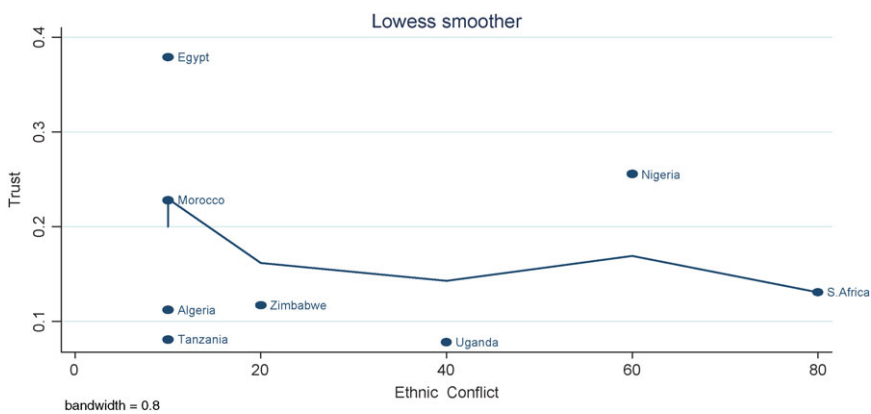

Figure 2: *Trust and Institutional Ethnic Conflict*

Though the number of observations is too small to give a robust interpretation of the Lowess estimates, the figure shows an inverse relationship between trust and ethnic nepotism. In countries where ethnic nepotism is prevalent as measured by the institutionalised ethnic conflict (e.g., South Africa), the trust levels appear to be lower.

Table 2 reveals another interesting pattern. The low-trusting countries Tanzania, Uganda and South Africa are highly ethnically fractionalised, while the relatively ethnically homogenous countries Egypt and Morocco are among the most trusting. However, Nigeria and Algeria are anomalies for this classification, as the former is highly ethnically fractionalised and has the second most trusting respondents, while the latter is among the least ethnically fractionalised but has one of the lowest proportions of trusting respondents.

We used a non-parametric smoothing method to further explore this relationship using the data at the individual level. The result of the Lowess smoothing is shown in Figure 3. The result suggests an inverse relationship between trust and ethnicity. It is important to note that the relationship between ethnicity and trust may not be as simple as the figure suggests. In particular, for example, the country's degree of ethnic fractionalisation and the presence of

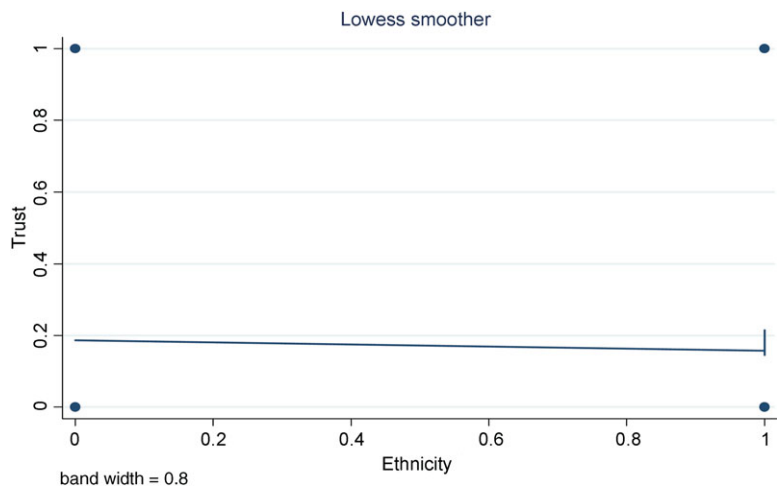

Figure 3: *Lowess Estimate of Trust and Ethnicity*

ethnic nepotism need to be controlled for, as these factors may shape the relationship between ethnic identity and trust. We explore this relationship further in the ensuing analysis.

In the following section, we undertake a multivariate analysis to better understand the links among trust, ethnicity and ethnic nepotism.

3. Econometric Evidences

In this section, we set up an empirical model to test the hypothesis that attitudinal levels of trust decline with high levels of ethnicity.

3.1. The Empirical Model

We estimate the following empirical model:

$$\text{TRUST}_i = \beta_0 + \beta_{1i}\text{Ethnicity}_i + \sum_{j=2}^{n} \beta_{ji} X + \varepsilon_i.$$

Our dependent variable is TRUST, a dummy to capture the respondent's view on whether most people can be trusted. As discussed earlier, this is a measure of generalised interpersonal trust and is based on the standard question of whether most people can be trusted or 'you cannot be too careful' in dealing with people. 'Ethnicity' is a dummy variable showing the respondent's ethnic inclination. $\boldsymbol{X}$ is a vector of variables comprising socio-economic characteristics, experiences of the respondent, country-level fractionalisation indices, as well as indicators of the presence of ethnic nepotism. A detailed description of the variables is given in Table 1.

In our estimation, we proceed step-by-step to examine the impacts of ethnicity and ethnic nepotism. First we introduce an ethnicity indicator to see how ethnicity affects trust. Controlling for social and demographical characteristics, the coefficient of ethnicity is expected to be negative and significant if the similarity argument holds.

Then we raise the question of whether people's perceptions about the existence of nepotism of any form matter for trust. To address this question, we use a variable that captures whether the respondent feels that the country is 'run by a few big interests' or 'run for all people'. We argue that when a respondent feels that a

few big interests are running the country, it is an indication of the presence of some form of nepotism—ethnic or non-ethnic.

Finally, to address the issue of ethnic nepotism directly we use Vanhanen's (1999) measure of institutionalised ethnic conflict. This measure, which ranges from 0 to 100, is constructed on the basis of the relative significance of ethnic parties and organisations,[3] ethnic inequalities in governmental institutions and the level of customary ethnic discrimination (see Appendix 1 for a detailed description of this variable). A higher value of this measure may show all or one of the following characteristics: ethnically organised parties are important, a high prevalence of ethnic inequality in government institutions and finally a higher degree of customary ethnic discrimination. These characteristics are also observable in societies marred by ethnic nepotism.

3.2. Results

3.2.1. Ethnicity and Trust

Exploring the link between ethnicity and trust yields the results reported in Table 3. The results presented in Table 3 support our hypothesis that a person who predominantly identifies him/herself with some ethnic group is less likely to think that most people can be trusted at a personal level. The results remain the same even after controlling for linguistic and ethnic fractionalisation at the country level. This suggests that ethnicity does matter for generalised trust, which is consistent with the findings both by Bahry *et al.* (2005), who report a negative relationship between ethnicity and trust in Russia, and by Helliwell (1996) for the USA and Canada.

3.2.2. Ethnic Nepotism and Trust

In Table 4,[4] we focus on the effects of ethnic nepotism on trust. In column 2, we introduce the 'interest' dummy variable, which captures people's perceptions about whether the country is 'run by a few big interests' or 'run for all people'. Interestingly, the

[3] When political parties are organised along ethnic lines, they tend to favour their ethnic groups once they are in power. The existence of many such organisations could, thus, create an environment conducive to ethnic nepotism.

[4] We do not report all the coefficients on the individual controls, as their effects remain stable.

Table 3: *Trust and Ethnicity: Probit Coefficients*

Dependent variable: trust				
	2	3	4	5
Ethnicity	−0.061 (0.083)*	−0.086 (0.033)**	−0.151 (0.000)***	−0.143 (0.000)***
Marital status	−0.028; −0.75	−0.015 0.89	−0.05 −(0.064)*	−0.054 (0.056)*
Education	− 0.035 (0.000)***	−0.095 (0.003)***	−0.111 (0.000)**	−0.11 (0.001)***
Education squared		0.007 (0.042)**	0.011 (0.020)**	0.011 (0.024)**
Age	0.002 (0.057)*	−0.014 (0.012)**	0.015 (0.000)***	−0.014 (0.000)***
Age squared		0.0002 (0.003)***	0.0002 (0.000)***	0.0002 (0.000)***
Sex	−0.004; −0.892	−0.023; −0.481	−0.008; −0.757	−0.006; −0.83
Size of town	−0.025 (0.013)**	−0.026 (0.024)**	−0.025; −0.109	−0.032 (0.059)*
Protestant		−0.131 (0.063)*	0.141; −0.459	0.164; −0.413
Orthodox		−0.406 (0.004)***	−0.164; −0.119	−0.096; −0.6411
Catholic		−0.064; −0.538	−0.154 (0.018)**	−0.143 (0.023)**
Evangelist		−0.173; 0.112	−0.093; −0.367	−0.092; −0.379
Muslim		−0.118; −0.181	0.312 (0.071)*	0.424 (0.007)***
Low class		0.087 (0.041)**	0.13; −0.124	0.13; −0.118
Upper class		0.058; −0.16	0.007; −0.886	0.004; −0.929
Language at home		−0.089; −0.497		
Linguistic fractionalisation			−0.542 (0.000)***	
Ethnic fractionalisation				−0.531 (0.007)***
Constant	−1.236 (0.000)***	−0.041; −0.842	−0.026; −0.925	−0.091; −0.762
Observations	10,640	7,787	8,599	8,599
Country specific effects	Yes	Yes	Yes	Yes

Robust *p*-values in parentheses.
*Significant at 10%; **significant at 5%; ***significant at 1%.

Table 4: *Trust and Ethnicity Nepotism: Probit Coefficients*

Dependent variable: trust			
	2	3	4
Ethnicity	−0.04; −0.33	−0.082; −0.112	0.064; −0.288
Interest (nepotism)	−0.251 (0.000)***		
Ethnic nepotism		−0.007 (0.004)***	−0.005 (0.077)*
Ethnicity*ethnic nepotism			−0.003 (0.012)**
Constant	−0.356 (0.035)**	0.101; −0.759	−0.002; −0.994
Observations	7,338	7,787	7,787
Country-specific effects	Yes	Yes	Yes

Robust *p*-values in parentheses.
*Significant at 10%; **significant at 5%; ***significant at 1%.

significance of our 'ethnicity' variable has vanished, while the 'interest' variable is highly significant and negative. In terms of marginal effects, nepotism seems to have a higher impact than ethnicity, suggesting that nepotism is a stronger determinant of trust than ethnicity is.

Columns 3 and 4 of Table 4 introduce our measure of ethnic nepotism. Both estimation results indicate that the presence of ethnic nepotism reduces generalised interpersonal trust. The third column shows ethnicity to be insignificant at the 10% level of significance, though negative, while the coefficient of ethnic nepotism is significant and negative. The implication of this result is consistent with the results in column 2, which indicate that nepotism, in this case ethnic nepotism, is stronger than ethnicity in explaining trust. In column 4, we interacted the ethnic nepotism and ethnic variables to test the hypothesis that ethnicity *per se* might not have an impact on generalised interpersonal trust unless it is accompanied by ethnic nepotism, i.e., ethnicity coupled with ethnic nepotism may reduce trust.

The non-linearities and complexities associated with using interaction terms in a probit model imply that we cannot directly interpret the coefficients of the interaction term in column 4 of Table 4.

Table 5: *Marginal Effects of Ethnicity*

Ethnic nepotism	Ethnicity	Interaction
10	0.00043 (0.977)	−0.0007 (0.039)**
20	−0.0079 (0.522)	−0.0006 (0.038)**
30	−0.0159 (0.12)	−0.0006 (0.041)**
40	−0.0235 (0.01)***	−0.0005 (0.05)**
50	−0.0308 (0.001)***	−0.0005 (0.06)*
60	−0.0378 (0.000)***	−0.0005 (0.092)*
70	−0.0444 (0.000)***	0.0004 (0.13)
80	−0.0507 (0.001)***	−0.0004 (0.18)

Probability values are in parentheses.
*Significant at 10%; **significant at 5%; ***significant at 1%.

To calculate the correct marginal effects, we use a method proposed by Norton *et al.* (2004), which entails computing the cross-derivative or cross-difference to derive the interaction effect. The results strongly support our hypothesis. In particular, the probit estimation with the interaction allows us to explore different channels through which ethnicity and ethnic nepotism work to affect trust levels. We evaluate the marginal effects at different values of ethnic nepotism and report the results in Table 5.

The marginal effect of ethnicity is significant only for higher levels of ethnic nepotism, suggesting that ethnicity by itself does not have a significant impact on trust levels unless it is accompanied by high levels of ethnic nepotism. Besides, our interaction variable is negative and significant for most levels of ethnic nepotism (from 10 to 60) and insignificant at the very high levels. This may be because of the possibility that individuals in societies with high levels of ethnic nepotism are more likely to be ethnically charged. In such cases, it is difficult to identify the effects of ethnicity and ethnic nepotism separately. Also, the interaction model shows that the probability of trust is a declining function of ethnic nepotism as shown in Figure 4.

The results underscore the importance of not only the direct effect of ethnic nepotism on trust but also its importance in shaping the effect of ethnicity on trust. Addressing the problems

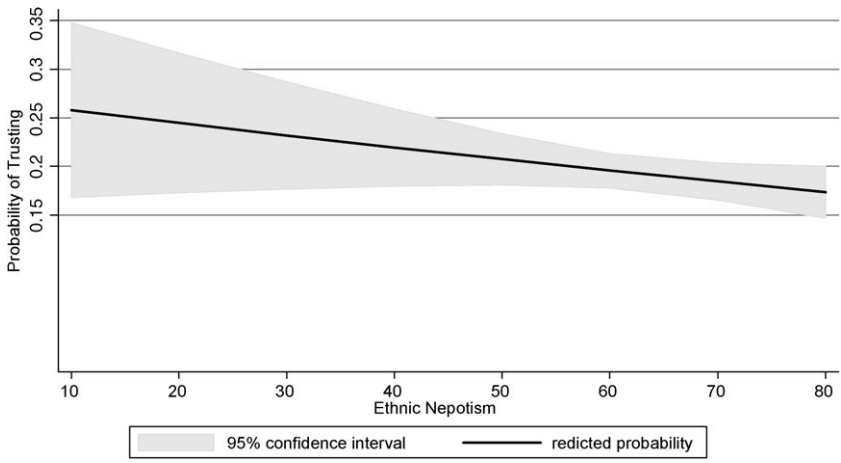

Figure 4: *Trust and Ethnic Nepotism*

of ethnic nepotism would thus be an important channel in promoting the levels of interpersonal trust in society.

3.2.3. Other Correlates of Trust

To capture individual characteristics and experiences, we include variables such as age, gender, education, size of the town the individual lives in, whether the individual's language is also the country's dominant language, income (formulated as a categorical variable with three different self-reported income groups, i.e., lower, middle and upper income classes), as well as the individual's religious inclinations (grouped into Protestant, Orthodox, Catholic, Evangelist, Muslim and no religion/Atheist, following the sample characteristics).

In all estimation results in Table 3, education is highly significant and the relationship between education and trust shows a robust U-shape, as both education and its square remain statistically significant at the 1% level. This implies that people with lower levels of education are less trusting, while people with higher levels of education are more trusting. Evidence from other research is in sharp contrast with our results. Schechter (2007) finds that higher educated people in rural areas of Uruguay spent less money in a trust game, suggesting that they are less trusting. Bellemare and

Kroger (2003) on the other hand use a random sample from the Dutch population and find that the correlation between education and trust follows an inverted U-shape. Our result, on the other hand, suggests that higher levels of education could possibly encourage cooperative behaviour, which builds trust. This result is important and hopeful, as it implies that the negative effect of ethnicity on trust can be mitigated through instruments such as education, which can be affected by policy.

A U-shaped relationship is also observed between age and trust. This is in contrast with Sutter and Kocher (2003), who, using an experimental trust game, find that trust in anonymous partners increases almost linearly from early childhood to early adulthood but then stays almost constant. However, we find that older people tend to be more trusting and that the age effect is convex.

Income is another possible correlate of trust. However, the expected impact of an individual's income on generalised trust is ambiguous. Following the argument that trust develops among similar people or groups of people, people in the lower and middle-income groups are more trusting, as they constitute the majority in many societies. For people in these groups, the phrase 'most people' in the trust questionnaires refers to people in their own groups. Hence, for people in the rich income group, the same phrase refers to people outside their own group. Given that trust develops among similar groups of people, the rich are then expected to be less trusting, while people in the lower and middle-income groups are more trusting. On the other hand, with ethnic nepotism, people in the discriminated and disadvantaged group are less trusting of others since they have experienced unfair rules and practices. As such people are concentrated in the lower income group, it is also possible that this group may be less trusting (You, 2005). At any rate, our results point to the first explanation; people in the lowest income group in Africa are more trusting, in line with the similarity argument.

Religion has a significant impact on trust. In all estimations, we explore the relationship between trust and specific religious affiliation at the individual level. Notwithstanding the variation in results across our different specifications mainly due to sample differences, the overall conclusion seems to be that Muslims are more trusting, and Catholic and Orthodox are less trusting compared with Atheists or people who claim they do not follow a religion.

We use the size of the town an individual lives in (in terms of population) as a proxy for the effect of population density. Our result confirms the hypothesis that residents in big cities are less trusting. Collier (1998) also finds a significant (though quadratic) relationship between population density and trust.

In ethnically diverse countries, communication between people belonging to different ethnic groups might be difficult due to the inability to speak the same language, which is likely to affect interpersonal trust negatively. We control for this by introducing a dummy equal to 1 if the respondent is able to speak the most commonly used language and zero otherwise.[5] Then we use the Alesina *et al.* (2003) linguistics fractionalisation index, which shows the probability that two randomly selected individuals from the population speak different languages. The results show that the language dummy variable is insignificant,[6] while our latter indicator, linguistic fractionalisation, is significant and negative. However, as linguistic fractionalisation is highly correlated with ethnic fractionalisation, the result may be driven by factors other than linguistic fractionalisation.

Personal traumas such as divorce do not affect trust, consistent with Alesina and LaFerrara (2000). Similarly, gender has no significant effect on trust, i.e., there are no significantly different patterns of trust between men and women. On the other hand, marital status appears to be significant and negative, suggesting that married people are less trusting.

Following Alesina and LaFerrara (2000), we tested the robustness of our results by removing the influential observations using the DFbeta method. Our results remained stable.

4. Conclusions

This paper has shown that while ethnicity and ethnic nepotism are each important in determining generalised interpersonal trust levels in Africa, their interaction has a self-reinforcing and negative

[5] We recognise the measurement errors arising from the fact that the respondent may speak the most commonly used language but reside in a locality where that language is not widely spoken. In addition, it is difficult to say which language is the most commonly used in the case of South Africa and Nigeria, where two or three languages are equally common.

[6] This result may be due to the poor measurement of the language variable as discussed in footnote 4.

effect on trust levels. That is, the presence of ethnic nepotism worsens the negative effect of ethnicity on interpersonal trust. In particular, our results suggest that ethnicity by itself may not affect trust significantly in situations where the degree of ethnic nepotism is low. Furthermore, we found that the other factors with strong effects on trust are education, age, income, religious affiliation and population density.

The implication of our findings is that policy interventions that reduce the extent of ethnic nepotism could be an important instrument in minimising the adverse effects of ethnicity on trust. This is consistent with an argument raised by Johnson (2005) where constitutional and fundamental organisational reforms are pointed out as viable long-term solutions in managing the undesirable outcomes of ethnicity.

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Appendix 1. The scale of institutional conflict

0 = No significant ethnic organisations; no significant ethnic inequality in political representation

5 = The share of ethnic parties comprises less than 10% of the votes cast in parliamentary or presidential elections; some other ethnic organisations; minor ethnic inequalities in political representation; some small ethnic groups are discriminated

10 = The share of ethnic parties 10–14%; some prominent ethnic organisations; clear ethnic inequalities in political institutions; ethnic discrimination

20 = The share of ethnic parties 15–29%; significant ethnic organisation; significant ethnic inequality in political institutions; serious forms of ethnic discrimination

40 = The share of ethnic parties 30–49%; ethnic organisations cover a significant part of the population; ethnic interest conflicts characterise social life; conspicuous ethnic inequality in governmental institutions; large ethnic groups are discriminated

60 = The share of ethnic parties 50–69%; most interest organisations are ethnic ones; ethnic interest conflict more important than other types of interest conflict; striking ethnic inequality in governmental institutions

80 = The share of ethnic parties 70–89%; nearly all interest organisations are ethnically based; ethnic interest conflict or inequality in governmental institutions dominate national politics

100 = The share of ethnic parties 90–100%; all significant interest organisations are ethnic by nature; practically all interest conflict between groups takes place along ethnic lilies

Source: Vanhanen (1999, p. 61; Table 1).