Democracy and Dictatorship:

Comparing household innovation across the border of Benin and Togo

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Summary. – We exploit a quasi-experimental situation – villages on either side of the international border at the remote northern tip of Benin and Togo – to evaluate how institutions affect household innovation. Our microeconomic analysis suggests that *ceteris paribus* households in democratic Benin are more likely to adopt soybean farming, plant trees, and use improved cookstoves and mosquito nets – four technologies that bring a combination of agricultural, environmental, and health impacts to rural households. These findings suggest that without proper institutions in place, it may be difficult to meet goals of alleviating poverty and improving health and environmental conditions in the developing world.

Keywords: Institutions, technology adoption, border matching, Africa, Benin, Togo

1. INTRODUCTION

Some of the highest incidences of poverty persist in Sub-Saharan Africa. Attempts to redress this situation and stimulate economic growth have typically focused on the promotion of technologies that bring agricultural, environmental, and/or health improvements to rural households. These investments have the potential of addressing many aspects of poverty, including malnutrition, disease and sickness, agricultural productivity, and environmental sustainability. Lower than anticipated levels of household technology adoption has put the spotlight on factors that influence a household's decision to invest in new technologies. While numerous studies have examined the socioeconomic factors that can lead to adoption of such technologies (Feder et al. 1985, for example), few have considered whether political institutions and governance at the national level influence these innovative behaviors at the household level.

There is a growing body of literature on the effects of democracy and governance on socio-economic development. Examples include impacts of democracy on public goods provision (Deacon 2003), natural resource management (Deacon 2004; Lopez 2005), and overall economic growth (Knack 2002). Despite this growing body of work, the Human Development Report acknowledges that the effect of political institutions on economic and social outcomes is not fully understood (UNDP 2002). One reason for this lack of certainty is that the 'empirical world' is multi-collinear: it is difficult to separate institutions and national political processes from other factors that vary across national boundaries. As we continue to gather empirical evidence on these institutional effects, there is a conspicuous lack of information at the micro-level on whether these institutions affect household investments. This type of information is important because macro-level studies by definition average out local and contextual influences, and

therefore cannot depict how political and governance structures influence household level choices – a level at which poverty alleviation programs operate and 'make or break' lives.

We exploit a quasi-experimental situation to examine rural household innovation under different political and governance structures in the countries of Benin and Togo in West Africa. These two countries share more than just a border – they are similar in their social and economic indicators at the national level. Two former French colonies, these countries have radically diverged in their political institutions since the early 1990s, and subsequentially, their governance patterns. At the national level, the political divergence in these two countries has had significant effects on provision of civil liberties, accountability, openness and transparency, and rule of law within each country. Despite differences resulting from national political and governance structures, the two villages considered in this research share many socioeconomic, physiographic, and cultural characteristics, so that the colonial-era placement of the national boundary creates a "natural experiment".

Using cross-sectional data from a 2004 survey and this border matching approach, we estimate the likelihood of adoption for four technologies that bring a combination of agricultural, environmental, and health impacts to rural households: soybeans, improved cookstoves, mosquito nets, and trees. Using binary choice models we proxy for political and governance differences using a dummy variable, controlling for statistical differences between the two study sites and other important adoption determinants. Results show that adoption rates for all four technologies are higher in Benin – *ceteris paribus* – and that the political and governance dummy is significant for all technologies. Findings suggest that political institution and governance can affect household adoption of technologies promoted to improve rural livelihoods.

The rest of this paper is organized as follows: in Section 2 we present the relevant conceptual issues; in Section 3 we provide background on the study sites; in Section 4 we describe the data; in Section 5 we present the empirical results; and in Section 6 we conclude.

2. CONCEPTUAL CONSIDERATIONS

(a) Political institutions and governance

The Universal Declaration on Democracy (1997) identifies two main components of a democracy – participation and accountability. The 2002 Human Development Report (UNDP 2002) is more specific, listing these key factors as constituting a democracy: a system of representation, free and fair elections, system of checks and balances, vibrant civil society, free and independent media, and effective civilian control over the military. In short, a democracy is a political system characterized by competition for executive office, a system of checks and balances on this executive power, and genuine public participation.

A concept often associated with democracy is "good" governance. A study by the World Bank offers six indicators of governance: voice and accountability, political instability and violence, government effectiveness, regulatory quality, rule of law, and control of corruption (Kaufmann et al. 2005). Even though democracy and good governance are often used interchangeably, they are not always associated. For example, it is feasible to have a dictator that provides good governance in the form of infrastructure, or access to public services (e.g., some East Asian countries). The reverse is also true – a country can be democratic without providing basic public services and civil rights, for example in some Latin American countries (Siegle et al. 2004).

There is a growing consensus that democracy and "good" governance play important roles in the development process (Bardhan 1997; Tanzi 1998; Nugent and Robinson 2002). Research has

shown that low-quality governance can limit human development, poverty reduction, public goods provision, and economic growth (Deinger and Mpuga 2005; Bulte et al. 2003). Knack and Keefer (1998) find that poor countries which lack good institutions and governance have slower overall growth. Isham et al. (1996) conclude that public accountability – through better governance – leads to greater efficacy in government action. Along the same lines, the empirical literature suggests that democratic countries use development aid more effectively (Siegle et al. 2004; Kosack 2005).

(b) Determinants of technology adoption

There is a large body of literature considering the adoption of agricultural, environmental, and health technologies in the developing world. Whatever the nature of the technology being considered, the adoption decision constitutes an individual choice to implement the new innovation. When an innovation is introduced, producers go through periods of becoming knowledgeable about the new technology, to forming positive or negative attitudes, to ultimately deciding whether or not to adopt (Feder et al. 1985).

Household, community, and institutional factors influence this decision process. Research on the adoption process often seeks to determine what set of characteristics influence a producer's adoption decision. Why some producers adopt the technology while others do not is modeled as a dichotomous choice. Regardless of the level of use, these types of studies only record the proportion of producers that have adopted the new technology at some snapshot in time (Doss and Morris 2001; Feder et al. 1985).

In a recent review of 32 agricultural and agroforestry adoption studies, Pattanayak et al. (2003) conduct a meta-analysis to identify characteristics of producers that influence their adoption decisions. They find that adoption factors can be classified into five broad categories

(see Clay et al. [1998] for a similar categorization): household preferences, resource endowments, economic incentives, risk and uncertainty, and biophysical characteristics. They also find that certain categories and factors are more likely to have statistically significant effects on the adoption decision of agricultural and agroforestry technologies. These include the categories of risk and uncertainty (78 percent), economic incentives (73 percent), biophysical factors (64 percent), and resource endowments (60 percent).

(c) Conceptual model

Using household production theory as an organizing framework (Amacher et al. 1993) and the five broad determinants of adoption discussed in Pattanayak et al. (2003), we develop a model of technology adoption as an investment choice. Basically, the economic agent will adopt the technology based on his/her estimation of the net benefits of the technology, which will be conditional on attributes or characteristics of the technology and the individual. If we consider the basic choice, the adoption variable takes on two values – zero and one – and so we can estimate a binary choice model of the adoption decision.

The utility maximization framework can be used to motivate this binary choice model. A household's adoption choice is based on whether the expected net utility derived from adopting the new technology is greater than from not adopting. Consider a representative farming household in a rural area that maximizes its utility, U, which is assumed to be a concave, continuous, twice-differentiable function of agricultural commodities, Q_C, (e.g., rice/corn) and household time inputs, Y_C (e.g., leisure). The function is conditioned by *household preferences* that are proxied by socio-demographics, H. Utility maximization is subject to three constraints (time input endowment, technology, and cash income). The household time input constraint implies that the sum of own input supply of time, Y_P (labor), and own input consumption of time,

Y_C (leisure), cannot exceed the household time endowment, Y_E, which is conditioned by household characteristics, *H*.

Agricultural outputs, Q_P, are assumed to be a convex, continuous production function, *F*, of, Y_P. Productivity depends on household *resource endowments*, *L*, such as land, tools, money and human capital. The *bio-physical characteristics of the farm*, *Z*, also mediate the production technology. A typical cash constraint requires household expenditures on commodities and inputs to be less than or equal to the sum of profits, π, which depend on *market prices*, P_Y, and exogenous income, *E*. The household's budget constraint combines a typical cash income constraint with the endowment constraint such that expenditures are equal to the sum of the monetary equivalent of the household input endowment, profits, and exogenous income; this sum is the "Beckerian" full income (Strauss 1986).

Following Amacher et al. (1993), the adoption of a technology requires joint investments of money, labor, and other resources (e.g., land) to acquire 'new technology'. That is, labor and money are collectively embodied in the amount of resources dedicated to the technology – be it soybean farming, improved cook stoves, use of mosquito nets, or tree planting. As described above, this joint investment is conditioned by the resource endowments and biophysical conditions faced by the household. The technology adoption can therefore be conceived as one among many sets of coordinated investments, L_A, that produce an annual rate of return, *r*, to enhance overall well-being. Since the returns to technology adoption occur in the future, households consider the expected stream of income net of consumption (*I*) or the *market-based incentives*, in choosing between alternate investments. This expected stream of income depends on *risks and uncertainty* (*R*) associated with the technology itself and the ecological and

institutional environment in which the household operates. The household's utility-maximization problem is expressed with the Lagrangian in Equation [1].

$$Max\ E\{[U(Q_C, Y_C; H) \quad + \quad \lambda(\pi + E - P_Y Y_P - rL_A) \quad + \quad \mu(Q_P, Y_P; L_A, Z)], R\} \qquad [1]$$

The objective is to maximize expected utility by choosing levels of inputs (including land) and outputs. The first-order conditions with respect to Q_C, Y_C, Q_P, Y_P, and L_A, have the standard Marshallian equimarginal interpretations when households choose the level of technology that maximizes total utility.

Under this framework, the utility maximizing household compares its expected net utility with and without adoption (ΔEU). A reduced form version of this net utility, which considers all the exogenous variables discussed in the model so far, is given by equation [2].

$$\Delta EU \quad = \quad \alpha_I I + \alpha_L L + \alpha_R R + \alpha_Z Z + \alpha_H H + \varepsilon \qquad [2]$$

where *I, L, R, Z*, and *H* are as defined above. Note, *I*, captures market incentives because net income is a function of explicit and implicit prices of outputs and inputs of the new technology. Since the true net utility function is unknown, we treat the estimated function as random by including the error term ε^1. Although ΔEU is not directly observable, the researcher can observe the household's adoption decision. Let T_j be an indicator of whether household *j* adopts the technology ($T_j = 1$) or not ($T_j = 0$), so that

$$T_j = 0\ if\ \Delta EU_j \le 0 \quad and \quad T_j = 1\ if\ \Delta EU_j > 0 \qquad [3]$$

Depending on the assumptions regarding the distribution of the error term in equation [2], this structural relationship can be estimated using a variety of methods (Maddala 1983). That is,

$$\Pr(T_j = 1) = \Phi(\alpha_I I + \alpha_L L + \alpha_R R + \alpha_Z Z + \alpha_H H) \qquad [4]$$

where Φ (.) is the cumulative distribution function and *I, L, R, Z,* and *H* are the explanatory variables in equation [2] and α is a vector of parameters to be estimated. Democracy and governance, and the activities they encourage, can impact many of the determinants of technology adoption – household preferences, resource endowments, economic incentives, and risk and uncertainty – and influence the adoption probability.

3. BACKGROUND ON RESEARCH AREA

(a) Benin and Togo

The West African countries of Togo and Benin provide a naturally paired comparison of political and governance structures, particularly in communities exactly at the border that experience a sharp discontinuity. External to political situation, the two countries are strikingly similar. In both countries about 30 percent of the population lives below the poverty line and average life expectancy is around 50 years. Over 80 percent of the population in these countries is engaged in agricultural activities. Main agricultural export products include cotton, cassava, and corn (although in Southern Togo coffee and cocoa are also important cash crops). In 2003, income per capita was slightly higher in Benin (370USD) than Togo (290USD), but Togo had higher literacy rates (57 percent versus 40 percent) and lower infant mortality rates (77/1000 versus 87/1000) (World Bank 2005).

Both Togo and Benin are former French colonies, having gained their independence in 1960. Throughout the first three decades of independence both countries were on paths far from democracy and good governance – Togo was ruled by a military dictatorship and Benin underwent a Marxist-military revolution from 1972 until 1989 (US Department of State 2005). However, in the early 1990s, external pressures were put on the governments of both countries to democratize, with very different outcomes.

Benin's peaceful transition to democracy is heralded as a success story and the country is considered a model of democracy within West Africa. Some of its most noted accomplishments are the provision of basic freedoms, including free press, and the provision of basic civil rights. Benin is also credited with fair, transparent, and peaceful elections; public voice and accountability; and a free and independent media. In addition, the country enjoys an outstanding record of peace and security (USAID 2005).

Togo's attempted transition to democracy was not a success – between the years 1990 and 1993 a series of violent clashes resulted between the dictatorial government, which was opposed to the transition, and the general public, which supported the transition. As a result of the government's failure to transition, the European Union and the United States installed economic sanctions against Togo and most non-governmental organizations pulled out of the country. In 1993 the violence ended, but all pretenses of democracy were abandoned as the long-standing dictator, Gnassingbe Eyadema, maintained control (US Department of State 2005). In early 2005, President Gnassingbe Eyadema passed away and his son, Faurve Gnassingbe, took control of the country. Little has changed in Togo in the past 15 years in terms of political rights and civil liberties.

International rankings and measurements by the World Bank, Freedom House, and Polity Project on political and governance indicators lend further proof of the divergent paths of these two neighboring countries (Table 1). The World Bank ranks 209 countries on six key dimensions of governance. The first indicator, voice and accountability, measures political, civil, and human rights within a country; in 2004, Benin ranks in the 55th percentile, while Togo ranks in the 13th. Political stability measures the likelihood that a country will not be upset by violent threats or changes in government – both countries receive similar scores in 2004 with Benin ranking in the 35th percentile and Togo in the 33rd. Government effectiveness measures the competency of the bureaucracy and the quality of public service delivery within a country. Benin ranks in the 39th percentile in 2004, Togo in the 7th percentile. Regulatory quality measures the presence of market-friendly policies – Benin falls in the 31st percentile and Togo the 21st percentile. Rule of law measures the quality of enforcement within a country, including the police and courts. Benin scores in the 41st percentile and Togo in the 16th percentile in 2004. Finally, control of corruption measures the ability to control petty and state corruption – Benin ranks in the 46th percentile and Togo in the 15th (World Bank Indicators 2004; Kaufmann et al. 2005).

<Insert Table 1 near here>

Freedom House ranks countries not on actual government performance but on the level of rights and freedoms enjoyed by individuals. Countries are ranked on a scale of one (highest) to seven (lowest) for two broad categories: civil liberties and political rights. The 2004 annual assessment covers 192 countries and 14 territories. Benin scores a two for both political rights and civil liberties. Togo scores a six for political rights and a five for civil liberties. Overall, Benin is given a freedom rating of 'free' and Togo a rating of 'not free'. Prior to 1990, Benin and Togo received similar rankings for political rights and civil freedoms (Freedom House 2005).

Polity Project Index measures a country's political institution. A country is rated from a 10 (representing a 'true' democracy) to a -10 (representing a 'true' autocracy). Polity Project uses various indices of executive competitiveness, regulation, and participation in government to construct these measurements. In 2003, Benin receives a six and Togo a negative two. Pre-1990, both countries score a negative seven (Polity Project 2005). Clearly, since 1990, Benin has not only made huge leaps toward democracy but is providing better governance and more access to individual rights and civil freedoms than Togo.

(b) Study sites

The two study sites (Figure 1) for this research control for many social, economic, and biophysical factors. Both villages are located in the Tamberma region – a 1300 square kilometer area in the extreme Northeastern tip of Togo and Northwestern tip of Benin where over 90 percent of the population is of Tamberma ethnicity (Tanti and Julien 1998). Along with ethnicity and culture, the two villages share the same geography, weather, and physiographic features; farm the same staple crops (millet, sorghum, cowpea, and maize); and have similar infrastructure (access to a primary school and health center, but no paved roads, electricity, improved water or sanitation facilities). Thus, the placement of the national boundary provides a "natural experiment".[2]

<Insert Figure 1 near here>

There are many agricultural, environmental, and health needs within the Tamberma region. However, due to its remoteness (far from the political capitals in the port cities of Lome and Cotonou along the Togo and Benin coast), only a limited number of technologies have been introduced in the area. These technologies have been introduced by some combination of governmental agencies (e.g., health centers), non-governmental organizations[3], missionaries, and

foreign volunteer services (e.g., United States and French volunteer agencies). For this study we identified four technologies that had been promoted in both villages that provide a wide range of household benefits. Specifically, we consider (a) cultivation of soybeans; (b) having an improved cook stove; (c) having a mosquito net; and (d) tree-planting in yards as representative of key innovations that impact rural households. Soybeans can help counter protein malnutrition, declining soil fertility, and food security issues. Improved cook stoves are innovations that can relieve pressures on fuelwood and decrease smoke-related illnesses. Mosquito nets are sold in the area to mitigate malaria in children and pregnant women. Reforestation at the household is an innovation that brings long-term environmental benefit, as well as household sustainability through the provision of fruits, fodder, and fuelwood.

We discussed earlier the differences in national political and governance structures in these two countries. Anecdotal evidence from the two study sites suggests that this divergence has permeated outside the political capitals. Through direct observations and key informant interviews, it was noted that government agencies, schools, and health centers were functioning more efficiently in Benin; one reason for this was that employees in Benin were actually being paid, whereas many Togolese employees would go months without seeing a paycheck.[4] In addition, as a result of national politics, a greater number of non-governmental organizations were operating throughout Benin compared to Togo and more tourists were visiting Benin, bringing local economic opportunities. National differences in political and governance structures were perceived by local people – individuals in Benin were much more willing to talk about national politics, while in Togo, people were afraid of being persecuted for being critical of their government. The attitudes and outlook of individuals were also notably more optimistic

and less repressive in Benin. In general, most Togolese lacked any sense of entitlement from their government.

4. DATA

Data for this study were collected through a cross-sectional survey of 135 farm households. The target population was the 329 households located in the villages of Koudogou, Benin and Warengo, Togo. A sampling frame was obtained from the local health center in each village; lists of households had been collected by the World Health Organization's River Blindness Eradication Campaign and were updated annually. The population was stratified by village, and a random sample was taken in each village. Ninety-six households in Warengo and 39 households in Koudogou were sampled. The instrument for this survey was a self-designed questionnaire and was based on the five categories of adoption determinants as identified in Pattanayak et al. (2003). A pretest of the survey instrument was conducted prior to survey implementation, experts reviewed the survey instrument, and final changes were made before survey implementation.

Face-to-face interviews were conducted by the primary author with the help of a local-language interpreter. A household was defined as those who 'eat out of the same pot', since several generations of a family tend to live under the same roof, but only immediate family members cook and eat together in this society. The head of the household was taken to be that person who had the last word in household decisions – typically an elder male. Due to the nature of many of these technologies (promotion of soybeans, cookstoves, and mosquito nets are typically aimed at women) the female head of household was interviewed when present. If she was not present, the male head of household was questioned. If both were present, for cultural sensitivity, the male and female were questioned simultaneously. For households where no adult

was present or consensus denied, a predetermined geographic rule of replacement was used.[5] Time per interview ranged from 15 to 50 minutes, with an average time of 26 minutes.

5. RESULTS

(a) Descriptive statistics

Using the data collected in this study, we first calculate statistics on the adoption behaviors for these two villages (Table 2). The majority of households in Benin have adopted the technologies of soybeans (90 percent), trees (90 percent), and improved cook stoves (74 percent). Adoption rates in Togo are significantly different for these technologies – 40 percent of households have adopted soybeans, 75 percent have adopted trees, and 20 percent have adopted improved cook stoves. The adoption of mosquito nets is found to be low in both communities, but still statistically different and higher in Benin (21 percent) than Togo (4 percent). These results are the first indication that differences exist in household innovation between the two villages.

<Insert Table 2 near here>

Next, we calculate descriptive statistics for the study variables to test for similarities between the two villages (Table 3). While most characteristics are statistically the same, there are some characteristics that are statistically different: education levels, cash cropping, assets, family outside the village, and hospital visits. Demographic characteristics within the two villages are almost identical, this includes age of heads of household, family size, number of children, and ethnicity. Livelihoods are also similar for the two villages – most households engage in subsistence agriculture, farmed approximately the same area of land in 2003, and own some type of livestock. In addition, about the same percentage of households in both sites frequent a weekly

market, are a member in an organization, and use a savings and credit system. Prevalence of tin roofs, an important and relatively costly asset, is also statistically the same for the two villages.

<Insert Table 3 near here>

Educational attainment is an important and counter-intuitive statistical difference between the two villages – men and women in Togo are more likely to have received at least some education. Unfortunately we do not have further information on why this is the case. The difference in attendance rates could be a result of government policies, of access to facilities over 35 years ago, or differences in costs of enrollment.

A second statistical difference is that cultivation of cotton is more prevalent among Togolese households, even though both countries are exporters of cotton and have national subsidized cotton programs. There is no information on whether access to the cotton program was not available in the Benin village or whether households just chose not to grow it. While cotton can potentially bring large amounts of cash income to a household, in rural areas such as Tamberma Valley, farmers do not have enough land or labor to grow the quantity of cotton needed to see significant profits. This is supported by statistical differences found in asset ownership between the two villages. Households in Benin are more likely to possess a radio or bicycle – popular commodities in the study area – despite the prevalence of cotton farming in Togo.

Two other statistical differences found in the sample population include households with members that live outside the village and hospital visits in the past year. Family members living outside the village can be a positive factor – they may serve as a source of financial assistance or source of new information – or a negative factor – they may be children attending school and therefore require direct financial assistance from the village household. While we do not know

the specific circumstances for the households in this sample, we do know that more households in Togo report having family members that live outside the village.

We asked households about hospital visitation to proxy for losses in income and time due to sickness. Households in Benin report having visited a hospital in the last year more frequently than households in Togo. While we do not have additional information on number of visits, costs, or illness, we know that the hospital in Benin is almost a third the distance compared to the hospital in Togo.[6]

In addition to village characteristics discussed above, we also consider whether or not migration into Benin is an issue. We find that this is unlikely because individuals have strong cultural and familial ties. In our questionnaire, we asked both men and women heads of households whether their fathers were from that village or were from a different village. We find that the majority of men in both Benin and Togo live in the village their father was born in. This is because land resources in the Tamberma region are passed down from father to son. Women are less likely to live in the same village as their father. This is because when a woman marries, she is expected to go and live with her husband. While we do not have any further information on which villages women migrated from, informal responses suggest that most women moved from adjacent villages and not between countries.

(b) Empirical estimations

Given statistical differences for community variables other than national political and governance structures, we use discrete-choice regression models of adoption with appropriate socio-economic, demographic, and physiographic controls to test for a 'Benin' effect (Pindyck and Rubinfield 1981; Maddala 1983). Using the utility maximization framework described in the conceptual model, we specify four similar equations for the technologies in consideration –

soybeans, improved cookstoves, mosquito nets, and planting trees. The dependent variable in each of the four models is the probability of adopting the technology being considered. This variable takes the value of "1" if the household had ever used the technology and a "0" if they had not. The probit model is used for all estimations.

We do not estimate a model with all the independent variables because most of the variables are statistically the same for the two study sites. Instead, we mainly consider variables that are statistically different between the study sites – education levels, cotton farming, assets, family outside the village, and hospital visits – and a few other critical variables that proxy for the major factors discussed in the conceptual model – number of children, membership, and total farm land cultivated in 2003. Our key variable that proxies for differences in political and governance structures is a dummy variable (POLITICAL) that measures village location (1=Togo, 0=Benin). Definitions, means, and standard deviations for the 11 independent variables are presented in Table 4.

<Insert Table 4 near here>

Results from the probit analyses on the adoption of these technologies are presented in Table 5. For the soybean technology, the percentage of correctly predicted respondents is 77 percent. Four of the 11 variables are significant at the 10 percent level or less. The POLITICAL dummy variable is significant at the one percent level – being located in Togo has a negative influence on the probability of adoption. At the one percent significance level, MENEDUC has a positive effect on adoption. At the 10 percent significance level, RADIO and TOTFARM have a positive effect on the adoption of soybeans.

<Insert Table 5 near here>

For adoption of improved cook stoves, 82 percent of respondents are predicted correctly. Three of the 11 variables are significant, including the POLITICAL dummy variable that is negative and significant at the one percent level. CHILD is significant at the one percent level with a positive effect on adoption. At the five percent significance level, MENEDUC has a positive effect on adoption of cook stoves.

For adoption of mosquito nets, 93 percent of respondents are predicted correctly. Five of the 11 variables are significant. The POLITICAL dummy variable is negative and significant at the five percent level – being located in Togo has a negative effect on probability of adoption. COTTON and RADIO are significant at the five percent level and have a positive effect on owning a mosquito net. At the 10 percent level, MBR has a significant positive effect on adoption. FAM has a negative effect on adoption of mosquito nets at the 10 percent level.

For planting trees the percentage of correctly predicted respondents is 80 percent. Four of the 11 variables are significant to the adoption decision. The POLITICAL dummy variable is negative and significant at the five percent level. FEMEDUC and TOTFARM are significant at the 10 percent level and have a positive effect on the adoption decision. CHILD has a negative effect on adoption at the 10 percent level.

The marginal effect of the POLITICAL dummy variable on the adoption of each technology gives an indication of the change in probability of adoption that would occur if a household went from a bad political and governance situation (Togo) to a better political and governance situation (Benin). For the soybean and cook stove technologies, the marginal effect of the POLITICAL variable is significant at the one percent level. We find that a household in Togo is 67 percent less likely to adopt soybeans than a household in Benin. For improved cook stoves, we find that a household in Togo is 83 percent less likely to adopt the technology than a

household in Benin. For the mosquito nets and planting trees models, the marginal effect of the POLITICAL variable is significant at the five percent level. We find that a household in Togo is six percent less likely to adopt mosquito nets than a household in Benin. For trees, we find that a household in Togo is 20 percent less likely to adopt the technology than a household in Benin. Our estimation results confirm a statistically significant and large 'Benin' effect on adoption of all four technologies.[7]

6. CONCLUSIONS

To summarize the main findings, even though the countries of Togo and Benin are similar geographically and socioeconomically, they have followed divergent political paths over the past 15 years. Benin has become increasingly more democratic, embraced ideals of political and civil freedoms, and implemented components of good governance. Togo has not undergone meaningful change to democracy or better governance, and has seen little improvement in political or governance structures over the past 15 years. At the village level, external effects of political institution and governance patterns have created a permeable divergence in attitudes and outlooks.

In our two study sites, we find similar cultures, demographics, and livelihoods. We find some statistical differences between the communities in educational attainment, cash cropping, assets, family outside the village, and hospital visits. Discrete choice regression models allow us to control for these differences and estimate whether national political and governance structures affect household innovation. While our sample size and cross-sectional data limit strong causal statements, our empirical estimations suggest that democratic institutions and good governance can encourage the adoption of technologies, which in turn have the potential to improve rural livelihoods.

These findings have important policy implications for rural development. At the macro-level, political and governance structures can affect technology adoption rates by the amount of resources a country invests in individuals and how efficiently these resources are used. A democratic country with a better governance record is more likely to invest financial resources in the development of individuals – this is a result of participatory government, political rights, and voice and accountability (Siegle et al. 2004). In addition, exclusive of the amount invested, political and governance structures affect how efficiently this money is used – a result of control of corruption and government effectiveness (Kosack 2005). Many of the policies and resources used to promote rural development technologies are externally funded, so in order to be effective these resources must reach the intended recipients.

At the micro-level, political and governance structures can affect many of the determinants of technology adoption: household preferences, resource endowments, economic incentives, and risk and uncertainty. Even if access to technologies is similar, adoption rates can be significantly lower where political and governance structures have negative impacts on these determinants. This is because individuals living in countries without democracy or good governance lack the short- and long-term security, support, and entitlement that encourage household investments.

This study suggests that in order for successful technological dissemination and household innovation to occur, democracy and good governance are needed. This conclusion supports findings in recent macroeconomic studies, most notably Siegle et al. (2004), Kosack (2005), and Acemoglu et al. (2005). Without proper institutions in place, the information and resources needed to promote beneficial household technologies may never reach rural communities. When they do reach the household, the short- and long-term certainty that comes with good institutions is missing. Without adequate political and governance structures in place, it may be difficult to

meet goals of alleviating poverty and improving health and environmental conditions in the developing world.

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Notes

1. Randomness exists potentially because of unobserved attributes, instrumental variables, measurement errors, and taste variations (see Feather and Amacher [1994]).

2. The border in this situation is porous in that people can cross freely from one country to the other, and do for certain markets; however, the border is not non-existent – everybody knows where one country ends and the other begins and people do not cross the border to use public services (e.g., schools or health clinics). There are also relics of a French-built border control station at the main crossing point – the gate just happens to always be open.

3. Most non-governmental agencies in these countries are locally staffed but externally funded and managed.

4. The primary author served as a Peace Corps Volunteer in Togo from 2002-2004. The other authors visited the field site during the design and set up of the study.

5. Only one household in the study area refused participation, 11 had to be replaced due to absence.

6. Hospital is different from the village health centers, which were present in both villages.

7. Interaction effects were calculated for each model. In the model for soybean adoption, five variables have a differential effect between the two villages. The variables FEMEDUC, COTTON, BIKE, and HOSP have more of an effect on the probability of adoption in Benin than Togo; MBR has more of an effect in Togo than Benin. For cook stove adoption, the variables of HOSP and MBR have more of an effect on the probability of adoption in Benin; RADIO has

more of an effect in Togo. In the mosquito net adoption model, HOSP has more of an effect on adoption in Benin. For planting trees at the house, FAM has more of an effect on adoption in Togo.

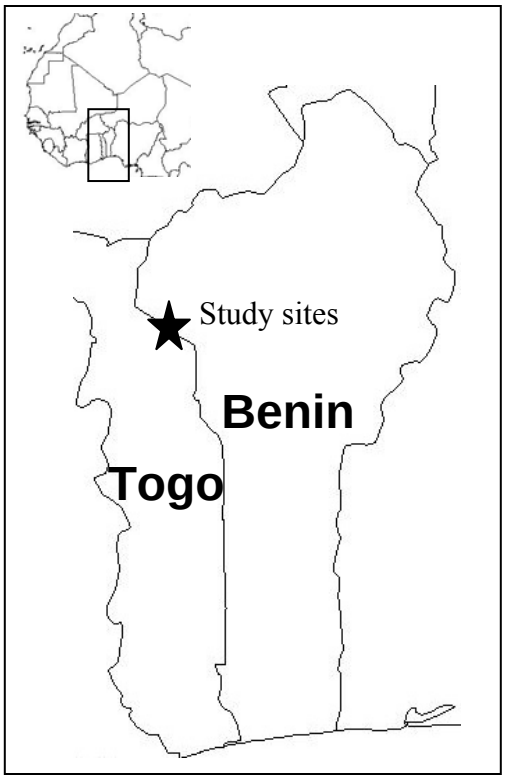

Figure 1. Study Sites

Table 1. Political Institution and Governance Indicators

World Bank Indicators[i]	**Benin**	**Togo**
Scale: Percentile rank (0-100)		
Voice and accountability 2004	55	13
Political stability 2004	35	33
Government effectiveness 2004	39	7
Regulatory quality 2004	31	21
Rule of law 2004	41	16
Control of corruption 2004	46	15
Freedom House Civil Liberties[ii]	**Benin**	**Togo**
Scale: 1 highest, 7 lowest		
1976-1989	6	6
1995	2	5
2004	2	5
Freedom House Political Rights[ii]		
Scale: 1 highest, 7 lowest		
1976-1989	7	7
1995	2	6
2004	2	6
Polity Project[iii]	**Benin**	**Togo**
Scale: 10 high democracy, -10 high autocracy		
1965-1990	-7	-7
2004	6	-2

[i] http://info.worldbank.org/governance/kkz2004/year_report.asp
[ii] http://www.freedomhouse.org/ratings/index.htm
[iii] http://www.cidcm.umd.edu/inscr/polity/report.htm

Table 2. Technology Adoption Rates

Technologies	Benin (n=39)	Togo (n=96)	P-value
Soybeans	89.7%	39.6%	0.000
Improved cook stoves	74.4%	19.8%	0.000
Mosquito nets	20.5%	4.2%	0.002
Trees	89.7%	75.0%	0.056

Table 3. Descriptive Statistics

Characteristic	Benin (n=39)	Togo (n=96)	P-value
Similarities			
Average household size	6	6	0.989
Average number of children	2	2	0.205
Average age of male head of household (years)	43	43	0.988
Average age of female head of household (years)	34	34	0.984
% Tamberma ethnicity	100	99	0.862
% Engage in subsistence agriculture	100	99	0.348
Hectares farmed in 2003	1.7	1.8	0.172
% Own livestock	100	97	0.268
% Frequent a weekly market	95	98	0.348
% Member in an organization	31	28	0.761
% Use savings & credit system	13	15	0.791
% Have a tin roof	41	42	0.999
Differences			
% Men with some education	28	57	0.000
% Women with some education	18	50	0.005
% Cultivate cotton	16	79	0.000
% Own a radio	62	39	0.015
% Own a bicycle	85	50	0.000
% Have family members outside of village	31	88	0.000
% Visited a hospital in past year	77	40	0.000
Migration			
% Men that have not migrated	92	91	0.528
% Women that have not migrated	56	75	0.000

Table 4. Definition of Variables

Variable Name	Definition	Mean (s.d.)
POLITICAL	Dummy variable for the political and governance situation in the two countries, represented by the village where the survey took place: 1 represents village of Warengo, Togo, 0 village of Koudogou, Benin	0.711 (0.455)
MENEDUC	Dummy variable for education of male head of household: 1 if have education, 0 otherwise	0.528 (0.501)
FEMEDUC	Dummy variable for education of female head of household: 1 if have education, 0 otherwise	0.420 (0.495)
COTTON	Dummy variable for income from cotton: 1 if household earns income from cotton, 0 otherwise	0.607 (0.490)
BIKE	Dummy variable for owning a bicycle: 1 if household owns a bike, 0 otherwise	0.600 (0.492)
RADIO	Dummy variable for owning a radio: 1 if household owns a radio, 0 otherwise	0.452 (0.499)
FAM	Dummy variable for family members living outside of village: 1 if have family outside village, 0 otherwise	0.711 (0.455)
HOSP	Dummy variable for having visited a hospital (not the local health center) in the past year: 1 if visited, 0 otherwise	0.504 (0.502)
CHILD	Number of children (defined as between 1-15 years) living in the household	1.822 (1.506)
MBR	Dummy variable for membership in an organization: 1 if involved in any formal or informal organizations, 0 otherwise	0.289 (0.455)
TOTFARM	Number of parcels a household farmed in 2003	4.985 (1.583)

Table 5. Empirical Results

VARIABLE	SOYBEAN	COOK STOVE	MOSQ NET	TREE
POLITICAL	-2.447***	-2.779***	-1.777**	-0.970**
MENEDUC	0.803***	0.756**	0.976	0.204
FEMEDUC	0.471	0.250	-0.026	0.550*
COTTON	-0.171	0.034	1.549**	-0.339
BIKE	-0.165	-0.281	0.393	-0.454
RADIO	0.509*	0.456	1.884**	0.349
FAM	0.287	0.525	-1.414**	0.424
HOSP	-0.321	-0.341	0.012	0.111
CHILD	0.016	0.282***	0.262	-0.177*
MBR	0.409	0.430	0.848*	-0.096
TOTFARM	0.202*	0.087	-0.051	0.195*
Constant	0.119	-0.343	-3.482**	0.677
Number of Observations	135	135	135	135
Log Likelihood	-61.369	-56.860	-23.357	-58.394
Prob > Chi^2	0.000	0.000	0.000	0.033
% Correctly Predicted	77	82	93	80

***Significant at the 1% level **Significant at the 5% level *Significant at the 10% level