Contributing to Contract Farming: Is Farmer Behavior Determined by the Past?

By David Wuepper and Johannes Sauer

Technical University Munich, Agricultural Production and Resource Economics

Prepared for BIOECON XVII:

Experimental and Behavioural Economics and the Conservation of Biodiversity and Ecosystem Services

13-15 September 2015 University of Cambridge, UK

Abstract Contract farming is a means to stimulate the sustainable intensification of smallholder farming. In Ghana, the performance of contract farming is mixed and not fully understood. Here, we investigate whether colonial experiences in the Gold Coast might explain a share of the so far unexplained variation in contract farming performance in Ghana. To this end, we surveyed 400 pineapple farmers and connect this new dataset to existing data on the locations of Christian missionary schools (19th and early 20th centuries) and the performance of colonial cocoa cooperatives (early 20th century). We find a significant effect of both historical variables on the current performance of contract farming. The causal channel is a change in culture: the performance of the colonial cocoa cooperatives persistently changed peoples' belief in their own capabilities to achieve business success (self-efficacy). The Christian missionary schools are found to have persistently reduced village social capital.

JEL codes N87 N57 O13 Q12 Q13

Keywords Contract Farming; Farmer behaviour; Cultural Evolution; Colonial Experiences

Contact David Wuepper, Technical University Munich, Agricultural Production and Resource Economics, Alte Akademie 14, Room 41, 85354 Freising. E-mail: david.wuepper@tum.de Tel: +49 8161 71-3458

I. Introduction

A dynamic and growing body of research finds evidence that history is an important explanation for cross-country-differences in economic performance (Acemoglu and Robinson 2012; Nunn 2013; Chanda et al. 2014). One reason is that history often shapes the evolution of cultural traits that are important for economic development (Guiso et al. 2006; Nunn and Wantchekon 2009; Nunn 2012; Alesina and Giuliano 2013; Alesina et al. 2013). Thus far, less research has been conducted to investigate the economic effects of historically determined cultural differences between individuals, although exceptions exist (Wantchekon et al. 2015).

In this paper we investigate whether it is possible to explain differences in the economic performance between smallholder farmers with historical variables and whether we can identify specific cultural traits linking the past to the present. For this, we analyze the performance of contract farming amongst smallholder pineapple farmers in the south of Ghana. We representatively surveyed them in 2013 and connected these data to two existing datasets on colonial developments in the Gold Coast.

Contract farming is promoted by development agencies in collaboration with the government of Ghana to overcome market imperfections, such as information dis-equilibria and financial constraints (German Society for International Cooperation 2005; USAID 2007, 2009; Millenium Development Authority 2011; World Bank 2011; USAID 2013). It is a forward agreement specifying the obligations of suppliers (farmers) and buyers (processors, exporters, or supermarkets) as partners in business. This requires the farmers' obligation to supply specified quantities and qualities and the buyers' obligation to buy the produce (often at pre-agreed prices). Furthermore, the buyer commonly supplies embedded services such as production-inputs, credit, logistics, or training (Eaton and Shepherd 2001; Will 2013). Recent research has found positive production and welfare effects for contract farming (Kirsten and Sartorius 2002; Barrett et al. 2012; Bellemare 2012; Wuepper et al. 2014) but has also identified

important and diverse constraints to their success (Fafchamps 1996; Fold and Gough 2008; Wuepper 2014).

Thus far, pineapple contract farming performance in Ghana has been heterogeneous in time and space (Fold and Gough 2008; Barrett et al. 2012; Gatune et al. 2013). A major problem seems to be reliability. Some farmers "side-sell" fruits instead of adhering to their contracts if they can obtain a better price or faster payment locally. Similarly, farmers have reported that in the past some companies refused to pick up fruits or pay for them because demand had switched to a new variety faster than the farmers could adapt. These experiences had a negative effect on how farmers currently perceive contract farming. However, some companies and farmers have apparently figured out how to make contract farming function, as indicated by the reliability and profitability of their contract agreements.

Our first hypothesis is that the observed variation in contract farming performance can be explained by culture. In particular, we hypothesize that two cultural variables play an important role: self-efficacy and social capital. Our second hypothesis is that these cultural traits can be explained by historical developments that occurred during the 19th and 20th centuries close to today's farm locations. These developments were the establishment of Christian missionary schools and that of colonial cocoa cooperatives.

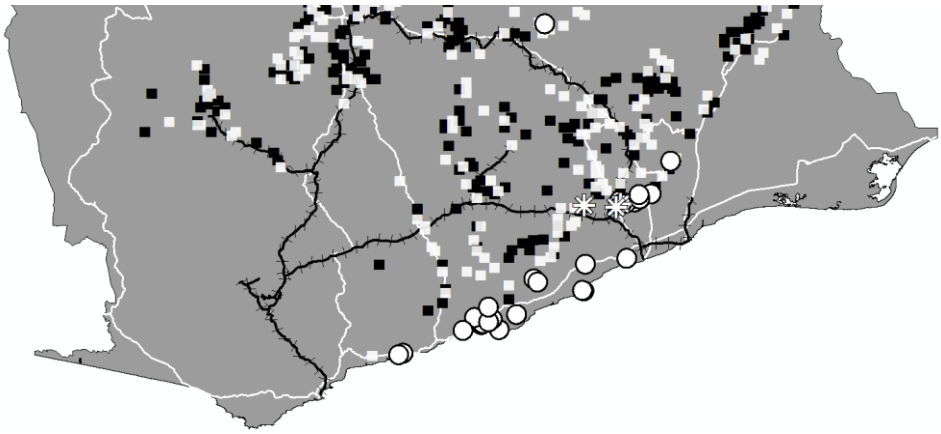
We begin with a description of the historical context (II) and our theoretical framework (III). Then, we describe our data and explain our variables (IV). Next, we outline our empirical framework (V) and present our analysis (VI–VIII). Finally, we discuss our findings (IX) and draw conclusions (X).

II. Historical Context

Our two historical variables originate from Ghana's colonial period, when it was called the British Gold Coast (1878–1958). The first variable is the success rate of colonial cocoa

cooperatives. After the British government abolished slave trade, they focused their attention on the export of cocoa. To improve production, they organized the cocoa farmers into cooperatives (Cazzuffi and Moradi 2010), which were in several ways similar to modern contract farming. Cooperatives were a true innovation for the approached farmers. Notably, the performance of these cooperatives varied as much then as the performance of contract farming does today (Figure 1).

Figure 1. Colonial cocoa cooperatives in the 20th century



The map shows the south of Ghana. Black squares denote successful and white squares denote unsuccessful cocoa cooperatives. White circles denote locations of sampled farms and asterisks denote the companies. White lines denote roads and black lines denote colonial railroad tracks.

The second historical variable was the location of Christian missionary schools. Cogneau and Moradi (2011), Nunn (2010), Woodberry (2004), and Wantchekon et al. (2015) investigate the effects of Christian missionaries and their affiliated schools. Most closely related to our research is the study by Wantchekon et al. (2015), who find that in neighboring Benin, the missionary schools persistently increased peoples' aspirations and their human capital, together resulting in higher incomes today. However, in our context, this effect is potentially countered by another effect that has been described in the historical literature: Ward (1966) writes about the19th century Gold Coast

> "the introduction of Christianity and of western education brought fresh problems. Christianity and education went together, and there were inevitably many who

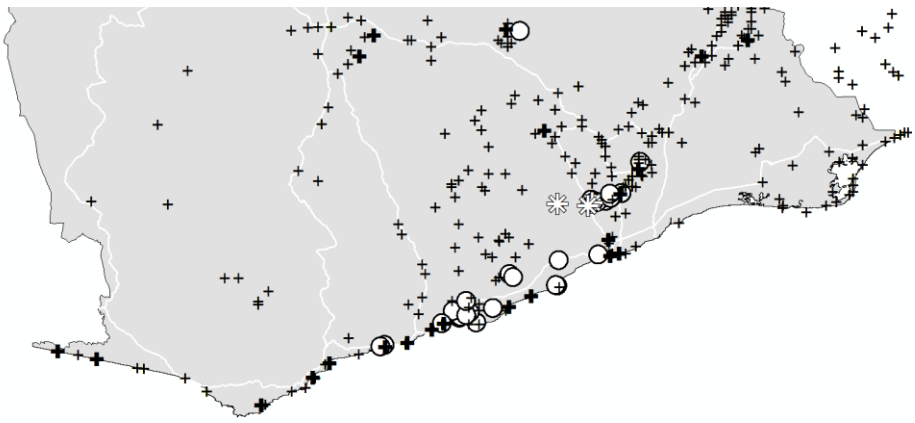
> acquired only a thin veneer. There was a good deal of trouble from semi-educated men whose scanty stock of learning led them to arrogance or downright rascality. In the early days, there was much antagonism - even sometimes rioting - between professing Christians and those who still followed the old ways"

and Claridge (1915) reports that some missions in the Gold Coast

> "adopted a policy of separating their converts entirely from the old life for fear lest the social and artistic attractions of the old life should lead them to forget their new religion: a policy which may have been inevitable from the point of view of the Christian evangelist, but which led to a most unfortunate cleavage in the life of the community"

Hence, one may expect to find a positive effect from the missionary schools, if one believes that human capital is more important than social capital. Conversely, one may expect a negative effect, if one believes that social capital is more important than human capital, which is equally plausible (Eaton and Shepherd 2001; Kirsten and Sartorius 2002; Kumar and Matsusaka 2009; Barrett et al. 2012; Bellemare 2012). The location of the missionary schools can be seen in Figure 2.

Figure 2. Christian schools in the 20th century



The map shows the south of Ghana. Bold crosses denote the missions, small crosses denote missionary schools, white circles denote locations of sampled farms, asterisks denote companies, and white lines denote roads.

III. Theoretical Framework

We aim to investigate whether missionary schools and colonial cocoa cooperatives shaped the evolution of self-efficacy and social capital and whether these variables significantly affect the current contract farming performance. In the most general terms, contract farming can be described as follows (Barrett et al. 2012):

(1) Company choice of a location: Companies choose regions that are agro-ecologically favored (because both potential production quantity and quality are affected by this easily observable variable) and are expected to have low transaction costs (e.g., determined by transport infrastructure, reliability of institutions, and local business culture).

(2) Company contract offer: When deciding whom to offer a contract, companies attempt selecting more skilled, entrepreneurial, reliable, and trustworthy farmers.

(3) Contract acceptance: Farmers only accept contracts that are beneficial to them. This benefit strongly depends on the efficiency of both contracting partners and their business relationship because mutual gains are the highest when business is successful and transaction costs are low.

(4) Decision to honor the contract by both partners: When the farmer is supposed to deliver and the company supposed to collect and pay, both sides must decide whether to honor their contract. During production, the farmers can divert company-provided inputs and credits to other means (e.g., for other crops or consumption purposes), and after harvest, the farmers can diverge from the pre-agreed quantity or quality. Similarly, the company can decide to breach the agreement by refusing to collect the produce, unfairly lowering the price or defaulting on the payment.

To link historical developments, culture, and contract farming, we require a working definition of culture and a theory as to how it connects historical developments to current economic outcomes. Defining culture is difficult for obvious reasons. We follow the definition of culture given by Guiso et al. (2006) as“those customary beliefs and values that ethnic, religious, and

social groups transmit fairly unchanged from generation to generation". Boyd and Richerson (1985), Richerson and Boyd (2008), Boyd et al. (2011), and Nunn (2012) furthermore understand culture as providing heuristics or "fast-and-frugal" rules-of-thumb, which have been learned as an adaptation to the (environmental or social) environment and then passed down through the generations. Nunn (2012) concludes:

> "Different societies make systematically different decisions when faced with the same decision with exactly the same available actions and same payoffs. A natural interpretation of these systematic differences is that different decision-making heuristics evolved across societies due to the different environments or histories of the groups."

This is the logic underlying our study. We hypothesize that the cultural evolution in the south of Ghana has been significantly shaped by historical events, leading to different cultural equilibria in different villages, which now impact economic outcomes.

The theoretical study of Galor and Michalopoulos (2012) demonstrates how environmental differences can determine the selection of cultural traits through natural selection. This selection effect has also been found empirically, e.g., by Alesina et al. (2013) on the effect of soil suitability for certain crops and the development of gender roles and by Nunn and Wantchekon (2009) on the effect of the major slave trades on mistrust in Africa.

We are interested in the roles of self-efficacy and social capital as intermediaries between the experiences with the Christian missionary schools and colonial cocoa cooperatives. Self-efficacy has yet not received much attention in development economics and economic history likely because it is difficult to measure. However, it has been widely investigated in psychological research (Bandura 1977, 1997; Schwarzer 2014). Noteworthy exceptions in economics include the studies by Bénabou and Tirole (2002) and Filippin and Paccagnella (2012), who use the term self confidence; Alkire (2005), who uses the term subjective human

agency; and Banerjee and Duflo (2011), who find some empirical evidence for the effect of micro-credits on self-efficacy. We define self-efficacy as "the subjective belief in one's own capabilities to achieve success." This belief motivates people to increase their effort to achieve a given goal and to maintain or further increase their effort in times of adversity. Without the feeling of having what is required to succeed, smallholder farmers will be hesitant to invest and show more risk aversion and stronger time preferences. Furthermore, they may also be less trustworthy because it does not make much sense to think about long-term relationships and consequences in a context in which external forces dominate one's life.

In addition to the individual cultural trait of self-efficacy, we also hypothesize that a collective cultural trait is important: social capital. This concept may be defined as that given by Putnam et al. (1994): "features of social organization, such as trust, norms and networks that can improve the efficiency of society by facilitating coordinated actions." Social capital has often been identified as being important for economic development and value chain development (Knack and Keefer 1997; Woolcock and Narayan 2000; Fukuyama 2001; Feigenberg et al. 2010; Meijerink et al. 2014).

IV. Data and Variables

We representatively surveyed 400 pineapple farmers in the south of Ghana in 2013. First, the major pineapple growing areas were selected and lists from groups of certified pineapple farmers were obtained. From these lists, groups were randomly selected and several farmers were interviewed reflecting the size of the group. To cover non-certified farmers as well, extension agents and development agencies were asked to identify a representative sample of non-certified pineapple farmers for interviews. In this way, we obtained a representative sample of smallholder pineapple farmers in Ghana.

Next, we connected our survey data to existing data-sets reported previously. Murdock (1959, 1967) provides data and locations of 834 African ethnicities as well as approximately 60 variables that described their cultural, social, and economic characteristics. We used these data on the Ga, Akyem, Asante, Dagbami, Ewe, Fante, Grumah, and Hausa because we sampled farmers from these ethnicities. Nunn (2007) used the data from Murdock and connected it to data on the major slave trades; we use this data as well. We also use the malaria risk index developed by Kiszewski et al. (2004). Nunn (2010) and Cogneau and Moradi (2011) provide us with data-sets on the location of Christian missions and missionary schools; and Cazzuffi and Moradi (2010) provide us with the locations and explanatory variables on the success and failure of colonial cocoa cooperatives.

To connect Ghana's present pineapple farmers with their ancestors, we followed two strategies [see Nunn and Wantchekon (2009) for a detailed treatment]:

First, because we know the ethnicity of the sampled farmers, we can connect the farmers to their ancestors using the ethnicity information. As an example, Nunn (2007) provides data on the impact of the slave trades on the majority of ethnicities in Sub-Saharan Africa as identified by Murdock (1959). Hence, we can use the ethnicity level impact of the trans-Atlantic slave trade as a control variable in our empirical framework.

Second, because we know the locations of the sampled farmers and the locations of our historical variables, we can join them together using GIS software. Because Cazzuffi and Moradi (2010) provide the locations of colonial cocoa cooperatives in the 1930s, we can count the number of successful and unsuccessful cooperatives (defined as having survived at least 5 years after establishment) in different radii (e.g. 5, 10, and 20 km) around our sampled farms. We can also compute the success rate in the different areas which we then associate with the farmers who now reside within these areas. Similarly, we can use the locations of the missionary schools and compute how many of them were established within a 5-, 10-, and 20

km radius around today's pineapple farms. Alternatively, we could compute the approximate distances from the farms to the next missionary school.

Our hypothesized channels from the historical developments are cultural. Specifically, self-efficacy and social capital, both of which are inherently difficult to capture. We define self-efficacy as "the subjective belief in one's own capabilities to achieve success" and social capital as "features of social organization, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions." Neither of the variables can be directly observed. To capture them we use two different approaches:

For self-efficacy, we asked the farmers what determined their income in the last 2 years. We then scored the answers between 1 (low self-efficacy) and 3 (high self-efficacy), depending on whether the answer included factors outside a person's control (e.g., the weather, soil, and market) or whether the answer focused on the behavior of the farmer (e.g., I learned, I improved, I adopted, and I increased). Ambiguous answers were coded as two. In the analysis, we entered the variables in two ways: In most specifications, we entered the variable in the form of two dummies, reflecting high and low self-efficacy. We also tested self-efficacy as a continuous variable with three values.

For social capital, we asked the farmers how often they attend social events in their village, with a score between 0 (never) and 6 (very frequently). We entered this variable as a continuous variable in all specifications.

To operationalize our dependent variable (contract farming performance), we use the percentage share of income a farmer received from contract farming. This variable has the advantage of being objectively measurable and it is independent from production quantity. Notably, it reflects how much company managers and farmers value the contract relationship. Currently, the sector is threatened by low pineapple supply. If the farmers only wish to sell a small share of their fruits to the companies (e.g., because this channel is perceived to be risky

TABLE 1. VARIABLES

Variable	Description	Mean	SD
cf_income	Income share received from contract farming (% per farmer)	22	40
cooperatives sr	Regional success rate of colonial cocoa cooperatives (% within 5 km)	.54	.18
schools	Number of Christian missionary schools around sampled farmers (w.10 km)	16	12
self-efficacy	Open ended question on past income determinants, coded into three categories according to whether farmers named internal factors, e.g., learning (=3) and external factors, e.g., rain (=1) or factors in between (=2).	1.9	.8
Social capital	How often the farmer attends social events in her or his village (scale 1–6)	4.4	1.8
age	The age of the sampled pineapple farmers in 2013 (in years)	44	11
education	The education level of the sampled pineapple farmers in 2013 (1–6)	2.7	1.2
innovativeness	Whether the farmer has tried an innovation in the recent past (1/0)	.75	.69
time preference	A farmer's discount rate of the future; choice experiment (1–7)	4.5	1.4
risk aversion	A farmer's willingness to pay to avoid risk; choice experiment (1–6)	3.3	1.3
infrastructure	Number of roads around a farmer's location (number)	3.9	4.6
coast distance	Distance from the farms to the coast (in km)	239.10	320.29
company dist.	Distance from the farms to the next company (in km)	461.54	359.97
city distance	Distance from the farms to the next city (in km)	366.50	163.60
accra distance	Distance from the farms to the capital (in km)	530.65	381.40
agency distance	Distance from the farms to the next development agency (in km)	408.83	274.73
MD2 variety	Whether the farmer grows the MD2 variety (1/0)	.31	.46
SC variety	Whether the farmer grows the Smooth Cayenne variety (1/0)	.32	.47
tenure security	How secure the farmer beliefs his fields to be (1–6)	3.3	.78
quantity sold	Quantity of pineapple sold (in kg)	9.09	16.39
farmsize	Total land available to the farmer (in hectares)	3.1	3.2
training	Repeated training (at least three times per farmer) (1/0)	.12	.32
leader	Reported openness for new ideas of the local chief (1–6)	5.3	1.2
prices	Price differential between local and company price (in US-Dollars)	.03	.20
rain quantity	Reported rainfall quantity (1–6)	4.8	1.3
rain timing	Reported rainfall timing (1–6)	4.0	1.5
rain variability	Squared difference between reported annual rainfall quantities	341	1099
rainfall zone	General rainfall pattern in Ghana (1–4)	2.4	.8
soil fertility	Reported fertility of the fields of each farmer (1–5)	1.7	.8
organic matter	General organic matter content of the soil (1–3)	1.8	.6
elevation	Elevation of the farmer's region (in m)	85	61
ruggedness	Standard Deviation of the terrain (in m)	42	38
slavery	Number of slaves exported from each of Ghana's peoples (in thousands)	102	204
malaria	Malaria ecology index on the suitability of regions for the disease	129	802
rainfall1931	Local rainfall for cocoa farms in 1931 (in mm)	12915	2035
cocoa_soil1931	Soil suitability of farms for cocoa in 1931 (in %)	.49	.46
neighbor_SR_5	Success rate of neighboring cocoa cooperatives within 5 km radius	.30	.45
dist_railroad1931	Historical distance between farms and railroad tracks (in km)	.23	.18
wider_SR_20	Success rate of cocoa cooperatives within a radius of 20 km around farm	.53	.18

or no more profitable than the local market) or if the companies only wish to buy a small share (e.g., because of low quality), the profitability and development of the pineapple value chain is threatened. In contrast, if farmers want to sell most of their fruits to the companies and the companies want to buy them, then we have a revealed preference for contract farming and a basis for its success. To construct this variable, we use our collected data on the quantity of pineapple sold locally, and the quantity sold through contract farming as well as the associated prices. From this information, we can compute the percentage income share from contract farming.

Finally, it is important that we control for the price premium that the companies offer relative to the local market prices. To construct this variable, we calculate the average price each company offers in each location for each variety and compare this to the average price that is paid by each local market for each variety. In Table 1, we present our variables, including controls and instruments.

V. Empirical Framework

In this section, we operationalize contract farming performance as a percentage income share (cf_income) that the farmers receive through contract farming. Because our dependent variable (cf_income) is measured in percentage, it is naturally bounded between 0 and 100. We therefore use two models: an ordinary least squares regression (OLS) and a so-called fractional logit, which is a generalized linear model (GLM) with a logit link function and a binomial distribution (Papke and Wooldridge 1993; Ramalho et al. 2011). While the former is the conventional analytical framework, the second considers that our dependent variable is bounded.

When we turn to the causal mechanism that explains our observations, we also use two approaches. First, 2-stages least squares (2SLS) with instrumental variables (discussed in this section), and second, a fractional logit with control functions (CF) with the same instrumental variables (Wooldridge 2007, 2011).

We estimated several specifications of our model to trace out the effect of history on culture and subsequently on the contract farming performance. Our starting point is to establish the correlation between our historical variables and the income share from contract farming:

$$Y_i = \beta_0 + \beta_1 x_i^H + \beta_3 x_i^Z + \varepsilon_i \tag{1}$$

where $Y_i = {inc_i^{CF}}/{(inc_i^{trad} + inc_i^{CF})}$ is the income share from contract farming, x_i^H is the vector of our historical variables of interest, x_i^Z is a vector of control variables and ε_i is the residual term.

Next, we need to demonstrate that once we control for cultural variables the estimated correlation between history and contract farming vanishes; this is our main identification strategy. Hence,

$$Y_i = \beta_0 + \beta_1 x_i^H + \beta_2 x_i^C + \beta_3 x_i^Z + \varepsilon_i \tag{2}$$

where x_i^C is a vector of cultural variables.

To more directly identify what determines our cultural variables, we estimate the following model:

$$X_i^C = \beta_0 + \beta_1 x_i^H + \beta_3 x_i^Z + \varepsilon_i \tag{3}$$

Because we are interested in the causal effect from history through culture on contract farming, we need to control for endogeneity. We start with our historical variables, and alternatively use instrumental variables and control functions, to estimate equations (1) to (3) once again but now ensuring exogeneity of our historical variables. Then, we consider our cultural variables

and estimate the following equation using the historical variables to instrument the cultural variables:

$$Y_i = \beta_0 + \beta_2 x_i^C + \beta_3 x_i^Z + \varepsilon_i \quad (4)$$

Next, we present some baseline results before proceeding to our main analysis.

VI. Baseline Results

Table 2 establishes some basic statistical observations. The dependent variable is always the income share from contract farming, and we always control for a diverse set of control variables that includes prices offered by companies and the local "market women," the impact of the historical slave trade, farm characteristics, and district fixed effects. Specification (1) indicates a positive correlation with the success rate of the colonial cocoa-cooperatives and a negative correlation with the Christian missionary schools. Specification (2) shows that once we control for self-efficacy, the correlation with the cooperative success rate loses its significance and once we control for village social capital, the same happens to the correlation with the Christian missionary schools. The same pattern is observed in specifications (3) and (4), in which the only difference is that we use a fractional logit instead of OLS regression. Specification (5) shows that the correlation between contract farming performance and history really only depended on the two considered cultural traits. This is robust to the inclusion of other explanatory variables, such as the farmers' level of risk aversion, the openness of the local chief (leader) for change or the quantity produced (quantity).

Having discovered two cultural traits that seem important for our analysis; we take them as dependent variables and show the results in table 3. This is also important to understand what we really actually capture with our variables. Culture is persistent and slow-changing; thus, long-term variables should explain our cultural traits. Consistent with this view and our results

in Table 2, it can be seen in Table 3 that self-efficacy is correlated positively with the performance of the colonial cocoa cooperatives and negatively with the missionary schools. The current variables of agricultural training from development organizations (training), the

TABLE 2. BASELINE RESULTS: CONTRACT FARMING PERFORMANCE

	(1)	(2)	(3)	(4)	(5)
dep.var.	cf_income	cf_income	cf_income	cf_income	cf_income
model	OLS	OLS	GLM	GLM	GLM
cooperatives sr	0.161**	0.0919	0.978***	0.728	1.063**
	(0.0725)	(0.0597)	(0.349)	(0.492)	(0.465)
schools	−0.142**	−0.0837	−0.809*	−0.758	−1.098*
	(0.0726)	(0.0586)	(0.471)	(0.536)	(0.655)
self-efficacy		0.121***		0.801***	
		(0.0218)		(0.198)	
social capital		0.0683***		0.782**	
		(0.0195)		(0.385)	
risk aversion					−0.531**
					(0.232)
leader					0.663***
					(0.232)
Quantity sold					0.381*
					(0.228)
prices	yes	yes	yes	yes	yes
farmsize	yes	yes	yes	yes	yes
accra dist	yes	yes	yes	yes	yes
Environment	yes	yes	yes	yes	yes
Slavery	yes	yes	yes	yes	yes
district fe	yes	yes	yes	yes	yes
N	398	398	398	398	398
(P) R2	0.39	0.51	0.38	0.51	0.44

Standard errors are bootstrapped. Significance levels are 10% (*), 5% (**), and 1% (***). "cf_income" is the share of farm-income from contract farming. "cooperatives sr" is the success rate of 1930s colonial cocoa cooperatives in a 5-km radius around the 2013 sampled pineapple farms. "schools" is the number of 19th and 20th century Christian missionary schools in a 10-km radius around the 2013 sampled pineapple farms. "prices" includes the price difference between companies and local markets. "environment" includes rainfall (quantity and variability), soil quality at the farm level, topography at the village level, and malaria risk at a regional level. "slavery" is the regional, historic impact of the trans-Atlantic slave trade.

openness of the local chief and current income from contract farming (cf_income, now an explanatory variable, to get an idea whether reverse causality could be an issue) were all significant but smaller in magnitude than the historical variables. The same pattern can be seen

for social capital. The main difference is that for self-efficacy, the performance of the cocoa cooperatives is more important, whereas for social capital, it is the missionary schools.

TABLE 3. BASELINE RESULTS: CULTURAL TRAITS

	(1)	(2)	(3)	(4)
dep.var.	self-efficacy	self-efficacy	social capital	social capital
model	OLOGIT	OLS	OLOGIT	OLS
cooperatives sr	2.001***	0.426***	1.093***	0.873***
	(0.678)	(0.107)	(0.292)	(0.270)
schools	−1.093*	−0.234*	−1.538***	−1.246***
	(0.632)	(0.120)	(0.417)	(0.313)
leader	0.727***	0.206***	0.616***	0.474***
	(0.218)	(0.0464)	(0.122)	(0.0913)
training	−0.372***	−0.119***	0.240***	0.158**
	(0.117)	(0.0236)	(0.0854)	(0.0751)
cf_income	0.839***	0.267***		
	(0.178)	(0.0383)		
prices	yes	yes	yes	yes
farmsize	yes	yes	yes	yes
accra dist	yes	yes	yes	yes
environment	yes	yes	yes	yes
slavery	yes	yes	yes	yes
district fe	yes	yes	yes	yes
N	398	398	398	398
(P)R2	0.23	0.40	0.12	0.31

Standard errors are bootstrapped. Significance levels are 10% (*), 5% (**), and 1% (***). "cf_income" is the share of farm-income from contract farming. "cooperatives sr" is the success rate of 1930s colonial cocoa cooperatives in a 5-km radius around the 2013 sampled pineapple farms. "schools" is the number of 19th and 20th century Christian missionary schools in a 10-km radius around the 2013 sampled pineapple farms. "prices" includes the price difference between companies and local markets. "environment" captures rainfall (quantity and variability), soil quality at the farm level, topography at the village level, and malaria risk at a regional level. "slavery" is the regional, historic impact of the trans-Atlantic slave trade.

VII. Causal Mechanism

The previous results are indicative but cannot be interpreted as causal because both the success rate of the colonial cocoa cooperatives and the location of the Christian missionary schools could be endogenous. If we want to determine whether the performance of the colonial cocoa cooperatives has a causal effect on current contract farming performance, we must rule out that both performances are explained by an omitted variable. For example, if some villages are traditionally more trustworthy, better coordinated, or more entrepreneurial, this could explain

why, across generations, farmers in these villages are successful with business partnerships. What we hence need is a source of exogenous variation that explains the performance of the colonial cocoa cooperatives but not the performance of the current pineapple contract farming (except through the channel of the performance of the cocoa cooperatives). Cazzuffi and Moradi (2010) analyze the performance of the colonial cocoa cooperatives and provide explanatory variables that are arguably feasible instruments. First, there is the local rainfall data for the year 1931. Conditional on controlling for local rainfall in 2013, it is plausibly uncorrelated with the current pineapple contract farming performance but does explain variation in the cocoa cooperative performance. Second, there is the cocoa soil suitability data for the year 1931, which, controlling for pineapple soil suitability in 2013, plausibly works as an instrument similar to the rainfall variable. Third, we use the success rate of the colonial cocoa cooperatives of neighboring villages as an instrument. This arguably removes persistent, local influences (assuming they were not present in the neighboring villages too) and is based on the assumption that the environment changes more continuously than village social variables.

These three instruments are used in our main specifications. All our instruments follow a similar logic: they all depend on the cocoa-specific natural environment, to condition out general, environmental, or social influences. we also compare our estimates to an alternative specification, in which our instruments are the historical distance to the railroad and the cooperative performance in the wider region. The second instrument is basically just another variation of our third instrument. However, the historical distance between the farms and the rail-road has a completely different logic. Cocoa was transported by train and today pineapples are transported by truck. Hence, our argument that the historical distance to the railroad explains the performance of the colonial cooperatives but not today's pineapple contract farming. However, this instrument is not as strong as our other instruments which is also

indicated by the observation that (in contrast to our application) it is not always significant in the estimates of Cazzuffi and Moradi (2010). In addition, it could potentially influence current contract farming because Jedwab and Moradi (2012) show that the railroad persistently increased the income in the surrounding area. Whether this violates the exclusion restriction is not clear, but for this reason, we exclude the additional instruments from our main specifications and only use them as comparison.

Christian missionary schools are plausibly exogenous. As Cogneau and Moradi (2011) describe, the location of the missions were influenced by several factors including disease, environment, and existing infrastructure. However, the missionary schools were spread out randomly (see Figure 2) (also: Macdonald 1898; Claridge 1915; Ward 1966; Nunn 2010; Wantchekon et al. 2015). Because there is no obvious pattern, it seems to be valid to assume that the Christian missionary schools are exogenous.

For now, let us assume that our cultural variables are determining the contract farming performance, but there is no feedback from contract farming performance to culture. In the short term, this assumption seems plausible (Boyd and Richerson 1985, 1995; Richerson and Boyd 2008; Boyd et al. 2011). Later, we will test our assumption by investigating whether we can explain cultural variables with the current contract farming performance. We will also instrument culture with historical variables in the coming section. But first, we turn to the causal mechanism linking history, culture, and contract farming performance.

Consistent with our general analytical framework, in table 4, we show six specifications. In the first two, we estimate 2SLS, and in the next two, we estimate a fractional logit with control functions. In the last two specifications, we estimate a 2SLS with alternative instruments and substitute the self-efficacy dummy for an ordinal variable (self-efficacy_alt) with three levels (1 = low se, 2 = medium se, and 3 = high se).

TABLE 4. CAUSAL MECHANISM LINKING HISTORY, CULTURE, AND CONTRACT FARMING PERFORMANCE

	(1)	(2)	(3)	(4)	(5)	(6)
2nd stage:	cf_income	cf_income	cf_income	cf_income	cf_income	cf_income
Model	2SLS	2SLS	Contr-F. GLM	Contr-F. GLM	2SLS	2SLS
coop. sr	0.164*	0.102	2.422**	1.463	0.485**	0.354
	(0.0843)	(0.0785)	(1.026)	(1.173)	(0.204)	(0.276)
Schools	−0.169*	−0.109	−1.872**	−1.302	−0.441**	−0.340
	(0.0864)	(0.0806)	(0.934)	(0.921)	(0.198)	(0.259)
self-efficacy		0.101***		0.766***		
		(0.0173)		(0.198)		
self-efficacy_alt						0.111***
						(0.0232)
social capital		0.0478***		0.760**		0.0582***
		(0.0168)		(0.296)		(0.0214)
1st stage:	coop. sr	coop. sr	coop. sr	coop. sr	coop. sr	coop. sr
model	2SLS	2SLS	OLS	OLS	2SLS	2SLS
rainfall1931	0.709***	0.706***	0.711***	0.709***		
	(0.0512)	(0.0512)	(0.0513)	(0.0512)		
cocoa_soil1931	0.487***	0.487***	0.462***	0.464***		
	(0.0465)	(0.0468)	(0.0434)	(0.0435)		
neighbor_SR_5	0.102***	0.1000***	0.102***	0.0996***		
	(0.0178)	(0.0178)	(0.0178)	(0.0178)		
dist_railroad1931					−0.245***	−0.229***
					(0.0547)	(0.0550)
wider_SR_20					0.232***	0.223***
					(0.0727)	(0.0720)
all covariates	yes	yes	yes	yes	yes	yes
prices	yes	yes	yes	yes	yes	yes
farmsize	yes	yes	yes	yes	yes	yes
accra dist	yes	yes	yes	yes	yes	yes
environment	yes	yes	yes	yes	yes	yes
slavery	yes	yes	yes	yes	yes	yes
company fe	yes	yes	yes	yes	yes	yes
district fe	yes	yes	yes	yes	yes	yes
N	398	398	398	398	398	398
2nd stage (P)R2	0.49	0.57	0.41	0.51	0.34	0.47
1st stage R2	0.97	0.97	0.97	0.97	0.92	0.92
1st stage F instr.	122.74	120.81	122.74	120.81	12.32	10.88

Standard errors are bootstrapped. Significance levels are 10% (*), 5% (**), and 1% (***). "cf_income" is the share of farm-income from contract farming. "cooperatives sr" is the success rate of 1930s colonial cocoa cooperatives in a 5-km radius around the 2013 sampled pineapple farms. "schools" is the number of 19th and 20th century Christian missionary schools in a 10-km radius around the 2013 sampled pineapple farms. "prices" includes the price difference between companies and local markets. "environment" includes rainfall (quantity and variability), soil quality at the farm level, topography at the village level, and malaria risk at a regional level. "slavery" is the regional, historic impact of the trans-Atlantic slave trade.

Specification (1) indicates a positive causal effect of the performance of the colonial cocoa cooperatives and a negative causal effect of the Christian missionary schools. Specification (2) shows that these causal effects lose their significance when we include self-efficacy and social capital. Specifications (3) and (4) show that the pattern is robust to using a control function fractional logit instead of 2SLS. Specifications (5) and (6) also show that also the self-efficacy dummy can be substituted with a three-level variable, and we can use other instruments without changing the pattern. Throughout, we control for a diverse set of control variables that include district and now also company fixed effects.

Table 5 shows what determines the cultural variables self-efficacy and social capital. Specifications (1) and (2) indicate that the experience with the colonial cocoa cooperatives shaped the current self-efficacy level of the farmers. The schools are not estimated to have had a significant effect. As expected, current context variables such as tenure security, rainfall variability, and infrastructure also contribute to our measured self-efficacy. Notably, training by a development agency is estimated to have a negative effect (the analysis of Wuepper et al. (2014) suggests that this is not due to prior farmer selection). To test whether reverse causality could be present, we also include the contract farming income share as an explanatory variable, which is significant but of a smaller magnitude than the effect of the colonial cooperatives. Specifications (3) and (4) show what determines social capital. A large, negative effect is found for the missionary schools. Positive effects are indicated for the performance of the colonial cocoa cooperatives and possibly, for that of the current pineapple contract farming as well.

Overall, this suggests that the performance of the colonial cocoa cooperatives determined the farmers' self-efficacy and that the Christian missionary schools affected the village social capital. Currently, both cultural variables shape pineapple contract farming performance. To conclude our analysis, we should consider a final point. If culture is the causal channel through which history impacts contract farming, we should be allowed to use the historical variables as

TABLE 5. WHAT DETERMINES THE CULTURAL TRAITS?

	(1)	(2)	(3)	(4)
2nd stage:	self-efficacy	self-efficacy	social capital	social capital
model	2SLS	CF O.LOGit	2SLS	CF O.LOGIT
cooperatives sr	0.452***	1.878**	0.403**	0.512***
	(0.152)	(0.736)	(0.192)	(0.175)
cf_income	0.306***	1.031***	0.587***	0.717***
	(0.0382)	(0.176)	(0.0810)	(0.154)
schools	−0.223	−0.901	−0.876***	−0.960***
	(0.148)	(0.661)	(0.207)	(0.252)
training	−0.126***	−0.427**	0.128	0.210
	(0.0352)	(0.170)	(0.0835)	(0.141)
accra dist	0.280	2.062	−0.723**	−0.487
	(0.327)	(1.604)	(0.289)	(0.404)
infrastructure	0.0579	0.475	0.231	0.402
	(0.122)	(0.512)	(0.222)	(0.297)
tenure security	0.115***	0.405**	−0.122*	−0.134
	(0.0322)	(0.184)	(0.0735)	(0.124)
rain variability	−0.111***	−0.333**	−0.0908	−0.127
	(0.0329)	(0.167)	(0.125)	(0.209)
1st stage:	coop. sr	coop. sr	coop. sr	coop. sr
model	2SLS	OLS	2SLS	OLS
rainfall1931	0.702***	0.702***	1.164***	1.164***
	(0.0522)	(0.0522)	(0.0426)	(0.0426)
cocoa_soil1931	0.542***	0.542***	0.474***	0.474***
	(0.0412)	(0.0412)	(0.0519)	(0.0519)
neighbor_SR_5	0.112***	0.112***	0.122***	0.122***
	(0.0179)	(0.0179)	(0.0220)	(0.0220)
all covariates	yes	yes	yes	yes
prices	yes	yes	yes	yes
farmsize	yes	yes	yes	yes
accra dist	yes	yes	yes	yes
environment	yes	yes	yes	yes
slavery	yes	yes	yes	yes
district fe	yes	yes	yes	yes
N	398	398	398	398
2nd stage (P)R2	0.42	0.25	0.34	0.12
1st stage R2	0.97	0.97	0.95	0.96
1st stage F instrument	161.92	161.92	381.37	381.38

Standard errors are bootstrapped. Significance levels are 10% (*), 5% (**), and 1% (***). "cf_income" is the share of farm-income from contract farming. "cooperatives sr" is the success rate of 1930s colonial cocoa cooperatives in a 5-km radius around the 2013 sampled pineapple farms. "schools" is the number of 19th and 20th century Christian missionary schools in a 10-km radius around the 2013 sampled pineapple farms. "prices" includes the price difference between companies and local markets. "environment" includes rainfall (quantity and variability), soil quality at the farm level, topography at the village level, and malaria risk at a regional level. "slavery" is the regional, historic impact of the trans-Atlantic slave trade.

instruments for the cultural variables, assuming that our historical variables do not affect contract farming through other channels, as suggested by our analysis thus far. Thus, we can explain the performance of contract farming with the variation in our cultural variables explained by our historical variables. This is presented in the next section.

VIII. The Effect of Culture on Contract Farming

Table 6 presents two specifications. In the first, we have to estimate three stages to correctly estimate the effect of culture on contract farming. In the second, two stages are sufficient. For the first specification, we estimate a probit to instrument high self-efficacy with the success rate of the colonial cocoa cooperatives. We then estimate regular 2SLS in which we instrument self-efficacy with the fitted values from the probit estimation. We used this complicated estimation because of Haussmann's "forbidden regression.": Only an OLS first stage is guaranteed to produce correct estimates for the second stage (Angrist and Pischke 2008; Greene 2008). If the first stage has a non-linear conditional expectation function (CEF), our strategy of estimating three stages, in which the fitted values of a first-stage probit are used as instruments in a subsequent 2SLS, is the accurate method. Because our dependent variable is still logically bound between 0 and 100, the second specification is arguably the more reliable. Here we estimate a fractional logit and control for endogenity with control functions. The results corroborate our hypothesis: Both historically shaped cultural variables, self-efficacy and social capital, are significant determinants of contract farming success.

TABLE 6. THE EFFECT OF CULTURE ON CONTRACT FARMING PERFORMANCE

	(1)		(2)	
3rd stage	cf_income		cf_income	
model	2SLS		Contr-F. GLM	
self-efficacy	0.260***		0.999***	
	(0.0891)		(0.323)	
social capital	0.189**		1.180**	
	(0.0773)		(0.586)	
prices	0.619**		2.506	
	(0.259)		(2.936)	
farmsize	0.0370		0.336	
	(0.0253)		(0.216)	
2nd stage	self-efficacy	social capital		
model	2SLS	2SLS		
fitted self-efficacy	2.235***	0.851***		
	(0.317)	(0.235)		
schools	−0.0299	−0.320***		
	(0.0649)	(0.0480)		
1st stage	self-efficacy		self-efficacy	social capital
model	Probit		Probit	OLS
cooperatives sr	0.501***		0.501***	0.343***
	(0.182)		(0.182)	(0.0957)
schools	−0.131		−0.131	−0.669***
	(0.226)		(0.226)	(0.119)
all covariates	yes	yes	yes	yes
prices	yes	yes	yes	yes
farmsize	yes	yes	yes	yes
accra dist	yes	yes	yes	yes
environment	yes	yes	yes	yes
slavery	yes	yes	yes	yes
company fe	yes	yes	yes	yes
district fe	yes	yes	yes	yes
N	398		398	
3rd stage (P) R2	0.18		0.49	
2nd stage R2	0.33	0.67		
2nd stage F instrument	27.14	184.36		
1st stage (P) PR2	0.28		0.28	0.33

Standard errors are bootstrapped. Significance levels are 10% (*), 5% (**), and 1% (***). "cf_income" is the share of farm-income from contract farming. "cooperatives sr" is the success rate of 1930s colonial cocoa cooperatives in a 5-km radius around the 2013 sampled pineapple farms. "schools" is the number of 19th and 20th century Christian missionary schools in a 10-km radius around the 2013 sampled pineapple farms. "prices" includes the price difference between companies and local markets. "environment" includes rainfall (quantity and variability), soil quality at the farm level, topography at the village level, and malaria risk at a regional level. "slavery" is the regional, historic impact of the trans-Atlantic slave trade.

IX. Discussion

The evidence presented contributes to two lines of research. We show that culture affects the performance of contract farming, which adds to the work on contract farming, agricultural value chains, and rural development in Sub-Saharan Africa (Eaton and Shepherd 2001; Kirsten and Sartorius 2002; Kumar and Matsusaka 2009; Barrett et al. 2012; Bellemare 2012; Will 2013). We also demonstrate that cultural differences between smallholder farmers can be explained with historical contexts, which adds to the study on the historical origins of culture (Guiso et al. 2006; Nunn and Wantchekon 2009; Tabellini 2010; Nunn 2012; Alesina et al. 2013; Galor and Özak 2014).

Our research also warrants several new questions. First, we find a negative social capital effect of Christian missionary schools, which translates into an overall negative effect for the performance of contract farming. Previous research has usually found a positive effect of Christian missionary schools on various economic and political outcomes majorly through the development of human capital (Woodberry 2004; Wantchekon et al. 2015). This raises the question of whether our finding is dependent on our focus on smallholder agriculture, where social capital is particularly important (Conley and Udry 2010; Pamuk et al. 2014; Wuepper et al. 2014) or whether there are other differences that affect the result. We treated all missionary schools as the same in our analysis. While considering a larger sample, it would be important to investigate whether the effects differ systematically across missions and countries. It would also be desirable to better understand why, in our context, formal education is rather unimportant, although social capital and self-efficacy are major drivers. In particular, self-efficacy has not received much attention yet, although our study suggests that it is important.

Another question is regarding the speed of cultural change. Giavazzi et al. (2014) indicate an interesting gap in the literature: Although culture is often defined in economics as the "customary beliefs and values that ethnic, religious, and social groups transmit *fairly*

unchanged from generation to generation" (Guiso et al. 2006), there is actually a spectrum of different cultural traits, some of which persist fairly unchanged through time while others evolve and adapt rather rapidly (Giavazzi et al. 2014). We consider colonial cocoa cooperatives and Christian missionary schools and find that they shaped the evolution of self-efficacy and social capital, which currently affects the contract farming performance. This suggests that both cultural variables are perhaps slowly adaptive, showing persistence in the short to medium term but converging to an adaptive equilibrium in the medium to long term. The reason for this observation is, however, unclear. We offer the hypothesis that some cultural traits are more fundamental than others possibly because they adapted over a longer period, coupled with genetic evolution and stronger selection (Richerson and Boyd 2008; Richerson et al. 2010; Galor and Michalopoulos 2012).

The abovementioned discussion leads us to consider policy implications. First, we find that European influences in the British Gold Coast changed the evolution of two important cultural variables. Second, we can still observe these effects decades later in modern Ghana. This may caution us to put greater emphasis on cultural effects in the context of development programs and policies, which does not only include the prevention of negative effects but also the development of strategies that will have a positive effect, i.e., how to increase village social capital and peoples' perceived self-efficacy, which could have long lasting effects.

X. Conclusions

We investigated the question whether the current variation in contract farming performance is determined by past events from Ghana's colonial period. To this end, we surveyed 400 pineapple farmers in Ghana and connected this new dataset to data on the locations of Christian missionary schools (19th and early 20th centuries) and the performance of colonial cocoa

cooperatives (early 20th century). Controlling for omitted variables using different instruments and control variables, amongst others, for local institutions (the local chiefs), geographic determinants (e.g., distances and infrastructure), and purely economic incentives (e.g., prices), we find an effect of both historical variables, the location of Christian missionary schools and the performance of colonial cocoa cooperatives, on the performance of contract farming. The causal channel is found to be a persistent change in culture: the performance of the colonial cocoa cooperatives changed peoples' belief in their own capabilities to achieve business success (self-efficacy), whereas the Christian missionary schools are found to have reduced village social capital.

Despite these findings, our analysis also makes clear that farmer behavior is affected but not determined by the past. Our models indicate that we can never explain more than 50% of the contract farming performance only with the historically shaped culture. This suggests that the colonial experiences are important but only a partial explanation for the performance of contract farming in Ghana, in addition to factors such as location, infrastructure and capital endowment.

We would like to thank Davide Cantoni, Francesco Cinnirella, Alexander Moradi, Chiara Cazzuffi, Barbara Drosten, and Matthias Blum.

References

Acemoglu, Daron, James A. Robinson, and Dan Woren. 2012. Why Nations Fail: The Origins of Power, Prosperity and Poverty. Vol. 4. New York: Crown Business.

Alesina, Alberto, and Paola Giuliano. 2013. Culture and Institutions. No. w19750. National Bureau of Economic Research.

Alesina, Alberto F., Paola Giuliano, and Nathan Nunn. 2013. "On the Origins of Gender Roles: Women and the Plough." Quarterly Journal of Economics 128:863-96.

Alkire, Sabina. 2005. "Subjective Quantitative Studies of Human Agency." Social Indicators Research 74:217-60.

Angrist, Joshua D., and Jörn-Steffen Pischke. 2008. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton University Press.

Bandura, Albert. 1977. "Self-Efficacy: Toward a Unifying Theory of Behavioral Change." Psychological Review 84:191.

Bandura, Albert. 1997. Self-Efficacy: The Exercise of Control. New York: Freeman.

Banerjee, Abhijit, Abhijit Vinayak Banerjee, and Esther Duflo. 2011. Poor Economics: A Radical Rethinking of the Way to Fight Global Poverty. PublicAffairs.

Barrett, Christopher B., Maren E. Bachke, Marc F. Bellemare, Hope C. Michelson, Sudha Narayanan, and Thomas F. Walker. 2012. "Smallholder Participation in Contract Farming: Comparative Evidence from Five Countries." World Development 40:715-30.

Bellemare, Marc F. 2012. "As You Sow, so Shall You Reap: The Welfare Impacts of Contract Farming." World Development 40:1418-34.

Bénabou, Roland, and Jean Tirole. 2002. "Self-Confidence and Personal Motivation." Quarterly Journal of Economics 19:871-915.

Robert, Boyd, and Peter J. Richerson. 1985. Culture And The Evolutionary Process. Chicago: University of Chicago.

Boyd, Robert and Peter J. Richerson (1995). "Why Does Culture Increase Human Adaptability?" Ethology and Sociobiology 16:125-43.

Boyd, Robert, Peter J. Richerson and Joseph Henrich. 2011. "The Cultural Niche: Why Social Learning Is Essential For Human Adaptation." Proceedings of the National Academy of Sciences 108:10918-25.

Cazzuffi, Chiara, and Alexander Moradi. 2010. Why Do Cooperatives Fail? Big versus Small in Ghanaian Cocoa Producers' Societies, 1930-36. No. 2010-18. Centre for the Study of African Economies, University of Oxford.

Chanda, Areendam, C. Justin Cook, and Louis Putterman. 2014. "Persistence of Fortune: Accounting for Population Movements, There Was No Post-Columbian Reversal." American Economic Journal: Macroeconomics 6:1-28.

Claridge, William Walton, and Sir Hugh Charles Clifford (1915). A History of the Gold Coast and Ashanti... With an introduction by Sir Hugh Clifford... With maps. John Murray.

Cogneau, Denis, and Alexander Moradi. 2011. "Borders That Divide: Education and Religion in Ghana and Togo Since Colonial Times." Working Paper no. 2911, Department of Economics, University of Sussex.

Conley, Timothy G., and Christopher R. Udry. 2010. "Learning about a New Technology: Pineapple in Ghana." The American Economic Review 100:35-69.

Eaton, Charles, and Andrew Shepherd. 2001. Contract farming: partnerships for growth. Food & Agriculture Org.

Fafchamps, Marcel. 1996. "The Enforcement of Commercial Contracts in Ghana." World Development 243:427-48.

Feigenberg, Benjamin, Erica M. Field, and Rohini Pande. 2010. Building Social Capital Through Microfinance. National Bureau of Economic Research.

Filippin, Antonio, and Marco Paccagnella. 2012. "Family background, self-confidence and economic outcomes." Economics of Education Review 31:824-34.

Fold, Niels, and Katherine V. Gough. 2008. "From Smallholders to Transnationals: The Impact of Changing Consumer Preferences in the EU on Ghana's Pineapple Sector." Geoforum 39:1687-97.

Fukuyama, Francis. 2001. "Social Capital, Civil Society and Development." Third World Quarterly 22:7-20.

Galor, Oded, and Stelios Michalopoulos (2012). "Evolution and the Growth Process: Natural Selection of Entrepreneurial Traits." Journal of Economic Theory 147:759-80.

Galor, Oded, and Ömer Özak. 2014. "DP10122 The Agricultural Origins of Time Preference."

Gatune, Julius, Mitchris Chapman-Kodam, Kwesi Korboe, Francis Mulangu, and Manitra A. Rakotoarisoa. 2013. "Analysis of Trade Impacts on the Fresh Pineapple Sector in Ghana." FAO Commodity and Trade Policy Research Working Paper no.41. Food and Agricultural Organization of the United Nations, Rome.

German Society for International Cooperation (2005). Market Oriented Agriculture Programme (MOAP).

Giavazzi, Francesco, Ivan Petkov, and Fabio Schiantarelli. 2014. Culture: Persistence and Evolution. National Bureau of Economic Research.

Greene, William H. 2008. Econometric Analysis. Granite Hill Publishers.

Guiso, Luigi, Paulo Sapienza, and Luigi Zingales (2006). "Does Culture Affect Economic Outcomes?" The Journal of Economic Perspectives 20:23-48.

Jedwab, Remi, and Alexander Moradi. 2012. "Colonial Investments and Long Term Development in Africa: Evidence from Ghanaian Railroads." http://Home.gwu.edu/jedwab/Jedwab_Moradi_Nov_2012. pdf (accessed December 5, 2012).

Kirsten, J. and K. Sartorius (2002). "Linking agribusiness and small-scale farmers in developing countries: is there a new role for contract farming?" Development Southern Africa 19(4): 503-529.

Knack, Stephen, and Philip Keefer. 1997. "Does Social Capital Have an Economic Payoff? A Cross-Country Investigation." The Quarterly Journal of Economics 112:1251-88.

Kumar, Krishna B., and John G. Matsusaka. 2009. "From Families to Formal Contracts: An Approach to Development." Journal of Development Economics 90:106-19.

Macdonald, George. 1898. The Gold Coast, Past and Present.

Meijerink, Gerdien, Erwin Bulte, and Dawit Alemu. 2014. "Formal institutions and social capital in value chains: The case of the Ethiopian Commodity Exchange." Food Policy 49:1-12.

Millenium Development Authority (2011). Millenium Challenge Account Ghana Program Agriculture Project.

Nunn, Nathan. 2007. The Long-Term Effects of Africa's Slave Trades. National Bureau of Economic Research.

Nunn, Nathan. 2010. "Religious Conversion in Colonial Africa." The American Economic Review 100:147-52.

Nunn, Nathan. 2012. "Culture and the historical process." Economic History of Developing Regions 27: S108-26.

Nunn, Nathan. (2013). "Historical development." Handbook of Economic Growth, forthcoming.

Nunn, Nathan, and Leonard Wantchekon (2009). The Slave Trade and the Origins of Mistrust in Africa. National Bureau of Economic Research.

Pamuk, Haki, Erwin Bulte, Adewale Adekunle, and Aliou Diagne. 2014. "Decentralised Innovation Systems and Poverty Reduction: Experimental Evidence from Central Africa." European Review of Agricultural Economics :jbu007.

Papke, Leslie E., and Jeffrey Wooldridge. 1993. Econometric Methods for Fractional Response Variables with an Application to 401 (k) Plan Participation Rates. National Bureau of Economic Research Cambridge, Mass., USA.

Putnam, Robert D., Robert Leonardi, and Raffaella Y. Nanetti. 1994. Making Democracy Work: Civic Traditions in Modern Italy. Princeton University Press.

Ramalho, Esmeralda A., Joaquim JS Ramalho, and José MR Murteira. 2011. "Alternative estimating and testing empirical strategies for fractional regression models." Journal of Economic Surveys 25:19-68.

Richerson, Peter J. and Robert Boyd (2008). Not by Genes Alone: How Culture Transformed Human Evolution, University of Chicago Press.

Richerson, Peter J., Robert Boyd, and Joseph Henrich. 2010. "Gene-culture coevolution in the age of genomics." Proceedings of the National Academy of Sciences 107:8985-92.

Schwarzer, Ralf. 2014. Self-efficacy: Thought Control of Action. Taylor & Francis.

Tabellini, Guido. 2010. "Culture and Institutions: Economic Development in the Regions of Europe." Journal of the European Economic Association 8:677-716.

USAID (2007). Trade and Investment Program for a Competitive Export Economy (TIPCEE) - Forth Year Work Plan for Partners. October 2007 - September 2008.

USAID (2009). Trade and Investment Program for a Competitive Export Economy - Final Report.

USAID (2013). Agricultural Development and Value Chain Enhancement (ADVANCE) - Project profile.

Wantchekon, L., Novta, N., & Klašnja, M. (2015). Education and Human Capital Externalities: Evidence from Colonial Benin. The Quarterly Journal of Economics, January 30, 2015.

Ward, William E. F. 1966. A History of Ghana. Allen & Unwin.

Will, Margret. 2013. Contract Farming Handbook - A Practical Guide for Linking Small-Scale Producers and Buyers Through Business Model Innovation. Deutsche Gesellschaft für International Zusammenarbeit.

Woodberry, Robert D. (2004). The Shadow of Empire: Christian Missions, Colonial Policy, and Democracy in Postcolonial Societies. University of North Carolina at Chapel Hill.

Woolcock, Michael, and Deepa Narayan. 2000. "Social Capital: Implications for Development Theory, Research, and Policy." The World Bank Research Observer 15:225-49.

Wooldridge, Jeffrey. 2007. Control Function and Related Methods.

Wooldridge, Jeffrey M. 2011. Fractional Response Models with Endogenous Explanatory Variables and Heterogeneity.

World Bank. 2011. Horticultural Exports from Ghana: A Strategic Study. Discussion Paper.(OECD), United Nations Development Programme (UNDP).

Wuepper, David, Johannes Sauer, and Linda Kleemann. 2014. "Sustainable Intensification of Pineapple Farming in Ghana: Training and Complexity." Working Paper, Kiel Institute for the World Economy.