Decolonization Violence in plantation-based Colonial Economies in Asia and Africa

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ABSTRACT

This paper explores the causal relationship between European colonial entities characterized by a plantation-based economy and the occurrence of violence in the subsequent decolonization period. Employing a novel dataset encompassing 69 former colonies in Asia and Africa, we employ a 2-stage least squares regression model, incorporating rainfall as an instrumental variable. Our findings reveal a statistically significant and moderately positive causal connection between the presence of colonial plantations and the level of decolonization violence, after accounting for potential endogeneity.

I. Introduction

A large part of the world today is a product of European colonialism. Over the last millennium, organic and indigenous institutional and social development in non-European countries have been supplanted by European frameworks. But different colonies experienced colonialism differently. One of those differentials in varying colonial experiences across the world is how different places experienced colonization and decolonization violence. More exploited colonies, unsurprisingly, can be expected to have experienced a higher degree of colonial and decolonialization violence due to the systems put in place by their colonizers, in contrast to the colonies that experienced a lesser degree or no exploitation at all. Plantation-based colonial economies were an important determinant in such an exploitation since colonial adventures were, in part, undertaken by a desire to obtain spices and other agricultural produce in the first place.

Following that thread, this paper attempts to examine the causal relationship between plantation-based colonial economies, with violence during the transitory decolonialization phase. Since colonial plantations are widely regarded as particularly exploitative due to the unethical use of indigenous human, and capital resources, it is expected that colonial economies with a higher dependence on plantations faced more violence during the decolonialization period.

To shed light on this question, this study uses a novel dataset consisting of 69 ex-colonies from Asia and Africa, for an econometric analysis where violence during independence is proxied by military combat deaths, and the main predictor variable of interest is the importance of plantations in colonial economies. Due to the abstract nature of this research question, and the potential endogeneity that comes with it, we use the 2-stage least squares regression framework by instrumenting importance of plantation economies with rainfall levels.

We find a positive and statistically significant relationship between the importance of plantations in colonial economies and the level of decolonialization violence, after instrumenting for the former with the measure of rainfall and the results are robust to different specifications. Important contributions are

made to the genre of economic history because while studies of comparative colonial outcomes have been undertaken before, our specific research question has not been studied empirically yet.

The next sections provide historical background, review literature, discuss the empirical model, provide results, and conclude.

II. Historical Background

Expansion of the European sphere of influence into other parts of the globe is generally believed to have started around late 15th century, as the Spanish and Portuguese were locked in a race to discover the farthest unexplored reaches of the globe unknown to them. Early explorers such as Vasco da Gamma and Christopher Columbus made discoveries of lands and sea routes unknown to Europeans.

Colonial states first began to emerge in South and North America in the 16th century. Around the same time European forays outside of the Americas started taking place. Primarily driven by economic and trade interests, the Portuguese, French and the British were the first to establish trading posts for small decentralized Indian kingdoms around the mid-16th century. From there, colonial ventures gradually expanded, both in scope and size, making headway to Southeast Asia, the middle east, Australia, and central Asia. The form of colonial relationship also changed as economic relationships forged to become exploitative colonies, with the colonial motherland often backing up pre-existing tribal or more powerful forms of state leadership for their own gain.

Colonial plantations played a crucial role in this economic system. Plantations were established to cultivate crops such as sugar, tobacco, cotton, coffee, and indigo. These cash crops were highly profitable, and European colonizers used forced labor to extract wealth from their colonies. Slavery and indentured servitude were common forms of labor exploitation on plantations. The brutality of these systems cannot be overstated, as enslaved Africans, indentured laborers, and indigenous peoples were subjected to grueling and inhumane conditions. The African Slave trade very much facilitated this process until it's dismantling in the 19th century.

The specific practices and levels of exploitation on plantations varied from one colony to another. The boom of rubber-based products in Europe in the late 19th century facilitated the growth of large corporate

plantations in Southeast Asia, particularly in the Indonesian Islands of Java, and colonial Malaysia (Gordon, 2001). While labor contracts were prevalent in Dutch and British colonies, the concern was not for the substantive fairness of the contract for the workers, but for the maximum profitability of the plantations (Fitzpatrick, 1980). This practice in modern parlance is referred to as indentured servitude. Dutch plantations in Indonesia and Malaysia were supplied with indentured workers primarily through native populations and migrant Indian workers, who in their lack of literacy were bound to exploitative contracts (Gordon, 2001). French colonialism in Indochina in what is now today Vietnam, Laos and Cambodia followed along similar patterns.

Africa was the last vestige of the world to be colonized, in the 19th century. Driven by European intra-continental geopolitics, the Germans under Otto von Bismarck held the infamous Berlin conference in 1884, splitting up Africa into colonial possessions. Perhaps, the worst known of these perpetrators are the Belgians, who in what is today the Democratic Republic of the Congo, established a labor system solely meant to extract cotton and rubber from Congolese plantations for the benefit of the Belgians. The French colonies in the western Sahara are not far off in that practice and formed the backbone of the contemporary *Franceafrique* economy based on colonial resource extraction. In Spanish possessions, a similar *Encomienda* system was set up, where labor movement was highly restricted because it was formed of strict racial hierarchies, and static land tenure systems whereby an entrenched group of aristocracts consistently held land capital privileges. These systems largely persisted in the colonial era and post-colonial South America. Historians acknowledge a slightly better off, more “inclusive” British colonial system (Lange, 2006, Fieldhouse, 1991), which possibly translated into colonial plantations as well. Some empirical literature reviewed in later sections acknowledge these comparative notions in a more rigorous fashion.

As colonies in Africa and Asia gained independence in the 20th century, much of these exploitative economic and social structures caused increasing levels of violence against the colonizer. These effects persist to this day. The oppressive labor practices, cultural erasure, and dispossession of indigenous peoples sowed the seeds of resistance. As colonized populations experienced the harsh realities of

colonial exploitation, they often resorted to various forms of resistance, including armed uprisings, protests, and the preservation of their cultural identities. Decolonization violence, as a response to the exploitation inherent in colonial plantations, would later become a significant aspect of the struggle for independence and self-determination. Such violence, often in exploitative plantation-based colonies, such as Algeria, Vietnam and Haiti, are not lost in the modern consciousness.

III. Literature review

Academic research on comparative colonial empires has generally stemmed from non-economic fields such as political science and sociology. However, with their seminal paper, The colonial origins of comparative development, Acemoglu, Johnson and Robison (2001) shed an interdisciplinary light into the sub-genre of Economic History, demonstrating that European actors and their transfer of institutions into their colonies can help explain large differences of economic prosperity across the world today. While institutional qualities cannot be fully captured in a single empirical variable, Acemoglu et al show, using economic variables that proxy institutional development in their methodology (such as property expropriation risk), that colonial economic institutions across colonies are heterogeneous, and they can chart a causal path dependence towards those ex-colonies' economic and institutional prosperity today. More relevant to us, they also introduce the notion of "extractive" and "inclusive" colonial institutions; the former characterized by a concentration of power and resources in the hands of a few, to the detriment of the population, whereas the latter distribute power and economic opportunities more widely, fostering innovation and economic growth. Under this premise, we attempt to explain varying outcomes of decolonization violence as a function of extractive colonial economic institutions based on plantations.

Besides Acemoglu et al., 2004, empirical economic study on comparative development of ex-colonies has some literature. Grier (1999) finds that colonies which were colonized for longer periods of time have experienced greater present economic development. However, in retrospection, due to the unavailability of more robust econometric methods in 1999, the causal relationship determined in that study must be taken with caution. While not establishing causality, Lange, Mahoney and vom Hau (2006)

do descriptive exercises to find that Spanish colonies due to their mercantilist economic institutions, whereby the colony and the entire colonial labor force's raison d'etre was for the benefit of colonizer, have substantially differing present economic outcomes compared to British colonies. In another case of causal path dependence of ex colonies, albeit on the more minute level of a single country, Dupraz (2019) conducts regression discontinuity analysis making use of a natural experiment in Cameroon whereby the ex-colony was partitioned into French and British zones, finding that British colonialism caused a greater positive impact on education levels.

However, empirical research specifically studying a causal relationship between colonial plantations and decolonization violence is not available, which this study attempts to make a novel contribution to. There is quantitative research, however, on the different *surrounding* aspects of this study. Firstly, it is important to understand the significance of colonial plantations in the European market demand during the era of colonization. New world spices and plantation produce, such as sugarcane, cocoa, coffee, and cotton were important drivers of colonial expansion into the new world (Pollmer, 2000). The emergence and development of these markets varied across time, colonial rulers, and place of colonization. As the economic historian BW Higman puts it, "The Sugar Revolution" was one of the major determinants to British colonial expansion (Higman, 2000). Furthermore, he notes the importance of colonial production in contemporary British consumption market. Using a collection of archival colonial data, Dauril (1976) concludes that the cocoa production was important factor in Spanish and Portuguese colonial expansion into Latin America and the Caribbean, driven by consumer demand in European markets.

Demand for these goods in European markets was complemented by demand for agricultural labor, which in turn was followed by high labor demand, met by an equally high labor supply. This labor supply was provided for through the means of cheap labor, which came in many forms and varied across colonies. For instance, the British Ceylon plantations had several different labor structures, varying from slavery, debt bondage, indentured servitude, and other forms of exploitative contracts (Alawattage, Wickramsinghe, 2009). In addition, in a follow-up to Acemoglu et al (2001), Robinson, Johnson and

Acemoglu (2004) using the same empirical data as their previous study, establish the following with regards to plantation based colonial institutions in the Spanish Caribbean:

1. The *Encomienda* system set-up by Spanish colonists, of which large parts of sugarcane plantations were worked by either wage-less, contract indentured or the enslaved, failed to provide enough economic incentives to promote growth and stifled innovation.
2. These plantation-based, export oriented and extractive colonial institutions effectively enshrined plantation economies effectively to Malthusian conditions. (Robinson, Johnson and Acemoglu, 2004)

These findings are consistent with Hatton (2014), which studies plantations in Barbados during its time of colonization on a microeconomic level. Using digitized data from 3 plantation companies, the study finds that plantation owners were able to maintain consistently high profits despite demand shocks from the American Revolutionary and Napoleonic wars, and were able to constantly innovate production techniques, still with relatively little human capital innovation and a labor-intense production due to cheap labor supply. The labor economic conditions established in these studies lead to the other aspect of our research question, i.e., linkages of colonial plantations to violence.

As has been seen, while empirical analyses on colonial plantation economies are extensive, the other aspect of this study, (i.e., linkages of colonial plantations to violence) have little econometric examination or empirical studies, so instead we have to rely on qualitative research to situate our study within both, our research question and in the broader context. While not exclusively focused on colonial plantations, Beckert (2014) offers a comprehensive analysis of colonial plantations in relation to “extractive” colonies. Beckert notes that plantation based colonial economies were export oriented, and hence, agricultural produce tended to only suffice the needs of indigenous populations, while the rest were exported to other regions, hence the term “extractive” as defined by Acemoglu et al (2001) neatly fits this model. Labor supply in plantation-based economies was either very cheap (indentured servitude contracts) or free (wage-less workers, enslaved peopled, depending on the timeframe). The Transatlantic slave trade played a major role in making this labor supply dynamic and had differing effects across Africa and the rest of

the world. As empirically established previously with Alawattage, Wickramsinghe (2009), Beckert notes how this unequal labor market dynamics led to increasing resentment towards colonial authorities, in turn increasing violence, upto and including decolonization wars. Beckert also notes that the highly unequal land and agricultural capital ownership system set up by extractive colonialist powers, between both the colonialist and the natives, and within the natives as well, set up resentment and instability during decolonization wars, and even later. Other qualitative literature helps shed some light on the relationship between plantation based colonial franchises, and colonial violence, albeit on a more local level. Ramasamy (2008) notes the tightly controlled British plantation system in Malaysia, and cheap indentured servitude labor supply forced upon Indian and Chinese migrant workers led to a violent decolonization war in region in the 1950s.

As mentioned before, while different aspects of our research question have been studied previously, their claims only take us so far, and hence, the causal relationship between the extractive colonial plantations with decolonization violence is not empirically established, and only backed by qualitative claims. Furthermore, existing studies only examine the question on a geographic limit, as seen in Ramasamy (2014). We attempt to contribute to the existing knowledge by conducting an econometric analysis studying causality between plantations and decolonization violence with the help of a new dataset, whose construction is described in the next section.

IV. Data

We construct a novel dataset specific to our research needs by compiling existing datasets used in other studies for our research question.

The first dataset we use is the Correlates of War (COW) Dataset. We use the COW dataset to compile all data relevant to decolonization violence. This dataset captures all combat-related military deaths in conflicts from 1816 to 2007, with each observation as a single discernible conflict. Within the COW dataset, there are several groupings of data that are of interest to us since it is divided into types of conflict: inter-state, extra-state, and intra-state. These classifications are based upon types of actors since some decolonial resistive parties may be a loosely organized guerilla group (such as the Viet Cong in

Vietnam), a corporate militia body (the National Liberation Front in Algeria), or even a state-actor (the Indonesians during the Dutch Police action). COW records all conflicts with at least 1000 combat related deaths, including other relevant data such as parties involved, start and end dates. We use this metric as proxy for decolonization violence by summing up all combat related deaths of all conflicts of a specific country during their decolonization period. For instance, the Spanish decolonization of Morocco consisted of an extra-state war (non-state entity and a state-entity), and an inter-state war (both parties are state entities). We combine the casualties from these two wars for the state of Morocco to come up with its combat deaths. Since the population of the colony must be factored into this metric, we divide the combat deaths by the closest verifiable and reliable population count of the colony at the time. This is our second data source. Due to developmental factors at around the time of decolonization, some former colonies, however, lack credible census data that enumerates the colonies' entire population. When the closest census data is available, we use that population. When it isn't, we generally rely on the previous editions of the United Nation's World Population Prospects publication to extract population estimates of the year closest to the decolonization period[1]. In a few cases, when neither of them are available, we use other credible sources using our own discretion to validate its reliability (World Bank estimates, CIA World Factbook are examples). In most cases, discrepancies between the year of independence, and the closest year of which we have a reliable population count is a difference of below 4 years, which we expect not to be a systematic issue with our data that biases results from our empirical model. In two cases (most notably Afghanistan), we find a much higher level of discrepancy. We do robustness checks in later sections to ensure that neither the small-scale discrepancies affect our results, nor the omission of large-scale ones.

Our third source of data is the data compiled by Sociology Professors Patrick Ziltener, Daniel Kunzler, and Walter Andre (2017). This dataset comprises of indictors of colonialism for all our relevant ex-colonies, including the variable which captures the scale of plantation in the particular colony. The

[1] The publication has 27 editions at the time of this study, and estimates aren't provided for each year. We extract the estimates closest to the decolonization date.

observation level for this data is at the country-level and includes other relevant variables that are used to control for potential endogeneity such as the length of colonization, type of colonization, scale of European settler immigration and scale of infrastructure development. Political indicators are an important variable that the dataset captures since political effects, such as representative democracy and public participation during decolonization period can be an important potential endogenous factors that needs to be controlled for.

Our fourth set of data is the data used by Acemoglu, Johnson and Robinson (2001). This dataset primarily provides us with control variables not provided by either of the other datasets. Relevant variables of interest include ethnolinguistic fragmentation, religion demographics, and geographic determinants such as soil type and climatic characteristics.

Our instrument, average rainfall per annum by country, comes from the World Bank, our fifth source of data. The earliest per annum rainfall levels for some countries date back to 1962, and the latest are current as of 2022. We take the mean of the average annual rainfall in mm for each country, starting with any year that the metric starts to be recorded, to include in our data. For some countries, we have years for which the rainfall data is available coinciding with the period of colonization, but for most, they start after they gain independence. So, in essence we are extrapolating current rainfall levels to the period of colonization. Averaging several years for which data is available can help us reduce the problems of such an extrapolation, of which potential candidates could be climate change, large scale infrastructure development like artificial lakes dams, and canals, that have occurred since the colonial period. We use alternative instrumental variables such as temperature in our robustness checks to ensure our results are still valid.

The dataset for our study uses important variables from all of these sources. We compile this data by firstly going through every country in Acemoglu et al (2001) and adding in COW data relevant to decolonization for the specific country. Then, to the dataset compiled to that extent, we include other relevant variables from Ziltener, Kunzler, Andre (2017), the World Bank and the several population-count

sources. The final compiled dataset gives us a cross-sectional dataset comprising of 69 ex-colonies from Asia and Africa.

One important decision regarding our data collection is the omission of all South American, North American ex-colonies (and Australia, the country, not the continent). That decision is not without merit. First of all, any empirical research ultimately faces the constraint of data availability. Except for Asia, Africa, and Europe itself, North and South America, and Australia gained de-facto or de-jure independence much earlier than Asian and African countries. As such, data on decolonization violence remains scarce, and when it does, comes from inflated accounts not in-line with modern historical practices. This is especially true for South American countries, most of whom gained independence in early 18th and 19th centuries. The prevailing military technology and conditions would also make violence asymmetric with regards to modern independence wars in Asia and Africa which occurred in the 20th century, and for which we have the data of. Secondly, some excluded continents, especially North America and Australia are what some historians describe "neo-Europe"—colonies with largely white European migration with practical independence in any part of their colonial experience, little decolonization violence, and much higher modern living standards. As such, our econometric research is only internally valid in Asia and Africa, although could possibly be externally valid for South America as well.

Ziltener, Kunzler, Andre (2017) dataset itself is a compilation of data from different sources. Our primary variable of interest from this dataset, i.e., scale of colonial plantation economy is an encoded variable that may take on 3 values: 0, 1 or 2. 2 indicates that the plantation economy was of great importance in the economy. 1 indicates that plantation economy existed to some extent but not to a significant extent, and 0 indicates that plantation economies were not of considerable significance in the colony's economy. These encodings are based on acreage, and output of colonial plantations from the colony collected from Mitchell International Historical Statistics (Mitchell, 1982). As described in the codebook for the dataset, plantations covered by Ziltener, Kunzler, Andre (2017) are characterized by large landholdings on which many workers are employed (wage labor or forced labor) who are not related

to the landowners. This includes both the targeted monocultural cultivation of certain plants as well as large-scale concessions for the extraction of wild plant raw materials (wild rubber, wood, etc.). It indicates the large extent of agricultural coverage that is captured in our data. One obvious downside of this encoding is that it leaves out information on a more granular level, for instance tonnage of production, or acreage of arable land. It also leaves out information in time periods since that could be important. However, it is also important to note that, as previously mentioned, this encoding is based on continuous data from Mitchell (1982), and it is further backed by the sociologists' own training and other qualitative materials, making our encodings particularly valid.

Another downside to our data is regarding our output variable: conflict death count per population. There are some limitations to this proxy that we use to measure decolonization violence. The first is that COW dataset only records conflicts where a minimum of 1000 combat related deaths occurred. This leaves out low-intensity conflicts that must have occurred during decolonization in some countries. Another limitation is civilian casualties, which often make up a portion of total deaths, are left out. We use alternative specifications and robustness checks in later sections to check that these do not pose a problem to our empirical results.

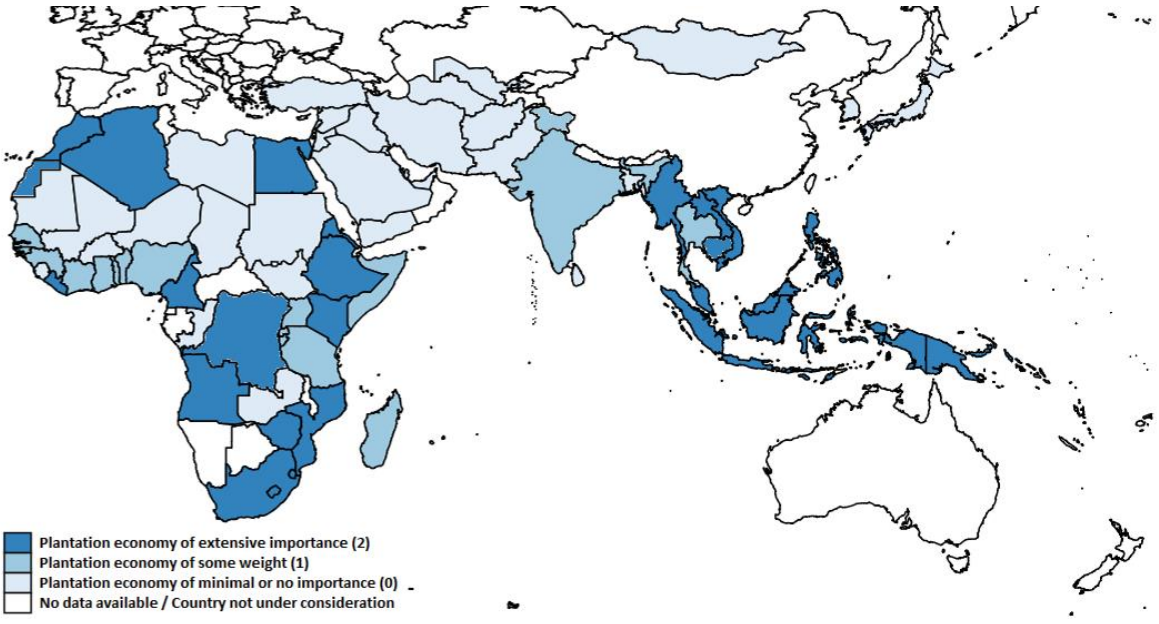

Figure 1: A choropleth of decolonization combat deaths by country. Their respective encodings are given in brackets in the accompanying legend. Countries that seceded post-independence, such as South Sudan

and Singapore are not considered a separate entity in regression since during the time of colonization, they were still a single country. Countries that were never colonized are not considered. In addition, some countries have no data available for deaths during decolonization (Namibia, Botswana, Oman).

Some countries from the two continents are notably absent from our analysis, as shown in the choropleth above. There are currently 112 recognized members of the United Nations from Asia and Africa. There are a few reasons why not all of those countries are included in our analysis. First and most obviously, not all countries in Asia and Africa were colonized by European powers. Some countries that are examples of this are Nepal and China in Asia, and Liberia in Africa, although they did experience significant European leverage upon their national sovereignty. Secondly, a few countries such as Uzbekistan and Tajikistan, were generally under the Russian Empire's sphere of influence before the 1920's and later part of the Soviet Union. It would be inappropriate to include them in an empirical analysis context due to their status as republics within the USSR until its demise in the 90's. Lastly, a few countries experienced independence from their mother countries after independence from their colonizers, such as Singapore from Malaysia and South Sudan from Sudan. This leaves us with just enough of around 70 observations of countries that were colonized by the European powers in Asia and Africa.

Descriptive Statistics of Relevant Continuous variables

Variable	Observations	Mean	Std. Dev.	Min	Max
Decolonization Deaths (Absolute Count)	73	4537.534	9052.723	0	32000
% of European Settlers in 1900	69	1.2275	3.5086	0	22
Average Rainfall per year (mm)	72	1011.664	816.719	18.1	3142
Years of Colonization	69	133.536	113.491	12	469
Percentage of Catholics in 1980	72	13.943	21.99	12	95.9
Census discrepancy (years)	69	1.228	3.509	0	22
	71	1.507	5.045	0	31

Table 2: Descriptive statistics of relevant continuous variables used in the study. Census discrepancy is defined as the number of years between decolonization, and the closest year to which we find a reliable population statistic.

However, a preliminary descriptive observation of our level of plantations encodings shed a problem. These are presented in Figure 2. It shows that while the level of plantations is a continuous

encoding (i.e., to say 1 is at a higher level than 0, 2 at a higher level than 1 and so on), using it as a continuous variable ensures that our data is heteroskedastic, when for our regressions we must assume homoskedasticity (the mean combat deaths for plantation level=1 is much lower than the other two). This makes our encoding much more akin to a categorical variable. However, such a variable is unusable in a 2-stage least squares regression model we will be using since that is our endogenous variable we will be instrumenting for. For that reason, we will be introducing an alternative technique by modifying this variable into a simple dummy variable. A plantation value of 1 and 2 will be encoded as 1, whereas the plantation value of 0 will be left as 0. This removes the problem of heteroskedasticity allowing us to use the same data for our empirical model.

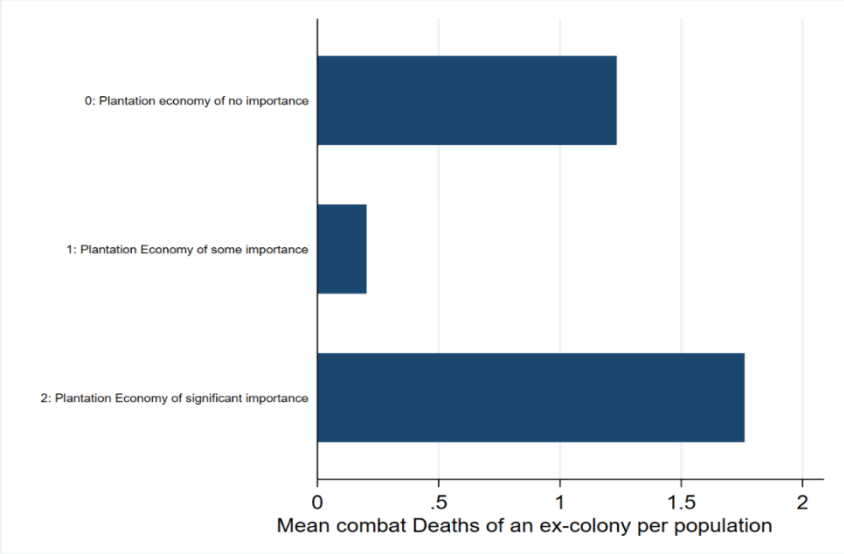

Figure 2: Mean decolonization Deaths per population, by levels of plantation. ***Population is expressed in thousands.*** *Hence, 1.5 mean deaths signify 1.5 combat deaths per thousand people. The mean combat deaths for an encoding of 1, Plantation economy of some importance, is much lower than the other two.*

It is important to note that our plantation variable covered by Ziltener, Kunzler, Andre (2017) are characterized *only* by large landholdings on which many colonial workers are employed (forced labor) who are *not* related to the landowners. As such, more inclusive plantation economies premised on entrepreneurial and non-exploitative spirit are not captured, reducing a source of potential endogeneity. After the process of conversion from 0,1 and 2, to a dummy, as described above, the dummy can essentially mean to say that a value of 1 indicates the existence of large landholdings on which many colonial workers are employed (forced labor) who are *not* related to the landowners. We use this variable in our empirical models described in the next section.

V. Empirical Model

We are examining the impacts of a plantation based colonial economy on decolonization violence. Hence, a simple model to study causality is simply an OLS regression where the output variable is the number of decolonization combat deaths per population, whereas the predictor is our plantation dummy. We build upon this model by using an instrumental variable approach and adding relevant control variables to come up with our main model specification.

Our main model uses rainfall as an instrument for the endogenous plantation variable. This provides a source of variation in the plantation variable that is exogenous to decolonization deaths, reducing potential endogeneity in the model. As such the appropriateness of this instrument is of key concern. Our instrument must meet the valid conditions of excludability and relevance. Rainfall levels, which in our case is average rainfall depth in mm for each country, (averaged for each year since records began[2]), are likely to meet both these conditions. Indeed, rainfall has been used in works seeking to examine similar research questions. For example, Miguel, Satyanath, Sergenti (2004) use rainfall variation in a similar context to examine the relationship between incidences of civil conflict and economic growth, instrumenting economic growth with rainfall variation for 41 countries in Africa in a linear probability model, finding a statistically significant positive relationship between economic growth and incidence of civil conflict. In a similar fashion, our rainfall measure also likely meets the conditions for a 2-SLS model.

Firstly, to meet the relevance condition, rainfall levels need to impact the importance of large-scale plantations in colonial economies. Plantations must require adequate rainfall, and hence, without sufficient rainfall, it is unlikely that the colonial venture would attempt to establish large scale exploitative plantations in the first place. The first-stage regression coefficients validate this theoretical notion empirically. We find a highly statistically significant positive relation between plantations and

[2] Records begin at different times for each country. For instance, if the Congolese data is available since 1960, we average the records for each year data is available since 1960, till present. Some observations have absent data for some years; however, all countries have sufficient years that data is available.

rainfall. We also find a strong F-Statistic for the first stage regressions, around the range of 10-12, which is what most econometricians consider to show a generally strong explanatory power of the instrument towards the endogenous variable, for such an analysis. These F-statistics are consistent across our different model specifications, including our robustness checks. They further validate the relevance condition. One demerit of using a static rainfall measure (instead of variability across a specific timeframe) is that the crops dominant to a specific colony may not require a similar level of rainfall as crops dominant to another colony. Our included colonizer fixed effects should account for this confounding factor.

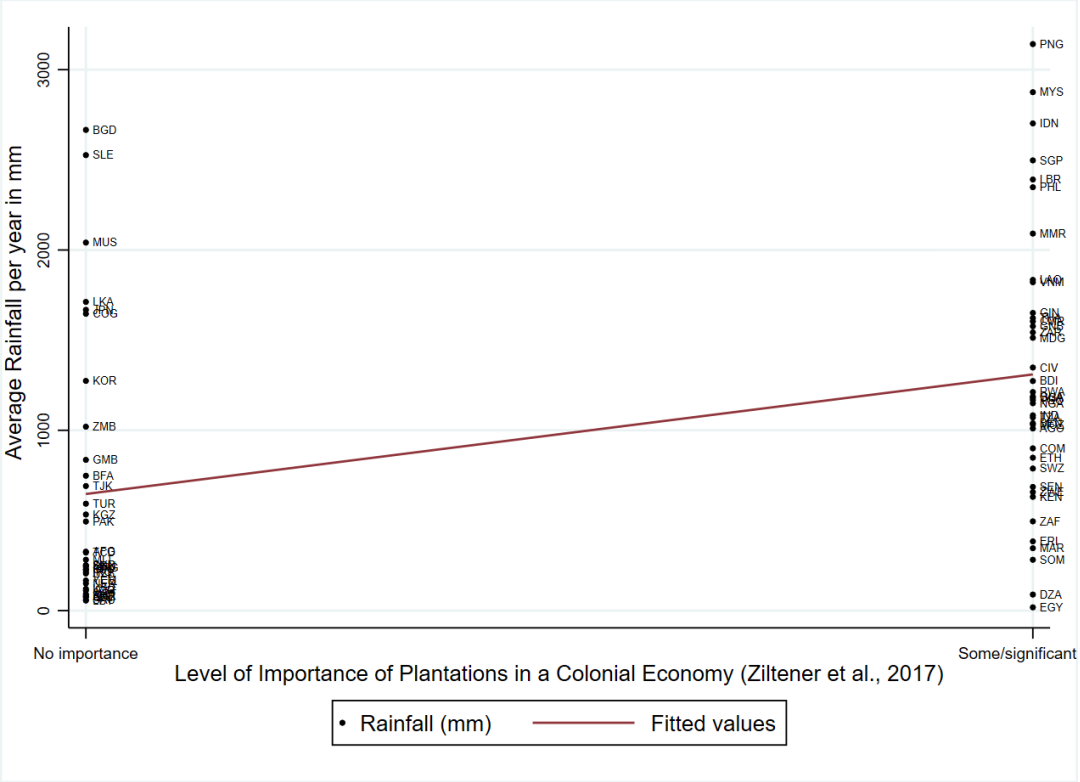

Figure 3: Scatterplot of rainfall instrument, against the encodings of the importance of plantations in colonial economies from Ziltener, Kunzler, Andre (2017). No importance is coded as 0, Some importance and Significant Importance as 1. As described in the Data section, the average of every year since data is available of "average rainfall per year in mm" for each country, is used. The three-letter country codes included for each point/observation follow World Bank coding conventions.

We have no reason to suspect that the excludability condition is not met. This condition cannot be tested econometrically though, so we have to rely on a qualitative basis to establish that claim. In our context, rainfall *does* and *must* affect decolonization violence, but *only* through the mechanism of

existence and levels of plantation. It is unlikely that any other causal pathway be made between rainfall and decolonization deaths. Military strategy may suggest that rainfall affects combat operations, and hence, combat deaths. But this would not affect the excludability conditions in either of two ways. Firstly, since some of the conflicts we are looking at are longer term, spanning across several seasons and climatic conditions, it nullifies the effects of such small-scale strategic combat decisions. Secondly, in the case that the conflicts do not span over several climatic conditions, it must be the case that they would have indeed occurred in a different timeframe anyways. As such, we can establish a strong qualitative basis for the excludability condition.

There is much empirical and qualitative research done that documents differences in economic and political spheres across the colonizing countries, discussed in the previous sections of this paper, which posits the use of a fixed effects for the colonizing country. This absorbs unobserved variation across the different colonizers. We present a model without inclusion of this fixed effect as well to demonstrate the robustness of the results.

Our first-stage model can be written as econometrically as:

$$\mathbf{Plantations}_{ic} = \alpha_1 + \beta_1 \mathbf{Rainfall}_{ic} + \mathbf{\Gamma X}_{ic} + \mathbf{\Delta_c} + \mathbf{E}_{ic}$$

where, $\boldsymbol{Plantation_{ic}}$ represents the dummy of the existence of large landholding plantations[3] for the country ***i*** for the colonizer ***c***, $\boldsymbol{Rainfall}_{\mathbf{ic}}$ represents the country ***i*** colonized by country ***c,*** $\mathbf{\Delta}$ represents the colonizer fixed effects, and $\mathbf{E}_{ic}$ is the error term for the equation.

The predicted values of this first-stage model are then used in our second stage regression of the 2SLS model since we have instrumented the existence of plantations with rainfall levels. The second stage regression model can be written econometrically as:

$$\mathbf{DecolonizationDeathsPerPop}_{ic} = \alpha' + \beta' \hat{\mathbf{Plantations}}_{\mathbf{ic}} + \gamma \mathbf{X}_{ic} + \delta_{\mathbf{c}} + \epsilon_{\mathbf{ic}}$$

[3] Where the owners were not related to either forced or wage labor workers in the colonial economy

where Decolonization $\boldsymbol{DecolonizationDeathsPerPop_{ic}}$ is the combat deaths per population faced by resistive country $\boldsymbol{i}$ against the colonizer $\boldsymbol{c}$, $\boldsymbol{Plantation_{ic}}$ is replaced by the predicted values from the first stage regression, $\boldsymbol{\beta'}$ is our main coefficient of interest, $\boldsymbol{X_{ic}}$ is a range of control variables included to control for potential endogeneity, which are discussed in the forthcoming paragraphs.

An important control is the percentage of European settlers in 1900 from Acemoglu, Johnson, Robinson (2004) for each country since that could be a confounding factor for the incidence of decolonization wars. This variable essentially acts as a proxy for the level of European settler colonialism. Indeed Acemoglu et al., uses European settler mortality as an instrumental variable, suggesting that settler colonialism has significant causal impact on colonial outcomes.

We also control for the incidence of political violence with a dummy variable. A limitation of our data, as discussed briefly in the previous section, is that the Correlates of War (2021) only recorded wars with a minimum of 1000 combat deaths. That leaves out conflicts that occurred that were lesser in scope and magnitude, whose omission may potentially bias our coefficients. Less intense decolonization conflicts, not captured by Correlates of War, are possibly categorized as a political conflict rather than wars itself. We therefore include a dummy variable for colonies in which political violence occurred during the decolonization phase, extracted from Ziltener, Kunzler, Andre (2017). This helps correct the bias potentially introduced by the omission of some conflicts from Correlates of War (2021).

We also include the percentage of catholic people in the colony in 1980 as a control, since the religious demographic of the country could be a possible confounding factor. This metric is extracted from Acemoglu, Johnson, Robinson (2004), and used by them to also control for the same potentially confounding factor. A valid question might arise as to whether abstracting 1980's demographic quantity to the colonial era demographic is a proper modeling choice, because indeed, migration, birth rates, economic and political exploitation of a certain minority may have changed the demographic makeup. Yet data is lacking for the same metric from earlier time periods. In any case, we provide results from models that do not include this control, which provides similar results. Upon Grier (1999)'s findings that the length of colonization could have caused comparative post-colonial (which in Grier's case was the

outcome of economic development), we use the length of colonization period as a control. A greater length of colonization may have facilitated the growth of economic institutions more favorable to exploitative plantations.

Upon this main specification of our model, we build up on different models for our main identification strategy, and then the robustness checks.

VI. Results

FIRST STAGE RESULTS

	(1) Main Model	(2) Without % of Catholics	(3) LPM	(4) Without IV	(5) Without Colonizer FE
Rainfall	.0003158***	.0003154**	.0003158***	-	.0003158***
	(0)	(0)	(0)		(0)
Political Violence	-.055	-.054	-.055		-.055
	(.106)	(.089)	(.106)	-	(.15)
Asia	-.228*	-.231	-.228*		-.228
	(.112)	(.14)	(.112)	-	(.154)
Years of Colonization	-.001**	-.001	-.001**		-.001
	(0)	(0)	(0)		(.001)
% of Catholics	0		0	-	0
	(.004)		(.004)		(.004)
% of European Settlers	.035**	.035*	.035**	-	.035**
	(.015)	(.016)	(.015)		(.014)
Colonizer Fixed Effects	YES	YES	YES	-	NO
Observations	67	67	67	-	67
R-squared	.437	.437	.437	-	.437
First Stage F-Statistic	10.58	9.74	10.58	-	13.95

2SLS RESULTS

	(1)	(2)	(3)	(4)	(5)
Plantation	.712**	.715**	.411***	.605***	.599
	(.285)	(.28)	(.129)	(.18)	(.473)
Political Violence	-.035	-.039	.109*	-.036	.1
	(.058)	(.071)	(.061)	(.081)	(.2)
Asia	.381**	.391**	.237	.358	.359
	(.155)	(.199)	(.153)	(.212)	(.245)
Years of colonization	.001*	.001	0	.001*	0
	(0)	(0)	(0)	(0)	(.001)
% of Catholics	-.001	-	.001	-.001	-.005
	(.005)		(.002)	(.006)	(.006)

% of European settlers	.322*** (0.15)	.322*** (0.17)	.044*** (0.12)	.324*** (0.11)	.322*** (0.11)
Colonizer Fixed Effects	YES	YES	YES	YES	NO
	(.044)	(.045)	(.008)	(.05)	(.063)
Observations	67	67	67	67	68
R-squared	.632	.632	.528	.633	.596

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Table 1: First and Second stage IV regression results. Standard Errors are clustered for each of the 11 colonizing countries. Each individual column is the result of a separate regression. Each individual observation is an ex-colony. Iraq is omitted due to it being an outlier. Our population metric is measured in the number of thousands of people. For instance, a population of 200,000 is expressed as 200. Decolonization deaths are then divided by this population to calculate decolonization deaths per population. The rainfall instrument is the average of the "average rainfall depth per year in mm" for each ex-colony ever since records are available. Plantation, Asia, Political Violence, and Independence Wars are dummy variables, whereas Percentage of European setters, and Percentage of Catholics is a continuous variable.

Table 1, Column 1 shows the results of our main empirical model. We find a statistically significant, positive first-stage coefficient for plantation, instrumented by rainfall, and again a significant, positive coefficient between plantation and the decolonization deaths, after controlling for potential endogeneity. The significance of our coefficients suggests a causal relationship. The coefficient for our plantation variable can be interpreted as: *the existence of large landholding of plantations in a colony, where landowners were not related to either wage-labor or forced-labor colonial subjects, increased the combat deaths during the decolonization phase by 0.71 deaths per thousand people, relative to colonies without such plantations*. In the outset, the magnitude of the coefficient suggests a relatively small increase in combat deaths. While it is certainly not a large magnitude, interpreting it in more meaningful ways can help us understand more about it. For instance, in a colony with 2 million people in close time proximity to the decolonization phase, the coefficient suggests an increase of 0.71*2000=1420 increased combat deaths relative to colonies without the existence of such large landholdings of plantations of the aforementioned conditions. Since we are using combat deaths as a general proxy for violence, it follows that an increase in combat deaths for such colonies was almost surely accompanied by more violence towards the non-combatant, civilian population.

All the columns in Table 1, which are alterative specifications for the same main model in column 1, share similar results. One of the elements in our vector of control variables included in the model is the percentage of Catholics in 1980, as discussed previously. We remove that control in column 2, to still find similarly consistent results.

We use a Linear Probability Model with the Independence war dummy as a dependent variable in Column 3, with similar specifications as the main model[4]. A statistically significant probability coefficient is obtained through the Maximum Likelihood Estimation technique. It indicates that the existence of plantations with labor conditions aforementioned increased the likeliness of any war occurring, by 41.1%.

We provide F-statistics of the first stage regression for each column where it is relevant since it is of key concern regarding the usage of our instrument. The magnitudes of the F-statistic validate the use of our instrument. Column 4 provides a regression without the use of this instrument. We find a statistically significant result for the plantation variable, but it is markedly different from the same coefficient from the other models that do use the instrument, which suggests a biased result due to unaddressed endogeneity in the non-IV model. It further validates the usage of an instrument for this purpose.

We remove the colonizer fixed effects in Column 5, receiving a somewhat similar, but statistically insignificant coefficient for the plantation variable. The insignificance validates studies reviewed earlier, such as Dupraz (2019), Lange et al (2006), and Acemoglu et al (2004) who studied comparative colonial outcomes.

Other covariates also receive statistically significant coefficients consistently across different model specifications. The percentage of European settlers in 1900 is positive and highly significant. The implication is that European settler colonialism had a positive causal impact on the level of violence during the decolonization phase. Qualitative literature reviewed previously tells us that lack of labor mobility due to prevalence of entrenched racial hierarchies could have played a role in causing greater

[4] This dummy is essentially 1 if any decolonization deaths occurred at all for a particular observation.

colonization as well as decolonization violence. This result for European settler colonialism backs up the claim empirically.

The duration of colonization also received a statistically significant, positive result in the main model. It may be that a greater duration of colonization extended support of an economic infrastructure that facilitated the growth of such plantation-based colonial economies.

FIRST STAGE RESULTS

	(1) Remove Census Discrepants	(2) Alternative IV: Temperature	(3) No Dummy conversion	(4) Dep Var is total Violence
Rainfall	.0003049***	-	.0004959***	.0003158***
	(0)		(0)	(0)
Political Violence	-.079	-.072	-.122	-.055
	(.108)	(.114)	(.185)	(.106)
Asia	-.251**	-.133	-.228	-.228*
	(.092)	(.166)	(.246)	(.112)
Years of Colonization	-.001**		-.001	-.001**
	(0)		(.001)	(0)
% of Catholics in 1980	0	-.004	-.003	0
	(.004)	(.003)	(.006)	(.004)
% of European Settlers in 1900	.034**	-.01	.096**	.035**
	(.014)	(.017)	(.033)	(.015)
First Temp Index	-	.023		
		(.067)	-	-
Second Temp Index	-	-.013		
		(.023)	-	-
Third Temp Index	-	-.02		
		(.029)	-	-
Fourth Temp Index	-	.019		
		(.028)		
Fifth Temp Index	-	-.019	-	-
		(.021)		
Independence War	-	.547***	-	-
		(.135)		
Colonizer Fixed Effects	YES	YES	YES	YES
Observations	65	66	67	67
R-squared	.433	.609	.465	.437
First Stage F-Statistic	10.046	48.03	13.39	11.63

2SLS RESULTS

	(1)	(2)	(3)	(4)
Plantation	.943***	.678**	-	.472***
	(.274)	(.312)		(.166)
Political Violence	.035	-.01	-.019	.041

	(.05)	(.061)	(.055)	(.034)
Asia	.285***	.471**	.321*	-.41***
	(.082)	(.212)	(.191)	(.058)
Years of Colonization	.002***	.001**	0	.002***
	(0)	(0)	(0)	(0)
% Catholic in 1980	-.002	-.001	.001	.006**
	(.005)	(.005)	(.005)	(.002)
% European settlers in 1900	.312***	.328***	.304***	.006
	(.04)	(.051)	(.054)	(.017)
Level of Plantation			.453**	
			(.202)	
Independence Wars	-	-	-	-.539***
				(.152)
Colonizer Fixed Effects	YES	YES	YES	YES
Observations	65	66	67	67
R-squared	.709	.644	.641	.599

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Table 3: Additional Robustness check models. Standard errors are clustered for each of the 11 colonies. Each individual column is the result of a separate regression. Each observation is an ex-colony. Iraq is omitted in each regression for it being an outlier. The Temperature indices are measured in degrees Celsius.

Additional robustness checks to supplement our main empirical findings are presented in Table 3. As discussed in the data section, we get our population data from the year closest to decolonization when either a census was conducted, or a reliable population estimate could be found. Some observations have a high degree of discrepancy between the year a first estimate/actual count could be found, and the year of independence. The results of the model in column 1 drop those observations with a discrepancy of more than 10 years. We find that results are similar, and significant at an even higher level, despite their omission.

Next, we use an alternative instrumental variable, a series of five average temperature variables across different seasons of the year, extracted from Acemoglu, Johnson, Robinson (2004). These are average present temperatures proxying for past temperatures, and as such are susceptible to the same extrapolation issues that our rainfall variable has due to factors such as climate change. We use the five temperature indices as instrumental variables in this case since any measure of finding a central tendency, such as mean, or median is susceptible to climatic variations across different regions that may not translate well when the central tendency measure is calculated. The results are provided in Table 3, column 2, with results similar to our main specification.

We generated a dummy for the existence of exploitative plantations in a colony based on the original encodings in Ziltener, Kunzler, Andre (2017), as described in the previous sections, due to the assumption of non-linearity not being met for a 2SLS regression (See Figure 2). Our coefficients should still remain unbiased when that is used, but with a lesser degree of model fit. We use the original encoding for the model's results presented in column 3, assuming that the levels of plantation are a continuous variable, which shows a significant positive coefficient for the plantation variable, but arguably not as similar to the coefficient obtained in our main specification. It validates our creation and usage of the dummy instead of the original encodings on our main empirical specifications.

The model in Column 4 of Table 3 is not a robustness check, but rather a small extension to the study. We use Total colonial Violence as described by Ziltener, Kunzler, Andre (2017) as a dependent variable to see if the same positive causality carries on to violence non-exclusively during the decolonization phase[5]. Rainfall levels should still meet the required conditions of excludability and relevance as we change our outcome variable in this case. We find a positive, statistically significant result that suggests that a colonial plantation economy caused a greater level of colonial violence. A magnitudinal interpretation of its coefficient, however, will not convey the same level of granularity as does our decolonization deaths per population variable, since the former is merely a continuous variable that signifies 3 incremental levels of violence, whereas the latter is an actual death count (See footnote 5).

VII. Conclusion

Our analysis suggests that exploitative plantation-based economies may have caused an increase in deaths during decolonization, in Asia and Africa. Using similar analytical techniques, we find that the same positive relationship may have extended to total colonial violence as well. We also find an increased likelihood of violent decolonization in such exploitative plantations.

[5] This encoding is similar to our original level of plantation variable, 0 signifying minimal violence, 1 signifying some violence, and 2 signifying substantial colonial violence. Hence, this is a continuous variable. It would not be an appropriate choice to create a dummy out of this, as we did for the plantations, since every colony in Asia and Africa experienced some level of violence. Hence, we chose to use the continuous encodings itself.

Since we proxy for general decolonization violence with military combat deaths during that phase, caution must be exercised since combat deaths may not always translate well to general decolonization violence, due to civilian deaths. By using this proxy, we are implicitly assuming some proportionality between the amount of military to civilian deaths in a decolonization conflict. But the lack of data of reliable civilian casualties impels us to use it. To make the case that we use a good proxy, though, it is likely the case that places that saw large amount of combat deaths also saw large amounts of civilian casualties, and hence, greater decolonization violence in general. Hence, coefficients obtained in this study would only be an *underestimate*, and the *positive causality is unlikely to change*. Therefore, the findings of this study, that the existence of colonies whose economies were plantation based, caused a greater amount of decolonization violence, is possibly valid. In any case, whether our proxy stands well, it is at least true that the existence of these colonial economies caused a greater number of combat deaths.

Lastly, our results may very well not be externally valid for *all* ex-colonies, especially since we have omitted neo-Europes (United States, Canada, Australia, New Zealand), and South and North America. There is enough empirical evidence to show that South American and Caribbean ex-colonies were faced with a particularly brutal, exploitative plantation systems, under the Spanish *encomienda*[6] (Yeager, 1995). Future research may explore inclusion of these places as new avenues of research if relevant data becomes available from other sources/ the usage of proxies.

[6] Also, for politico-social analysis, see Fukuyama (2014)

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