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Post-Colonial Policy?  
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from a Natural Experiment in South Asia**

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# Colonial Institutions, Geography, or Post-Colonial Policy?

*Evidence on Long-Term Comparative  
Development from a Natural Experiment in South  
Asia*

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## Abstract

The ‘divergence debates’ revolve around the relative importance of two exogenously predetermined factors--- colonial institutions and geography--- in shaping the long-term development prospects of different countries. As a part of the same research agenda, albeit a focus on economic divergence between peripheral economies, this paper enquires about the extent to which comparative development is shaped not only by the two inherited factors, but a third, *endogenous* channel: economic *policies* pursued *after* independence. I propose that a ‘twin study’, modelled within a Difference-in-Difference experimental design, with evidence from natural experiments of partitioned economies provides an ideal setting, allowing a decomposition of the impact of history/geography (‘nature’) from policy (‘nurture’) via the aid of a *counterfactual*. I present evidence from one South Asian case, the agrarian Punjab region partitioned between India and Pakistan in 1947. The two sub-regions have been exposed to very different policy environments, despite their historical similarities. To examine the impact of these policy differences on agricultural performance, I constructed a district-wise dataset on colonial land-revenue institutions, geography, and yields of food crops from 1900-2016, and setup a pre- and post-treatment juncture at the time of partition in 1947, with one state acting as ‘control’ for the other. The results indicate a strong policy effect *beyond* history/geography: given identical initial conditions, if a Pakistani district were assigned to India in 1947, it would enjoy a 53% and 70% higher yield of wheat and rice, respectively. The comparative analysis reveals that the Indian land reform, combined with public investments in the provision of cheap credit/inputs, created optimal conditions for private investments to flourish during the Green Revolution, leading over time to significantly better development indicators and lower wealth inequality, in comparison with Pakistani Punjab which chose a fairly laissez-faire approach to agrarian policy.

**Keywords:** Economic Divergence, Institutional Development, South Asian Economic History, Colonial Institutions, Post-Colonial Development

## 1. Introduction

The ‘divergence debates’ are an intriguing area of research in contemporary development economics that deal with one elusive and controversial question: what explains the large differences in development outcomes between different countries? While a large part of the literature deals with the causes of differences in economic development between rich and poor countries, a recent strand has illuminated the *historical* dimensions of the question by providing explanations for differences between poor countries, and peripheral regions, within these countries (Banerjee and Iyyer, 2005; Iversen, 2012, Roy, 2014). Marking a rupture with traditional growth models, in which an answer was typically sought in variations in ‘factor accumulation’, ‘technology’, ‘human capital accumulation’, and ‘innovation’ (Solow, 1956; Cass, 1966; Koopmans, 1967; Romer, 1990), recent discussions have sought to shift the emphasis away from the *mechanics* of the growth process, or what Acemoglu (2005) terms the ‘proximate causes’ to the more ‘fundamental causes’ underpinning those mechanics (Acemoglu, 2005; p. 388). The transition has come about as a result of a broader realization, first pointed out by Douglass North and Robert Thomas in their seminal work on institutional dynamics: the “factors we have listed (innovation, economies of scale, education, capital accumulation etc.) are not causes of growth; they *are* growth” (North and Thomas, 1973, p.2, italics in original)

Consequently, in the last two decades the debate on divergence has shifted towards a quest for ‘fundamental causes’, which has itself revolved around the relative importance of two *alternative* channels: 1) Colonial history, via its impact on the initial institutional structure inherited by an economy, is argued to reproduce economic outcomes through ‘institutional persistence’ long after the initial institutions have themselves disappeared (Engerman and Sokoloff, 2000; Acemoglu, Johnson and Robinson, 2002; La Porta, Lopez-

de-Silanes, Shleifer, 2008; Banerjee and Iyyer, 2005, 2008); or 2) Geography, with its impact on ‘climate and work effort’ (Montesquieu, 1756), ‘choice of technology’ (Diamond, 1998), ‘disease environment’ (Sachs, 2000), or ‘agricultural productivity’ (Sachs and Warner, 1999), is argued to shape the endowments of an economy and constrain its development prospects within the matrix of a ‘natural’ possibilities frontier.

But an alternative line of scholarship criticizes the very premises of the new divergence debates, and its yearning for ‘fundamental’ causes of differences in comparative development. In a number of influential studies, Chang (1995, 2004, 2006, 2012) challenges recent theorizations for not accounting for ‘real human agency’, and for assuming that development is completely predetermined by a ‘structure’. According to this view, the state--as an instrument that develops the ‘technology of institutional reform’---plays a central role in defining the contours of a development policy, *given* a structure: the historical legacies and geographical constraints of different economies. Instead of focusing on structural channels, studies within this trajectory pay closer attention to the role of politics at the level of the state in shaping the agenda of policy reform and its impact ultimately, on development outcomes. Chang (2006) examines the East Asian case, David and Foray (2006) explore the process of policy formation in Switzerland in the early 20<sup>th</sup> century, Woo (2009) focusses on legal reform in Malaysia in the 1970’s, while Burlamaqui, Pereira de Souza, and Barbosa Filho (2011) explore multiple instances of institutional and fiscal reform in Brazil, to show how in each case policy reforms were vigorously contested by internal distributional struggles, so that political compromises in one period shaped the evolution of the economy via their impact on public policy. Thus, in direct contrast to the scholarship that seeks exogenously predetermined ‘fundamental’ causes of divergence, this line of inquiry places greater emphasis on the endogeneity of the developmental process by pointing to the crucial role of politics and policy.

This paper, which is a part of the same broad research agenda, makes an attempt to synthesize the two alternative lines of inquiry by presenting a reformulation of the problem of divergence by asking the following question: to what extent can the observed differences in comparative development outcomes between post-colonial economies be explained, respectively, by the inherited ‘fundamental’ factors (colonial history and geography) that have been identified in the recent literature, versus the kinds of public *policies* that were pursued in these former colonies *after* they gained independence? In other words, to what extent are peripheral economies best conceptualized as being merely prisoners of birth--- with their future economic prospects being completely functional to time-invariant factors (‘extractive colonial institutions’, ‘warm climate’, ‘disease environment’) inherited at independence--- and to what extent can the effects of an unfortunate historical legacy, or an unfriendly geography, be mitigated via the agency of the state and its monopoly over domestic policy *after* native-rule has been established?

Given this reformulation, I posit an econometric technique that borrows from the methodological device of ‘twin studies’ in the empirical behavioral sciences and incorporate it within a Difference-in-Difference (DID) experimental design. Since an answer to the question requires a *decomposition* of the impact on observed development outcomes of exogenously given time-invariant factors on the one hand, from state policy (which is endogenous, by definition) on the other, I propose that the best evidence for it can be obtained by examining natural experiments of partitioned regions; that is, sub-regions *within* countries that were divided between two or more post-colonial states at the time of their independence. These smaller regional economies provide researchers with an ideal setting to examine the competing theoretical claims of the ‘structure’ vs. ‘agency’ debate by exploring economic development in one sub-region with the aid of a *counterfactual*: an alternative history. The shared colonial legacies, similar geographic environments, and comparable

cultures of these sub-regions on the one hand, and their subsequent subdivision and assignment to different political and policy environments after independence on the other, allows for a unique engagement with questions pertaining to the relationship between politics and policy in post-colonial economies, and their impact in turn, on economic development in the long term.

While there are multiple examples of such partitioned economies, and evidence for these can only be accumulated via subsequent studies<sup>1</sup>, in this paper I present evidence from one such natural experiment: the partition of the predominantly agrarian Punjab region in South Asia between the states of India and Pakistan in 1947. Despite their shared history and similar geography, the two sides have been exposed to a very different set of policies post-independence, and the result has been a sharp *divergence* in development indicators and economic outcomes, that is reflective of those policy differences. This runs contrary to what existing institutional or geography models of long-term development would predict: two states that inherited identical institutions (for example the same ‘settler mortality rate’ as in Acemoglu et al 2002) and geography (the same ‘climate’ or ‘disease environment’) at independence should have seen their economic fortunes *converge* in the long-run. Yet, as the evidence presented in this paper suggests, post-colonial policy differences have a far greater role to play than time-invariant, predetermined ‘similarities’ in shaping comparative development outcomes.

After seven decades of differential policy reform, the per capita yearly income of Indian Punjabis is approximately 400 dollars *higher* than their neighbors in Pakistani Punjab; infant and maternal mortality rates are 50% *lower*, and literacy rates 18% higher on the Indian side. While just over 8% of the population is below the poverty line on the Indian side, the rate is twice as higher (measured at \$2 a day), at 19% on the Pakistani side of Punjab. While barely half the adult females on the Pakistani side can read or write, the female literacy

rate on the Indian side stands at 70%. Given their better living standards, Indian Punjabis also have a higher life-expectancy than their Pakistani neighbors (Table 1). Thus, by any metric of development, the two Punjabs have *diverged* significantly in the post-independence period.

*Table 1 Comparison of Selected Development Indicators*

	<b>Punjab, India</b>	<b>Punjab, Pakistan</b>
Area (sq km)	50,362	205,345
Population	27 million	101 million
GDP per Capita (current \$)	2178	1682
Overall Literacy Rate	77%	61%
Male Literacy Rate	80.44%	71%
Female Literacy Rate	70.73%	52%
Infant Mortality Rate (per 1000)	26	77
Maternal Mortality Rate (per 1000)	155	300
Metaled Roads (KM)	47,605	38,000
Life Expectancy	69	64
Poverty Rate (% living below \$2)	8.02%	19%

Sources: Punjab Development Indicators Report, Government of Pakistan (2015)  
Vital Statistics of Punjab, Government of India (2015)

The question is: what explains the large divergence in the two parts of what is basically the same region, that was exposed to an identical colonial history, and also has a similar geography?

Given the centrality of agriculture to Punjab’s economy, and the significance of ‘food security’ to discussions of development in South Asia in general, I develop an empirical understanding of this question by exploring the factors underpinning differences in agricultural yields. To do this, I constructed a unique district-wise panel dataset with the yields of the two major staples, wheat and rice, across more than a century of colonial and post-colonial data from 1900-2016. Moreover, following the seminal work of Banerjee and Iyyer (2005), who provide a convincing account of the importance of colonial land-revenue institutions in explaining inter-regional differences in agricultural productivity within present-day India, I also obtained information on land revenue institutions in colonial Punjab



using archival data from *District Settlement Reports* and *Land Revenue Reports*. These, along with measures of ‘tenancy relations’ during the colonial period serve as my controls for initial institutional structure. I also account for geography variables (latitude/longitude, rainfall, and soil quality) using government data from both countries.

My identification strategy involves a Difference-in-Difference (DID) experimental design to compare the performance of districts that were assigned to one or the other state, with one acting as the treatment<sup>2</sup>, while the other as the control group across two qualitatively distinct time-periods: pre-and post-partition in 1947. Given this design, the state-policy estimator captures the pure effect on agricultural yields of being assigned to one policy environment, *after* controlling for historical institutions and geography.

The *evolution* of the divergence is captured by mapping the major turning points in the evolution of yields onto policy changes, and examining the transformation in the agrarian structure (tenancy relations, land distribution, Lorenz curves), over time. Since the year 1947 marks a watershed moment--- a rupture in the political environment--- with the two sub-regions being permanently fenced into two distinct policy islands, the DID methodology allows the seven decades of these differential policies to be examined *relative* to an alternative economic history. As robustness checks I also use ‘border districts’ and other district-level clustered comparisons to capture the magnitude of the divergence in agricultural yields, which resulted in the differences in overall development outcomes in the long term.

The rest of the paper is structured as follows: Section two describes the construction of the data and introduces my measures of colonial institutions and geography. Section three presents the empirical methodology. Section four explains the results of the DID experiment and conducts robustness checks using ‘border districts’ and other district-level clusters. Section five concludes by discussing the differences in political structures and agrarian public

policy (land distribution, tenure, provision of inputs) that might provide an explanation for the economic divergence between the two sides.

## **2. Data**

### *a) Construction: Sources and Issues*

The dataset used in the paper brings together an ensemble of government datasets from the colonial and post-colonial period:

#### *1) Season and Crop Reports*

The output side is captured by a panel dataset of district-wise agricultural yields of the two major staple food crops---wheat and rice --- from 1900 to 2016. There are 43 districts in total, 29 of which are today in Pakistan and 14 are in India. The colonial data has been tabulated using *Season and Crop Reports*, which were collected by the colonial government for every year from 1900 to 1947. The post-colonial data is all state-level government data from both countries.

#### *2) District Settlement (DS) Reports*

These have information about the ‘formal’ land-revenue institutional type employed by the British at the time of the settlement of a district. These include the *Zamindari*, *Pattidari*, *Bhaichara* tenures (explained below) that have also been used by Banerjee and Iyyer (2005) in their prize-winning study.

#### *3) Land Revenue Administration Report*

These give more detailed information than the DS reports, especially about the ‘substantive institutions’, such as actual ‘tenancy’ relations, form of holding (joint versus single), land-revenue payments by ‘class’ of landowner. Keeping in view the Iversen (2011) critique of Banerjee and Iyyer’s data, that ‘formal’ institutional type may not correspond with ‘substantive’ institutional type, I include both measures for robustness.

#### 4) *Census Reports*

The British conducted decennial censuses from 1861 to 1941. These give detailed information about the demographic makeup of India and its various ‘provinces’. The information includes data on ‘occupations’ and for ‘agriculturalists’ (which are 90% of the population) there is information about the ‘kind of work’ being performed (whether as an owner-cultivator, a tenant, or a capitalist farmer).

Two problems arise in constructing the dataset and utilizing it for comparisons across the colonial and post-colonial time periods. The first problem arises as a result of the fact that what was once ‘British Punjab’ is today divided between two countries and four ‘states’/‘provinces’. After the partition in 1947, the Indian Punjab was sub-divided in 1967 to form Punjab and Haryana, while the state of Himachal Pradesh (also a part of British Punjab) was given union status in 1950 and state status in 1971. Throughout the paper, I treat Haryana and Himachal Pradesh as a part of Indian Punjab in both periods. This comes with the disadvantage of possibly understating any peculiarities that may have arisen as a result of these administrative changes. Yet, there is no simple way around the problem and dropping these districts would result in severe loss of information. I try to mitigate these problems, however, by focusing on subsets, such as border districts (consisting of the pairs Amritsar-Lahore, Ferozepur-Kasur and Gurdaspur-Sialkot) and clustered comparisons as robustness checks in the final section of the paper.

A second problem arises due to the fact that new districts have been added to each Punjab after independence. These additions have come about because of one of two reasons: 1) old districts have been subdivided to form new districts. These ‘new districts’ were previously sub-districts (called *tehsils*) during the colonial period and have been granted ‘district status’ after independence; 2) ‘Princely states’ have been added to the list. These were ‘independent’ states ruled by native princes or rulers during the colonial period and

were never formally a part of British administrative rule. After partition, they were amalgamated into one or the other country.

If a district has been added because it was previously a princely state I drop it from the sample. This is due to concerns of focus as well as practicality. In the paper, I am primarily interested in conducting a sub-regional comparison with the aim of contrasting between the colonial and post-colonial policy effects in districts that were *directly under British rule*. Any differences that are due to variations in ‘Native-rule’ versus ‘colonial rule’ can only complicate matters. As Banerjee and Iyyer (2007) and Iyyer (2008) have pointed out, that there are major differences between ‘directly ruled’ versus ‘indirectly ruled’ (or princely) states, especially in terms of the provision of public goods. An inclusion of these ‘districts’ (former princely states), therefore, runs the risk of obfuscating matters for the present study. By dropping these districts from the sample, I avoid these complications altogether.

If on the other hand, the reason why a new district has been added is that an old sub-district (*tehsil*) has been given the status of a full district after independence, I resolve the problem by comparing new maps with old ones. Using these maps, I first identified the ‘old district’ of which the ‘new district’ was formerly a *tehsil* (sub-district). Having made this identification, I solve the problem through two ways depending on the situation. If sub-district level data is separately available, I treat the *tehsil* as if it were a district during the colonial period as well. This is a reasonable assumption as long as district-status does not *systematically* bias the results in any way. However, if *tehsil* level colonial data is not available, I solve the problem by treating the new district as if it remained a *tehsil* in the post-colonial period as well. This avoids the data loss that would otherwise arise if I drop these districts, despite the availability of post-colonial data. But to make the data points comparable across the two time periods, I adjust the weight by the size of a district’s area and its

contribution to production in the district. For example, the British district of Mianwali has today been sub-divided into three districts, Mianwali, Bhakkar, and Layyah, and *tehsil*-level data is not available for the latter two. As a result, the colonial data for Mianwali (which includes the weight of Bhakkar and Layyah as well) cannot be, strictly speaking, compared with the post-colonial data for what is today recorded as Mianwali (which only includes the weight of the first of the three sub-districts) in the government data. To make them comparable, I readjust the value for that district in the post-colonial period by adding the productions and acreages in Mianwali, Bhakkar and Layyah to calculate one value for Mianwali district. In other words, when *tehsil*-level data is missing I treat the district as if it were never divided to form new districts.

#### *b) Measures of Colonial Institutions*

I use two different measures to capture the colonial institutional structure of a district during British rule:

##### *1) Land-Revenue Institutions*

Banerjee and Iyyer (2005) point out in their seminal paper that “land revenue, or land tax, was the major source of revenue for all governments of India, including the British” (Banerjee and Iyyer, 2005; p. 1192). Its centrality to the colonial economy meant that the institutions that sustained it played a crucial role in shaping the social structure of Indian society during this period. A land revenue system defined the rights and liabilities of individuals and groups within the village towards the land, its output, and payments to the state. As such, the land revenue system can be seen as a tenure system that defined the relationship between the ‘owners’ and the ‘tenants’ of a piece of land.

Land revenue systems varied significantly across India but can be divided, broadly speaking, in three major forms: a landlord-based<sup>3</sup> *zemindari* system, a cultivator-based *raiyyatwari* system, or a village-based *mahalwari* system (Ibid). The difference between the

three lies in the distribution of the revenue liability on an individual or a group of individuals. For example, in the traditional landlord-based *zemindari* system that was followed under Company rule in Bengal and Bihar, a single individual or family was held responsible for collecting revenues from a set of villages. In contrast, in the *raiyyatwari* system of Madras and Bombay the state abolished intermediaries and instead dealt directly with the cultivator. In Punjab (and a few other parts of North Western India), the *mahalwari* system placed the revenue-liability on a village-body that collectively owned the land and its produce, and was responsible for setting the terms for non-owners, with the latter being recorded in British land-settlement records as tenants of the former.

In the Punjab *mahalwari* system, three different schemes were used in determining the constitution of a village-body. These were the 1) *Pattidari* 2) *Bhaichara* and 3) *Zamindari* systems. The first two are variants of joint-ownership of the village-body in a coparcenary arrangement of members connected by one common male ancestor. The village-body is considered the joint-property of those declared to be in ‘cultivating possession’ at the time of settlement and everyone else is documented as their tenant. This is also why *bhaichara* villages were often named after an old ‘patriarch’, a ‘great ancestor’ (*Punjab Tenancy Act, 1901*). The third case is similar to the classical landlord-based system of Bengal and Bihar, where an individual, or a group of individuals within an influential family, were put in charge of the village-body and everyone else was documented as a ‘tenant’ in the *jamabandi* (*record-keeping book*).

Every district had villages with all three kinds of institutional mechanisms. The tenure in every village was set at the time of its ‘settlement’ by a British officer and its terms were recorded and published by the government as *District Settlement Reports*. On average, districts in East Punjab that were later assigned to India had a slightly higher proportion of non-*zemindari* tenures as compared to West Punjab (Table 2 and 3). I calculated this

proportion, following Banerjee and Iyyer's (2005) method, by going through *District Settlement Reports* for each district in colonial Punjab.

*Table 2: Descriptive Statistics- Pakistani Punjab*

<b>District</b>	<b>Non-Zemindari Proportion</b>	<b>Latitude</b>	<b>Rain (mm/y)</b>	<b>Longitude</b>	<b>Location</b>
Attock	0.95	33.91	537.00	72.31	West
Bhakkar	0.83	31.63	213.00	71.07	West
Chakwal	0.96	32.93	519.00	72.86	West
Chiniot	0.92	31.72	336.00	72.98	West
D.G Khan	0.91	30.05	155.00	70.63	West
Lyalpur	0.31	31.42	346.00	73.08	West
Gujranwala	0.48	32.15	581.00	74.18	West
Gujrat	0.95	32.57	704.00	74.08	West
Hafizabad	0.48	32.07	437.00	73.68	West
Jhang	0.92	30.58	248.00	72.32	West
Jhelum	0.96	32.93	847.00	32.93	West
Kasur	0.70	31.12	424.00	74.45	West
Khanewal	0.38	30.30	166.00	71.93	West
Khushab	0.92	32.30	400.00	72.34	West
Lahore	0.70	31.55	607.00	74.34	West
Layyah	0.83	30.97	195.00	70.94	West
Lodhran	0.38	29.53	146.00	71.63	West
Mandi Bahauddin	0.95	32.58	576.00	73.50	West
Mianwali	0.83	32.59	370.00	71.54	West
Multan	0.38	30.20	175.00	71.47	West
Muzaffargarh	0.91	30.07	157.00	71.19	West
Nankana Sahib	0.33	31.45	367.00	73.70	West
Narowal	0.67	32.11	1000.00	74.87	West
Okara	0.40	30.81	296.00	73.45	West
Pakpattan	0.40	30.35	234.00	73.39	West
Rajanpur	0.91	29.10	205.00	70.33	West
Rawalpindi	0.95	33.60	941.00	73.03	West
Sahiwal	0.40	30.58	279.00	73.33	West
Sargodha	0.92	32.08	410.00	72.67	West
Sheikhupura	0.33	31.72	476.00	73.99	West
Sialkot	0.67	32.50	1000.00	74.54	West
Toba Tek Singh	0.31	30.98	255.00	72.48	West
Vehari	0.38	30.04	169.00	72.35	West
<b>Average West</b>	<b>0.68</b>	<b>31.47</b>	<b>417.30</b>	<b>71.56</b>	

Source: Colonial and Post-Colonial Government Data

Table 3: Descriptive Statistics- Indian Punjab

District	Non-Zemindari Proportion	Latitude	Rainfall (mm/y)	Longitude	Location
Ambala	1.00	30.62	919.00	76.78	East
Amritsar	0.93	31.63	703.00	74.86	East
Bhiwani	0.75	28.08	465.00	76.13	East
Bilaspur	1.00	31.19	1255.40	76.75	East
Chamba	1.00	32.29	1469.60	76.12	East
Faridabad	0.86	28.04	604.00	77.31	East
Fatehabad	0.58	29.50	395.60	75.27	East
Firozpur	0.49	30.53	484.00	74.60	East
Gurdaspur	1.00	32.00	959.00	75.25	East
Gurgaon	0.86	28.04	618.00	77.03	East
Hamirpur	1.00	31.43	1437.90	76.52	East
Hisar	0.58	29.09	459.00	75.70	East
Hoshiarpur	0.85	31.48	991.00	75.92	East
Jalandhar	1.00	31.26	769.00	75.58	East
Kaithal	0.81	29.57	568.00	76.38	East
Kangra	1.00	32.05	2031.90	76.32	East
Karnal	0.81	29.57	766.00	76.98	East
Kinnaur	1.00	31.36	778.80	78.42	East
Kulu	1.00	31.58	922.10	77.10	East
Kurukshetra	1.00	29.57	763.00	76.84	East
Lahaul Spiti	1.00	32.00	1305.50	77.83	East
Ludhiana	0.96	30.77	726.00	75.85	East
Mandi	1.00	31.43	1476.70	76.93	East
Moga	0.49	30.04	505.00	75.17	East
Muktsar	0.49	30.04	384.00	74.52	East
Nawanshahr	0.85	31.37	700.00	76.12	East
Panipat	0.81	29.57	660.00	76.97	East
Rohtak	1.00	28.76	589.00	76.58	East
Rupnagar	1.00	30.77	775.60	76.53	East
Shimla	1.00	31.06	1242.90	77.17	East
Sirmaur	1.00	30.33	1650.70	77.29	East
Sirsa	0.75	29.09	335.00	75.00	East
Solan	1.00	30.53	1378.80	77.09	East
Sonipat	0.88	28.76	652.00	77.02	East
Una	0.85	32.16	1051.30	71.03	East
Yamunanagar	1.00	30.62	1049.00	77.28	East
<b>Average East</b>	<b>0.88</b>	<b>30.45</b>	<b>884.47</b>	<b>76.23</b>	

Source: Colonial and Post-Colonial Government Data



## 2) Degree of Tenancy Relations

Iverson et al (2011) present a critique of Banerjee and Iyyer's (2005) conceptualization of the relationship between land-revenue institutions and the social structure of the agrarian economy of India during the colonial period, in particular, their translation of non-*zemindari* land-revenue institutions as 'non-*landlord* institutions'. As Iverson (2011) and Roy (2013) point out, while this translation may be apt for Bengal, the term may mean something completely different in the context of North India where it could refer to anyone from an owner-cultivator to a joint-ownership in a coparcenary arrangement.<sup>4</sup>

The conceptualization becomes especially troubling if one understands a 'landlord structure' to be one where *tenancy* is the predominant social relationship between cultivators and owners. Thus, if the *mahalwari* land revenue system of Punjab had been a non-landlord system, as Banerjee and Iyyer believe, one would not expect tenancy relations to be a major concern. Yet, as the *Punjab Land Revenue Report (1938)* shows, for the Punjab as a whole 60% of the holdings commanding 52% of the cultivated area were 'tenant' holdings (Table 2). Moreover, 'tenants' could be either 'occupancy tenants' with rights to occupy the land that could not be alienated without legal recourse, or 'tenants-at-will' who enjoyed no such rights and could be evicted at any time at the whims of the landlords (i.e. the owners of the village-body). It is not difficult to see that the bargaining power of the latter would be significantly lower than the former owing to their precarious position in society. Yet, an overwhelming majority of the holdings (83%), encapsulating 85% of the farm area, were cultivated precisely by such 'tenants-at-will', who had no rights to occupy the land (Table 5).

To account for the possibility of a mismatch between the formal and substantive institutional type I include the proportion of non-occupancy tenancy in a district as an alternative measure to control for the initial agrarian colonial structure in that district.

Table 4: Owner-Cultivation vs. Tenancy in Colonial Punjab

District	Owner-Cultivators		Tenancy		Location
	Holdings	Area	Holdings	Area	
Hissar	33.14%	40.72%	67%	59%	East
Rohtak	45.61%	62.50%	54%	38%	East
Gurgaon	46.13%	52.46%	54%	48%	East
Karnal	49.50%	63.75%	51%	36%	East
Ambala	46.59%	56.50%	53%	43%	East
Simla	73.05%	83.68%	27%	16%	East
Kangra	50.32%	64.30%	50%	36%	East
Hoshiarpur	33.05%	45.86%	67%	54%	East
Jullunder	43.66%	54.55%	56%	45%	East
Ludhiana	44.15%	57.31%	56%	43%	East
Ferozepore	37.19%	45.43%	63%	55%	East
Lahore	38.91%	43.16%	61%	57%	West
Amritsar	38.26%	46.44%	62%	54%	East
Gurdaspur	36.76%	47.36%	63%	53%	East
Sialkot	34.90%	45.56%	65%	54%	West
Gujranwala	28.80%	37.26%	71%	63%	West
Sheikhupura	31.26%	35.60%	69%	64%	West
Gujrat	43.22%	53.88%	57%	46%	West
Shahpur (Sargodha)	35.77%	38.32%	64%	62%	West
Jhelum	46.08%	54.51%	54%	45%	West
Rawalpindi	54.60%	60.34%	45%	40%	West
Attock	34.84%	39.69%	65%	60%	West
Mianwali	33.87%	38.55%	66%	61%	West
Montgomery	28.33%	20.14%	72%	80%	West
Lyallpur	43.45%	51.61%	57%	48%	West
Jhang	32.57%	34.50%	67%	66%	West
Multan	31.05%	25.34%	69%	75%	West
Muzaffargarh	44.41%	48.27%	56%	52%	West
Dera Ghazi Khan	34.54%	35.99%	65%	64%	West
East Punjab	44.42%	55.45%	55.58%	44.55%	East
West Punjab	37.29%	41.42%	62.71%	58.58%	West
Total	40.48%	47.71%	60%	52%	Total

Source: 1938 Punjab Land Revenue Report

Table 5: % of Tenants by Occupancy vs. Non-Occupancy Tenancy

District	Occupancy Tenants		Non-Occupancy Tenants	
	Holdings (1)	Area (2)	Holdings (3)	Area (4)
Lyallpur (W)	0.11%	0.03%	99.89%	99.97%
Jhang (W)	4.11%	5.32%	95.89%	94.68%
Sheikhupura (W)	5.09%	4.83%	94.91%	95.17%
Multan (W)	5.86%	6.27%	94.14%	93.73%
Gujranwala (W)	7.49%	6.08%	92.51%	93.92%
Montgomery (W)	7.89%	2.21%	92.11%	97.79%
Dera Ghazi Khan (W)	8.86%	6.20%	91.14%	93.80%
Shahpur (W)	9.15%	15.42%	90.85%	84.58%
Ludhiana (E)	9.37%	9.15%	90.63%	90.85%
Kangra (E)	10.88%	13.46%	89.12%	86.54%
Muzaffargarh (W)	11.60%	10.21%	88.40%	89.79%
Karnal (E)	12.03%	11.10%	87.97%	88.90%
Rohtak (E)	13.32%	12.30%	86.68%	87.70%
Gurdaspur (E)	14.73%	14.98%	85.27%	85.02%
Sialkot (W)	15.71%	13.30%	84.29%	86.70%
Amritsar (E)	16.09%	13.33%	83.91%	86.67%
Lahore (W)	16.63%	15.97%	83.37%	84.03%
Ambala (E)	17.43%	16.86%	82.57%	83.14%
Mianwali (W)	18.09%	11.22%	81.91%	88.78%
Jullunder (E)	18.26%	17.67%	81.74%	82.33%
Gujrat (W)	18.66%	12.73%	81.34%	87.27%
Gurgaon (E)	22.01%	21.04%	77.99%	78.96%
Jhelum (W)	25.74%	27.66%	74.26%	72.34%
Ferozepore (E)	29.53%	27.01%	70.47%	72.99%
Hissar (E)	32.96%	31.05%	67.04%	68.95%
Rawalpindi (W)	33.72%	33.74%	66.28%	66.26%
Attock (W)	37.16%	28.94%	62.84%	71.06%
Hoshiarpur (E)	41.59%	39.05%	58.41%	60.95%
East Punjab Average	18.56%	17.54%	81.44%	82.46%
West Punjab Average	14.12%	12.51%	85.88%	87.49%
<b>Total</b>	<b>16.11%</b>	<b>14.93%</b>	<b>83.89%</b>	<b>85.07%</b>

Source: Land Revenue Administration Report 1938, Government of Punjab

### *c) Measures of Geography*

As controls on agro-climatic conditions I include rainfall (mm/year), longitude, latitude, and soil quality dummies in all regressions. The eastern districts that were assigned to India, on average, have a lower alluvial content of soil, a higher proportion of rainfall (mm/y), a slightly lower latitude, and a higher longitude (Tables 1 and 2).

## **3. Empirical Methodology**

### *a) Approximating Twin Studies in Economic Development*

Twin studies have been an integral part of research in the behavioral sciences since Galton (1875) first used data on identical twins to examine the role of ‘nature’ versus ‘nurture’ in determining ‘intelligence’ in individuals. In recent years, sociologists have imported some of these techniques to empirically assess questions pertaining to ‘returns to education’ and cognitive ability (McGue M and Bouchard TJ 1998), ‘political choice’ (Medland and Hatemi 2009), and other intriguing questions about social choice (for a survey of these studies see Felson, 2014). The general theme in this empirical approach is to examine twins over a long period of time to separate the effect of ‘nature’ from ‘nurture’, that is to determine whether and to what extent, a given observed outcome can be attributed to ‘natural’ or ‘inherited’ factors versus ‘nurture’ or ‘environmental’ factors.

Can we use the technique to examine differential returns to economic policy in partitioned economies? The answer depends on whether or not we can find reasonable estimates of ‘inherited factors’. In the behavioral sciences, an understanding of these factors as well as the mechanism through which they are passed on are fairly well established. While the same level of exactitude cannot be assumed to apply to questions pertaining to economic history and development, there is, nevertheless, room for an *analogy* to be drawn.

The recent debate on divergence is contested by two ‘fundamental’ channels--- ‘colonial institutions’ and ‘geography’--- as having the final word in determining differences in long run comparative development outcomes between countries. What is common to both sets of explanations is the fact that one, or the other ‘unchangeable initial condition’ (an inherited trait), is assumed as having the key determining effect on long-term real outcomes. Analogously to the twin-studies design, however, one can differentiate between the set of ‘inherited factors’ (time-invariant conditions) from the set of policy or ‘environmental’ factors that influence current economic outcomes in developing economies.

A twin study, premised on partitioned economies (that share a common history and geography), can provide us with an answer if we can identify the set of ‘institutional’ and ‘geography’ factors that can act as controls for the initial structure. In the context of the present paper, which deals with the Indian Sub-Continent, the Banerjee and Iyyer (2005) study provides the basis for using colonial land-revenue institutions as controls for institutional ‘inheritance’.

*b) Identification Strategy: Difference-in-Difference Estimation*

Given the ‘twin study’ analogy, one can use the ‘Difference-in-Difference’ (DID) strategy to estimate the state-policy (‘nurture’) effect. The DID strategy is modeled along an experimental research design that calculates the effect of a treatment on an outcome by comparing the average change in the ‘treatment’ group with the average change in a ‘control’ group. Starting off with the pioneering work of Ashenfelter and Card (1985), DID methods have become widespread in econometrics. The design is setup with some outcome variable being examined for at least two groups in two qualitatively distinct time periods (pre- and post- treatment). One of the groups is exposed to differential treatment---a different policy or law---in the second period while both groups are exposed to the same environment in the first period. The second group is not exposed to the ‘treatment’.

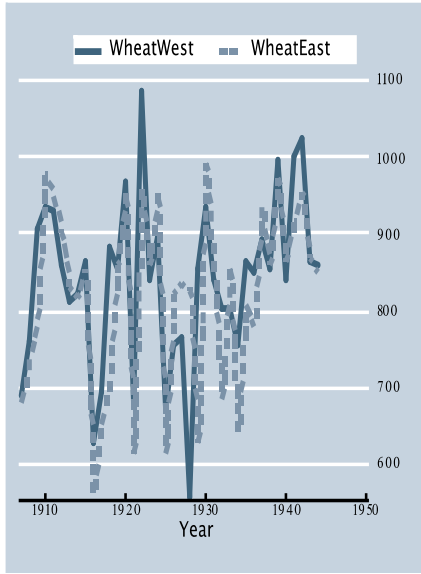
Given this setup, the average change in the treatment group is subtracted from the average change in the control group, leading to a mitigation of any biases due to ‘permanent differences’ or biases from “comparisons over time in the treatment group that could be the result of trends” (Wooldridge, 2007). In this way, the strategy captures the evolution of the ‘differences’ in the means over time and the effect can be interpreted as having *causal* inference. In our case, the goal is to capture the difference in outcomes in agriculture as a result of differences in post-colonial policy, holding the effect of colonial institutions and other geography constant.

The key assumption of the DID strategy, which must be fulfilled for the strategy to work, is the ‘parallel trends assumption’ (Ibid). Simply put, the assumption states that in order to approximate a DID design one must show that prior to the treatment being induced the outcome variable to be assessed did indeed follow ‘parallel’ trends in both groups. This would demonstrate that if the division had not taken place, the same trends would be reproduced on both sides. Thus, if the two sides did not follow parallel trends prior to being partitioned, our entire methodological framework would produce biased results.

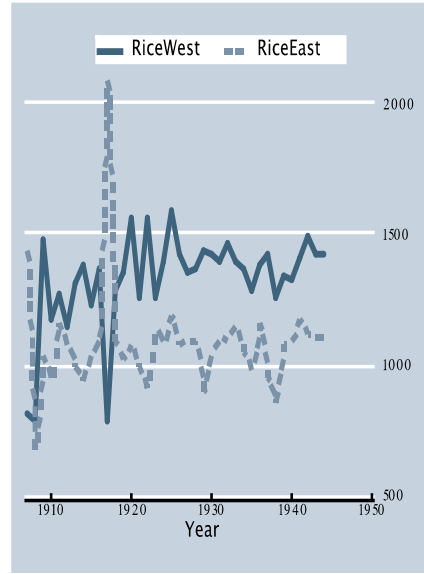
Fortunately, agricultural yields for wheat follow identical (and not just parallel) trends prior to 1947 across both states (Fig. 1a). For rice, barring the exception of the year 1919 (an outlier), the trends across the two states are parallel, with the western districts (that were later assigned to Pakistan) enjoying a slight but consistent advantage over the eastern districts (Fig. 1b)

Figure 1- Parallel Trends in Pre-Partition Period

Average Yield in East and West Punjab 1900-1947 (Kilograms Per Hectare)



a) Yearly Average Wheat Yield



b) Yearly Average Rice Yield

c) The Model

I run specifications of the following form to capture the effect of differential state policy:

$$\text{Log } Y_{it} = \beta_1 + \beta_2 T_t + \beta_3 C_i + \beta_4 (T_t \cdot C_i) + \delta Z_i + \beta_5 X_i \quad (1)$$

where  $T_t = \begin{cases} 0 & \text{if } t < 1947 \\ 1 & \text{if } t > 1948 \end{cases}$

$$C_i = \begin{cases} 0 & \text{if } i \in \text{Pakistan} \\ 1 & \text{if } i \in \text{India} \end{cases}$$

In equation 1,  $\text{Log } Y_{it}$  is our main outcome variable and it measures the yield per hectares of a crop in district  $i$  at time  $t$ ;  $Z_i$  is the measure of ‘colonial institutions’ (*zemandari proportion* and *non-occupant tenancy*) in a district, and  $X_i$  is the matrix of geography variables. The time-dummy  $T$  takes a value of 1 if the period in question is post-partition ( $t > 1948$ ) and 0 if it is from the colonial period; the country-dummy  $C$  switches on for districts assigned to India (the treatment group) and 0 for Pakistan (the control group).

With such a specification, the coefficient  $\beta_4$  is the ‘difference-in-difference’ state policy estimator of the effect of the ‘treatment’, that is, the effect of being assigned to the agrarian policies of Indian Punjab. The log-linear specification implies that  $\beta_4$  will capture the percentage effect on the yields per hectare of a crop of being assigned to India.

*d) Alternative Specifications: Border Districts and Clustered Comparisons*

I use three different subsets of the dataset to specify the model: 1) Whole sample, divided by districts assigned to Indian or Pakistani Punjab, 2) Border districts, consisting of the pairs Amritsar-Lahore, Ferozepur-Kasur and Gurdaspur-Sialkot, 3) Subsamples, carefully chosen so that ‘high-performing’ districts during the colonial period that were assigned to Pakistani Punjab are compared against ‘low’ and ‘medium’ performing districts that were assigned to the Indian Punjab; this allows us to assess the intensity of the state effect, that is, it allows us to see whether or not and to what degree, state policy in the Indian Punjab has managed to uplift the status of areas that inherited worse than average initial conditions in 1947. We assume that a district that had worse-than-average performance, below 1.5 standard deviations of the mean yield, inherited worse than average initial conditions.

#### **4. Results**

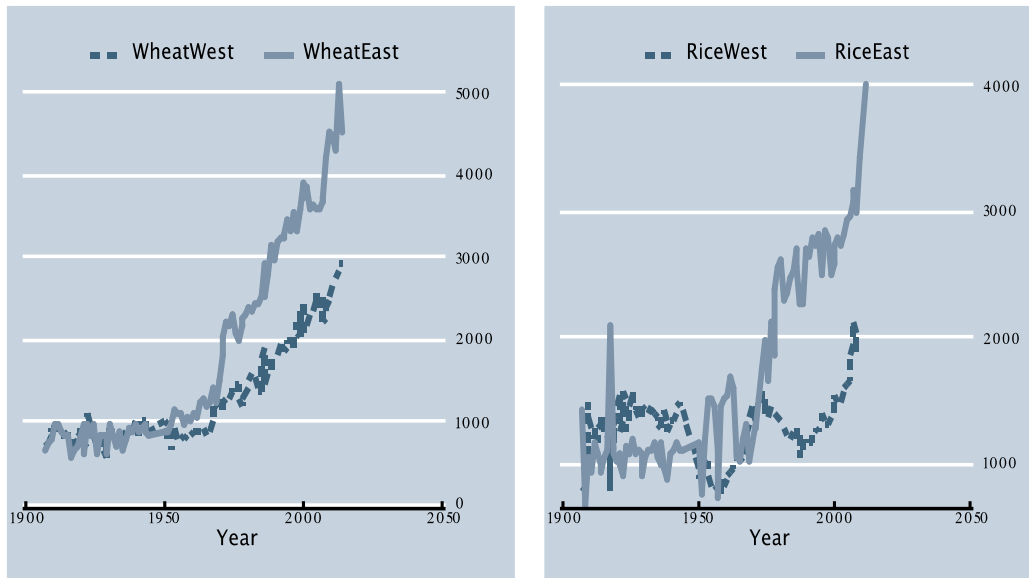
*a) State Policy Estimator*

The colonial period witnessed relative stagnation in the agrarian sector in terms of the yields for both crops (Figure 2). This confirms the pioneering results of Blyn (1966), who having examined agricultural productivities of British India as a whole, assessed it as a period of ‘retarded development’. Other studies have also looked at undivided India, as in Sivasubramonian, (1997, 2000), and confirmed some of the earlier insights of Blyn. The post-colonial period saw an expansion in agricultural productivities across both sides, following a brief period of decline in the first decade in the immediate aftermath of partition. But while it



is clear that *both* sides benefitted from the end of colonial rule, the crucial question is to inquire about the degree to which each side managed to realize the potential gains from independence, and how these were distributed between social groups *within* each side.

Figure 2: Yields in East and West Punjab 1900-2016 (Kilograms Per Hectare)



a) Yearly Wheat Yield

b) Yearly Rice Yield

For the whole sample, the ‘state policy estimator’ reflects profound differences between the two groups in the post-colonial period in terms of agricultural productivity for both crops. A district assigned to the Indian Punjab has a 53% and 70% higher yield per hectare of wheat and rice, respectively, *after* controlling for the impact of initial institutions and geography (Table 5).

When we restrict our analysis to the set of border districts, the coefficient on our state policy estimator falls slightly in all cases, reflecting the mitigation of cofounding factors from the first regression. Yet, the set of Indian border districts are associated with a 49% and 58% higher yield per hectare of wheat and rice than the districts across the fence. The results indicate, for example, that if Lahore--- the capital of Pakistani Punjab---had been assigned to India at the time of independence, it would today produce *twice* the wheat that it currently produces, per hectare, like its neighbor Amritsar--- the capital of Indian Punjab.

Table 5- OLS Results: Differences in Agricultural Yields

	Dependent Variable					
	Log Wheat Yield			Log Rice Yield		
	Whole Sample	Border Districts (1)	High vs. Low Performing (2)	Whole Sample	Border Districts (1)	High vs. Low Performing (2)
<b><i>Specification 1</i></b>						
Zemindari Proportion	0.12**		0.18**	0.07**		0.0003
Latitude	0.03*		0.04*	0.006		0.0104
Longitude	0.005*		0.003	0.001		0.003*
Rainfall	0.0032**		0.014**	0.0016***		0.0002***
<b>State Policy Estimator</b>	<b>0.53***</b>	<b>0.49***</b>	<b>0.14***</b>	<b>0.70***</b>	<b>0.58***</b>	<b>0.22***</b>
<b><i>Specification 2</i></b>						
Non-Occupant Tenancy Ratio	0.0142***			0.006*		
Latitude	0.06**		0.09**	0.002		0.0001
Longitude	-0.0001		-0.004	0.001		0.00014
Rainfall	0.0046**		0.054**	0.0027***		0.0048***
<b>State Policy Estimator</b>	<b>0.59***</b>	<b>0.36***</b>	<b>0.19***</b>	<b>0.68***</b>	<b>0.43***</b>	<b>0.12***</b>

Notes: 1) There is no need to control for geography and initial institutions when looking at border districts as the two are completely identical.

2) High performance districts ( $X > 1.5SD + u$ ) in Pakistani Punjab were: Lyallpur, Jhang, Sheikhpura, Gujranwala, Montgomery; Low performance districts ( $X < u - 1.5SD$ ) in Indian Punjab were: Hissar, Karnal, Rohtak, Ferozpur

\*\*\* Significance at 1%; \*\* Significance at 5%; \* Significance at 10%

The most intriguing aspect of the results is their robustness to stratified comparisons.

As explained earlier, I compared formerly below-par districts assigned to the Indian state with formerly high-performance districts that were assigned to Pakistan. These subsample comparisons allow us to capture the *extent* of the impact of differences in policy on outcomes by comparing historically (i.e. during the colonial period) more productive districts assigned to the Pakistani Punjab, with below-median productivity districts assigned to the Indian Punjab. This comparison reveals most sharply how an activist state policy has the ability to ‘reverse’ and ‘mitigate’ the ill-effects of inheriting worse-than-average initial conditions: formerly less productive districts such as Hissar, and Ferozpur (which inherited large feudal landholdings) that were assigned to the Indian state outperform even the formerly rich canal

colonies that were assigned to the Pakistani Punjab such as Lyallpur and Montgomery<sup>1</sup>.

These comparisons show that a district that consistently displayed below median-performance during the colonial period but was assigned to the Indian Punjab in 1947, today has a 14% and 22% higher yield per hectare of wheat and rice, respectively, than a high-performing district that was assigned to Pakistan.

#### *b) Impact of Inherited Factors: Colonial Institutions and Geography*

The results indicate that state policy, or ‘nurture’, seems to matter much more than initial institutions or geography. The impact of inherited factors dwarfs in comparison to the state policy effect. The coefficient on two out of three of the geography is insignificant at the 10% level. While rainfall (mm) is statistically significant, the magnitude of its impact seems to be negligible. This is also confirmed when we focus on the set of border districts, restricting the sample to which does not lead to a major reduction in the magnitude of the state policy estimator. Lying on either side of the fence, these six districts replicate identical geographic conditions (and institutions), and as the confluence between the results for the whole sample and the border districts shows, geography variables do not matter as much as the difference in the policy environment, post-independence.

The coefficient on the initial institutional variables--- *zemindari* proportion in the first specification and *non-occupant tenancy ratio* in the second--- is significant, capturing the fact that colonial institutions indeed have a long-term impact on economic outcomes *despite* differences in post-colonial policy. It shows, somewhat counterintuitively, that a district with a higher *zemindari* proportion and *non-occupant tenancy ratio* in the colonial period performs *better* than a district with a lower *zemindari* proportion in the present period. Although the Banerjee and Iyyer (2005) study shows a negative association between the *zemindari* proportion and agricultural yields for the whole of India, the result is nevertheless

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<sup>1</sup> Lyallpur is now known as Faisalabad; Montgomery is now known as Sahiwal

consistent with their findings where dropping districts from the Punjab leads to a decline in the size of their coefficient.<sup>2</sup>

## **5. Discussion: Policy Differences, Agrarian Structure, and Long-Term Development Outcomes**

What were the differences in the policy environments between the two sides that caused the divergence in economic outcomes that we observe in the OLS results? These can best be seen by examining four arenas of agrarian policy: 1) Legislations pertaining to land ceilings 2) Legislations pertaining to the prevention of land fragmentation 3) Tenancy reforms and distribution of occupancy rights to landless peasants 4) Support mechanisms, such as the provision of credit, subsidized inputs (electricity and fertilizers). Each of these factors had an impact on the evolution of the structure of the agrarian society, which in turn influenced agricultural yields, and subsequently, overall development indicators.

### *a) Land Ceilings*

One of the major differences in the agrarian policies pertains to ‘land reforms’. The Indian reforms began as soon as the early 1950’s and are “the largest body of land reform legislation ever to have been passed in so short a period in any country” (Thorner, 1962). Besley and Burgess (2000) use panel data from sixteen states from 1958 to 1992 to show that the reforms had an “appreciable impact on growth and poverty” (Besley and Burgess, 2000; p. 389). Sen (1978) persuasively argues that the “reforms effectively abolished the system of landlordism”, leading to the growth of a “broad group of middle and rich farmers” (Sen, 1978; 218-219).

Given the ‘*mahal*-based’ nature of landownership in Punjab, land ceilings were quoted in ‘family’ as well as ‘individual’ units. On the Indian side, two major acts were introduced within the first decade of independence; these were the *Punjab Security of Land*

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<sup>2</sup> They use ‘non-landlord’ proportion as their measure whereas I have used zemindari proportion as my measure.

*Tenures Act, 1953* and the *Pepsu Tenancy and Agricultural Land Act, 1955*; two further acts were introduced in 1972 and 1973. The first two led to: 1) Abolition of all large estates, or ‘jagirs’; 2) Establishment of land ceilings at 30 acres of irrigated and 60 acres of non-irrigated land; 3) Rights of occupancy to non-occupant tenants. The subsequent acts of 1972 further reduced the land ceiling for a family to 17 acres of irrigated and 50 acres of non-irrigated land (*Punjab Land Reforms Act, 1972*).

In contrast, on the Pakistani side the first land reform was carried out in 1959 under the military dictatorship of General Ayub Khan. The reforms were to be a part of the ‘industrial policy’ of Pakistan with the aim of encouraging the extremely large landlords to expand their investments into the industrial sector (Hirashima, 1968). A land ceiling of 500 acres of irrigated (more than 15 times higher than the Indian reforms of 1952) and 1000 acres of non-irrigated land was established. The extremely generous ceilings ensured that in terms of actual content, they would have very little to offer (Khan, 2001). A second wave of land legislations took place in Pakistan under its first elected government in 1972. The new wave of reforms sought to bring down the land ceiling to 150 acres of irrigated and 300 acres of non-irrigated land. Even with the much larger limit on landownership, actual implementation was scarce, as more than half (58%) of the landholdings over the established limit were never even appropriated.

Given the failure of the first two rounds of land reforms in Pakistan, the elected government in 1976 announced a third wave of ‘radical reforms’; the aim of these reforms would have been to bring down the ceilings to 100 acres of irrigated and 200 acres of non-irrigated land. However, within a year of the Act being passed, its implementation was preempted via a military coup. Soon after, an Islamic court (Federal Shariat Court) was established which would look into the matter of whether or not land reforms were allowed by

Islam. The court gave a ‘landmark’ decision with the following judgement permanently vanquishing all attempts at future land legislation in Pakistan:

“Islam has imposed no quantitative limit (ceiling) on land or any other commodity that can be owned by a person. If the state imposes a permanent limit on the amount of land which can be owned by its citizen, and legally prohibits them from acquiring any property beyond that prescribed limit, then such an imposition of limit is completely prohibited by the Shariah.” (Federal Shariat Court, Pakistan)

#### *b) Consolidation of Land Holdings*

Soon after independence, the Indian Punjab enacted a legislation called the *East Punjab Holdings Act* (1948) for the mandatory consolidation of landholdings and prevention of fragmentation. The Act stipulated that the “State Government may, after such inquiry as it deems fit, provisionally settle for any class of land in any notified area the minimum area that can be cultivated profitably as a separate plot” (*East Punjab Holdings Act, 1948*). Two further acts, known as the *Security of Tenure Acts* were passed in 1953 and 1955. All the consolidation work was completed within two decades of the passing of this act. In contrast, the Pakistani Punjab, under its first martial law regime also brought the *Consolidation of Landholdings Act in 1960*. However, the percentage of farm area (26%) that had been actually consolidated was very low.

#### *c) Access to credit*

The Indian Punjab offered low-interest loans to a large body of farmers via one of two mechanisms: 1) Schemes for the establishment of cooperative credit societies, 2) Land Mortgage Banks (LMB’s). Credit from the former source required membership by individual households and by the mid 1970’s a large percentage of rural households were members of some credit society (Table 7). These credit societies typically provided farmers with short-term loans at low interest rates to meet seasonal demand for variable inputs.

Table 7- Provision of Agricultural Credit by Source

Period (Moving Average)	Pakistani Punjab			Indian Punjab	
	Members of Credit Societies*	Loans by Cooperatives**	Loans by ADBP**	Members of Credit Societies*	Loans by Cooperatives**
1955-60	257	13.6	0.4	631	27.1
'60-65	386	27.5	32.5	1203	75.5
65-70	479	33.7	47.7	1612	455.3
70-75	505	51.1	85.2	2206	684.7
75-80	639	68.2	134.6	2714	1376.6
80-85	602	71.5	359.2	2891	1963.6

\*Membership is quoted in 000's

\*\*Loans are quoted in million rupees

LMB's provided long-term credit, typically for longer term investments in the acquisition of machinery (such as tractors, threshers etc.) and/or the installation of tube wells and other automated water-delivery mechanisms. The amount of credit given by these sources almost doubled within the first two decades (Table 7).

In comparison, on the Pakistani side loans provided by credit societies actually shrank in the first decade of independence, falling from Rs. 17 million in 1949 to Rs. 11 million in 1957 (Agricultural Statistics of Pakistan, 1965). While over 93% of the rural households on the Indian side were members of credit cooperatives by 1975, less than a fourth of the households on the Pakistani side were members of cooperative credit societies, which were the only source of institutional credit during the first decade. The Pakistani government established the Agricultural Development Finance Corporation<sup>3</sup> (later ADBP) in 1957, with the stated aim of 'modernizing' agriculture. The priorities of agricultural loans would be set by the aim of advancing long-term loans, typically to large owners, for mechanized farming. Barring the exception of the 1970-77 period in which Pakistan was under a democratically elected regime, and loans furnished to poor farmers saw an increase from Rs. 60 million to Rs. 450 million, the percentage of rural households with access to credit from the corporation

<sup>3</sup> Renamed the Agricultural Development Bank of Pakistan in 1970

has been very low. In 2015, while almost half the rural households were indebted, a tiny fraction (0.7%) had taken the loan from ADBP and the overwhelming majority (92%) reported informal sources (friends, relatives, family) as their primary source of credit (Agricultural Abstract, 2015).

*d) Input-Support: Fertilizer and Electricity*

A fourth major difference in the agrarian policies of the two states lies in the set of mechanisms pursued for the provision of non-farm inputs to farmers. While the Indian side focused on ‘provision’ mechanisms in conjunction with its cooperative credit societies, the Pakistani side focused on market driven pricing mechanisms. Over time, private investments in fertilizers on the Indian side significantly outstripped those on the Pakistani side (Table 8). Starting with the mid 1960’s Green Revolution, fertilizer use per hectare began to grow exponentially in the Indian Punjab and the difference has grown substantially over the years.

*Table 8- Fertilizer Consumption (Nitrogen Kilograms per Hectares)*

<b>Period (Moving Average)</b>	<b>Indian Punjab</b>	<b>Pakistani Punjab</b>
1955-60	1.8	2.8
'60-65	2.1	2.9
'65-70	18.7	15.4
'70-75	32.5	21.7
'75-80	57.4	35.3
'80-85	77.2	46.7
'85-90	93.6	66.1
'90-95	125.1	87.2
'95-2000	157.4	104.5
2000-05	184.1	132.5
'05-10	194	151

**Source:** Government of Punjab Agricultural Census Reports



In addition to fertilizer, an important non-farm input is the provision of rural electrification. Cheaper electricity provides farms with better access to tube wells, motorized pumping, and allows for the extensive use of threshers. The provision of subsidized or free electricity to farmers was a key component of the set of public policy reforms that took place in the early 1950's and 60's in Indian Punjab. The size of this subsidy stands at 7% of the state expenditures on the Indian side, while Pakistan provides no subsidies for electricity consumption in the agricultural sector (World Development Report, 2008: 116).

*Table 8- Percentage Villages with Electricity\**

<b>Period (Moving Averages)</b>	<b>Indian Punjab</b>	<b>Pakistani Punjab</b>
1950-55	0.2	0.5
'55-60	14.5	1.1
'60-65	29.4	3.7
'65-70	47.1	5.7
'70-75	87.3	9.5
'75-80	100	10.6
'80-85	100	14.5
'85-90	100	24.1
'90-95	100	36.8
'95-2000	100	47.8
2000-05	100	57.4
'05-10	100	73.4

Source: Government statistics

Note: A village is deemed as 'electrified' if 10% of the households in that village have access to electricity

As a result, the “share of electricity consumption by agriculture with respect to domestic, industry and commercial uses, increased from 3.9% in 1960, to 10% in 1970, to 18% in 1980, and to 32.2% in 1998” (International Food Policy Research Institute, 2007). At the time of independence, electrification was practically non-existent in the Punjab region, with the Indian side having slightly over 0.2 percent and the Pakistani side with slightly over 0.4

percent of villages with electricity. But while complete rural electrification had been achieved on the Indian side by 1978, the Pakistani side has still not been able to deliver electricity to over 27% of villages.

*e) Differences in Private Investments*

The difference in public investments, in turn, led to major differences in private investments as well, in terms of the application of farm machinery (Table 9).

*Table 9- Utilization of Farm Machinery (per 1000 acres)*

<b>Equipment</b>	<b>Indian Punjab</b>	<b>Pakistani Punjab</b>
Electric Tubewells	70	1.57
Diesel Tubewells	14	14
Tractors	33	7
Threshers	28	2
Tillers	24	5.9
Disk Harrow	25	0.3
Seed Driller	16.9	1.24
Combined Harvesters	0.7	0.04

Source: Government of Punjab India Census of Farm Machinery 2012  
Pakistan Bureau of Statistics, Census of Farm Equipment 2012

*f) Evolution of Agrarian Structure*

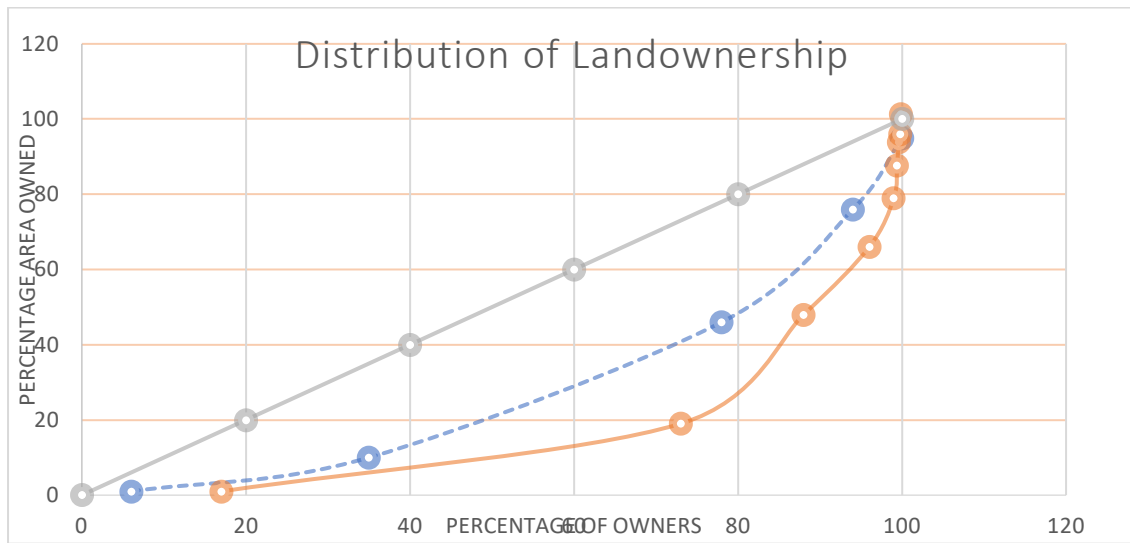
The direct impact on yields took place via the intermediation of differences in the evolution of the post-colonial agrarian structure, specifically, the tenure relations and the land distribution (Table 10). Farms greater than 50 acres represent 1% of the landholdings on the Indian side and account for 7% of the farm area. There are no farms above the size of 100 acres. In contrast, on the Pakistani side, the 1% (those operating more than 50 acres) controls more than one-fifth (22.3%) of the operated area; 14% of this is controlled by just the top 0.5% (who control 100 acres of land or more) while the top 0.1% (who control 250 acres or more) control 5% of the total farm area. This has a direct impact on the degree of land inequality along each side (Figure 3).

*Table 10- Evolution of Landownership (Operational Landholdings)*

Size Groups (acres)	Indian Punjab		Pakistani Punjab		Indian Punjab		Pakistani Punjab		Indian Punjab		Pakistani Punjab	
	% of owners	% Area owned	% of owners	% Area owned	% of owners	% Area owned	% of owners	% Area owned	% of owners	% Area owned	% of owners	% Area owned
	1960-61				1972-73				2010-11			
Less than 1	6.6	0.5	3.5	0.2	18.8	1.4	8.5	0.3	6	1	17	1
1-5	34.5	9.4	53.4	6.7	32.7	11.1	37.9	8.2	29	9	56	18
5-12.5	31.4	26.9	19.6	15.6	27.6	26.6	29.2	18.9	43	36	15	29
12.5-25	17.5	30.5	14	16.4	14.3	29.9	13.6	18.6	16	30	8	18
25-50	6.7	23.1	5.8	21.9	5.5	22	6.9	18.2	6	19	3	13
50-100	1.2	9.7	2.7	15.9	1	7.5	2.6	13.9	1	7	0.4	8.7
100-150	0	0	0.5	7.7	0	0	0.7	6.3	0	0	0.2	6.2
150-250	0	0	0.4	4.5	0	0	0.4	6	0	0	0.2	2.1
>250	0	0	0.1	11.2	0	0	0.2	9.5	0	0	0.1	5.3

Source: Agricultural Censuses of Punjab (Government of Punjab, India; Government of Punjab, Pakistan)

Figure 3 Lorenz Curves for Landownership



Note: Dashed line represents Indian Punjab

35% of all owners are small (those operating between 1-5 acres) or marginal owners (those who operate less than 1 acre) on the Indian side and they control 10% of the farm area. In comparison, small and marginal holdings represent a staggering 73% of all operational landholdings on the Pakistani side, while controlling less than one-fifth (19%) of all farm area. This can also be confirmed by considering that the percentage of ‘marginal farmers’ --- those who own an acre or less---in Pakistani Punjab rose from 3.5% to 17% in the fifty years from 1960 to 2010. On the Indian side of Punjab, in contrast, the number of marginal farms *fell*, especially after the 1972 reforms, from 18% to 6% in 2010.

A third major difference between the agrarian structure of the two sides lies in the greater strength of the middle (5-12.5) and rich capitalist (12.5-50 acres) farmers on the Indian side of Punjab. Rich capitalist farms account for about 22% of all farmers and own half (49%) the farm area on the Indian side of Punjab. The fraction of rich capitalist farms within the 25-50 acres category is 16% as compared to 8% on the Pakistani side; these account for 30% and 18% of farm area, respectively. Moreover, as a comparison of the 2010 and 1972 data reveals, the percentage and area operated by middle (5-12.5 acres) farmers on the Indian side has seen an expansion over the period; the percentage number of such farms

increased from 27.6% to 43% while the area under this category of landholdings increased by 10%. This increase is attributable to the upward push received by marginal and small farmers after the 1972 reforms, which were implemented between 1972 and 1976. The consolidation and anti-fragmentation reforms were precipitated by a spike in marginal farms in Indian Punjab from 6% in 1960 to 18% by 1972.

The same trend can be confirmed by examining the evolution of tenancy relations, measured as the percentage of farm area under tenant cultivation from 1955 to 2010 (Table 11).

*Table 11- Evolution of Tenancy Relations (% of Farm Area under Tenant Cultivation)*

	Year						
	1955	1960	1972	1980	1990	2000	2010
Pakistani Punjab	53.2	47.8	45.3	26	22	16	12
Indian Punjab	40	29	10	2	0.03	0	0

Source: Agricultural Census for Pakistani Punjab, NSS 8<sup>th</sup>, 16<sup>th</sup>, 17<sup>th</sup> and 18<sup>th</sup> rounds for Indian Punjab

The percentage of farm area under tenancy relations on the Indian side fell from 40% to 10%, between 1955 and 1972, and pure tenancy arrangements became practically non-existent thereafter. In contrast, there was just an 8% decline in tenancy relations from 1955 to 1972 on the Pakistani side. It was only after the 1972 reforms that tenancy actually began to decline: it almost halved from 45% in 1972 to 26% by 1980. Even today, 12% of all farm area continues to remain under pure tenancy arrangements. A staggering 86% of all tenancy relations take place under sharecropping agreements (*Punjab Statistical Abstract, Pakistan Bureau of Statistics, p. 28*), reflecting the continuing domination of landlord-oriented social relations on the Pakistani side of Punjab.

## **Conclusion**

The divergence in development outcomes that has been observed between the two sides of the Punjab region has taken place as a result of the following chain of events: On August 15<sup>th</sup>, 1947, two sides with relatively similar institutions, and geography were born. One side pursued an activist state policy, engaging in one of the largest land reforms in history, while the other pursued a relatively *laissez-faire* approach to public policy. In addition to the land reform, the Indian side also encouraged public investments via massive non-farm subsidies and credit provision for its farmers. This created qualitatively different kinds of environments for farmers along the two sides. On the Indian side, medium-sized self-operating or owner-cultivated farmers benefitted from state subsidization of farm and non-farm inputs, and responded by intensifying private investments. In contrast, on the Pakistani side, large landholders extracted potentially investable surpluses from peasants and sharecroppers, as rents. Over time, the very different sets of policies resulted in a completely distinct set of incentives for productive investments, leading to major differences in agricultural yields between the two sides. These differences in the yields of food crops, in turn, have resulted in major differences in the development outcomes between the two sides.

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## Notes

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<sup>1</sup> They include countries in the Middle East that were formerly a part of the Ottoman Empire and were divided after World War I by the Allied forces. Other examples include the “Scramble for Africa”, which led to its partition between 1881 and 1914, the partition of Korea in 1949, the partition of Bengal in 1905/1947/1971 to name just a few.

<sup>2</sup> Strictly speaking, ‘differential treatment’ group as both sides witnessed policy changes after independence.

<sup>3</sup> Banerjee and Iyyer’s (2005) classification of non-*zemindari* as non-landlord is problematic as argued by Iverson et al (2011). This is true in the context of Punjab as well where non-*zemindari* institutions could correspond with a very high degree of tenancy relations, giving little credence to the view that these were non-*landlord* areas.

<sup>4</sup> This was a matter of debate amongst colonial administrators as well as can be seen from the arguments presented by different sides on how to conceptualize ‘*zemindari*’ in relation to the nomenclature used to define tenure in England. See the introduction to the *Punjab Alienation of Land Act (1901)* for a survey of this debate.