Choosing Ungoverned Space: Pakistan's Frontier Crimes Regulation[*]

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Abstract

Why do administratively competent states leave territory ungoverned? We examine the Frontier Crimes Regulation (FCR) in Pakistan, a British Colonial law only abrogated in 2018, that left legal decisions up to local customary councils. This contrasts with areas where the British and Pakistani state built modern political and bureaucratic institutions. Using primary legal documents we create a dataset of when and where FCR applied between 1901 and 2012. Exploiting spatial variation in the Green Revolution's impact in the 1960s, we show that governance was extended to places where the state stood to benefit the most in land revenue.

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1 Introduction

Territory with little or no effective state presence—ungoverned space—persists in many developing countries (e.g. Colombia, India, Morocco, Myanmar, New Guinea, and Pakistan, among others). In addition to having few state services, these areas also provide room for terrorists, smugglers, drug manufacturers, and criminals to operate, creating negative externalities locally and globally. Pakistan has many such areas, and has for over a century, as both a British colony and an independent nation. Unusually among such states, the legal status of ungoverned space in north-western Pakistan is set forth in law; the Frontier Crimes Regulation (FCR) of 1901, a system under which governance was largely left under tribal control. This law cleanly delineates areas with and without state institutions, and allows for documenting how these areas have changed over time. The history of the FCR thus provides a unique opportunity to study the determinants of state control. We study one key predictor of the extent of the FCR jurisdiction over time—potential agricultural revenue—thereby contributing to the understanding of how and when states absorb ungoverned tracts.

During colonial rule, the British divided Pakistan into two main regions. The first was the Raj—areas where the British built modern political and bureaucratic institutions. This included a modern legal system, a tax system, a civil service, and an army. The second was governed according to the Frontier Crimes Regulation (FCR).[1] Here the British put a small number of "political agents" in charge of large tribal areas with almost no colonial institutions backing them. Instead of the Raj system, institutions already in existence were given the force of law, and traditional local councils, or Jirgas, made most legal decisions. Under FCR the political agents could appoint Jirga members and collectively punish tribes for the behavior of their members, but there were few other institutions. As a result of the British division, independence and subsequent partition left roughly half of modern-day Pakistan effectively ungoverned by the state. Over time, all of Pakistan has been removed

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[1]There was also a third way of indirect governance in what were called 'princely states", including most notably Kashmir, but these were not nearly so prominent as in areas that are now within India.

from the FCR except for the small regions along the Afghan border known as the Federally Administered Tribal Areas (FATA) and a few small Provincially Administered Tribal Areas (PATA).[2]

There have been many empirical attempts to understand the initial choice to govern a space during colonial times. Several competing hypotheses have been offered to explain the broad patterns in the historical record: (i) the availability of resources, and the ease with which they can be extracted, determine the initial set of institutions (Diamond, 1998; Gallup et al., 1999; McArthur and Sachs, 2001; Acemoglu et al., 2001); (ii) natural terrain, and the military advantage it affords indigenous groups, make full colonization impractical in some regions (Fearon and Laitin, 2003; Nunn and Puga, 2012); and (iii) it is both efficient, and easier, to maintain order in such regions through a system of indirect governance (Padró i Miquel and Yared, 2012; Scott, 2009).[3] All three perspectives are consistent with the British decision to set up minimal governance institutions in areas initially under the FCR.

Turning to how state presence changes over time within internationally-recognized borders, there are several additional hypothesis pertaining to why a state may maintain or roll-back ungoverned space. Acemoglu et al. (2013) put forth a model in which individuals and/or parties push to add or remove areas from the formal state based on a vote cost-benefit analysis. Similarly, a literature on constrained kleptocracies examines situations in which it is optimal for kleptocrats to not control their entire territory (Grossman and Noh, 1990, 1994). And even well-intentioned governments may chose not to contest rebel control when the expenditures required to efficiently do so are high relative to the costs rebels can impose (Berman et al., 2011) or when there are rents to gained from having limited ungoverned space within one's territory (Felter, 2006; Bapat, 2011). All of these papers suggest a simple cost-benefit calculus: extend control to a given region when the net benefits of doing so

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[2]These areas have periodically provide safe haven to domestic and international terrorists. Training facilities operate openly and with impunity to this date in some of them.

[3]Note Scott (2009) points out that peripheries of countries in South East Asia are typically poorer than the core areas of the country. In Pakistan's FATA, however, households in ungoverned space have high incomes relative to the country average (Blair et al., 2013).

exceed the costs.

There have also been many empirical attempts to understand the impacts of these important institutional decisions. Iyer (2010) compares British direct colonial rule to indirect rule (princely states). The author finds that areas under indirect rule have better education, health, and road systems in the postcolonial period. Banerjee and Iyer (2005) study variation in land revenue institutions, finding that areas of the Raj with landlords subsequently have less investment in land as well as in education and health. Others have studied variation in rulers' religions identity (Chaudhary and Rubin, 2016), in industrial investment (Gupta, 2014), and in political elites (Cheema et al., 2009). Others yet have studied the limits of the impacts of long-term colonial institutions (Chaudhary and Garg, 2015; Roy, 2002). A closely link literature studies the impact of the partition of India at independence (see, for example, Bharadwaj and Fenske (2012); Bharadwaj and Mian (2015)).

We contribute to this literature in at least two ways. First, we examine a different institutional variation—that between FCR and non-FCR areas of Pakistan (including princely states). Second, rather than focusing on the long-term impacts of colonial decisions or the lack-thereof, we focus on the decisions themselves, not just made by the British but subsequently by independent Pakistan. And we know from this literature that these decisions were very consequential for the long-term well-being of households.[4]

One natural proposition that flows from the simple cost-benefit calculus perspective is that the time path of integration of peripheral areas into the state will change in response to technological innovations that shift one side of that cost-benefit calculation. This is particularly relevant in understanding current-day decision making in developing countries as the international system has taken interstate wars of conquest off the table, meaning that many of the incentives for territorial integration studied in the classic literature on state formation no longer pertain.[5] In such a setting we test a simple explanation for ungoverned

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[4]Note we would ideally also directly test the long-term impacts of the decision to place land under FCR or not but have not found modern household socioeconomic data with sufficient geographic coverage for this exercise in Pakistan.

[5]The broad literature concerning the size, shape, and number of countries in international equilibrium

space. Innovations to production technology increase the benefits of integration. With costs unchanged, this increase has two implications. First, the technological change should increase the amount of territory governed by the central authority. Second, since costs are heterogeneous within states, areas that benefit relatively more should be more likely to be integrated. Our core objective in this paper is to empirically test this logic.

Of course, production innovations could lead to greater integration through several mechanisms. First, such innovations increase potential tax revenues, potentially increasing the state's interest in controlling the territory. Second, access to public goods provided by the central authority, such as roads, access to courts and greater protection of property rights, and access to government support for agricultural production—a highly relevant consideration during the state-led Green Revolution in Pakistan—may increase interest in integration. In the language of Alesina and Spolaore (1997), policy preferences in peripheral regions will shift to be more aligned with the central authority's policy, resulting in a new equilibrium with greater integration of peripheral regions.

Several features of the process of integration suggest the latter mechanism was at work in our case. Pakistan gradually integrated outlying regions, removing the FCR successfully over the course of more than a century. The process almost never resulted in violent conflict, and was broadly supported both by the state and by citizens living in peripheral regions. While far from conclusive, this suggests that technological innovation, particularly the episode we study between 1962 and 1965, shifted the equilibrium in such a way that the government, as well as citizens and indigenous authorities in peripheral areas, preferred integration.

We test this cost-benefit logic in two stages. First, we make use of geo-spatial information and crop suitability data from the Food and Agriculture Organization of the United Nations to study why the British chose to apply FCR to over half of modern-day Pakistan in 1901.

was developed to analyze the distribution of nation states in a setting where state death was a possibility (see e.g. Friedman, 1977; Alesina and Spolaore, 1997; Alesina and Wacziarg, 1998; Alesina and Spolaore, 2003). Larger political jurisdictions reduce the per capita cost to providing non-rival public goods, make income taxes more appealing relative to customs taxes (Easterly and Rebelo, 1993), and, if international trade is imperfect, increase economic activity and opportunities for co-insurance through market integration.

Once we condition on proxies for local productivity and the cost of imposing state institutions we find no correlation between a sub-district's crop suitability for wheat (the main crop influenced by the Green Revolution in Pakistan) and the initial British choice to apply FCR. This first result is correlational. It would be consistent with our hypothesis that increased potential revenue should have increased the British's desire to govern many parts of Pakistan if it was the costs of implementing institutions that was much more binding initially.

Next, we exploit the differential impact of the Green Revolution by crop suitability to understand Pakistan's decisions to continue to apply or to roll FCR back across parts of the country throughout the 1960s and 1970s. The Green Revolution in South Asia is widely understood to have increased productivity for wheat more in marginal areas than in already-productive regions—it allowed lower-suitability sub-districts to 'catch-up' to other districts in potential revenue extraction. Because the FCR's original application was conditionally-independent of crop-suitability, the Green Revolution created a plausibly exogenous differential increase in agricultural land value. Places that were less suitable for wheat before the technological innovation saw their value increase more at a specific point in time than areas which were highly suitable for wheat.These places would then be more likely to switch from expected revenue negative to positive as a result of the Green Revolution, and should be relatively more likely to be integrated into the state.

Our results suggest a substantively large correlation between small productivity changes and integration. A one unit increase in crop suitability is associated with a 9.6 percentage points differential increase in the likelihood that FCR continues to be applied to a sub-district following the Green Revolution. This result has a causal interpretation to the extent that: (i) the initial decision to apply the FCR was conditionally-independent of wheat crop suitability (which it appears to have been); and (ii) the timing of the Green Revolution varietals' introduction in Pakistan was exogenous to planned changes in the extent of the FCR.

We provide corroborating evidence for a productivity change using data from the 1960

and 1972 agricultural censuses in Pakistan. We show that areas of low wheat suitability saw disproportionate increases in the amount of farm land being fertilized and in the number of farms using fertilizer between these years. This suggests that the extension of state control led to shifts in investment decisions in the same pattern our simple logic predicts.

Our results provide new evidence on the importance of extractable land value, and technology-driven changes in land value, for the choice to integrate peripheral areas into the state. We also provide additional evidence on the importance of the Green Revolution in South Asia. Our novel contribution to the literature on state development is to provide concrete evidence that technological change can lead to ungoverned spaces being folded into country's cores without civil war or serious violence. The parts of Pakistan that still have FCR today are, of course, the most resistant to government control, but so were many parts of the sub-districts that were brought into the government in the 1970s. Yet what was stopping the government from integrating them, and those living in these peripheral areas from consenting to integration without violence, at least in part, a simple cost-benefit calculation.

This paper proceeds as follows. Section 2 provides additional background on the FCR. Section 3 outlines our data, Section 4 describes our empirical strategy, Section 5 presents results, and Section 6 concludes.

2 Background

2.1 The Frontier Crimes Regulation, Through Independence (1901-1947)

In the 1840s, the British began to replace the Sikh government in Punjab with the same colonial institutions that were taking hold across the British Raj—tax collectors, police, a modern legal system, and other bureaucratic structures. However, they met limited success in what was to become the North Western Frontier Province (NWFP), in at least two im-

portant ways.[6] First, much of the area was operating at a deficit due to limited crop yields and heavy security expenses. Second, the British legal system, being codified throughout India at the time through the 1860 Indian Penal Code and the Code of Criminal Procedure, was vehemently resisted by local Pashtun clan leaders and other established elites in favor of a customary legal system. Among other major differences, this customary system forgave crimes for honor reasons, including killings. Such differences were highly publicized, especially in cases involving women (Nichols, 2013).

After multiple decades of struggle, the British eventually decided to stop fighting the customary legal system in favor of appropriating it in what would be codified in 1901 as the Frontier Crimes Regulation (FCR). This regulation put a single 'political agent', appointed by the local Governor, in charge of the entire region. Criminal cases were to be first sent to a local council of elders, or Jirga, for trial. The political agent would then approve of the Jirga's ruling or could overturn it. Convicted criminals were not allowed appeals. And importantly, Jirgas could not sentence anyone to death. The Jirgas and the political agent could, however, pass collective judgment on communities, or punish relatives of those convicted, rulings that were very much customary and would not be allowed in the modern British legal system.

Perhaps of equal importance, with this unique legal system in the NWFP came a profound lack of other institutions. Tax collection was minimal (the political agent was also in charge of this and had limited enforcement capacity despite absolute authority), though the army was present near the borders, there were few police, and other public services were non-existent. Local tribal communities were left more-or-less untouched, so long as crime reports remained acceptable. At the same time, more troubled regions were brought under FCR—including large parts of the Balochistan and Sindh provinces.

Over the next half-century, FCR changed very little. Besides extending it to a few additional regions, the legal systems and lack of other institutions remained fixed. The

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[6]Initially, these areas were the districts of Hazara, Peshawar, Kohat, Bannu, Dera Ismail and Dera Ghazi Khan in the Punjab province. These and several other districts were then made into the NWFP in November, 1901. NWFP was renamed Khyber-Pakhtunkhwa in 2010.

British had found an acceptable solution in dealing with these areas.

2.2 The Frontier Crimes Regulation Since Independence (1947-2012)

Perhaps surprisingly, after independence FCR was not revoked from most of modern-day Pakistan; the language of the regulation was left intact for over half of a century. Political agents were still appointed, now by the head of the Punjab Province. Cases still went to Jirgas. In fact, several years after the country's independence, FCR was extended to including additional parts of Balochistan and, briefly, new areas in Punjab and Sindh. It was only over the course of several decades that it was slowly rolled back to the tribal areas which remain under FCR today. We detail these geographic changes in Section 3 below.

Throughout this time period, FCR stopped being about controlling criminal activity and became more a choice to not extend the new government to tribal areas for expressly economic reasons. In a famous address to the assembled leaders of the tribal jirgas of Pakistan on April 17, 1948, the founding leader of Pakistan Muhammad Ali Jinnah discussed this choice. He said:

> "Pakistan has no desire to unduly interfere with your internal freedom. On the contrary; Pakistan wants to help you and make you, as far as it lies in our power, self-reliant and self-sufficient and help in your educational, social and economic uplift, and not be left as you are dependent on annual doles, as has been the practice hitherto which meant that at the end of the year you were no better off than beggars asking for allowances, if possible a little more. We want to put you on your legs as self-respecting citizens who have the opportunities of fully developing and producing what is best in you and your land. You know that the Frontier Province is a deficit province..."[7]

[7] See http://www.jinnah.pk/2009/09/27/the-frontier-policy-of-pakistan/. Accessed August 28, 2018.

Here Jinnah is making explicit the cost-benefit logic that this paper empirically tests when he calls areas under FCR a deficit province.

The debate in recent decades has shifted much more towards representation, as it was not until 1997 that Pakistanis in FCR regions were even granted representation in the national legislature. Party-based elections were only introduced to areas under the FCR in 2013, decades after the rest of the country.

In May 2018, the President of Pakistan approved the 31st Amendment to the constitution, beginning the merger of tribal areas into the 'settled' part of the Khyber Pakhtunkhwa (KP) province. Under the reform, FCR would no longer be applied for governing the remaining tribal and frontier regions. The local populations will elect new members to the KP assembly within a year to get direct representation at the provincial level.

Importantly, tax exemptions for the newly incorporated area suggests that the bargaining that preceded the merger focused extensively on how the state would phase in taxation in the area. The Economic Coordination Committee, the highest financial decision-making body of the Government Pakistan, announced 5 year sales, income, and corporate tax exemptions for these areas.[8] Debates in the Khyber Pakhtunkwa Assembly also revolved around issues of tax exemptions, aid packages, and law and order.[9] This focus is consistent with that of our paper—on the costs and benefits of government.

3 Data

3.1 FCR Application, 1901-2012

In order to understand both the British and later Pakistan's decisions to apply FCR to and continue to maintain FCR in large parts of Pakistan, we use primary legal documents to

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[8]See https://www.thenews.com.pk/print/323999-ecc-approves-tax-exemptions-for-fata-pata-for-next-five-y accessed Aug 28, 2018.

[9]See https://dailytimes.com.pk/245672/kp-assembly-seals-merger-with-fata/, accessed Aug 28, 2018.

create a dataset of when and where FCR has applied between 1901 and 2012 for all 403 sub-districts (tehsils) in Pakistan. Basic summary stats are presented in Table 1 and in Figure 1. The years selected in the table and figure were intentional. They represent all of the years in which there have been changes in FCR status of at least one sub-district, in addition to 2012 (or present as it has not changed since then). The first two years demonstrate that there was very little change in FCR application between 1901 and Pakistan's independence from the British in 1947. The following six years follow the changes that occurred before and after the Green Revolution. In 1965, the biggest roll-back in FCR thus far occurred. This roll-back will provide the primary variation for our differences-in-differences analysis, which we will discuss below. The choice of 2012 demonstrates that FCR application has not changed since 1978.

A complication in coding FCR exists due the presence the Princely States that comprised a third regime of governance under the British Raj and Pakistani government. While technically not governed under the FCR, we code Princely States as FCR for the main analysis as they were not directly under the ambit of the central state. We also report robustness of the results to an alternate coding where we drop Princely States from the analysis. Also note that several princely states were shifted to be under FCR officially when they were dissolved rather than into Pakistan's central government.

3.2   Crop Suitability and the Green Revolution

For a time-invariant measure of potential crop yields, we utilize crop suitability data from the Food and Agriculture Organization of the United Nations (FAO, 2012). The FAO provides us with sub-district level indices of agro-climatical suitability for a variety of crops. We focus on wheat which was by far the most common crop in Pakistan around the time of the Green Revolution and the crop that would overwhelmingly benefit from the new technologies. The FAO indices are based on factors such as location-specific geography, rainfall, and temperature over the period 1961-1990. Our measure of crop suitability is the average

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of these FAO indices across different potential irrigation levels at low input.

Figure 2 shows the extent of geographic variation in crop suitability for wheat. While most of Pakistan falls in the medium to not suitable categories, there is a fair amount of geographic variation, especially in areas that at one point had or have FCR.[10]

Though the data used to create these FAO indices include more recent weather information than many of the years in our analysis, we believe that the cross-sectional variation applies across this time period given that the geographic are fixed and that rainfall and temperature are very slow to change.

Importantly, we have also documented the point at which the Green Revolution first began in Pakistan—1965. These changes were driven by the technological changes in wheat production, which was the most important Green Revolution Crop in Pakistan. And with wheat the key changes were not in terms of inputs. Rather, the key change was the introduction of new high-yielding varieties first introduced in Punjab in 1965.[11] In Western Pakistan, wheat production increased by 79 percent from 1966 to 1969, with a peak growth rate of agricultural output of 15 percent during fiscal 1967-68 (Child and Kaneda, 1975).

The Green Revolution in South Asia was characterized by increased crop yields among the staple crops. With wheat there were few required changes in input technologies, labor to capital ratios, or irrigation. We will therefore consider the Green Revolution to mitigate the importance of crop suitability for wheat.[12] This is consistent with Foster and Rosenzweig (1996) and with Child and Kaneda (1975).[13]

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[10]Note that the FAO crop suitability data is provided in raster images with various resolutions depending on the crop. Sub-district-level means for each input level are extracted from each raster images, and then these means are averaged to form a single index for each crop.

[11]See Dowswell (1989). Using similar data, the International Maize and What Improvement Center (CIMMYT) reports that the 118156 wheat variety, the basis for the most important Green Revolution varieties, was first released in 1966 (Lantican et al., 2012).

[12]This is different from Southeast Asia where the introduction of new rice varieties effected both input requirements (more fertilizer) as well as the modes of cultivation and distribution of returns (see e.g. Scott, 1977).

[13]Note that we are unable to provide district-specific trends in Green Revolution take-up for Pakistan as Foster and Rosenzweig (1996) do for India due to a lack of available data.

3.3 Pakistan Censuses of Agriculture

We have also hand coded the 1960 and 1972 Pakistan Censuses of Agriculture for all sub-districts for which information was available in both years (109). While this is only roughly one quarter of sub-districts, it does cover all of Pakistan, including 13 sub-districts in Balochistan, 15 in NWFP, now Khyber Pakhtunkhwa, 62 in Punjab, and 19 in Sindh.

For each of these sub-districts, we have total cropped area, wheat cropped area, irrigated area, cropped area with fertilizer, and farms using fertilizer. In 1960 we additionally have number of ploughs, and in 1972 number of tractors.

4 Empirical Approach

We conduct three complementary analyses. First, we correlate fixed, sub-district-level characteristics, including crop suitability, with the initial decision that the British made to select roughly half of Pakistan for FCR in 1901. Second, we correlate crop suitability with changes in agricultural inputs and usage during the Green Revolution. Finally, we exploit the differential impact of the Green Revolution by crop suitability to understand Pakistan's decisions to roll FCR back across parts of the country throughout the 1960s and 1970s.

4.1 Initial FCR Application in 1901

For our first analysis, we will use a simple empirical specification:

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\begin{aligned}
\text{FCR\_applied\_1901}_d = \alpha &+ \beta_1 \, \text{Sub-district\_area} + \beta_2 \, \text{Ruggedness}_d \\
&+ \beta_3 \, \text{Distance\_to\_capital}_d + \beta_4 \, \text{Crop\_suitability}_d + \Gamma_d + \epsilon_d
\end{aligned}
\tag{1}
$$

Where $\text{FCR\_applied\_1901}_d$ is a dummy for whether FCR was initially applied to sub-district d in the 1901 FCR legislation, $\text{Sub-district\_area}_d$ is is the area of sub-district d in thousands of square kilometers, Ruggedness_d is a sub-district measure of terrain roughness (SD of height above sea level), $\text{Distance\_to\_capital}_d$ is the distance, in 1000s of kilometers, from the centroid

of each sub-district to the capital through the late 1960s (Karachi), Crop_suitability$_d$ is a sub-district's crop suitability measure, and Γ_d are sub-district covariates. Note that FCR was originally applied at the district level, so we cluster the standard errors by district. We leave the specification at the sub-district level, however, to avoid having to aggregate up the geo-specific measure any more than has already been done.

This analysis will give us a correlation. What is informative is that while sub-district geographic characteristics that proxy for productivity at the time of territorial demarcation (which happened over the latter half of the 19th century), the challenge of exerting control, and transportation costs all correlate in the expected direction with FCR application, FCR application is conditionally independent of crop suitability for wheat. We proxy for initial productivity with sub-district area because administrative units were sized to capture similar populations during the initial demarcation in the mid-19th century and more productive places were more densely populated at the time. We therefore expect productive areas to have had physically smaller administrative units. We proxy for the challenge of exerting control with the standard deviation of elevation. It is well established that rougher terrain is harder to police given modern military technologies and this was certainly true in a time before mechanized transportation. We also proxy for transportation costs with the distance to the Karachi, the main port at the time for areas that would become Pakistan, because wheat was an important export crop. The value of controlling territory where it was produced was therefore likely related to the costs of moving it to market. We do not have pre-1901 data to control for potential omitted variables such as differential time trends in productivity, or for specific time-invariant covariates of a sub-district. As such, we will only consider results from this analysis as suggestive.

4.2 The Green Revolution and Agricultural Productivity Gains in Pakistan

We are interested in confirming that the spread of high-yielding varieties of wheat seeds in Pakistan at the onsent of the Green Revolution did increase the productivity (and thus potential land revenue) disproportionately in originally less-suitable areas as this is a necessary condition for us to test our theory in the next subsection. We would ideally use a direct measure of productivity, either yields or land revenue, but we have not found records of such measures for this time period. As a second best, we will consider agricultural input and usage variables from the agricultural census that we believe would be positively correlated with yields and revenue. That is, we would expect greater differential investments during the Green Revolution in places that gained differentially in terms of productivity during this time.

For this analysis, we will use another correlational specification:

$$\text{Y(1972-1960)}_d = \alpha + \beta_1 \text{ Below\_Median\_Wheat\_Suitability}_d + \beta_2 \text{ Area}_d + \epsilon_d \qquad (2)$$

WhereY(1972-1960)_d is an outcome from the census of agriculture in 1972 minus that same outcome in 1960 and Area_d is a control for the area of the subdistrict. Again, we cluster standard errors by district. We also limit our analysis to sub-districts that were not subject to FCR at the start of the Green Revolution, akin to limiting to "control" sub-districts so that we can document a pattern between suitability and agricultural productivity without changes in FCR status potentially confounding our simple analysis.

4.3 FCR Application and the Green Revolution

For our third and primary analysis we exploit pre-existing cross-sectional variation in the marginal impact of Green Revolution wheat varieties on productivity with an exogenously timed technological change (the introduction of those varieties) to identify incentives for

rolling back the FCR. Our primary specification will be as follows:

$$\text{FCR\_applied}_{dt} = \alpha + \beta_1 \text{Crop\_suitability}_d + \beta_2 \text{Post\_GR}_t +$$

$$\text{Post\_GR\_Crop\_suitability}_{dt} + \delta_d + \delta_t + \epsilon_{dt}$$

$$\text{for sub-district } d \in \{\text{ever had fcr}\}$$

$$\text{for year } t \in \{1947, 1957, 1962, 1964, 1965, 1974, 1978\}$$

(3)

Here FCR_applied_{dt} is a dummy for whether FCR continued to apply to sub-district d in year t, $\text{Crop\_suitability}_d$ is our crop suitability measure of sub-district d, and $\text{Post\_GR\_Crop\_suitability}_{dt}$ is the linear interaction of the the two terms. δ_d and δ_t are sub-district and year fixed effects. Note that we will not be able to separately identify β_1 from sub-district fixed effects.

Analysis for Equation 3 is limited to sub-districts in Pakistan that ever had FCR and to years $t \in \{1947, 1957, 1962, 1964, 1965, 1974, 1978\}$. The latter limitation is to all the years in which one or more sub-districts changed FCR application, within 20 years of the Green Revolution.[14] We limit to these years as an event study of sorts, assuming that there was enough of a political cost to changing the FCR legislation that it could not be done continuously. This approach matches the historical record in that decisions to remove sub-districts from the law happened episodically and in groups. There are two more extreme alternatives: (i) leave the data at the yearly level and run the same specification; or (ii) collapse the data down to two observations for each sub-district and run a simple difference of means between pre and post the Green Revolution. We see our specification as superior to (i) because it will not over-emphasize the many zeros that likely did not represent real decisions and to (ii) because it allows for a more accurate accounting for variation across time.[15]

With sub-district and year fixed effects, and with a differences-in-differences estimator, we

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[14]And more or less within a much larger window considering the little change in FCR between 1901 and 1947 and the no change in FCR after 1978.

[15]Note that if we take the conservative approach and run analysis on data for all 20 years before and after the Green Revolution as in (i), we obtain coefficients with 1/3 to 1/2 of the magnitude and the same level of significance. These are still very meaningful magnitudes. Results available upon request.

will consider this analysis to capture the causal differential impact of the Green Revolution, or more generally of an exogenously timed change in a sub-district's agricultural land value, on the choice by the Pakistani government to maintain or remove FCR. For our identification strategy to hold, we need that there were no time-varying omitted variables that differentially impacted sub-districts before and after 1965. In other words, we need that there were no other major changes other than the Green Revolution happening at or around 1965 that had differential impacts on FCR application by crop suitability. We will discuss other major potential changes in the context of our results below.

5   Results

This section presents results from two complementary analyses of the choice to apply, and then maintain, FCR provision in regions of Pakistan. First, we correlate fixed, sub-district-level crop suitability with the initial decision that the British made to select roughly half of Pakistan for FCR in 1901. Second, we exploit the differential impact of the Green Revolution by crop suitability to understand Pakistan's decisions to roll FCR back across parts of the country throughout the 1960s and 1970s.

5.1   Initial FCR Application in 1901

Table 2 presents results for this analysis. In-line with our model, column (1) shows that the British applied FCR in less productive places (under our assumption that sub-district area was negatively correlated with productivity), column (2) shows that places which were more costly to tax due to rough terrain, as proxied by height above sea level, were more likely to be in the FCR, and column (3) shows that places with higher transportation costs (and thus lower revenue potential given productivity) were more likely to be included. Column (4) shoes that there was a positive correlation between wheat crop suitability and initial FCR application, but column (5) then shows that once our other factors are accounted for the

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sub-district suitability for wheat is uncorrelated with initial FCR application.

Thus we argue that initial assignment to the FCR is plausibly exogenous to wheat crop suitability once we condition for proxies for local productivity and the cost of imposing state institutions.

5.2 The Green Revolution and Agricultural Productivity Gains in Pakistan

We provide evidence corroborating the fact that initially less suitable areas of Pakistan gained the most from the Green Revolution in Table 3 using data from the 1960 and 1972 agricultural censuses in Pakistan. We correlate below median wheat suitability with changes in cropped area, wheat area, irrigated area, cropped area with fertilizer, farms using fertilizer, and farm equipment (tractors in 1972 and ploughs in 1960). We find that areas of low wheat suitability saw disproportionate increases in all of these measures between 1960 and 1972. These increases are significant for irrigated area, cropped area with fertilizer, and farms using fertilizer. In all cases, the increases are large in magnitude as well. For example, irrigated area increased by nearly 100,000 acres in above median wheat suitability sub-districts during this team period. In below median wheat suitability sub-districts it increased by an additional 57 percent, or 57,000 acres.

While correlational and on a limited sample, these results are consistent with the fact that that the extension of state control led to shifts in investment decisions in the same pattern our simple logic predicts. In other words, as it was originally less suitable areas that gained the most from the Green Revolution, it is those areas that received the greatest increased investment in resources (many of which were state controlled in Pakistan during this period). While we have argued above that with Green Revolution varieties of wheat there were few required changes in input technologies, labor to capital ratios, or irrigation, we would also expect changes at the extensive margin (land that was not used before the Green Revolution but was after) to drive these inputs up as cropped area increased.

5.3 FCR Application and the Green Revolution

Table 4 presents results for our third and primary analysis—exploiting the differential impact of the Green Revolution by crop suitability to understand the integration of peripheral areas into the state throughout the 1960s and 1970s. We first present a simple correlation of sub-district crop suitability and FCR application across the years in this analysis with and without year fixed effects. In columns (1) and (2), we see that there is no clear correlation between sub-district wheat suitability and FCR status when we do not use our Green Revolution instrument. This is not surprising as our previous results from 1901 suggest that wheat suitability might not have been an important predictor of FCR application initially, and there were very few changes in FCR before the Green Revolution. It is also consistent with the fact that the Green Revolution cause wheat suitability to matter differentially at a discrete point in time.

Second, we present a differences-in-differences specification, adding year fixed effects, sub-district controls, and then sub-district ficxed effects column-by-column. We can see that crop suitability differentially positively predicts FCR's continued application after the Green Revolution relative to before by 8-10 percentage points, with our prefererred specification with year and sub-district fixed effects having a coefficient of 9.6 percntage points. We then divide crop suitability at the median in column (7) to show that below median crop suitability sub-districts are *less* likely to have FCR retained after the Green Revolution. This point estimate is substantively large — 31.6 percentage points. These results are confirmed visually in Figure 3, where we group sub-districts into above and below median crop suitability and show mean FCR application levels over time for all those sub-districts that ever had FCR. We see that after the Green Revolution low suitability districts became much less likely to have FCR maintained.

This result is consistent with the fact that the Green Revolution mitigated the importance of crop suitability. As mentioned above, the Green Revolution is characterized by increased crop yields among the staple crops of South Asia with little to no required changes in input

technologies, labor to capital ratios, or irrigation. Thus places that were once harder to farm became relatively easier, causing lower-suitability sub-districts to 'catch-up' to other districts in potential revenue extraction. Thus lower-suitability districts were more likely to switch from expected revenue negative to positive as a result of the Green Revolution, and these districts were relatively more likely to have their FCR application removed.[16]

Our results suggest a fairly large magnitude of an effect as well. Using our preferred specification in Table 4 column (3), we see that a one unit increase in crop suitability, from say 'medium' to 'good,' is associated with a 10 percentage points differential increase in the likelihood that FCR continues to apply to a sub-district following the Green Revolution.

5.4 Robustness Checks

We present four robustness checks to our Green Revolution result. First, we conduct a placebo check in which we add to our main specification the interaction of a dummy for post Green Revolution with crop suitability levels for other crops that were not impacted by the Green Revolution in Pakistan during this time period (rice became important in the 1980s), including gram (the second most important crop in Pakistan before the Green Revolution by cultivated area), and an average over gram, cotton, and rice. Results are presented in Appendix Table A.1. Note we do not show cotton or rice separately. For cotton, this is because it is 97 percent correlated with wheat suitability in our sample. For rice, it is because there is no variation in rice suitability in all of Balochistan (it is zero throughout). In columns (2) and (3), our results remain completely driven by wheat crop suitability. This assures us that our results are not driven by some correlate of wheat suitable sub-districts that has nothing to do with potential land revenue—if such was the case it seems unlikely such a spurious result would exist with crop suitability for wheat but not the second most important crop or an average across three important crops.

Second, we conduct a placebo check in which we vary the year in which the Green

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[16]This is consistent with Foster and Rosenzweig (1996) and with Child and Kaneda (1975).

Revolution supposedly took place. If there were pre-existing trends in low- relative to high-suitability sub-districts, such a placebo check should pick them up. Results are presented in Appendix Table A.2. As you can see, we only get results when we use the true year of the Green Revolution in Pakistan. This is encouraging, and consistent with the pre-trends visible in Figure 3.

Third, most importantly, we turn to alternative changes that could have occurred in exactly 1965 in Pakistan that differentially affected some sub-districts over others in a way that is correlated with both wheat suitability and FCR application.[17] From the history of Pakistan around 1965, two plausible alternative stories arise. The first is Pakistan's on-going dispute with India over areas of northern Pakistan, including Kashmir and Gilgit-Baltistan. In 1965, there was a war between the two countries in this region which involved skirmishes in Kashmir (the Indo-Pakistani War of 1965). It is possible that this war constrained Pakistan's ability to roll back FCR from the northern region of the country in 1965. If this is the case, and the northern area is on average more suitable for wheat than Balochistan, where FCR was mainly rolled back in 1965, we could be obtaining spurious results. To ensure this is not the case, in Table A.3, column (2), we limit our analysis to only Balochistan, the province for which there are major changes in FCR status in 1965. We see that, if anything, our result becomes stronger when limited to only Balochistan. This ensures that the northern areas of Pakistan are not driving our results.

The second alternative story that we consider takes place within Balochistan. Balochistan has historically been dominated by two ethnic groups—the Balochis and the Pashtuns. The Pashtuns have lived in the northern part of the district and the Balochis in the Southern. It is possible that the President of Pakistan in 1965, General Ayub Khan, had different relationships with the two groups that might have affected FCR decisions, and in this time period the president was very active domestically. If the Pashtun or Balochi groups were systematically on more or less suitable land, we could be obtaining spurious results. To ensure

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[17]Note we consider the Green Revolution to encapsulate all changes in crop technology at the time, so we are not concerned about other simultaneous agricultural advances.

this is not the case, in Table A.3, column (3), we limit our analysis to only the historically Balochi sub-districts in Balochistan.[18] We find that our results generally hold (our standard errors get larger with the smaller sample but the main result remains significant at 10%). Thus, putting together our results from this table, even in the Balochi-dominated districts in Balochistan, we see the same relationship holding in which crop suitability differentially positively predicts FCR's continued application after the Green Revolution relative to before.

Fourth, we ensure that our results are robust to whether we consider princely states to be ungoverned (and thus coded as if under FCR) or governed (and thus coded as not under FCR). As we can see in table A.5, our results are not at all sensitive to how we code princely states. This is not a surprise at they do not represent a large area of Pakistan.

6   Conclusion

In this paper, we showed that the trajectory of state presence within the borders of modern day Pakistan is consistent with a model in which states extend governance to areas where the economic benefits of developing full institutions through taxation and resource extraction outweigh the costs of doing so. Using crop suitability data from the Food and Agriculture Organization of the United Nations, we show first that the choice by the British to apply FCR to over half of Pakistan in 1901 was conditionally uncorrelated with crop suitability. We then exploit the fact that Green Revolution had a greater marginal effect in areas of low crop suitability to understand Pakistan's selective roll-back of FCR throughout the 1960s and 1970s. We find that sub-districts more suitable to agriculture were more likely to see continued FCR application after the Green Revolution raised the relative value of less-suitable sub-districts.

Because the timing of the Green Revolution in Pakistan was exogenous to local politics we are able to isolate a plausibly causal effect of agricultural land value on FCR application.

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[18]Historically Balochi and Pashtun sub-districts were hand-coded using a map created by Dr. Michael Izady at www.Gulf2000.Columbia.edu/maps.shtml.

Our results suggest a large effect. Specifically, a one unit increase in crop suitability from 'medium' to 'good' is associated with a differential increase in a sub-district's probability of being left ungoverned by over twenty percent following the Green Revolution, relative to before. Though counter intuitive at first glance, this pattern is actually consistent with our hypothesis that the Green Revolution mitigated the importance of crop suitability and thus caused lower-suitability sub-districts to 'catch-up' to other districts in potential revenue extraction. Thus lower-suitability districts were more likely to switch from expected revenue negative to positive as a result of the Green Revolution, and these districts were relatively more likely to have FCR removed.

These results are important for at least four reasons. First, we provide microeconomic evidence on the importance of extractable land value, and technology-driven changes in land value, to the choice to govern land, supporting the hypothesis of a rich macroeconomic development literature when applied at the sub-national level. Second, we provide additional evidence on the importance of the Green Revolution in South Asia, not only in increasing land values and growth but in influencing the choice of the Pakistani government to govern (and Pakistani citizens to accept government in) large parts of the country that had thus far remained ungoverned. Third, we present microeconomic evidence in support of the idea of Fearon (2008) and Besley and Persson (2011) of *ungoverned-by-choice* space. Lastly, we provide heartening evidence that technological chance can lead to ungoverned spaces being folded into country's cores without civil war or serious violence. The parts of Pakistan that still have FCR today are, of course, the most resistant to government control, but so were many parts of the sub-districts that were brought into the government in the 1970s. Yet what was stopping the government from integrating them, and those living in these peripheral areas from consenting to integration without violence, at least in part, a simple cost-benefit calculation.

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7   Tables and Figures

Table 1: FCR Application Summary Statistics

	% of Sub-districts under FCR	% area under FCR (km^2)
Year:		
1901	42.93	52.08
1947	42.43	50.07
1957	43.42	58.15
1962	46.65	59.66
1964	34.00	52.12
1965	23.57	21.77
1974	15.63	10.21
1978	11.91	02.97
2012	11.91	02.97

Notes: Percentage sub-districts (tehsils) under FCR based on a total of 403 sub-districts. Area under FCR based on a total area of 872,027 square kilometers.

Table 2: Crop Suitability and Initial FCR Application

	FCR applied in 1901 (=1)				
	(1)	(2)	(3)	(4)	(5)
Sub-district Area (Square KM / 1000)	0.019**				0.016*
	(0.009)				(0.009)
Sub-district SD of height above sea level (FT / 100)		0.023***			0.024***
		(0.006)			(0.006)
Distance to Capital (KM / 1000)			0.351***		-0.088
			(0.107)		(0.165)
Sub-district Wheat Crop Suitability				0.061*	0.082**
				(0.031)	(0.038)
Mean of dependent variable	0.429	0.429	0.429	0.429	0.429
# Observations	403	403	403	403	403
# Clusters	129	129	129	129	129
R-Squared	0.016	0.145	0.074	0.034	0.192

Notes: Unit of observation is the sub-district (tehsil). *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Standard errors clustered at the district level reported in parentheses. Crop suitability scores are as follows: 0 is not suitable, 1 is very marginal, 2 is marginal, 3 is moderate, 4 is medium, 5 is good, 6 is high, and 7 is very high. Karachi was the capital at independence and the main export port in the late-1900s.

Table 3: The Green Revolution and Changes in Agricultural Inputs

| | Difference between 1972 and 1960 values | | | | | Farms with |
| | Cropped Area | Wheat Area | Irrigated Area | Cropped Area with Fertilizer | Farms using Fertilizer | Tractors '72 − Ploughs '60 |
	(1)	(2)	(3)	(4)	(5)	(6)
Below Median Wheat Suitability (=1)	74513	12457	57337**	82484**	12942***	514
	(48189)	(17135)	(21434)	(38324)	(3024)	(3700)
Mean of dependent variable	164622	51187	97138	165329	5575	139
# Observations	80	80	79	77	77	75
# Clusters	45	45	44	43	43	42
R-Squared	0.147	0.039	0.112	0.257	0.344	0.121

Notes :*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Standard errors clustered at the district level reported in parentheses. All regressions include controls for total sub-district (tehsil) area. Data source: 1960 and 1972 Pakistan Censuses of Agriculture. Sample: tehsils for which agricultural census information was available in both 1960 and 1972 and that were not subject to FCR at the start of the Green Revolution. For reference, there are 215 total tehils subject to FCR after the start of the Green Revolution. All areas are in Acres.

Table 4: Crop Suitability and FCR Application Before and After the Green Revolution

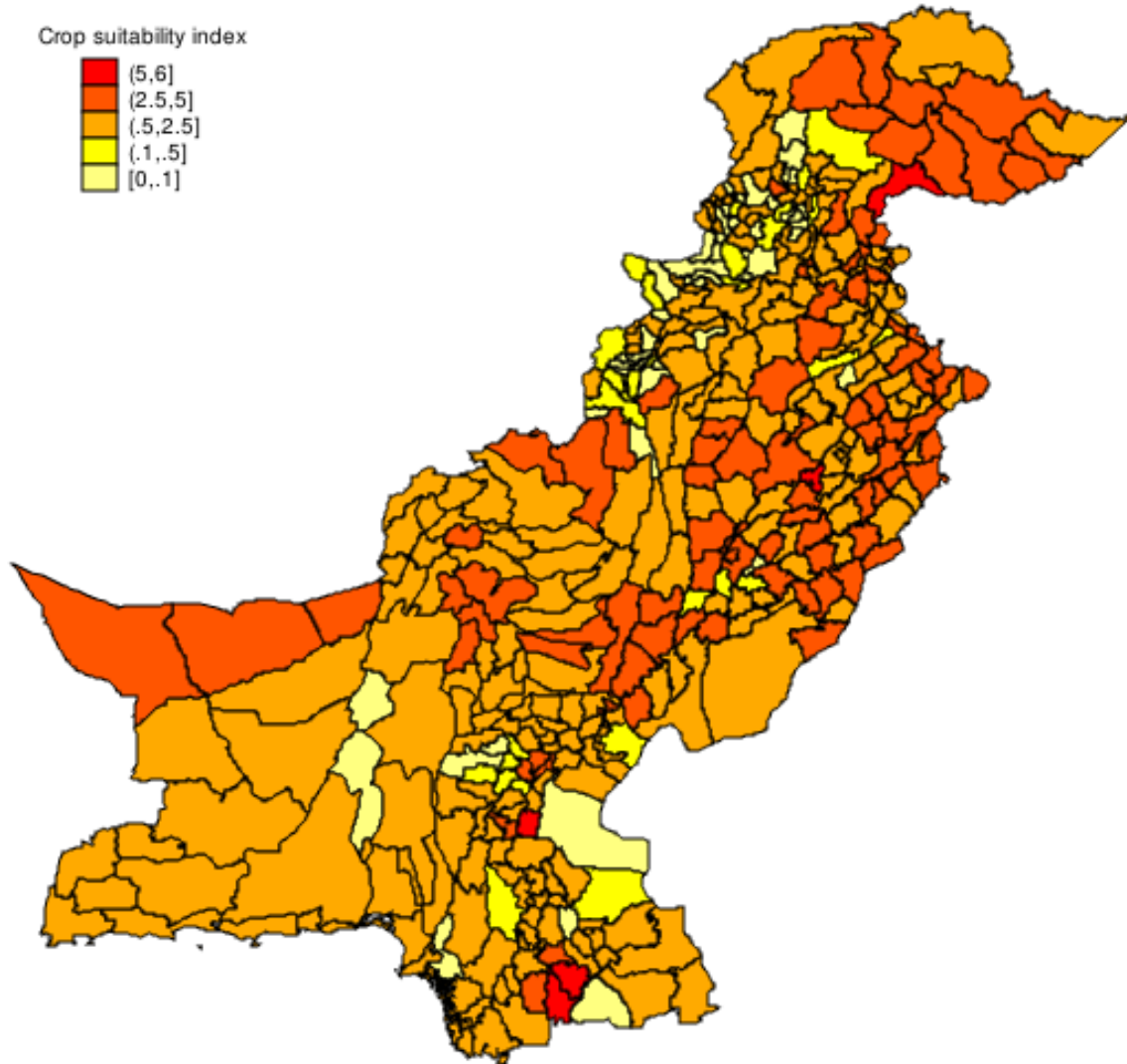| | FCR applied (=1) | | | | | | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sub-district Wheat Suitability	0.029	0.029					
	(0.037)	(0.037)					
Post Green Revolution (=1)			-0.606***	-0.724***	-0.759***	-0.667***	-0.436***
			(0.067)	(0.068)	(0.069)	(0.072)	(0.085)
Wheat Suitability * Post Green Revolution			0.083*	0.083*	0.108**	0.096***	
			(0.048)	(0.048)	(0.042)	(0.031)	
Below Median Wheat Suitability (=1) * Post							-0.270***
							(0.092)
Mean of dependent variable	0.952	0.952	0.952	0.952	0.952	0.952	0.952
# Observations	1421	1421	1421	1421	1421	1421	1421
# Clusters	74	74	74	74	74	74	74
R-Squared	0.006	0.291	0.270	0.308	0.342	0.454	0.454
Year FEs?	NO	YES	NO	YES	YES	YES	YES
Sub-district controls	NO	NO	NO	NO	YES	NO	NO
Sub-district FEs?	NO	NO	NO	NO	NO	YES	YES

Notes :*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Standard errors clustered at the district level reported in parentheses. Crop suitability scores are as follows: 0 is not suitable, 1 is very marginal, 2 is marginal, 3 is moderate, 4 is medium, 5 is good, 6 is high, and 7 is very high. Post Green Revolution is a dummy for years after 1963. Years in analysis limited to those years where any sub-district had FCR removed— 1922,1937,1947,1956,1963,1964,1971,1973,1977. Sub-dsitrict controls are Sub-district Area (Square KM / 1000), Sub-district SD of height above sea level (FT / 100), and Distance to Capital (KM / 1000).

Figure 1: FCR Application over Time
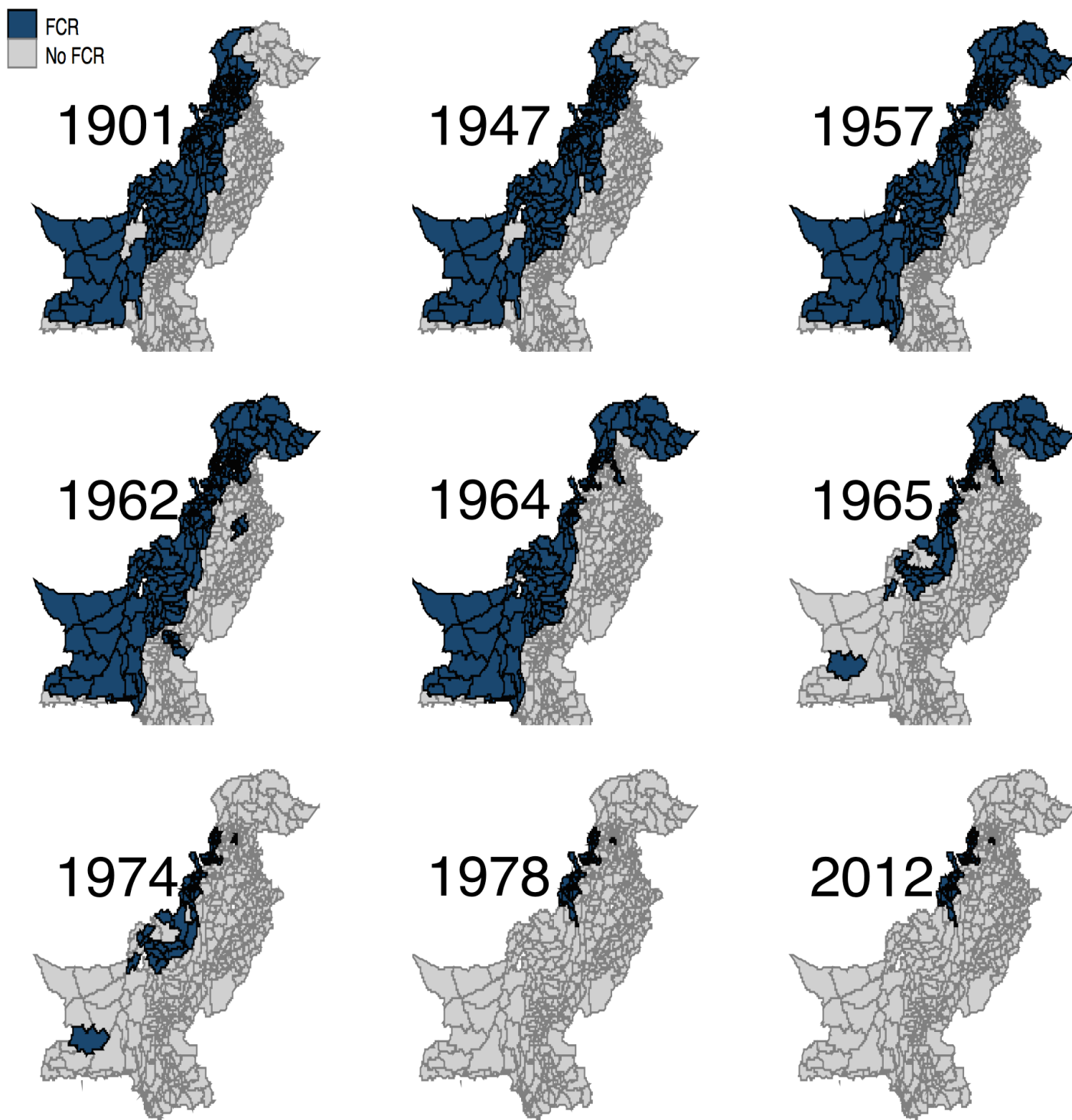
Sub-district (tehsil) boundaries marked. White sub-districts are those for which we do not have data, due to changes in sub-district boundaries between 1901 and 2012. For the main analysis we code all Princely States as FCR, though their formal status differed. Please see text for a discussion of the robustness of our results if we do not consider these areas.

Figure 2: Crop Suitability

Sub-district (tehsil) boundaries marked. Crop suitability scores are as follows: 0 is not suitable, 1 is very marginal, 2 is marginal, 3 is moderate, 4 is medium, 5 is good, 6 is high, and 7 is very high. Data from FAO, 2012.

Figure 3: FCR application over time by crop suitability
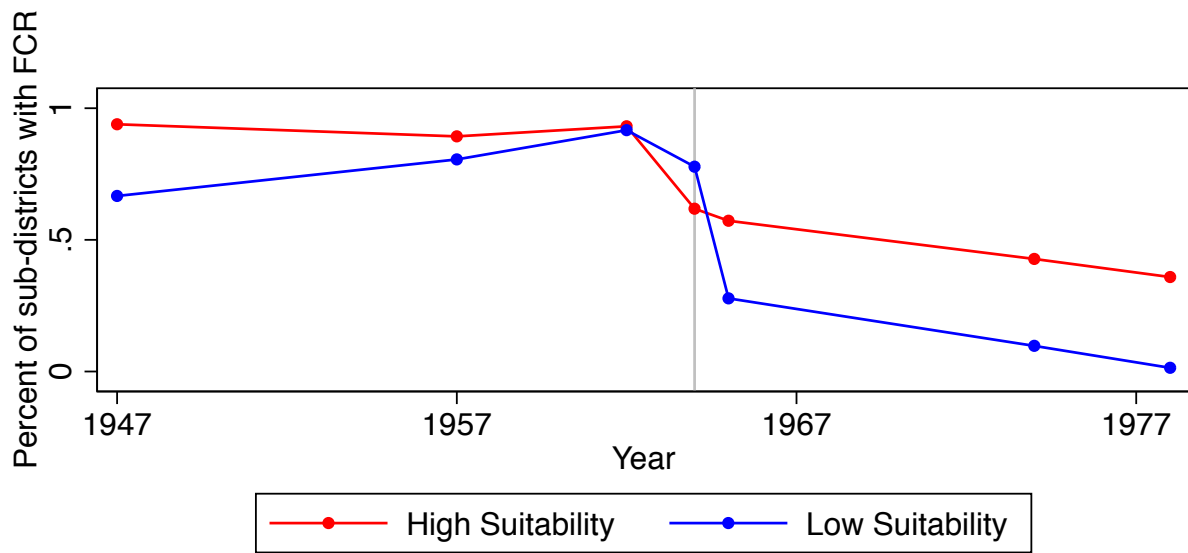
Points show the mean sub-district FCR application dummy values in years used in analaysis within above (high) and below (low) medium wheat crop suitability bins. Lines are fitted using locally weighted scatterplot smoothing.

A   Appendix Tables and Figures

Table A.1: Robustness Check 1—Other Crop Suitability Placebos

	FCR maintained (=1)		
	(1)	(2)	(3)
Wheat Crop Suitability * Post Green Revolution	0.096***	0.087	0.147*
	(0.033)	(0.074)	(0.082)
Gram Crop Suitability * Post Green Revolution		0.011	
		(0.083)	
Other Crop Average Crop Suitability * Post Green Revolution			-0.090
			(0.125)
Mean of dependent variable	0.952	0.952	0.952
# Observations	1421	1421	1421
# Clusters	74	74	74
R-Squared	0.454	0.454	0.455
Year FEs?	YES	YES	YES
Sub-district FEs?	YES	YES	YES

Notes :*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Standard errors clustered at the district level reported in parentheses. Other crop suitability is the average of gram, cotton, and rice crop suitability.

Table A.2: Robustness Check 2—Year Placebos

	FCR maintained (=1)			
	(1)	(2)	(3)	(4)
Wheat Crop Suitability * Post Green Revolution	0.096***			
	(0.033)			
Wheat Crop Suitability * Post 1957		-0.063		
		(0.046)		
Wheat Crop Suitability * Post 1962			-0.008	
			(0.033)	
Wheat Crop Suitability * Post 1964				0.031
				(0.035)
Mean of dependent variable	0.952	0.952	0.952	0.952
# Observations	1421	1421	1421	1421
# Clusters	74	74	74	74
R-Squared	0.454	0.433	0.428	0.430
Year FEs?	YES	YES	YES	YES
Sub-district FEs?	YES	YES	YES	YES

Notes :*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Standard errors clustered at the district level reported in parentheses.

Table A.3: Robustness Check 3—Focus on Balochistan

	FCR maintained (=1)		
	(1)	(2)	(3)
Wheat Suitability * Post Green Revolution	0.096***	0.198**	0.190*
	(0.033)	(0.083)	(0.100)
Mean of dependent variable	0.952	0.842	0.799
# Observations	1421	420	315
# Clusters	74	25	18
R-Squared	0.454	0.776	0.845
Year FEs?	YES	YES	YES
Sub-district FEs?	YES	YES	YES
Sample	All	Balochistan Only	Non-Pashtun Balochistan

Notes :*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Standard errors clustered at the district level reported in parentheses.

Table A.4: Robustness Check 4—Crop Suitability and FCR (dropping Princely States)

	FCR maintained (=1)				
	(1)	(2)	(3)	(4)	(5)
Sub-district Area (Square KM / 1000)	0.024**				0.019*
	(0.011)				(0.010)
Sub-district SD of height above sea level (FT / 100)		0.023***			0.025***
		(0.006)			(0.007)
Distance to Capital (KM / 1000)			0.322***		-0.108
			(0.113)		(0.178)
Sub-district Wheat Crop Suitability				0.057*	0.079**
				(0.032)	(0.039)
Mean of dependent variable	0.425	0.425	0.425	0.425	0.425
# Observations	360	360	360	360	360
# Clusters	119	119	119	119	119
R-Squared	0.016	0.130	0.059	0.031	0.174

Notes :*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Standard errors clustered at the district level reported in parentheses.

Table A.5: Robustness Check 5—FCR application after the Green Revolution (with and without Princely States)

	FCR maintained (=1)	
	(1)	(2)
Wheat Suitability * Post Green Revolution	0.096***	0.086**
	(0.031)	(0.033)
Mean of dependent variable	0.952	0.960
# Observations	1421	1225
# Clusters	74	67
R-Squared	0.454	0.423
Sample	All	Non-Princely States

Notes :*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Standard errors clustered at the district level reported in parentheses.