When Redistribution Exacerbates Poverty: Evidence from Gamal Abdel Nasser's Land Reforms

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Abstract

Many postcolonial governments unveiled expansive land reforms designed to alleviate poverty and landlessness. Yet the socioeconomic outcomes of these programs varied widely, even across relatively small areas. Using the canonical case of Gamal Abdel Nasser's land reforms in Egypt, we present evidence that while land redistribution dismantled large estates, restrictions on beneficiaries' sale and use of that land inscribed long-term poverty into the landscape. We focus on the historic influence of the *'izba*, an ubiquitous and coercive local agricultural institution that emerged in the early 1800s to facilitate the industrial-scale production of cotton, and lasted until a series of land reforms in the 1950s. By coupling spatial data on the location of thousands of historic *'izba* with contemporary, geo-located survey data on over 50,000 Egyptian families, we identify a local but significant effect on wealth that is robust to a variety of specifications as well as an instrumental variables regression. Tracing the the effects of the post-1952 land redistribution efforts reveals how land grants and a new co-op system to manage agricultural production combined to lock former *'izba* residents into place and systematically depress their earning potential.

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Introduction

Modern governments have frequently used major reforms to develop economies, improve standards of living, and break the social bases of their opponents. Among the most far reaching and intrusive of these measures are programs designed to systematically redistribute land to peasants (Albertus 2015*a*, Lipton 2009, Dai and Tai 1974, Warriner 1962). Yet the empirical record is mixed: not only is there wide variation in the success of these programs— particularly at the subnational level— at times these top-down reforms worsen the problems they were crafted to solve (Bates 1981, Sikor and Müller 2009). We investigate this local variation in a canonical case of post-colonial land redistribution: Gamal Abdel Nasser's Egypt. Specifically, we ask, under what conditions do redistributive land reforms alleviate poverty? Why do policies designed to reduce poverty sometimes exacerbate it?

We argue that redistributive projects which fail to fully account for underlying institutional differences can reproduce, or even exacerbate, subnational patterns of poverty. In particular, redistributionist policies that also limit cropping choices as well as the ability to sell or divide received land, serve to spatially consolidate long-term poverty. Our empirical investigation is based on a particular and historically ubiquitous Egyptian institution of coercive agriculture, the *'izba* (عزبة) (Ayrout 1963, Blackman 1927, Lozach and Hug 1930, Nahas 1901). Akin to the Latin American *hacienda*, the *'izba* emerged in the 1800s to produce cotton at scale through a regime of debt peonage, surveillance, and hierarchical violence (Mitchell 2002). Thousands of *'izba* dotted the length and breadth of Egypt until they were formally dismantled and much of their land redistributed by Nasser's post-1952 reforms (Taylor 1984, 168-173).

Matching comprehensive historical spatial data on the distribution of thousands of *'izba* (Survey of Egypt 1932, Maslahat al-Misāha al-Misriyya 1932) with geolocated contemporary survey data on tens of thousands of Egyptian families, we find that respondents proximate to historic *'izba* are systematically poorer than those distal from these large estates. The relationship is robust to a variety of specifications, including a placebo test based on the

distribution of *kafr* (a rural hamlet) as well as an instrumental variables regression exploiting the proximity of *'izba* to historic irrigation canals. Historical and additional statistical evidence shows how Nasser's redistribution of land to former *'izba* residents locked them into place even as compulsory membership in the new agricultural co-op system degraded the value of their labor.

In addition to recent attention on the coalitional dynamics of regimes, our work suggests that the ability of large scale land reforms to reshape a country's political economy are circumscribed by underlying institutional characteristics. In so doing, our work connects with a burgeoning interest in the enduring influence of historical events, including cultural institutions such as the Islamic *waqf* (Kuran 2004, 2011, Bazzi, Koehler-Derrick and Marx 2020), styles of rule (Blaydes and Chaney 2013) and coercive labor practices (Dell 2010) particularly slavery (Nunn 2007, 2008, Nunn and Wantchekon 2011). Our work extends this agenda by explicitly theorizing and empirically supporting how redistributive policies link historic events to contemporary outcomes.

Our work also helps adjudicate an ongoing debate among historians about the effects of Nasser's land redistribution program. Contemporaries praised these measures for decreasing rural land inequality and increasing agricultural productivity and general peasant well-being (Tai 1974, 310-314; Warriner 1957, 37). As one more recent observer notes, "one cannot think of an act in recent Egyptian history that was more empowering to the poor than agrarian reform" (Saad 2002, 122). This general consensus rests on a sense that the land redistribution program systematically destroyed the feudal and exploitative system of agricultural production that had dominated Egyptian agriculture for generations. As Abdel Mohsen Aboul-Nour, the Minister of Land Reclamation, put it, the reforms inaugurated a period "the features of which seem to have had no relation with the past" (Ministry of Agrarian Reform and Land Reclamation 1964, i). Our work shows that this optimism was misplaced, and provides evidence that Nasser's paradigmatic land reforms unintentionally increased poverty in areas of the country exposed to Egypt's historic cotton boom. That

these patterns are detectable after fifty years testifies to the enduring relationship between the Nasser's radical reform and the feudal legacies he intended to eradicate.

Our paper proceeds as follows. The next section reviews the literature on land reform to identify the conditions under which such policies succeed or fail. The following section describes the emergence and operation of the *'izba* in the context of Egypt's cotton boom. We then present the data and describe our estimation strategy, including a placebo test and an instrumental variables regression. A subsequent section refocuses on the mechanism through which Nasser's reforms counterintuitively reproduced the deleterious effects of the *'izba*, identifying a systematic connection between the pre-reform density of these institutions to higher levels of contemporary landholding. After discussing our results, a conclusion highlights how our findings should inform future research on the politics of land reform and economic development in key non-Western cases.

Causes and Consequences of Land Reform

Among the most far reaching and intrusive programs that governments undertake are ones designed to systematically redistribute land (Albertus 2015*a*). Much of the extant research on redistribution has focused on "upstream" questions about the conditions under which governments engage in such reform. These investigations have identified a series of relevant predictors, including electoral logics (Bardhan and Mookherjee 2010), obstinate bureaucrats (Allina-Pisano 2004), or popular opinion (Gibson 2010). Albertus' and co-authors' recent work has advanced the study of land reform by explicitly connecting it to logics of political survival, particularly in how regimes rely on land redistribution to undercut the social bases of rival elites and generate new bases of mass support (Albertus 2019, Albertus, Brambor and Ceneviva 2018, Albertus 2015*b*,*a*, Albertus and Menaldo 2012).

On the downstream side, there is considerable variation in the degree to which these policies can actually re-shape patterns of wealth and poverty. In some cases authors have identified consistent positive effects (Besley and Burgess 2000, Keswell and Carter 2014,

Finan, Sadoulet and De Janvry 2005) while in others the effects are mixed (Mendola and Simtowe 2015, Deininger, Hoogeveen and Kinsey 2004). Yet identifying the causes of this variation is freighted with political import- as Albertus finds, one reason that these reforms may fail to improve livelihoods is that regimes engineer them in order to lock beneficiaries into a pattern of political subservience via clientelism (2013).

This variation in outcome prompts our investigation: under what conditions do redistributive policies focusing on land actually "work" to reduce poverty? Why do top-down policies designed to alleviate inequalities in land ownership display such stark variation at the local level?

We build our argument on previous scholarship which has shown how certain institutions often have significant unintended legacies and an uncanny ability to persevere over time (Pierson 2004). We have good reason to expect that unintended consequences are especially important to consider in the specific case of land redistribution. First, land redistribution programs are exactly the types of top-down political reforms that, due to their scope and complexity, are particularly likely to trigger unintended— and unforseen— consequences (Sikor and Müller 2009, Bates 1981). Second, there is ample empirical evidence that institutions of coercive agriculture deeply inscribe patterns of beliefs and behaviors into polities, economies, and societies. Indeed, a rich literature shows how exposure to coercive labor practices tend to reduce contemporary economic productivity by lowering trust (Nunn 2007, 2008, Nunn and Wantchekon 2011), reducing investment and efficiency (Banerjee and Iyer 2005, Engerman and Sokoloff 2011), disincentivizing the provision of public goods (Dell 2010), and decreasing state capacity (Acemoglu, García-Jimeno and Robinson 2012). Research has even tied coercive labor institutions to the persistence of racial animus more than a hundred years after the abolition of slavery in the U.S. (Acharya, Blackwell and Sen 2018). Given how the instantiation of land reforms is at least to some extent endogenous to the prevalence of coercive agricultural institutions, we expect their influence on the post-reform landscape to be particularly hard to escape.

While the relationship between coercive labor institutions and land redistribution is underdetermined, the general expectation is that redistributing land to the poor should decrease poverty: land is a valuable asset not only in terms of providing stability, but because it can provide income when rented or sold (Banerjee 2000). Indeed, drawing on evidence from Columbia's 1968 reforms Galán finds that receipt of land served as a reservoir of credit that allowed beneficiaries to enter urban markets and invest in education (Galan 2020). Yet as we may expect, these benefits can be undone by limits on the use of land gained via reform. In Mexico, Dell finds that prohibitions on renting and transference, as well as requirements that politicians support decisions over use, reduces development of redistributed land (Dell 2012). Likewise, in India, inheriting land without the ability to freely enter the labor market— due to cultural norms— has adverse consequences for household wealth (Fernando 2016).

These insights help tie together our argument. On the one hand, coercive labor institutions are particularly likely to leave attitudinal and socioeconomic traces among the populations upon which they are imposed. And, as such, our expectation is that their legacies will be detectable even in post-land reform cases. Yet it is the connection to labor immobility that helps specify why these reforms succeed or fail in reducing long-term poverty: where receipt of reform land comes along with extensive restrictions on use, we expect the prospects for material gain to be inconclusive, at best. And, to the extent that the restrictions on use of land gained via redistribution *also* include prohibitions on moving or selling the land, our theory also provides an explanation for why these effects are often detectable in the geography of wealth and poverty decades after their enshrinement into law.

In the following sections we begin to empirically substantiate this argument with data from pre- and post- 1952 Egypt. We first use historical accounts to describe the *'izba* system and draw out intuitions about how subsequent land redistribution policies would highlight their legacies. We then introduce the statistical material that allows us to systematically examine the extent to which these historic institutions of coercive agriculture combined with Nasser's post-1952 reforms to lock-in patterns of local wealth and poverty that have persisted

into the present.

Coercive Agriculture in Egypt's Cotton Kingdom

Beginning in the early 1800s Egypt's agricultural economy began to transform. Successive Khedives, assisted by French and then British engineers, set the initial conditions for a cotton economy by extending a network of irrigation canals across the country (Willcocks and Craig 1913). At roughly the same time, a French agronomist fortuitously identified a new type of long staple cotton that, while water intensive, rivaled the best American products (Norris 1934, Earle 1926). When British mills began to struggle to reliably source American cotton due to the Civil War, Egypt emerged as more than just a substitute. It was, in the words of one British expert, "the most perfect cotton-country of the world" (Balls 1920, 193).

Yet while engineers planned canals that reliably irrigated Egyptian land, scientists had identified a sought after varietal, and buyers were starved for product, Egyptian producers struggled to meet demand. The problem was that decades of enclosure, heavy taxation, and flight from *corvée* labor had rendered a generation of Egyptian peasants landless (Baer 1962, 28- 39; Cuno 1992, 163-164). The expanding canal system similarly eliminated the historically slack (summer) season when the traditional irrigation basins dried out, meaning that producers suddenly needed agricultural workers year-round. But small scale farmers, "had no interest in growing a crop they could not eat, or process to serve local needs" (Mitchell 2002, 59). While this vast pool of laborers was good for large scale producers because it kept wages low, to produce cotton for export large landowners needed a means to corral large numbers of mobile workers, and compel them to spend the entire year cultivating a new crop that they could not eat, feed to their animals, or sell themselves.

Recent work suggests that while some of the demand for labor was met by an increase in slaves among small and medium-sized landowners, this option ceased in 1877 with the abolition of slavery (Saleh 2019). In response landowners increasingly turned to the *'izba*. Fundamentally a sharecropping system, laborers were given small plots of land grouped on

the outskirts of large estates on which they were expected to live with their families and grow their own food and fodder for their animals.[1] In exchange, these workers were required to work their landlord's holdings exclusively; a period Richards estimates at 25 days per month (1978, 505).

Debt peonage ensured continued compliance with the *'izba* system. While the workers were paid a small wage for their work on the owner's land, in practice it was often insufficient to pay for the inputs for their own small plot of land, necessitating loans. In many cases they had to buy or borrow these materials from the landlord himself (Stauth 1990, 297). A 1930 memo from the undersecretary of state to the minister of finance noted the extent of this dependency: "It is to the landlord that the tenant looks for seed, for manure, for water: he pays a high price for what he buys and receives little for what he sells; but there is no escape: he begins the year in debt and he ends it in debt; he is fettered and bound and by more than one chain" (Abdel Wahhab 1930, 31).[2]

A semblance of land tenancy, even when it came with financial indebtedness, was undoubtedly attractive to a generation of landless peasants. But underpinning the *'izba* was a system of "detailed and continuous control" that facilitated intense coercion (Mitchell 2002, 66). Because every moment spent working on the landlord's cotton was a moment away from a tenant's own food plot, shirking was a constant threat to efficient production (Richards 1977, 20). This was partially mitigated by an estate's overseer (*nazir*), a man adept with a club or the notorious hippopotamus-hide whip known as the *khourbaj*, and often specifically chosen for his proclivity towards violence (Abbas and El-Dessouky 2011, 113). In his own classic study, Henry Ayrout described this figure as:

[1]This is perhaps the relation to the Arabic root ع-ز-ب meaning "to be far or distant from." Wehr defines an *'izba* as "country estate, farm, rural settlement" (1994 (196, 713). Lozach (1930, 156-160) also provides a helpful explanation. Alleaume even connects the etymology of *'izba*, and the Arabic root meaning "distant from" to the fact that "...peasants were uprooted from their native lands and regrouped on the estate in housing modeled on workers' villages" (1999, 342). See appendix for a further discussion.

[2]The landlord's rent-seeking was notoriously comprehensive: "Most landowners require the renter to return to the land a fixed quantity of *baladi* (barnyard animal) manure per acre each year," which they were expected to purchase from the landlord himself (Norris 1934, 33).

> [T]he owner's real executive, on whom the whole system depends. Obsequious to his master, inexorable with the [peasant], it is his business to put all possible pressure on the agricultural machinery, that is, the [peasants], to increase production. To use an expression of the [peasant], he is like the saw, which cuts coming and going. He controls plowing, manuring, sowing and harvesting by the roughest kind of rule (1963, 17).

As Abaza concludes, based on the testimonies of former *'izba* residents, "spreading fear among the permanent workers was one main element that maintained order and discipline in the [estate]. Killings perpetrated by some *ghafirs* (guards) who terrorized the entire *'izba* did occur. Such murders were perceived as a 'natural' plague, with which the permanent workers had to cope" (2013, 79).

Even if the fear of returning to landlessness overcame the terror of *'izba* life, *'izba* properties were also designed and constructed— through walls, gates, and guards— to virtually imprison workers (Lozach and Hug 1930, 159). One former resident likened the setup to "a concentration camp" (Mitchell 2002, 70).[3] Another remembered how "the night guards (*ghafirs*) used to encircle the village or wait for the peasants along the road to stop them from running away and beat them" (Abaza-Stauth 1985, 50).

The *'izba* was thus a "total institution" that "represented a system of supervision and coercion that succeeded for the first time in fixing cultivators permanently in place on the land and preventing them from abandoning cultivation or moving to another region" (Mitchell 2002, 67). And while this institution defined Egyptian rural life for over a century, it was ultimately dismantled by Gamal Abdel Nasser's land reforms. In Saad's study of a former *'izba* property, she notes how, just a few years following the 1952 Revolution, distinctions between *'izba* residents, migrant labor, and landed peasants had "disappeared completely" (1989, 37). And as Stauth wrote in 1983, "Today, the *'izba*, as the classical unit of cash-crop production, has lost its former importance in Egyptian agriculture... the big estate as a

[3]The appendix includes images from two such estates, reproduced from a contemporary study (Lozach and Hug 1930).

production unit separated from the village economy has in fact almost completely vanished" (1990, 286).

Most historical accounts suggest that the legacies of the *'izba* ended with the land reform. On the other, there is evidence that the scars of the institution were cut deeply into areas where they once held sway. Recalling her own family *'izba*, Abaza writes in 2013 that "even through these 'private villages' ... have today withered away, they have remained mentally intact in the collective memory of the village. For many years, the village (the worker's hamlet) has been perceived by its surrounding villages as inferior in status, and its people as the most destitute of their neighbors" (2013, 80).

Abaza's quote suggests that while the physical institution of the *'izba* has vanished, its legacies have persisted through Nasser's dramatic reforms, to maintain an influence over the socioeconomic conditions of those in its former orbit. Did the *'izba*'s legacies endure beyond the land reform? If so, why did these legacies prove so durable despite the sweeping nature of the land reform? In the next section we introduce the historic and contemporary data that allow us to systematically assess this argument.

Research Design and Data

Dependent Variable: Household Wealth

Our dependent variable is an asset ownership index of common household items compiled in the large scale *Demographic and Health* (DHS) surveys of Egyptian women (Rutstein 2008, 2015).[4] In 1995, 2000, 2005, 2008, and 2014 enumerators surveyed 12,567, 16,957, 21,972, 18,968, and 28,175 ever-married Egyptian women of childbearing age (15-49), respectively. As questions across each wave were largely identical (although independent samples were drawn for each), we pool these five survey waves and add survey year fixed effects.

DHS surveys also account for the local spatial context of respondents. Since Egypt's 1992

[4] `https://dhsprogram.com/What-We-Do/survey-search.cfm?pgtype=main&SrvyTp=country`.

survey, "clusters" of nearby respondents have been assigned a single latitude and longitude at the approximate center of the respondents neighborhood or village (ICF International 2012). The particular spatial characteristics of the sample influence our analysis in important ways. Because this fine-grained spatial data is considered personally identifiable, DHS perturbs the latitudes and longitudes of each cluster in a random direction by a random but capped distance: up to 5km in designated "Rural" areas and up to 2km in "Urban" ones.[5] We rely on this built-in DHS perturbation to exogenously identify "local" catchment areas of 5km (buffers) for each cluster, and thus a plausible measure of the local geographic context of respondents.

Independent Variable: *'Izba Density*

The institution of the *'izba* emerged in the first half of the 1800s to manage cotton production and by the beginning of the twentieth century it was widespread. To identify the precise spatial distribution of these institutions near their peak extent, we geocode a 1932 *Gazetteer of Egypt* (Survey of Egypt 1932, Maslahat al-Misāha al-Misriyya 1932).[6] This document, produced by cartographers working for the Survey of Egypt, indexes by name every inhabited place in Egypt at the time. Testifying to the breadth of the institution, of the 14,166 inhabited places listed in the gazetteer, over half— 7,770— are identified as "*'izba*."[7] Each row of the gazetteer also includes each inhabited place's *mudiriya* (a first-level administrative division), *markaz* (a second-level administrative division) and, critical for our purposes, an Easting and Northing position (in kilometers) as well as the specific map sheet on the accompanying 1:100,000 scale map of Egypt on which the place can be found.[8]

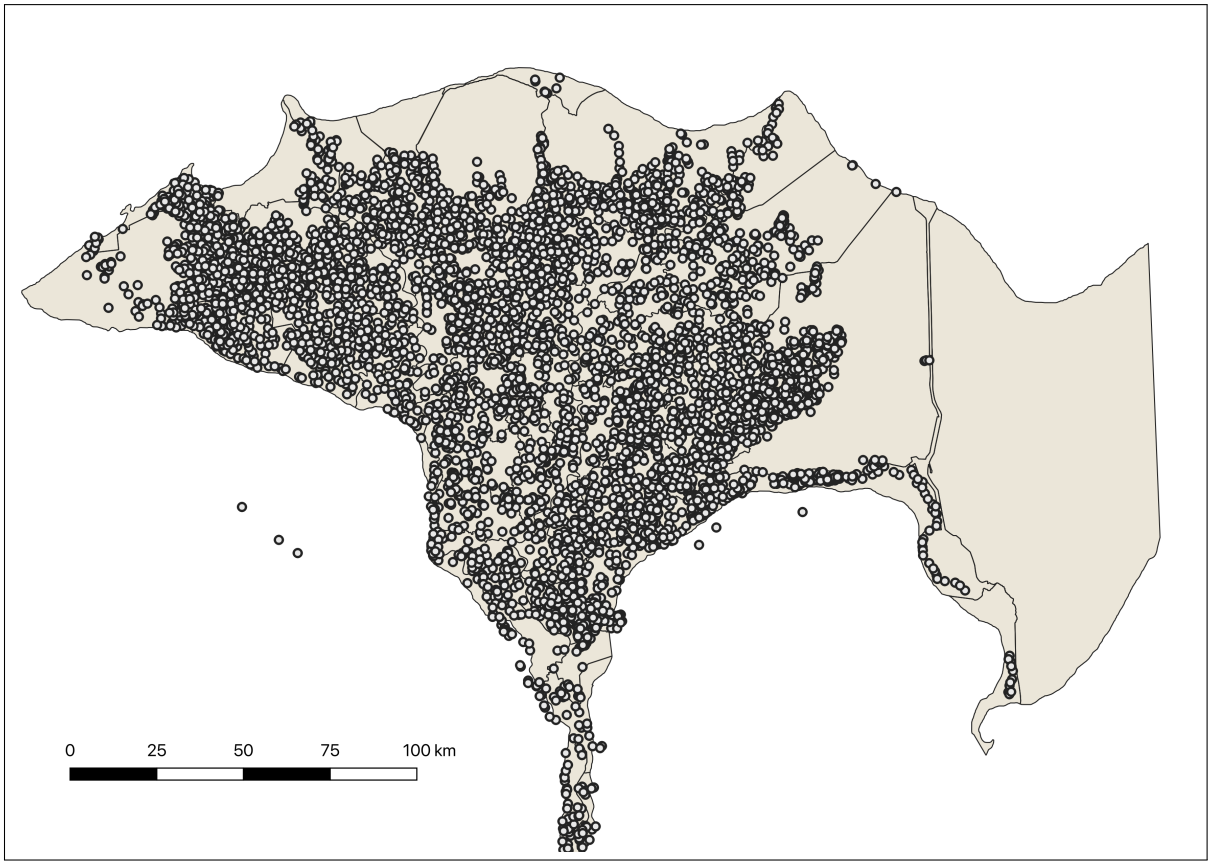
[5]Further, a randomly selected one percent of rural clusters are also displaced by up to 10 km.

[6]This English version of this document was digitized via OCR and manually checked and corrected for errors with reference to the Arabic version.

[7]Each also specifies the owner of the estate following the prefix *'izba*. As one contemporary chronicler noted, this designation followed the property: "each *'izba* has a name, and this name is of the founder (for example *'izba* Zaky Boulous or *'izba* Mahmoud Ibrahim); if he [the founder] dies the inheritor imposes his own name" (Lozach and Hug 1930, 159).

[8]These maps are held, in digitized form, at the University of Texas at Austin's Perry Castañeda library, at `http://legacy.lib.utexas.edu/maps/ams/egypt/`.

Figure 1: Spatial Distribution of *'izba* (Nile Delta)

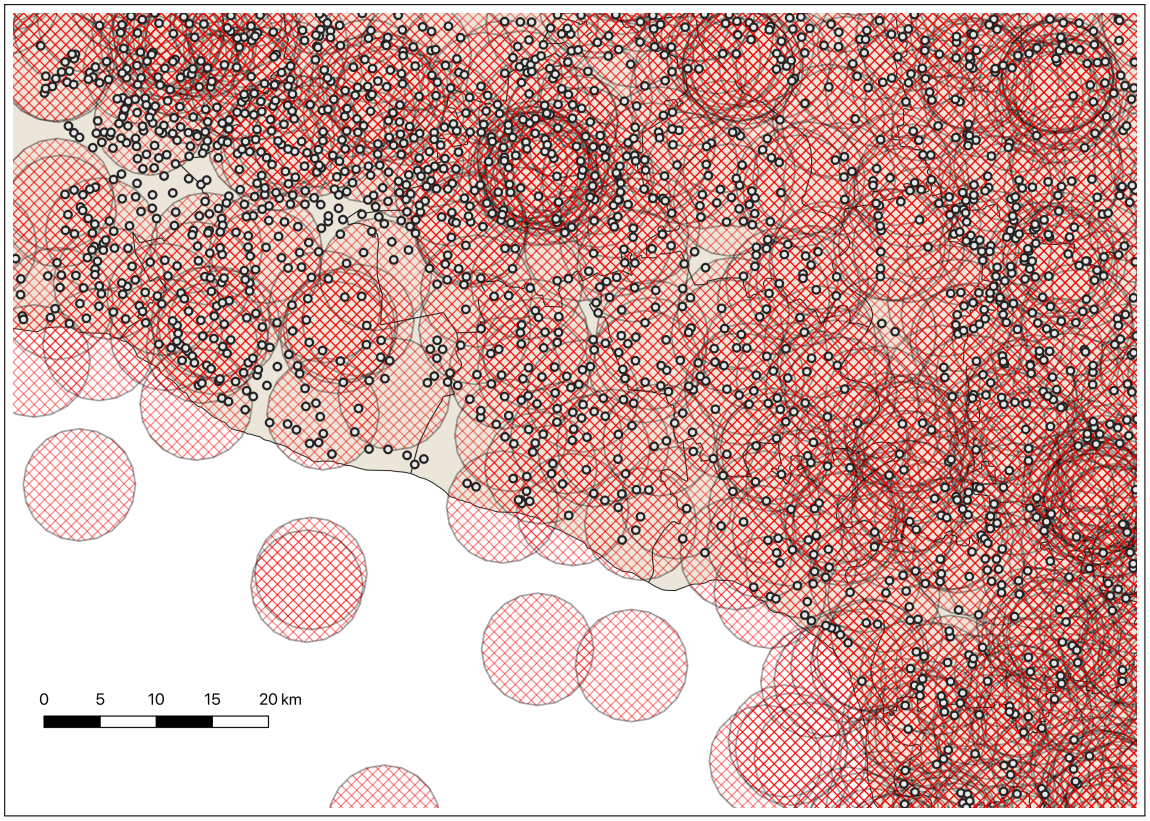


We transform the Easting and Northing coordinate system of the Gazetteer (Egyptian 1907 Red Belt Datum) to decimal degrees and overlay it onto a geo-referenced 1:100,000 scale map of Egypt from the interwar period from which district boundaries have been extracted and rendered as polygons.[9] We project the resulting distribution of *'izba* onto this shapefile of historic Egyptian districts to generate a national-level map of coverage. Figure 1 presents a subsection of this shapefile focusing on the Nile Delta.

We overlay the geolocated *'izba* as depicted in Figure 1 with the latitudes and longitudes of the DHS survey clusters and their associated 5km buffers, then calculate a count of *'izba* that fall into each cluster's catchment zone. Figure 2 illustrates the process with a close-up of the Nile Delta northwest of Cairo. Note that the underlying shapefile charts the historic extent of Egyptian districts approximately contemporaneous with the gazetteer (1932).

[9]More information on this particular datum can be found at: `https://epsg.io/22992`.

Figure 2: *'Izba* and Cluster Overlay (Western Nile Delta)



Before proceeding, it is worth further specifying the relationship between our theory, our concepts, and our measurement. We argue that the *'izba* spatially concentrated Egyptian peasants into an intense and highly unequal relationship of coercion and hierarchical dependency. The nature and length of this exposure systematically and locally depressed economic development in a manner that has persisted decades later, even through redistributive reforms that were designed to eliminate it. We measure our outcome with reference to DHS surveys of Egyptian women, which are valuable because they contain a rigorous measure of wealth based on an asset index of common household items. A more difficult task is to connect these contemporary outcomes to historical exposure to *'izba*. The nature of the DHS surveys here is both a hinderance and a help. On the one hand, the random spatial displacement of these groups of DHS responses ("clusters") is suboptimal: by design it obscures the true location of each respondent, which does not allow us to measure *'izba* exposure as pre-

cisely as we would like.[10] On the other hand, the maximum extent of these displacements— and the fact that they are explicitly done at random— helpfully generates an *ex-ante* catchment area: we know with certainty that each respondent lies within the catchment area. With this in mind, we can identify for each respondent the number of "proximate" *'izba*— i.e. the number of historic *'izba* inside their catchment area. In the absence of better measures, we view this count of proximate historic *'izba* properties as approximately capturing the intensity of that population's historic exposure to the *'izba* properties, and the likelihood they were influenced by subsequent institutional changes related to land redistribution policies.

Additional Variables

DHS surveys also allow us to adjust for a variety of theoretically relevant co-variates.[11] One challenge of our outcome variable— family wealth— is to avoid obvious but "bad controls" that are themselves outcomes of family wealth (Angrist and Pischke 2008). With this in mind, we produce variables for whether the head of household is a male or female, the age of the head of household, and the age of the respondent. We also generate for each household a sex ratio of ever-born children (male minus female children) with the expectation that this is plausibly exogenous to wealth and that households with more male children will be better off.

We also include the bespoke DHS variables for the percentage of land in each cluster currently used for pastureland as well as for farmland, and a dummy for whether or not the cluster is in a DHS-designated "urban" or "rural" area. We also expect that there exists a relationship between public goods and household wealth, and so we download from Open Street Map a nationwide shapefile of all major roads, and use this to calculate the sum

[10] This practice also has important implications for assessing spatial autocorrelation. See appendix for a discussion.

[11] DHS data is nested: respondents are situated inside households, and households are situated inside clusters. We effectively collapse the household and the respondent by dropping from the analysis all household members except the female head of household (i.e. the wife or widow of the head of household). 375 households (less than 1%) are polygamous, and for these we randomly drop all but one wife.

distance of all road segments (in log meters) that pass through a cluster's catchment area.[12] Our assumption is that the greater amount of road distance in each cluster, the greater available infrastructure. Our key independent variable, the number of *'izba* within the 5km catchment area, is also measured at the cluster level.[13]

Falsification Test

Our independent variable measures historic *'izba* density proximate to a sample of contemporary survey respondents. One possible concern is that *'izba* density, as measured by our catchment approach, is confounded by an unobserved feature of Egypt's agricultural economy, geology, environment, or something else. If this were the case, this unobserved factor— not any characteristic of the *'izba* itself— would confound any observed relationship.

To help mitigate this concern we derive a falsification test based around the *kafr* (كفر), defined by Hans Wehr as a "small village, hamlet" (1994 (196, 975). While *kafr* were also small agricultural communities, they did not feature the highly institutionalized coercion and large-scale production of the *'izba*. They were also the second-most numerous type of inhabited place in the gazetteer (behind the *'izba*): the gazetteer lists 833 *kafr* throughout the country. To the extent that any observed correlation between historic *'izba* density and contemporary wealth is actually an artifact of our particular measurement strategy, the density of historic *kafr* proximate to survey clusters would *also* emerge as a correlate of contemporary wealth. In contrast, if *kafr* density is uncorrelated with wealth, this would indicate that the our measure of *'izba* density is capturing something specific to the institution itself.

[12]Specifically, these are what Open Street Map classifies as motorways, trunk, primary, secondary, and tertiary roads.

[13]Summary statistics, as well as the correlation matrix, are available in the appendix.

Instrumental Variables Regression

While a placebo test may mitigate some concern about measurement error and unobserved confounder(s), *'izba* placement may itself be endogenous to poverty. In this section we revisit the historical record to address these constraints. The first part of this section derives historical evidence suggesting that the placement and operation of *'izba* was plausibly exogenous to extant socioeconomic conditions. The second uses this historical record to establish the spatial proximity of *'izba* to canals as an instrument that allows us to account for potential endogeneity or omitted confounders (Angrist and Krueger 2001).

Qualitative historical literature aligns on the point that *'izba* inhabitants were actually considered *better off* than those laborers elsewhere. As discussed above, widespread landlessness and poverty made the sharecropping arrangement of *'izba*— labor for land— a sought-after situation. In fact, it gave *'izba* inhabitants a privileged position vis-a-vis the itinerant seasonal labor migrants whose "situation was, and remains, the worst among the peasants" (Beinin 2001, 53). As noted above, this tight labor market allowed estate owners to hang what Richards (1978, 511-512) calls the "ultimate threat" of expulsion from the *'izba* over the heads of their workers to ensure compliance (see also (Abaza-Stauth 1985, 50)).[14] As Abaza describes it, life on the *'izba* "was not exactly a master-slave relationship but a complex one, based on a sort of protection under the rule of terror, whereby the peasants experienced a kind of bond with the estate since they perceived themselves, through this bond, as belonging to a higher rank than outsiders. They were the protected men of the *'izba*, *riggalat al-'izba*, who were entitled to minimal advantages, and yet lived under total surveillance" (2013, 78). This historical evidence should not only reduce concerns of endogeneity, but actually heighten the puzzle: given that *'izba* residents were historically thought to be advantaged over those on the outside, why, today are inhabitants in formerly *'izba* dense areas worse off?

[14]Elsewhere, Richards pithily summarizes how *'izba* owners maintained their regimen of production by threatening workers with "sack and the stick" (Richards 1979, 485).

An instrumental variables regression can also help address these concerns. Following Duflo and Pande (2007) we use exogenous hydrological factors to aid our causal inference strategy. Specifically, we instrument for *'izba* density with the distance (in meters, logged) between the centroid of DHS cluster and the nearest major irrigation canal as identified on a nationwide, 1:750,000- scale map of Egypt produced at roughly the same time as the gazetteer (see Appendix).

The history of Egypt's agricultural economy supports both the plausible exogeneity and relevance of our instrument. Egypt's canals were initiated by the French in the 1820s and vastly expanded on by Mohamed Ali and the British under the "protectorate" after 1882 (Brown 1994). At all points the physical geography of the Nile dominated planning, including seasonal variation in flow, soil quality, and slope. One historian noted how the early French attempts were "constructed at random and chaotically" and how later British improvements relied on "parts of old-river beds in the Delta" (Gudowski 1984, 104). The foremost British authority on Egyptian irrigation noted this pattern in the 1890s: "of the existing canals a few are on new alignments, most follow the traces of the old channels, and are in consequence very winding and crooked. They however, command the country well and intercept no drainage" (Willcocks and Craig 1913, 369). This suggests that the water-intensive cotton varietal grown on *'izba* would establish a spatial relationship between *'izba* density and major irrigation canals.

The instrumental variables approach rests on an untestable "exclusion restriction" which assumes that the instrument can only effect the outcome through the endogenous explanatory variable. In our case, this means historic canal proximity can only influence family wealth via *'izba* density. The historical evidence shows how the Egypt's major canals largely preceded the *'izba* system, mitigating concerns of reverse causation. However, an additional concern is that these historic canals might influence contemporary poverty through a backdoor path related to exposure to waterborne diseases and parasites such as schistosomiasis (*Schistosoma mansoni*), which is endemic in Egypt. This relationship is theoretically plausible: according

Table 1: Correlation Test, Historic Canal Proximity and Child Health Outcomes

	Model 1 *Fever*	Model 2 *Diarrhea*	Model 3 *Anemia*	Model 4 *Stunting*	Model 5 *Mortality*
Distance to Canal (M, log)	0.0000644	-0.00215	0.00176	10.62	0.000689
	(0.00210)	(0.00164)	(0.00107)	(18.97)	(0.000689)
Observations	40818	40818	40818	40818	41397
Controls	Yes	Yes	Yes	Yes	Yes
Survey Year FE	Yes	Yes	Yes	Yes	Yes
Governorate FE	Yes	Yes	Yes	Yes	Yes
Adjusted r^2	0.048	0.025	0.075	0.056	0.015

Cluster robust standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

to the World Health Organization, "in terms of socioeconomic and public health importance in tropical and subtropical areas, [schistosomiasis] is second only to malaria" (1985, 16-20). To identify if this relationship threatens the exclusion restriction, we use supplemental DHS data on children— the demographic most at risk for schistosomiasis— to construct five epidemiological outcome measures:

- Percentage of children in the household who have had diarrhea in the past two weeks ("Diarrhea").
- Percentage of children in the household who have had a fever in the past two weeks ("Fever").
- Percentage of children in the household who have mild, moderate, or severe anemia ("Anemia").
- Average height-weight ratio of children in the household ("Stunting").
- A dummy for whether or not a child in the household died ("Mortality").

Table 1 presents the results of OLS regression models assessing whether or not these health outcomes correlate to our proposed instrument, proximity to major historic irrigation canals.

Results from Table 1 are encouraging: none of the measures correlate with proximity to canals at a level where the null hypothesis can be rejected. While the exclusion restriction

is ultimately an assumption— i.e. untestable— the combination of historic evidence and epidemiological data should raise confidence that the path connecting Egypt's historic system of major irrigation canals to contemporary poverty would most plausibly run through the *'izba* system.

Results

As noted, because we pool multiple waves of the DHS survey we include survey year fixed effects. Egypt's first level administrative division, known as the governorate, plays an important role in the provision of public goods and general operations of the state.[15] Thus we also apply fixed effects to account for unobserved heterogeneity at this level. Finally, since treatment is effectively assigned at DHS cluster, we enter cluster robust standard errors at that level.

Table 2 presents the results of our examination into the influence of the *'izba* on contemporary wealth. Model one shows the reduced form, estimating the effect of *'izba* density on wealth with only minimal specifications. Model two includes full controls. Model three presents the results of the falsification test, swapping out as the key independent variable a measure of *kafr* density for *'izba* density. Model four is the instrumental variables regression.[16] Complete results for each model are available in the appendix.

A variety of factors contribute to the economic status of a given Egyptian family. Results in Table 2 suggest an important but as-yet unappreciated structural factor: whether or not a family resides in an area where *'izba*, were historically dense.[17] The historic density of

[15]These are correct as of the latest survey wave in 2014, they have since changed. They are: Cairo, Alexandria, Port Said, Suez, Damietta, Dakhaliyya, Sharkiyya, Qalyubiyya, Kafr El-Sheikh, Gharbiyya, Menoufiyya, Beheira, Ismailiyya, Giza, Beni Suef, Fayoum, Minya, Assiut, Sohag, and Aswan. The small governorates of Qena and Luxor are combined in the DHS data, as well as the governorates of Matrouh, Wadi Gedid, Red Sea, and North and South Sinai (as "Frontier" governorates).

[16]We use the `ivreghdfe` suite of commands produced by Sergio Correia `https://github.com/sergiocorreia/ivreghdfe`.

[17]In the appendix we provide a series of robustness checks, including dropping from the analysis all respondents who report having moved, dropping all residents designated by DHS as living in an "urban" cluster, using as independent variable count of *'izba* where the owner had a formal title (e.g. pasha), dropping all frontier governorates, and logging our independent variable. We also use a multilevel model to fit the

Table 2: Relationship Between *'Izba* Density and Wealth

	Model 6	Model 7	Model 8	Model 9	
	Reduced	*Full*	*Falsification*	*1st Stage IV*	*2nd Stage IV*
	OLS	*OLS*	*OLS*	*OLS*	*2SLS*
'Izba Density	-.00342***	-.00422***			-.0155***
	.00076	(.0006)			(.00325)
Kafr Density			.00489		
			(.00287)		
Meters to Historic Canal (log)				-1.8903***	
				(.14334)	
Observations	69,400	69,400	69,400	69,400	69,400
Controls	No	Yes	Yes	Yes	Yes
Survey Year FE	Yes	Yes	Yes	Yes	Yes
Governorate FE	Yes	Yes	Yes	Yes	Yes
r^2	.2754	.4672	.4653		

Cluster robust standard errors in parentheses
$+p < 0.1, *p < 0.05, **p < 0.01, ***p < 0.001$

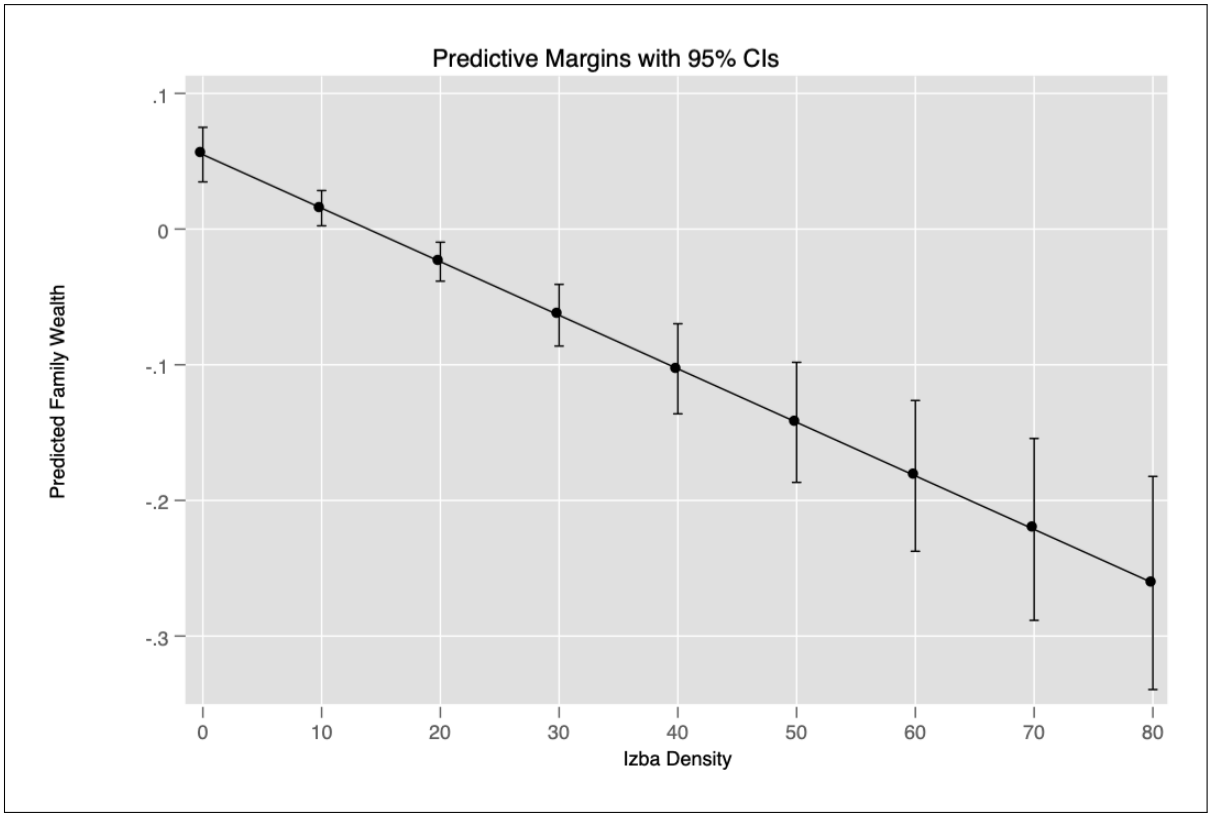
these coercive agricultural institutions proximate to a given family is strongly and inversely correlated with that family's wealth, and its coefficient is relatively stable in terms of magnitude, including once the model is adjusted to account for theoretically relevant covariates. To help illustrate the relationship, Figure 3 presents the predicted shift in our dependent variable, an asset index measuring household wealth, from the fifth to the 95th percentile of the count of *'izba* within the catchment area of the cluster, holding all other variables at their means.

Models eight and nine provide further support for the argument. In the falsification test (Model eight) *kafr* density does not register an effect on contemporary wealth that is different from zero at conventional levels of statistical significance (p = .26). This is one sign that the effect noted for *'izba* is not an artifact of an unobserved confounder related to our measurement strategy (again, if we observed the *kafr* placebo behave similarly as the *'izba* variable, that would indicate our findings were possibly an artifact of some unmeasured variable).[18] Our instrumental variables regression (model nine) provides strong evidence

data, including random intercepts at the level of the DHS cluster. In all these specifications the results are substantively unchanged.

[18]We also interpret it as evidence that our results are not overly driven by spatial autocorrelation. See

Figure 3: Marginal Effects of *'Izba* Density on Family Wealth



that *'izba* density is causally related to family wealth.[19] The first stage is strongly and, as expected, inversely correlated: the closer a respondent lives to a historic irrigation canal, the more dense *'izba* become.[20] The second stage results of model nine identify the average treatment effect of how *'izba* density influences contemporary patterns of wealth and poverty: families living in historically *'izba* dense areas are significantly poorer than those living further away.

The *'izba* dominated Egypt's agricultural economy for a century, and was one of the first casualties of the 1952 revolution. Yet according to our data, there is a consistent relationship between historic *'izba* density and contemporary patterns of wealth and poverty. In the

appendix for further discussion.

[19]Our instrumental variable passes the appropriate tests. The Kleibergen-Paap Wald F Stat for weak identification is 170.255, this allows us to reject the null hypothesis that the equation is weakly identified. The Kleibergen-Paap LM statistic for underidentification is different from zero, rejecting the null hypothesis of underidentification.

[20]The appendix produces small-scale historic maps that are further supportive of this relationship.

following section we explain why this relationship proved so persistent.

Why Nasser's Land Reforms Exacerbated Poverty

One unintended side effect of Egypt's canonical post-1952 land reforms was to spatially consolidate poverty in formerly *'izba*-dense areas. In this section we describe and provide evidence consistent with a causal chain whereby the receipt of redistributed land that could neither be sold nor subdivided locked former *'izba* residents into the agricultural economy. Simultaneously, the instantiation of a compulsory agricultural co-op system for managing supply and demand systematically depressed the value of their labor. The result is the pattern of landowning but asset-poor families that appears in our data.

A centerpiece of the Free Officers reforms was the redistribution of land, so that former *'izba* sharecroppers soon found themselves in possession of a small plot (usually 2-5 feddans—one feddan is slightly larger than one acre) of agricultural land. Richards describes the logic of these reforms: "primarily ex-tenants received land, since only they were presumed to have the necessary farming skills. Landless day laborers, by contrast, acquired comparatively little land" (1982, 177).[21] In practice, this meant that former *'izba* residents— the "ex-tenants"—disproportionately benefitted from these reforms (Saad 1989, 53). One condition of the redistribution, however, was that owners could neither sell nor divide through inheritance their land for thirty years (Warriner 1962, 33-35).[22] As Weyland puts it, "Nasserist reforms have enhanced the cultivator's position by small land grants and by legally securing tenure systems in his favor— at the same time the reforms thus had the effect of securing the cultivator's attachment to the land" (2002, 97).

Anchoring beneficiaries to former *'izba* land provides part of the link to contemporary poverty. A second link arises because the beneficiaries of the land reforms were also required

[21]Similarly, in his case study, Adams notes how his village lacked many large landowners, so patterns of landholding and landlessness was not influenced by the reforms (1986, 164).

[22]Saad's ethnographic work shows how many families developed informal ways to subdivide the plots to maintain inheritance traditions inside families (Saad 1989, 100-107).

to join new, government-organized agricultural cooperatives (Radwan 1977, 15). Theoretically, these institutions would "replace the former landowner in the organisation of cultivation, provision of credit and other inputs, and the marketing of produce," allowing the new landowners to maintain the benefits of efficiently producing at scale (Radwan 1977, 57). In addition to managing production through control of inputs, the co-op system also served as a channel through which the state structured the economic output by buying a mandated quota of the production at a set price, before re-selling it on the world market (Warriner 1962, 33-35, 43-49). However, as Radwan notes, "the prices of compulsory deliveries were usually fixed at much lower levels than those that could be obtained from the free market" (1977, 72). One case study even calculated that co-op farmers were losing up to 40% of the value of their crop because of state monopsony (Adams 1986, 161). As Saad summarizes, "a common view is that, due to these restraining factors, any kind of rational calculation would make them prefer to be wage laborers rather than Agrarian reform beneficiaries" (1989, 75). Indeed, as one farmer lamented, "If I had not taken *Islah* land (land distributed as part of Nasser's reforms), it would have been better for me. I would have been working as a laborer for 4 pounds daily" (cited in (Saad 1989, 75)).

The irony of replacing predatory absentee landlords with mandatory government co-opts has not been lost on observers. A variety have noted how the co-op system reproduced the *'izba* in all but name, even down to using former *'izba* overseers (*nazir*) as managers of the new co-ops (Owen 1986, 81-82). For example Stauth describes the transition from *'izba* to co-op as one "without discontinuity" (1989, 123). Richards claims that "it would not be a great distortion to say that Land Reform Cooperatives were "Government 'Izab" (1982, 181). And Weyland concludes that "in the wake of Nasserist reforms the Egyptian countryside had become ... one large *'izba* operated primarily according to the state's interests." (2002, 96).

These quotes suggest that Nasser's celebrated land reform policies were the key link between historic *'izba* density and contemporary poverty: instead of freeing former tenants to use their new asset to take advantage of the labor market, it chained them to relations

Table 3: Relationship Between *'Izba* Density and Landownership

	Model 10	Model 11
	Agricultural Landowner	*Works Other's Land*
Izba Density	0.000660**	-0.00235+
	(0.000208)	(0.00122)
Observations	76,925	4,259
Survey Year FE	Yes	
Governorate FE	Yes	Yes
Adjusted r^2	0.138	0.058

Standard errors in parentheses
+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001

of production that were not noticeably different than those they had just escaped. This historical evidence establishes an implication testable with our quantitative data: that areas with a higher density of historic *'izba* feature systematically *higher* rates of contemporary landowning. Two DHS questions allow us to assess this implication. The first queries whether or not the household owns agricultural land. The second queries a small subset of one survey wave if the husband works on someone else's land. We model these outcomes in Table 3. All model specifications follow those in model 7 from Table 2.

Table 3 shows how areas with more historic *'izba* systematically correlate with contemporary land ownership. The relationship for the main question is strong ($p < .01$) and robust to our suite of control variables as listed above. The smaller sample of husbands yields similar, although slightly weaker ($p = .055$) results: areas with more historic *'izba* featured fewer agricultural laborers working someone else's land. A closer look at the history of post-1952 reveals the source of this unexpected relationship: Nasser's land reforms, which redistributed former *'izba* land to peasants even as forced them into a mandatory government co-op system, systematically tied former *'izba* residents to the land and depressed their earning potential. In light of this, it seems that the aforementioned commonalities between the defunct *'izba* system and the government co-opt that replaced it are systematically detectable in the data. Meet the new boss, same as the old boss.

Conclusion

Why do some redistributionist policies fail to alleviate poverty? This question is highly relevant for land reforms, which are designed specifically around the idea that land is a key asset that eases the climb up the ladder of socioeconomic mobility. In cases where these reforms fail to achieve their stated goal, or even exacerbate the problem, what is the specific causal mechanism responsible?

We combine historic data on the spatial distribution of thousands of Egyptian *'izba* with contemporary survey data from thousands of Egyptian families to identify a connection between the paradoxical, poverty-embedding results of Egypt's post-1952 land reforms and the underlying structures dating to the country's prewar Cotton Boom. Qualitative evidence, a placebo test, as well as an instrumental variables analysis all raise confidence in both our measurement strategy and the causal effect we propose. Further analysis reveals how Nasser's package of post-1952 land reforms redistributed land to Egypt's peasants, yet simultaneously institutionalized labor immobility and depressed earning potential among beneficiaries. By distributing land and a limited, rather than full, suite of rights, land reform failed to produce the expected benefits (Goldstein and Udry 2008).

Our strategy is valuable because it leverages a quirk of a naming convention to identify the conditions under which redistributive policies succeed or fail. But there are a variety of ways our analysis might be bettered. First, our measure of contemporary respondents' historic exposure to *'izba* is noisy and to some extent speculative; ideally we would be able to better trace our respondents' genealogies to more concretely isolate their— or their family's exposure— to the historic incidence of an *'izba*. To the extent that better data on the beneficiaries of land reforms could be recovered, it would also help to more precisely isolate the ways that land reform operated at the local level. And while our data about the geography of Egypt's cotton economy is new, it also necessitates treating every *'izba* as identical: our key independent variable, isolated from a historic gazetteer, is comprehensive but shallow. It lacks useful additional information such as the acreage, working population,

and age of each *'izba* that likely influence their particular legacies. Future scholars should be alert for opportunities to revisit and potentially revise our findings as better data becomes available.

Our work also implies new ways to think about Egypt's specific history. Scholars of Egypt's agricultural economy describe considerable coercion and inequity, yet these investigations have been highly specific, often focusing on personal experiences in a single village or town (Abaza 2013, Saad 1989). Other investigations identify the *'izba* as a historic institution inexorably linked to Egypt's pre-war cotton economy (Mitchell 2002). We build on these accounts, but also show how the *'izba's* influence was both widespread and persistent. Relatedly, our findings suggest revising the narrative of Egypt's much-discussed land reform initiatives. While it may have cemented the new revolutionary regime by degrading alternative centers of power and distributing land to the landless, one unintended consequence appears to have been the creation and perpetuation of a new strata of land rich, asset poor Egyptians.

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Appendix: When Redistribution Exacerbates Poverty: Evidence from Gamal Abdel Nasser's Land Reforms

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1 Summary Statistics

Table 4: Summary Statistics
(Cluster-level Variables in *Italics*)

	Mean	Median	Std. Dev.	Min	Max
Own Age	34.321	34	8.341	15	49
Family Wealth	.003	-.044	.941	-6.405	6
Child Sex Balance	.1	0	1.86	-10	11
HH Head Age	41.206	40	9.785	16	97
Male HH Head (0/1)	.944	1	.229	0	1
Cropland	.171	.211	0	.463	
Kafr Density	1.469	0	2.549	0	27
Pastureland	.039	.04	.013	.001	.069
'Izba Density	13.319	10	13.409	0	80
Rural (0/1)	.537	1	.499	0	1
Major Road (M, Log)	10.44	10.583	1.88	0	12.876
Distance to Historic Canal (M, Log)	8.342	8.269	1.615	.646	13.056

Each observation comprises one family (n = 69,400)
69,400 families nested in 6,278 *clusters*.
6,278 clusters nested in 21 governorates.

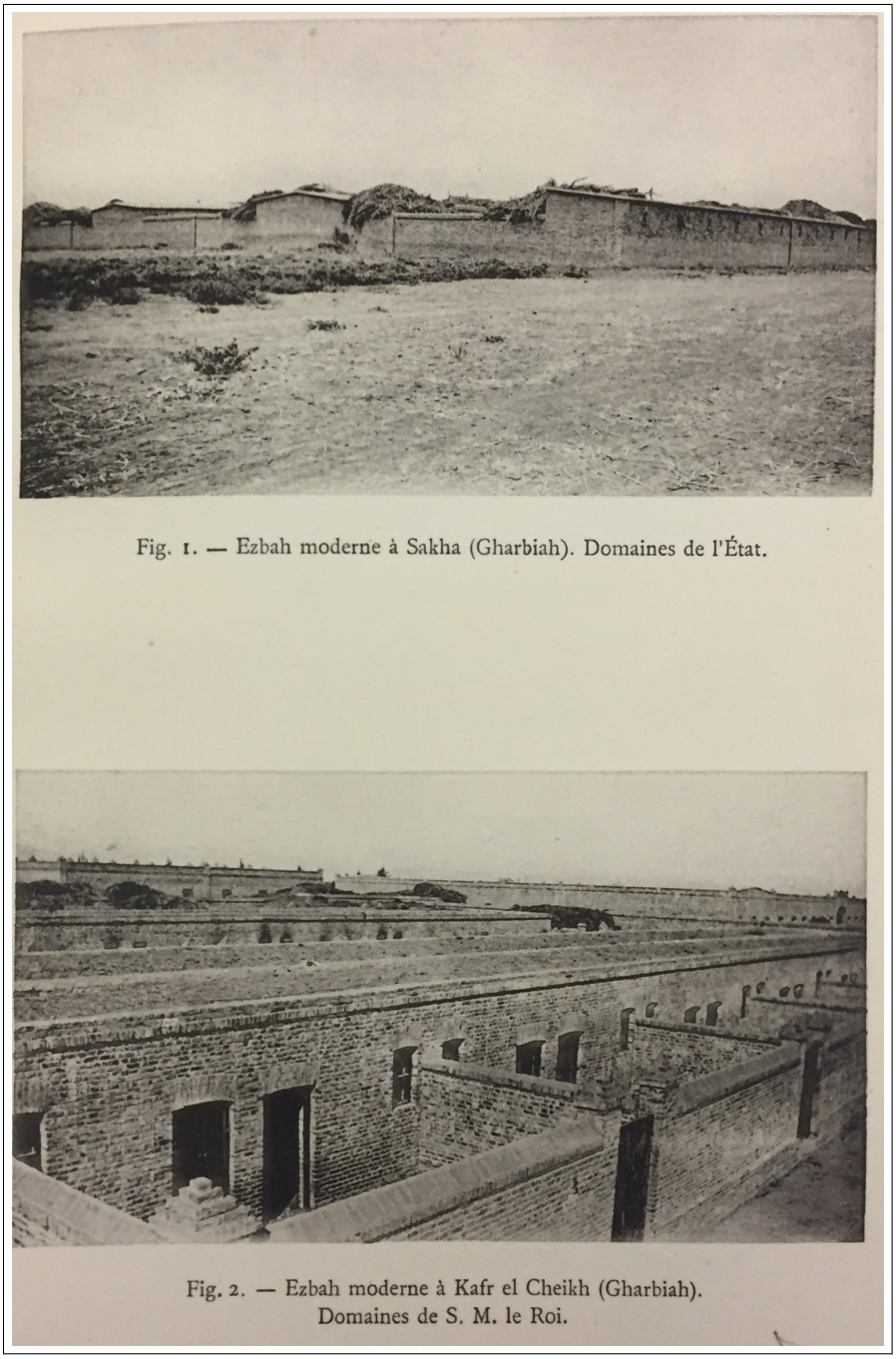
2 Correlation Matrix

	(1)											
	Family Wealth	Izba Density	Kafr Density	Distance to Canal (M, log)	Rural (0/1)	Pastureland	Cropland	Child Sex Balance	Major Road (M, Log)	HH Head Age	Age	Male HH Head (0/1)
Family Wealth	1											
Izba Density	-0.0762	1										
Kafr Density	-0.00941	0.302	1									
Distance to Canal (M, log)	0.0698	-0.365	-0.249	1								
Rural (0/1)	-0.616	0.131	0.160	-0.147	1							
Pastureland	0.142	0.134	0.332	-0.359	-0.0787	1						
Cropland	0.244	0.356	0.377	-0.362	-0.0625	0.218	1					
Child Sex Balance	-0.0177	-0.00205	0.000558	0.00150	0.00653	0.00103	-0.00664	1				
Major Road (M, Log)	0.362	0.0454	0.0426	-0.0906	-0.392	0.307	0.190	-0.00461	1			
HH Head Age	-0.00761	-0.0304	-0.0337	0.0252	-0.0490	-0.0285	-0.0216	0.0164	0.0349	1		
Age	0.0318	-0.0219	-0.0102	0.0134	-0.0859	-0.00353	0.0262	0.0162	0.0599	0.803	1	
Male HH Head (0/1)	0.0392	-0.00303	-0.00249	0.0166	-0.000761	-0.00275	-0.00712	-0.000903	-0.00799	0.00511	-0.197	1

3 The *'Izba*

Figure 4 depicts an *'izba* belonging to the Royal Family in Gharbia, Lower Egypt circa 1930 (Lozach and Hug 1930, Plate VIII).

Figure 4: Royal *'izba* in Lower Egypt



4 Spatial Autocorrelation

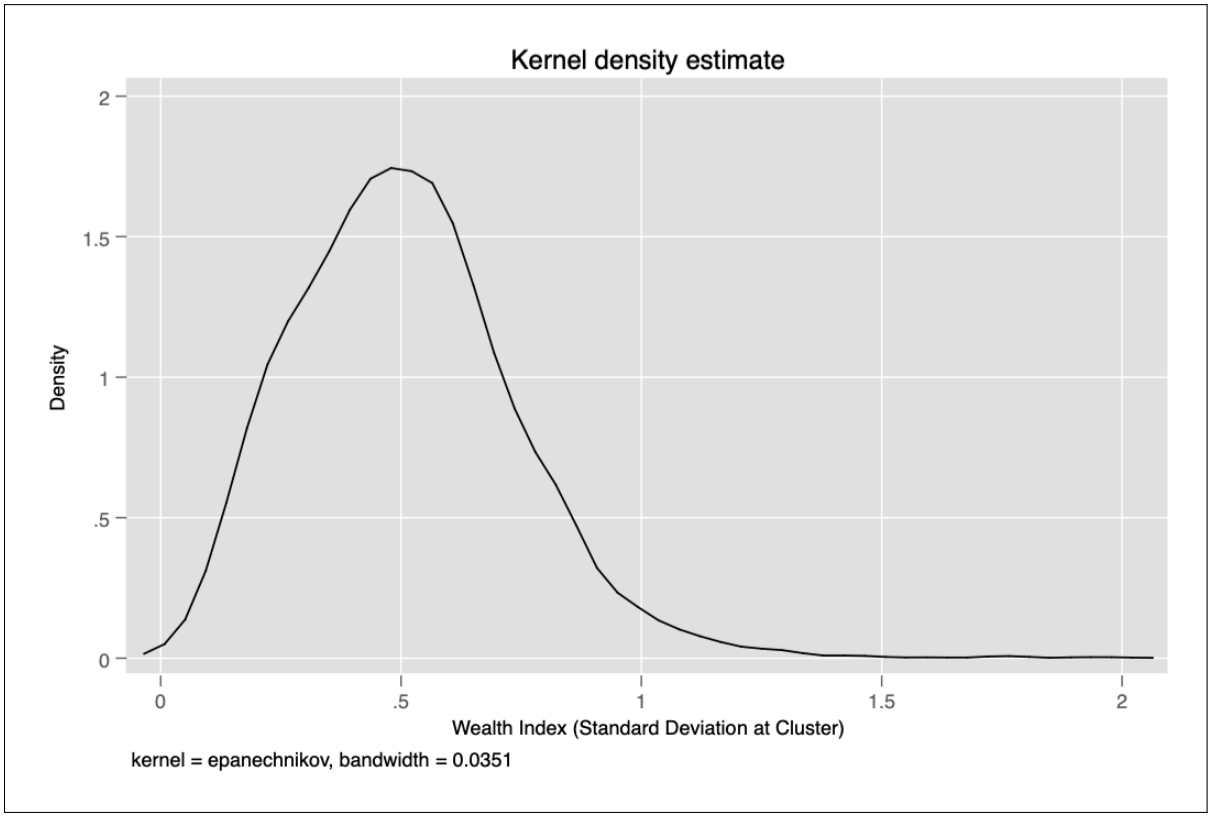
A clear concern is the possible existence of spatial autocorrelation in our data. If this were severe enough, it would trigger a Type I error. Indeed, this shortfall has been flagged as a particular problem in the type of cross-sectional historical persistence study as ours (Kelly 2019). Unfortunately, a natural check for the severity of spatial autocorrelation, Moran's I, is not possible due to the structure of our data. First, the size of our dataset— nearly 70,000 individuals— renders computing a k-nearest neighbor matrix extremely intensive computationally, to the extent that the program (`ape`) hangs. Second, even if the computational demands could be met, the nature of the DHS geolocation would render the measure effectively meaningless. Recall that small sampling areas ("clusters") are randomly selected and proximate families are randomly selected for interviews. To protect their privacy, each family is assigned the same latitude and longitude: the central point of the cluster. Effectively, then, every family is perfectly spatially correlated with every other family in the sampling cluster.

There is likely some degree of spatial autocorrelation in our data and skepticism over the results are warranted based on this alone. However, we would flag two points indicative of the likelihood that our results are more than just artifacts. First, our placebo test based on distribution of the *kafr* does not show the same correlation to wealth as the *'izba*. The *kafr* was a similarly agricultural community, but not based on the coercive, sharecropping-style of production that marked the *'izba*.[23] To the extent that our results do not explain something our theory predicts they should not, concerns that our results are spurious should be somewhat mitigated.

Second, there is considerable within-cluster variation in families' wealth and poverty. Figure 5 displays a kernel density plot of each cluster's standard deviation of family-level

[23]In effect, our *kafr* is a placebo check for our independent variable. We also substitute our dependent variable (the wealth index) for two variables we take as plausibly uncorrelated with *'izba* density: the birth month of the female respondent, and the month that marriage co-habitation began. As expected, neither show a strong correlation: $p = .907$ and $p = .503$, respectively.

Figure 5: Individual-Level Variation in Outcome



wealth indices (our dependent variable):

In fact, the interclass correlation of the null model (see below for full mixed-effects specifications) indicates that individual-level factors account for over 40% (.4098) of the variation in wealth (while cluster-level factors account for approximately 59% (.5902) percent of the variation). That we see a fair amount of within-cluster variation we would expect concerns about spatial autocorrelation to be lessened.

5 The *'Izba*-Canal Relationship

In the body of the paper we adduced historical evidence that Egypt's historic system of irrigation canals are a plausible instrumental variable for *'izba*. Our measure of canal proximity comes from georefererencing the major canals on a Nicohsoff map roughly contemporaneous to the gazetteer (1932). Figures 6 and 7 and show portions of the georeferencing and original map, respectively.

Figure 6: Historic Canal Network (Geolocated)

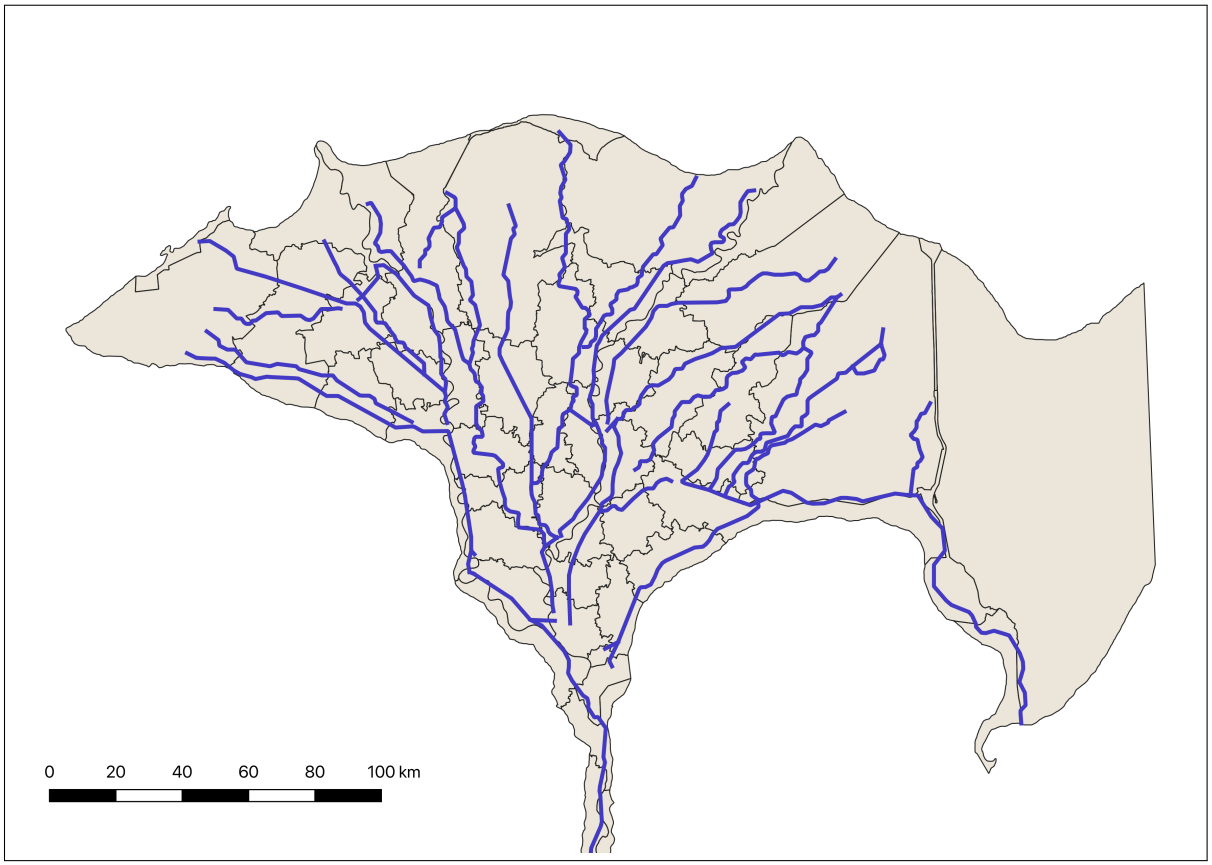
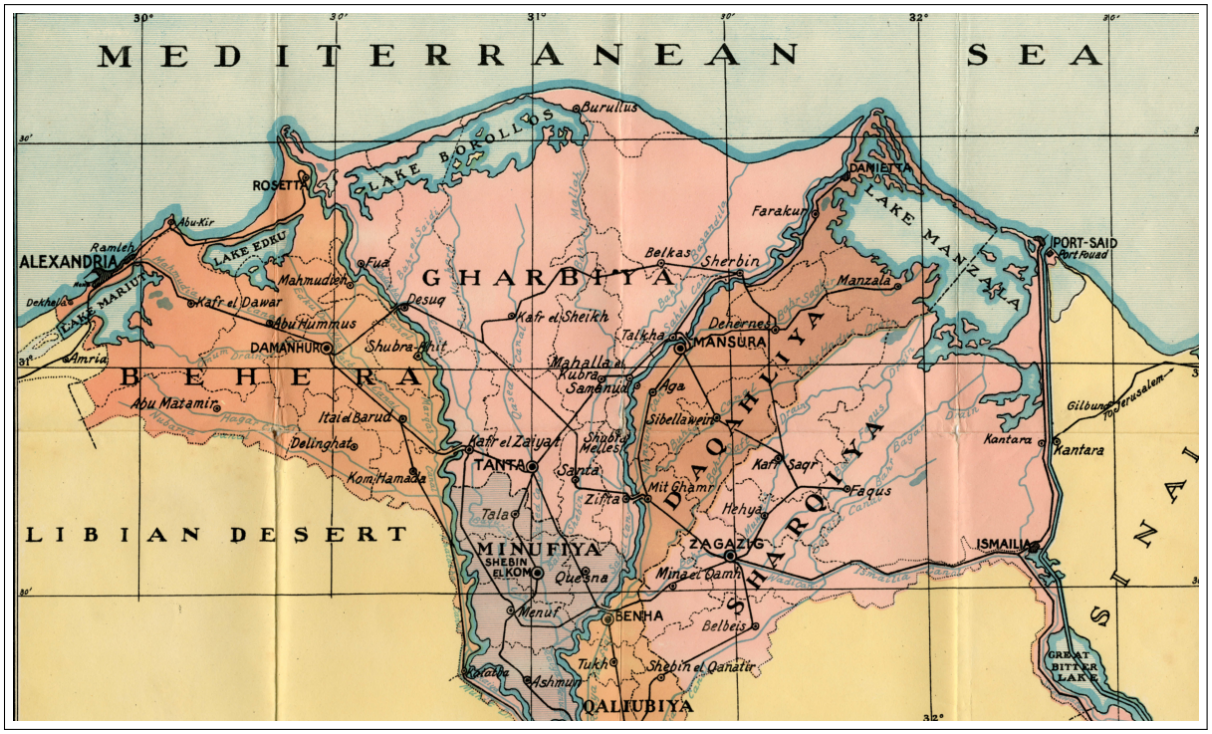
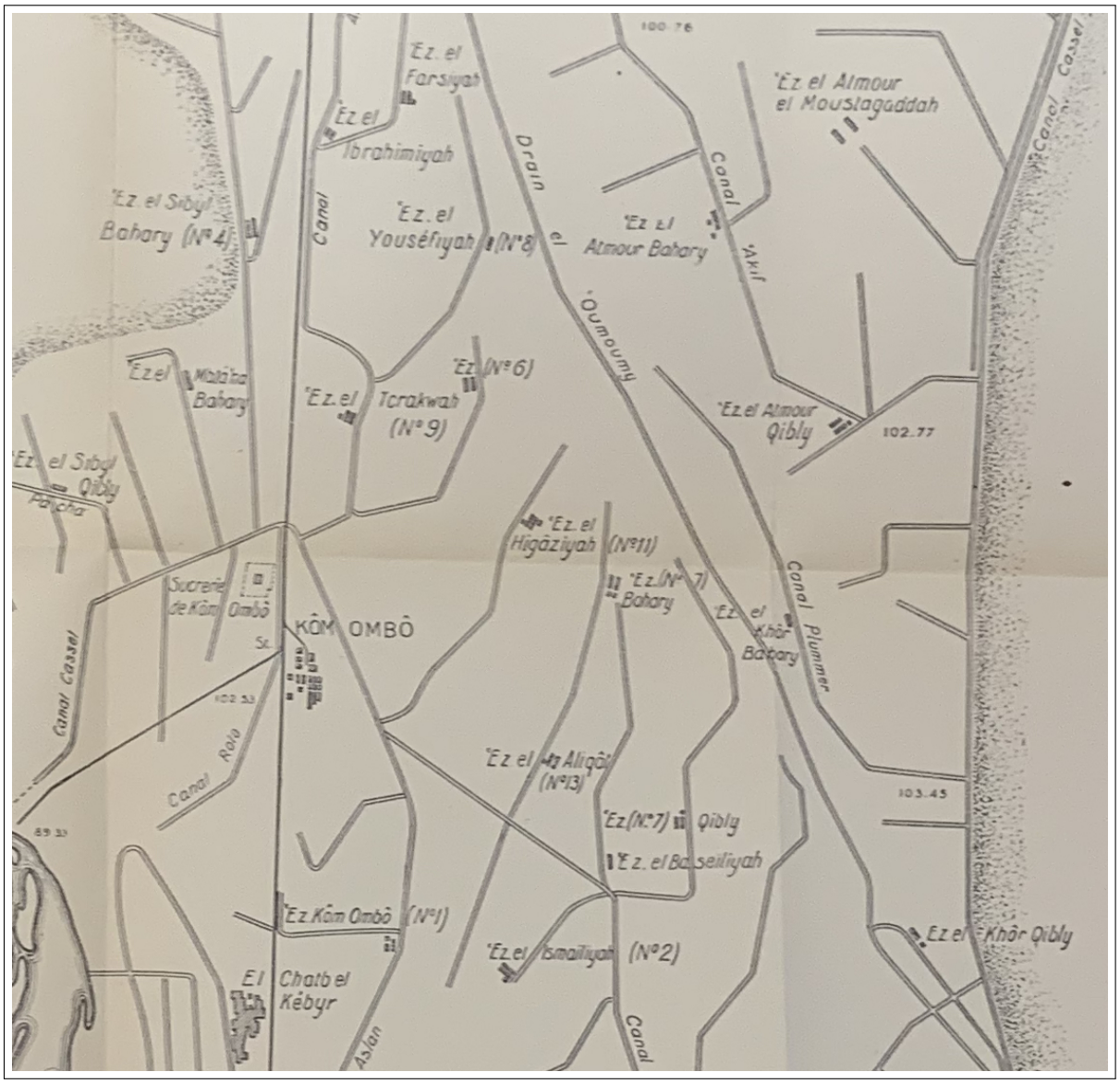


Figure 7: Historic Canal Network (Original)



As noted, our first stage results show a strong relation between proximity to historic canals and *'izba* density. Figure 8 reproduces a map from Lozach and Hug's study of the Egyptian countryside that helps illustrate the tendency of *'izba* to cluster around canals (1930, Carte hors text I).

Figure 8: Clustering of *'Izba* and Canals



IV Correlation Test

Table 1 in the main text reported a condensed series of results for a plausibility probe whether or not there may exist a backdoor path between canal proximity and wealth running through exposure to waterborne disease (as opposed to *'izba* density). Table 5 presents the full results of those regressions.

Table 5: Correlation Test, Historic Canal Proximity and Child Health Outcomes

	Model 1 *Fever*	Model 2 *Diarrhea*	Model 3 *Anemia*	Model 4 *Stunting*	Model 5 *Mortality*
Distance to Canal (M, log)	0.0000644	-0.00215	0.00176	10.62	0.000689
	(0.00210)	(0.00164)	(0.00107)	(18.97)	(0.000689)
Rural (0/1)	-0.0000112	0.00225	0.00935**	3.136	0.00923***
	(0.00572)	(0.00437)	(0.00312)	(51.86)	(0.00180)
Pastureland	-0.301	0.0196	-0.667***	7980.6**	-0.0119
	(0.289)	(0.211)	(0.166)	(3001.9)	(0.103)
Cropland	-0.00115	-0.0978	-0.0810	943.3	0.00150
	(0.0901)	(0.0571)	(0.0550)	(784.4)	(0.0272)
Child Sex Balance	0.00117	0.00115	-0.000145	-37.36***	0.000306
	(0.00103)	(0.000776)	(0.000594)	(8.066)	(0.000410)
Major Road (M, Log)	-0.00157	-0.000587	-0.00112	-48.73***	-0.0000989
	(0.00145)	(0.00112)	(0.000745)	(13.70)	(0.000483)
HH Head Age	0.0000633	-0.0000200	-0.0000844	1.604	0.000129
	(0.000367)	(0.000288)	(0.000214)	(2.838)	(0.000140)
Age	-0.00115*	-0.00264***	-0.00000478	-2.513	0.000341*
	(0.000453)	(0.000359)	(0.000266)	(3.571)	(0.000172)
Male HH Head (0/1)	-0.0163	-0.00618	0.00605	152.4	-0.00258
	(0.0141)	(0.0108)	(0.00731)	(109.8)	(0.00550)
Observations	40,818	40,818	40,818	40,818	41,397
Survey Year FE	Yes	Yes	Yes	Yes	Yes
Governorate FE	Yes	Yes	Yes	Yes	Yes
Adjusted r^2	0.047	0.025	0.074	0.055	0.014

Cluster robust standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

6 Full Main Models

Table 6 presents the full results of the main models (Table 2 in the body of the paper).

Table 6: Relationship Between *'Izba* Density and Contemporary Wealth

	Model 6	Model 7	Model 8	Model 9	
	Reduced	*Full*	*Falsification*	*1st Stage IV*	*2nd Stage IV*
	OLS	*OLS*	*OLS*	*OLS*	*2SLS*
Izba Density	-0.00342***	-0.00422***			-0.0155***
	(0.000765)	(0.000594)			(0.00325)
Kafr Density			0.000489		
			(0.00287)		
Meters to Historic Canal (Log)				-1.890313***	
				(0.1433417)	
Rural (0/1)		-0.934***	-0.938***	0.720436*	-0.922***
		(0.0175)	(0.0176)	(0.335633)	(0.0182)
Pastureland		0.733	0.623	5.523952	1.000
		(0.968)	(0.979)	(10.87172)	(0.968)
Cropland		0.794***	0.591**	35.09237***	1.335***
		(0.194)	(0.193)	(4.366018)	(0.248)
Child Sex Balance		-0.00536***	-0.00525***	-0.02177166	-0.00564***
		(0.00149)	(0.00150)	(0.190763)	(0.00150)
Major Road (M, Log)		0.0376***	0.0346***	0.6219637***	0.0454***
		(0.00419)	(0.00427)	(0.0923311)	(0.00490)
HH Head Age		-0.00562***	-0.00561***	-0.00194	-0.00566***
		(0.000515)	(0.000516)	(0.007058)	(0.000523)
Age		0.00264***	0.00266***	-0.006676	0.00258***
		(0.000623)	(0.000624)	(0.0081687)	(0.000629)
Male HH Head (0/1)		0.188***	0.188***	-0.1364311	0.186***
		(0.0126)	(0.0126)	(0.1629035)	(0.0127)
Observations	69,400	69,400	69,400	69,400	69,400
Adjusted r^2	0.275	0.467	0.465		

Cluster robust standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

7 Alternative Specifications, Main Models

Table 7 presents alternative specifications in order to assess possible errors in our analysis. Model 12 drops from the analysis all respondents in our survey who report having moved from their place of birth. Because our analysis assumes that patterns of wealth and poverty are tied to particular places, we take this step to account for the possibility that either poorer Egyptians disproportionately move to *'izba* areas, or wealthier residents systematically moving away from them.

Model 13 drops from the analysis all respondents living in Frontier governorates (North and South Sinai, Red Sea, Western Desert, and Matrouh). We do this because these areas have particular characteristics (such as political instability, tourist economies, military governors, etc...) that have changed since the interwar period. Because almost no *izba* existed in these areas, we may worry that they are significantly richer than the rest of Egypt and thus exacerbate the *izba* effect.

Model 14 drops from the analysis all urban areas. Despite controlling for Urban/Rural status in our model, we may worry that systematic differences between urban and rural inhabitants in our model are still influencing results.

Model 15 uses an alternative strategy to control for possible measurement error tied to the definition of *'izba*, and thus a longer explanation is in order. Beyond the coercive industrial-style farm that our analysis relies upon, *'izba* has an older meaning that captures a temporary settlement far from home where animals are kept and agriculture cultivated during harvest time (Lozach and Hug 1930, 156). Crary's study of a farming community in Upper Egypt, for instance, includes an in-depth description what appears to be this type of *'izba* (Crary 1949). Entries in the Gazetteer simply record the name of the location and do not provide any categorical variable distinguishing one type of *'izba* from the other. The obvious risk is that our measurement strategy conflates these relatively innocuous *'izba* with the institutionalized systems of coercion and violence that mark the production farm discussed by Mitchell and others.

We do not think this is likely for two reasons. First, the types of temporary dwellings studied by Crary are precisely that— temporary, only for the harvest season (1949). The gazetteer, in contrast, tracks "inhabited places," which seemingly would not apply to these seasonal dwellings. Second, a 1913 law stipulated that *'izba* status would not be granted to new properties less than 50 feddans, (21 hectares). This provides us with some reassurance that the locations enumerated in the Gazetteer, published in 1932, are not the small seasonal encampments that worry us.

However, because *'izba* properties were given the name of their owners, we can use properties that include an obvious formal title as a subset of our data. In these cases, we are extremely confident that *'izba* properties owned by individuals with a formal title (e.g. "Pasha") were *not* seasonal encampments but rather the type of estate in which we are interested. In the gazetteer, 1,500 of 7,000 entries are titled.

Finally, model 16 uses a linearly-transformed $(n + 1)$ logged count of *'izba* as the independent variable instead of the straight count.

Table 7: Additional Specifications

	Model 12 *No Movers*	Model 13 *No Frontier*	Model 14 *No Urban*	Model 15 *Titled 'Izba*†	Model 16 *Log 'Izba*††
Izba Density	-0.00215**	-0.00412***	-0.00185**	-0.0117***	-0.05437***
	(0.000771)	(0.000592)	(0.000691)	(0.00207)	(0.00749)
Rural (0/1)	-0.898***	-0.932***		-0.931***	0.928 ***
	(0.0228)	(0.0175)		(0.0175)	(0.0176)
Pastureland	-1.194	0.196	-4.003**	0.806	0.761
	(1.314)	(1.347)	(1.437)	(0.970)	(0.967)
Cropland	0.774+	0.912***	0.672*	0.661***	0.877***
	(0.406)	(0.195)	(0.330)	(0.192)	(0.197)
Child Sex Balance	-0.00408*	-0.00536***	-0.00172	-0.00532***	-0.0053
	(0.00205)	(0.00148)	(0.00182)	(0.00149)	(0.0015)
Major Road (M, Log)	0.0659***	0.0325***	0.0216***	0.0361***	0.039***
	(0.00663)	(0.00426)	(0.00388)	(0.00421)	(0.0042)
HH Head Age	-0.00353***	-0.00521***	-0.00435***	-0.00562***	-0.0056***
	(0.000771)	(0.000519)	(0.000640)	(0.000516)	(0.00515)
Age	0.000617	0.00220***	-0.00469***	0.00264***	0.00265***
	(0.000910)	(0.000632)	(0.000779)	(0.000623)	(0.000622)
Male HH Head (0/1)	0.192***	0.189***	0.118***	0.188***	0.187***
	(0.0175)	(0.0126)	(0.0165)	(0.0126)	(0.0126)
Observations	34,084	65,650	37,740	69,400	69,400
Survey Year FE	Yes	Yes	Yes	Yes	Yes
Governorate FE	Yes	Yes	Yes	Yes	Yes
r^2	0.476	0.477	0.191	0.466	0.468

Cluster robust standard errors in parentheses
+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001
†Independent variable is a count of *'izba* with titled owners.
††Independent variable is a log transformed $(n + 1)$ count of *'izba*.

8 Robustness, Multilevel Models

Table 8 reports results from a multilevel mixed-effects linear regression.[24] Random intercepts account for variability at the level of the cluster.

Table 8: Alternative Modeling Strategy

	Model 17	Model 18
	Multilevel	*Multilevel*
Izba Density	-0.00327***	-0.00397***
	(0.000720)	(0.000557)
Rural (0/1)		-0.979***
		(0.0136)
Pastureland		0.257
		(0.655)
Cropland		1.233***
		(0.121)
Child Sex Balance		-0.00336**
		(0.00118)
Major Road (M, Log)		0.0394***
		(0.00349)
HH Head Age		-0.00491***
		(0.000401)
Age		-0.000623
		(0.000475)
Male HH Head (0/1)		0.160***
		(0.0102)
Random Effects Parameter	0.3710634***	0.1671215***
	(0.0076347)	(0.0036281)
Observations	69,400	69,400
Survey Year FE	Yes	Yes
Governorate FE	Yes	Yes
AIC	131623.0	125955.0

Standard errors in parentheses
+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001

[24]The significant ($p < .000$) random effects parameter denotes considerable cluster-by-cluster (between group) variation in family wealth, leading us to fit a multilevel model.

9 Full Models: Mechanisms

Table 3 in the body of the paper presented a reduced version of Table 9.

Table 9: Relationship Between *'Izba* Density and Landownership

	Model 19 *Agricultural Landowner*	Model 20 *Works Other's Land*
Izba Density	0.000660**	-0.00235
	(0.000208)	(0.00122)
Cropland	-0.0851	-0.0625
	(0.0673)	(0.564)
Pastureland	-1.095***	-2.017
	(0.307)	(1.424)
Rural (0/1)	0.195***	-0.0262
	(0.00468)	(0.0401)
Child Sex Balance	0.00118	-0.00161
	(0.000727)	(0.00324)
Major Road (M, Log)	-0.0111***	0.000972
	(0.00159)	(0.00502)
HH Head Age	0.00339***	-0.00572***
	(0.000255)	(0.000995)
Age	0.000391	0.00393**
	(0.000296)	(0.00134)
Male HH Head (0/1)	0.0493***	-0.0552
	(0.00553)	(0.0285)
Observations	76,925	4,259
Survey Year FE	Yes	Yes
Governorate FE	Yes	Yes
Adjusted r^2	0.138	0.058

Cluster robust standard errors in parentheses
+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001