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Essays on Long-Run Economic Development and Political Economy

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Abstract

In the first chapter, I study how human populations adapt to ethnically diverse societies. Using new data on a natural experiment from Peru's colonial history, the results show that ethnic diversity need not spell poor development outcomes—a history of within-group heterogeneity can turn ethnic diversity into an advantage for development. The second chapter explores the effects of political accountability on the selection of politicians when accountability mechanisms are prone to political capture. Using a comprehensive dataset on the characteristics of candidates running for mayor in Peru, the results show that having a recalled incumbent in the previous term causes a negative selection of candidates in terms of their education, experience in public office, and representativeness of native populations.

Resumen

En el primer capítulo, se estudia cómo las poblaciones se adaptan a sociedades étnicamente diversas. Usando datos nuevos de un experimento natural en Perú, se muestra que la diversidad étnica no conlleva necesariamente *peores* resultados—haber pertenecido a un grupo étnico con individuos de especializaciones heterogéneas puede convertir la diversidad étnica en una ventaja para el desarrollo económico. El segundo capítulo explora el proceso de selección de autoridades locales cuando existen elecciones revocatorias que se usan como instrumento político en lugar de como mecanismo de control. Usando datos sobre las características de candidatos a alcalde municipal en Perú, se muestra que los candidatos de municipios en los que previamente se ha revocado al alcalde tienen menos años de educación y de experiencia en cargos públicos y son menos representativos de la población nativa.

PREFACE

The effect of ethnic diversity on economic growth and development is a question of long-standing interest in economics (Easterly and Levine, 1997; Alesina and Glaeser, 2004; Alesina and La Ferrara, 2005). Diversity brings opportunities and challenges. While most empirical studies find corrosive effects, in the first chapter I show that ethnic diversity need not spell poor development outcomes—a history of within-group heterogeneity can turn ethnic diversity into an advantage for development. I collect new data on a natural experiment from Peru's colonial history: the forced resettlement of native populations in the 16th century. This intervention forced together various ethnic groups in new jurisdictions. Where these groups were composed of more heterogeneous subpopulations, working in different ecological zones of the Andes prior to colonization, ethnic diversity has systematically lower costs and may even become advantageous. Cultural transmission is one likely channel. Specifically, where different ethnic groups were composed of more heterogeneous subpopulations, they engage in more cooperative behavior and exhibit more open attitudes toward out-group members.

The empirical analysis relies on anthropological and archaeological evidence on the spatial distribution of pre-colonial ethnic groups. In recent years, the literature on the roots of comparative development has incorporated relatively accurate historical maps, combining them with anthropological and high-resolution geospatial data (Michalopoulos and Papaioannou, 2018). Specifically, maps on the approximate spatial distribution of pre-industrial ethnicities have received increasing attention (Murdock, 1959). In the first chapter, I present a novel approach to validate historical ethnic borders. In certain contexts, provided that surnames are inherited, measures based on surname commonality between individuals can provide information on common ancestry. I use surnames from colonial baptism records in Peru. After identifying native surnames based on a novel dictionary of indigenous linguistic roots, the results suggest that, on average, surname heterogeneity among native populations was significantly higher close to ethnic borders, as compared to places that were located at the interior of ethnic homelands.

The ethnic background continues to be a relevant dimension in modern Peru. In the second chapter, co-authored with Lukas Kleine-Rueschkamp and Gianmarco León-Ciliotta, we study whether and how accountability mechanisms affect the characteristics and background of politicians who decide to run for office. In particular, we compare the characteristics of candidates running for mayor in municipalities where the incumbent was ousted from office through a recall referendum with those who run where the recall referendum failed by a small margin. Having a recalled incumbent in the previous term causes a negative selection of candidates in terms of their education and previous experience. They are also less representative of native populations. The results are driven by municipalities where the accountability institution is likely used for political purposes. They highlight that in countries with low state capacity, where accountability institutions are at risk of being captured or manipulated by political elites or special interest groups, the objectives of institutions that aim at increasing voters' control over politicians can be distorted.

CONTENTS

Chapter 1

Within-Group Heterogeneity in a Multi-Ethnic Society

1.1 INTRODUCTION

The effect of ethnic diversity on economic growth and development is a question of long-standing interest in economics. Following initial work by Easterly and Levine (1997) and Alesina and Glaeser (2004), a large body of literature has examined the costs and benefits of ethnic diversity.[1] Most empirical studies find corrosive effects. If individuals within ethnic groups are homogeneous, and groups differ in preferences toward policies or public goods, then conflicting preferences can lead to inefficiencies in public good provision or to policy choices that may not benefit the entire society. Inter-group tensions can also result in civil conflicts or exacerbate mistrust and lack of cooperation. However, on the other side, if ethnic groups differ in subsistence activities or skills, then complementary specializations can generate economic gains, stimulate innovation, and promote inter-group trade. While there is a general understanding that diversity brings opportunities

[1] See Alesina and La Ferrara (2005) for a survey of this literature

and challenges, there is scarce evidence on which factors determine its positive or negative consequences. When is ethnic diversity good for comparative economic development, and when is it bad?

In this paper, I argue that the effect of ethnic diversity on long-run comparative development depends on the heterogeneity of subpopulations within ethnic groups. Underlying previous literature is the assumption that individuals within ethnic groups tend to be homogeneous. However, ethnicities are not necessarily homogeneous entities. Subpopulations within ethnic groups may differ in many dimensions, including preferences, economic activities or skills, as well as cultural, genetic, and linguistic traits (Ashraf and Galor, 2013; Desmet et al., 2017; Depetris-Chauvin and Özak, 2020). I focus on the degree of heterogeneity in economic specializations within ethnic groups and ask whether having been part of a more heterogeneous ethnic group is a pre-condition that contributes to overcome the costs of ethnic diversity. I show that where ethnic groups are composed of more heterogeneous subpopulations, ethnic diversity has systematically lower costs and may even become advantageous.

I exploit a natural experiment of history: the 16th-century Spanish intervention in Peru. Two features of the study setting allow me to examine whether the consequences of ethnic diversity depend on previous exposure to within-group heterogeneity. The first is variation among the subpopulations of pre-colonial ethnic groups, which were engaged in a variety of specialized production niches *within* their respective ethnic groups. According to Andean ethnohistory, this variation emerged as a result of pre-colonial adaptation to the mountain environment—an environment characterized by multiple ecological zones created by differences in elevation (Murra, 1975). The second feature is quasi-random variation in ethnic diversity across colonial jurisdictions. I analyze a forced resettlement of native populations that occurred after the Spanish conquest, which led to variation in ethnic diversity as a consequence of a mismatch between the pre-colonial strategy of adaptation and the Spanish notion of jurisdiction. Importantly, the degree of within-group heterogeneity to which native populations were exposed before colonization was inherent to reshuffled populations.

Are more heterogeneous ethnic groups better able to integrate in a multi-ethnic society? Although trust may be higher among members of the same ethnicity, individuals belonging to ethnic groups with more heterogeneous subpopulations are traditionally used to operate in diverse environments. They may also exhibit greater "openness to experience", a personality trait defined as the preference for novelty and variety. This trait has been associated with lower levels of prejudice and more favorable attitudes toward out-group members. More open individuals also tend to be less risk averse and more creative when looking for potential solutions.[2] In contemporary societies where multiple ethnicities coexist (e.g., as a consequence of voluntary migrations in an increasingly globalized world or due to events of forced displacement), understanding whether the consequences of ethnic diversity depend on previous exposure to within-group heterogeneity is important for policy discussions.[3]

The following quote by the anthropologist John Murra summarizes the subsistence strategy of pre-colonial Andean groups:

> "In a territory so broken up by altitude, aridity, and brusque alternations ..., we should expect wide differences between ecological or production zones ... Access to the productivity of contrasting zones becomes indispensable. This could have been achieved by maintaining a series of markets at different altitudes, run by the ethnic groups inhabiting each separate ecological niche. However, this was not the

[2] For social psychology studies on openness to experience, see McCrae (1996), McCrae and Costa (1997), Flynn (2005) and Sibley and Duckitt (2008), among others.

[3] Hatton (2020) documents the global increase in both international migrants and refugees since 1960.

> Andean solution. They opted for the simultaneous access of a given ethnic group to the productivity of many microclimates." (Murra, 1995, p. 60-61)

During the pre-colonial period, the settlement pattern of native groups was largely influenced by the mountain environment. Societal organization relied on simultaneous access to ecologically specialized production zones. Specifically, according to anthropological studies, the group guaranteed self-sufficiency by sending subpopulations to settle vertically distributed production zones, rather than relying on inter-group exchanges (Murra, 1975).[4] Subsistence was then achieved by exchanging resources between individuals from different ecologies within the same ethnic group.

This vertical and dispersed settlement pattern made tribute collection and religious indoctrination a difficult task after the Spanish conquest (1532). By the end of the 16th century, Spanish officials had consequently carried out a forced reorganization of native populations. The aim of the resettlement policy was to concentrate dispersed populations into small jurisdictions with a delimited and continuous space, which went against a key characteristic of the pre-colonial subsistence strategy: the exchange of resources between subpopulations settled at different elevations (Pease, 1989). Colonial officials con-

[4]Murra's work describes Andean groups before the expansion of the Inca empire (see Section 1.2.1). Although information on their institutions is not abundant, to my knowledge there is no evidence on formal states or other institutions that could serve as a basis for sustained inter-group cooperation during the pre-Inca period. In my setting, group adaptation to the mountain environment resulted in within-group heterogeneity in specialized production zones. This pattern of specialization is consistent with findings that variation in geographic characteristics, such as regional land quality and elevation, may lead to specialization through the formation of region-specific human capital (Michalopoulos, 2012). With respect to societal structure, a more tightly-knit extended family network is expected to strengthen within-group cooperation and to discourage interactions with out-group members. In turn, adverse environments may be related to stronger kinship networks (Enke, 2019; Moscona et al., 2020).

centrated populations into such jurisdictions without an awareness of the spatial distribution of subpopulations within ethnic groups, that is, without considering that individuals from such a wide variety of elevations could belong to the same ethnic group. As a result of the tension between the pre-existing settlement pattern, which was a native response to the mountain environment, and the Spanish notion of jurisdiction, a feature of a more horizontal world, new jurisdictions did not respect initial ethnic divisions (Pease, 1989, 1992; Wachtel, 1976, 2002).

I use variation in the location of parishes (the jurisdictional unit of analysis) with respect to ethnic borders as a source of quasi-random variation in ethnic diversity. I start by defining ethnic diversity as an indicator for whether the parish capital was located close to an ethnic border. For this task, I use a map of the approximate extent of native groups at the moment of the Spanish conquest (Rowe, 1946). I furthermore implement a novel approach to validate historical ethnic borders using information on surnames from colonial baptism records (1605-1780). In certain contexts, provided that surnames are inherited, measures based on surname commonality between individuals can provide information on common ancestry.[5] In this setting, the pre-Hispanic practice of endogamy and the recent introduction of family names by the Catholic Church in the 16th century allow me to focus on the early common origin of native surnames as markers of common ancestry through the male line. After identifying native surnames based on their linguistic roots, the results for the subsample of parishes with available information suggest that, on average, surname heterogeneity among native populations was significantly higher in parishes located close to ethnic borders (*with ethnic diversity*), as compared to those located at the interior of ethnic homelands

[5] See Lasker (1980, 1985) and Colantonio et al. (2003) for a review on isonymy methods and the use of surnames in human population biology. See subsection 1.3.2 for further details.

(*without ethnic diversity*).

To measure within-group heterogeneity, I use a diversity index that sums over production zones within the land inhabited by each ethnic group. Ecological or production zones are defined according to elevation intervals following a well-established classification for the region of interest (Pulgar Vidal, 1941).[6] In order to capture the average level of within-group heterogeneity to which the native populations in a parish were exposed before colonization, I then compute a weighted average of within-group heterogeneity for each parish. Specifically, I use the area share of each ethnic group in the parish as weight.

The empirical analysis intends to capture whether *forced* ethnic diversity has a differential effect on economic development depending on previous exposure to within-group heterogeneity. Results from balance tests show that local officials did not systematically concentrate populations of mixed ethnicity in locations that were inherently different in terms of geography or initial wealth. Furthermore, I document that the correlation between ethnic diversity and average within-group heterogeneity in specializations is not statistically significant, supporting that parishes located close to ethnic borders did not systematically concentrate populations from more heterogeneous ethnic groups.

The first result in the paper documents the direct effect of ethnic diversity, which I benchmark against previous results in the literature. I find that ethnic diversity is robustly associated with lower living standards in the long run. Specifically, I explore a variety of outcomes that capture contemporary living standards. As proxies for local economic activity, I use light intensity per capita (2000-2003) and a measure of non-subsistence agriculture from the agricultural census

[6] The homelands of most groups include all production zones, but in different proportions.

of 1994.[7] On access to public infrastructure, I use data from the 1993 population census on access to public sanitation and to the public network of water supply. This result is in line with the literature on the costs of ethnic diversity, though it also highlights the persistent consequences of forced diversity at the local level.

I then examine the effect of ethnic diversity and average within-group heterogeneity. The results exhibit a robust pattern: the coefficient on ethnic diversity is negative, but its interaction with the average level of within-group heterogeneity in specializations is positive. I show that this pattern remains statistically significant when controlling for geographic and initial socioeconomic characteristics, as well as when accounting for the religious order in charge of the parish, colonial bishopric, and administrative province. Looking at the average effect size across contemporary outcomes (Kling et al., 2004; Clingingsmith et al., 2009), the results show that the costs of ethnic diversity tend to be overcome among populations from more heterogeneous ethnic groups. On average, after baseline controls and fixed effects, the negative association between ethnic diversity and contemporary living standards decreases −from -0.47 to -0.13 standard deviations− as average within-group heterogeneity reaches the median value and turns positive −from 0.21 to 0.32 standard deviations− for parishes above the 90th percentile.

I conduct a series of robustness checks to make sure that the previous pattern is not driven by omitted group characteristics or due to specific variable definitions. I first show that the observed pattern is robust to accounting for the interaction of ethnic diversity and the main correlates of within-group heterogeneity (i.e., variation in elevation and in pre-colonial caloric suitability within the ethnic homeland).

[7] Since high quality data on income per capita is not available at the local level, I follow the empirical literature in using luminosity data from satellite images at night (Henderson et al., 2012; Hodler and Raschky, 2014; Michalopoulos and Papaioannou, 2013, 2014).

Furthermore, the same pattern is observed when accounting for the interaction effect of ethnic diversity and other characteristics of ethnic groups, such as surface area and approximate population density at the time of the Spanish conquest. I then check that the results exhibit the same pattern when controlling for an extended set of (uninteracted) ethnic characteristics, as well as when including fixed effects for the majority ethnic group in the parish and when excluding the largest groups in terms of surface area from the analysis. Additional results show that the same pattern arises if I use a robust version of the ethnic diversity dummy variable that accounts for imprecise ethnic borders, or if I use a standard measure of ethnic diversity based on the Herfindahl index. Using an alternative diversity index to measure within-group heterogeneity in specializations yields the same pattern. Moreover, estimates from a placebo analysis using borders of colonial provinces instead of ethnic borders are small and not statistically significant. Overall, these results support that, beyond the direct effect of geography, having belonged to an ethnic group with more heterogeneous subpopulations plays an important role in explaining the long-term effects of ethnic diversity.

To understand the evolution of these long-term effects, I use data from the 1876 population census. I show that the documented pattern was accompanied by structural change and improved literacy rates. While the estimated coefficient on ethnic diversity is negative, its interaction with the average level of within-group heterogeneity is again positive. I find that parishes built on ethnically diverse populations, as compared to those built on a single ethnic group, tend to be more oriented toward manufacturing, retail, and services, to the detriment of the agricultural sector, as average within-group heterogeneity increases. By 1876, ethnically diverse parishes were also associated with better literacy rates, relative to those without ethnic diversity, the higher the average within-group heterogeneity among their ancestors.

Finally, I explore the mechanism underlying these findings. Although it is difficult to identify the precise mechanism at work, the historical literature suggests that pre-colonial exchanges were sustained by engaging in reciprocities between individuals of the same ethnic group. One possibility is that the subsistence strategy of Andean groups, which relied on within-group interactions between individuals with different specializations, shaped individual attitudes toward diverse people and ideas. The transmission of cooperative behavior and more open attitudes toward out-group members may have favored inter-group contact and beneficial interplays between individuals of different ethnic origin during the colonial period. To examine cultural transmission, I start by looking at contemporary neighborhood and agricultural associations. Previous literature has shown that ethnic diversity is associated with lower social engagement (e.g., Alesina and La Ferrara 2000). Consistent with the transmission of cultural traits, I find that this negative association decreases the higher the average within-group heterogeneity to which native populations were exposed. I then provide evidence supporting that exposure to within-group heterogeneity favored inter-group contact and societal integration during Spanish rule. In particular, I use information on the parents of baptized individuals and focus on inter-ethnic unions as a proxy for integration.[8] Lastly, I explore economic complementarities between ethnic groups. In line with recent papers emphasizing the positive role of inter-group complementarities for the integration of minority groups (Jha, 2013; Becker and Pascali, 2019), the results suggest that an economic advantage emerges where a majority with low within-group heterogeneity enjoys any complementary skill arising from a minority that comes from a highly heterogeneous ethnic group.

[8]The use of inter-ethnic marriages as a proxy for integration is well established in sociology (Gordon, 1964). For recent applications in economics see, for instance, Bazzi et al. (2019).

To my knowledge, this is the first paper to explore the effects of ethnic diversity in a setting with variation in within-group heterogeneity. By doing so, this study contributes to a large literature on the consequences of ethnic diversity. Studies in this literature have been conducted at different levels of analysis, obtaining mixed results while implicitly assuming that individuals within ethnic groups tend to be homogeneous. Across countries and US localities, ethnic heterogeneity has been associated with lower levels of economic growth, public good provision, quality of government, and social capital, as well as with higher political instability and civil conflict.[9] Using micro-level data, Miguel and Gugerty (2005) show that ethnic diversity is associated with lower public good provision in Kenya. Focusing instead on the private sector, Hjort (2014) provides causal evidence for the effect of ethnic diversity on team productivity at a Kenyan flower plant, showing that teams of ethnically diverse workers are, on average, less productive than homogeneous teams. The underlying mechanism appears to be a taste for discrimination against co-workers of different ethnic origin.

More recently, Montalvo and Reynal-Querol (2021) have focused on the size of the unit of analysis, finding that ethnic diversity has a positive effect on economic growth if we look at small units. They argue that a potential explanation in the case of Africa is the increase in trade close to ethnic borders, suggesting ethnic specialization into complementary activities. This result links with studies on the positive role of inter-group complementarities. The theoretical framework in Jha (2013, 2018) establishes that peaceful inter-ethnic coexistence can be sustained through the specialization of ethnic groups into complementary activities that are costly to replicate and to expropriate. Becker

[9] See Easterly and Levine (1997), La Porta et al. (1999), Alesina et al. (1999), Alesina and La Ferrara (2000), Alesina et al. (2003), Alesina and Glaeser (2004), Alesina and La Ferrara (2005), Fearon and Laitin (2003), Montalvo and Reynal-Querol (2005), Desmet et al. (2009), and Desmet et al. (2012), among many others.

and Pascali (2019) provide empirical evidence in the context of anti-Semitism in Germany.[10] In sum, while previous studies have found a variety of results, this paper provides evidence that the medium- and long-term effects of ethnic diversity depend on previous exposure to within-group heterogeneity.

The diversity of subpopulations within societies or ethnic groups has received little attention in the literature. Ashraf and Galor (2013), the first paper to consider interpersonal diversity *within* populations, show that the degree of genetic diversity within societies has influenced their comparative development in both pre-colonial and modern times. Desmet et al. (2017) focus on the degree of cultural diversity and document that most of the diversity in contemporary norms and attitudes takes place between individuals of the same ethnolinguistic group rather than between groups. Depetris-Chauvin and Özak (2020) find that diversity in genetic and linguistic traits within pre-modern societies was conducive to labor division and specialization. I focus on the degree of heterogeneity in specialized production zones within pre-colonial ethnic groups and find that exposure to within-group heterogeneity is a pre-condition that contributes to overcome the negative effects of ethnic diversity.[11]

The cultural transmission mechanism adds to the literature on the long-term effects of cultural traits (Nunn and Wantchekon 2011; Voigtländer and Voth 2012; Alesina et al. 2013; Guiso et al. 2016,

[10]In the context of firms, see Lazear (1999) on the positive role of skill complementarities.

[11]While within-group heterogeneity has been less explored, the literature has studied other characteristics of pre-industrial societies or ethnic groups. This literature has mainly focused on Murdock (1967)'s *Ethnographic Atlas*. For example, the hierarchical structure of ethnic institutions, as measured by the number of jurisdictional levels beyond the local community, has received increasing attention (Gennaioli and Rainer, 2007; Michalopoulos and Papaioannou, 2013). See Alesina et al. (2013) for the practice of plough agriculture and Bentzen et al. (2017) for rules of succession to the office of local headman, among others.

among others). Specifically, the results in this paper support that within-group heterogeneity in specializations, which emerged as a result of native adaptation to the mountain environment, favored the formation of cooperative behavior and more open attitudes toward out-group members. This in turn contributed to a greater ability to engage in multi-ethnic societies. I provide evidence consistent with the idea that having belonged to an ethnic group with more heterogeneous subpopulations facilitated inter-group contact during the colonial period and, over the course of generations, contributed to sustain long-run performance.[12]

The remainder of the paper is organized as follows: Section 1.2 provides a summary of the pre-colonial setting and the Spanish intervention, Section 1.3 explains the data construction process, Section 1.4 describes the empirical strategy, Section 1.5 presents the results, and Section 1.6 concludes.

1.2 HISTORICAL BACKGROUND

1.2.1 *Pre-Colonial Settlement Pattern*

The *Chocorvos*, the *Lucanas*, the *Soras*, the *Chancas*, the *Quichuas*, the *Caviñas*, the *Chilques* and the *Aymaraes*, among others, were native groups under Inca rule at the time of the Spanish conquest (Tello,

[12]Other papers have emphasized the role of climate and geography in shaping culture. For example, Buggle and Durante (2021) find that European regions exposed to higher environmental risk during the pre-industrial era exhibit higher levels of interpersonal trust today. The study argues that, in face of variability in precipitation and temperature, farmers developed cooperative strategies that contributed to the emergence of more trusting attitudes. Nunn and Puga (2012) document the indirect positive effect of ruggedness on the development of African countries by allowing protection from slave traders. Separately, a culture of mistrust has been shown to persist among the descendants of individuals affected by the slave trade (Nunn and Wantchekon, 2011).

1939; Rowe, 1946).[13] Specifically, by the time the Spanish arrived (1532), the Andean civilization comprised several coexisting groups that had been incorporated during the previous century to the Inca empire. The archaeologist and anthropologist John Rowe maps the approximate extent of these groups by 1530 (Rowe, 1946).

The exact stage of development as political units is unclear for most groups. However, there were no formal states before the expansion of the Inca empire. Based on early chronicles, the social unit is generally described as an endogamous group of several extended families with descent through the male line. Studies suggest that leadership was sometimes based on personal prestige, while in other cases it was inherited. The historical and anthropological literature also recognizes language differences, although these disparities tended to be homogenized with the spread of Quechua, the language of the Incas.[14]

In the Andean highlands, differences in elevation give rise to a variety of vertically arranged ecological zones. Within a short distance, diverse environmental and soil conditions create specific production niches. The pioneering ethnographic and ethnohistorical work of Murra (1975, 1995, 2002) documents how pre-Inca Andean peoples managed to overcome the complexities of the mountain environment. Murra's model describes the settlement pattern of a given ethnic group as vertical and dispersed (a "vertical archipelago"), where subsistence was based on simultaneous access to ecologically specialized production zones. Specifically, the group guaranteed self-sufficiency by sending subpopulations to settle vertically distributed production zones. These settlements were usually located at a three or four days' walk from the main settlement of the group, around which the system was organized and where individuals maintained ties to their

[13] I interchangeably refer to pre-colonial native groups as "tribes" or "ethnic groups".

[14] See the first book by Garcilaso de la Vega (1960)[1609], Rowe (1946) and Murra (1975).

extended family and homeland.[15] Since each zone is characterized by a particular microclimate, they are respectively suited to a different assortment of crops. Rather than relying on inter-group exchanges, ethnohistoric research suggests that group subsistence was achieved by exchanging resources between subpopulations spread across specialized production zones.[16]

According to Murra's and subsequent research, this adaptive strategy was already in place during the pre-Inca period. The Inca expansion (1438-1525) was achieved through the gradual incorporation of groups to the empire, which led to the creation of provinces based on ethnic distinctions (Rowe, 1946). Inca government was indirect in the sense that provinces were governed by the ethnic rulers of the corresponding groups. This is a key characteristic of Inca rule because it supports that ethnic traits were preserved during this period (Murra, 1975, 2002). At the same time, provincial rulers were pushed to continue with their control of different vertical zones in order to sustain the empire (Murra, 2002).

1.2.2 *The Spanish Intervention*

The contemporary administrative division of Peru has its origin in the early colonial period. When Viceroy Francisco de Toledo (1569-1581) first disembarked in Peru, native populations followed the Andean pattern, living scattered along mountain slopes.[17]

[15]The analysis in Pease (1989) for the *Collaguas* native group also suggests that populations located at lower elevations were not excluded from contact with higher elevations.

[16]This subsistence strategy is supported for the Andean range of Peru, and especially for the central and southern Andes. However, it is unclear how the model applies in relation to coastal peoples (Murra, 1975; Pease, 1989). In this paper, I move beyond specific case-study evidence and perform a systematic analysis of Andean groups regarding the extent to which they relied on diverse production zones.

[17]At the time, most native populations were under the *encomienda*, a Spanish labor system that rewarded conquerors (*encomendero*) with the services of a par-

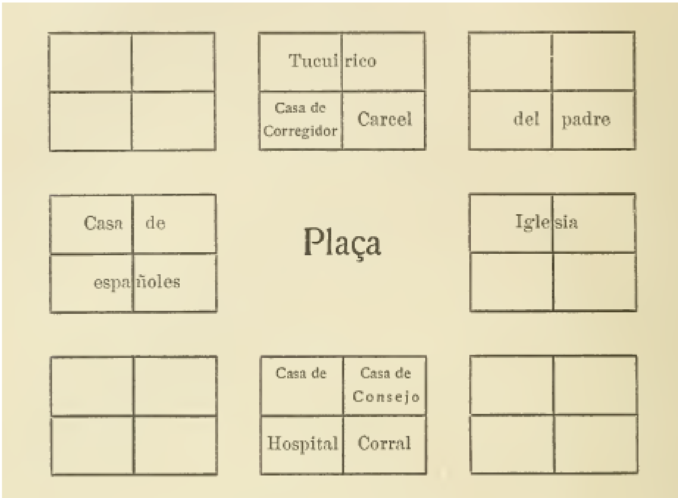
This dispersed settlement pattern was an obstacle for the Spanish administration. In words of the Spanish official Juan de Matienzo, "the *indios*, for being isolated in *huaycos* and ravines, do not live in right order, and this is the main obstacle to be indoctrinated" (Medina, 1974a, p. 155). In order to facilitate tribute collection and religious indoctrination, Toledo ordered the forced reorganization of native populations into residential (*reducciones*) and religious (*doctrinas*) jurisdictions.

The idea of the *reducciones* (also known as *pueblos de indios*) was to concentrate native populations into small villages with a delimited and continuous space (Medina, 1974a,b, 1993). The model of the village was originally designed by de Matienzo as a grid system, interconnected by straight-line streets that formed quadrilaterals and were organized around a main square with a church (see Figure 1.1). Colonial officials carried out the resettlement policy between 1570 and 1575, arranging the division of native populations from all discovered lands in the Viceroyalty of Peru into such *pueblos de indios*. In turn, several *pueblos de indios* were under the jurisdiction of a single *doctrina* or *parroquia*, a parish served either by the regular or the secular clergy.[18]

Within four decades of the conquest of the Inca empire, the Spanish administration had undertaken a complete reorganization of native populations. There is little documentation on how the resettlement policy was carried out. However, the historical literature does note that colonial officials, who were not fully aware of the spatial distribu-

ticular number of natives. However, the *encomienda* did not imply a title over land. The *encomendero* was only entitled to a share of the product of native labor (Dougnac Rodríguez, 1994, ch. 9). The historical literature suggests that there was no conflict with pre-Hispanic ethnic divisions under this system because the *encomienda* was not based on territory but on population (Pease, 1992, p. 180; Murra, 2002, p. 62).

[18]The regular clergy included priests of several religious orders −Santo Domingo, La Merced, San Francisco, San Agustín and Compañía de Jesús−, but secular priests who were not members of any religious order were also present, see de Armas Medina (1953).



(a) Model of village in 1567

(b) Modern aerial view of Yanque (Collaguas)

Figure 1.1

Notes. Subfigure (a) shows the model of village designed by Matienzo (1910)[1567]. Subfigure (b) shows a modern aerial view of Yanque, Collaguas, created as a result of the resettlement policy of the 16th century (Servicio Aerofotográfico Nacional del Perú, in Medina, 1993).

tion of subpopulations, concentrated populations without considering that individuals so discontinuously scattered across elevations could belong to the same ethnic group. There was a tension at the moment of the policy between the pre-existing settlement pattern, which was a native response to the mountain environment, and the Spanish notion of jurisdiction, a feature of a more horizontal world. As a result, colonial jurisdictions did not respect pre-existing ethnic divisions (Pease, 1989, 1992; Wachtel, 1976, 2002).

It is important to note that the new model limited the movement of native populations, pointing against a key characteristic of the pre-Hispanic subsistence strategy: the exchange of resources between subpopulations settled at different elevation zones (Pease, 1989). The intention of the resettlement policy was not to create sustainable jurisdictions that maximized access to resources from different ecological zones, but rather to concentrate dispersed populations in a way more consistent with the Spanish view of the world. Importantly, historical studies widely discuss that, in practice, the limitation of movement was effective at the parish level (Saignes, 1991; Medina, 1974a,b, 1993). Indeed, this structure was maintained over the entire colonial period and, at the time of independence from Spain, parishes were called districts, forming the basis for what is currently the third-level administrative division in the country.[19]

1.3 DATA

1.3.1 *Explanatory Variables*

Unit of analysis. I focus on the Peruvian territory conquered by the Inca empire that remained in the Viceroyalty of Peru for the entire

[19] For details on the correspondence between parishes and districts, see *Guía Política, Eclesiástica y Militar del Virreynato del Perú, para el Año de 1793* and *Calendario y Guía de Forasteros para el Año de 1834*.

colonial period (1532-1810). The census prepared during 1791-95 under the administration of Viceroy Gil de Taboada y Lemos lists all parishes created in this territory. Parishes are displayed by administrative region (*intendencia*) and province (*partido*). After the Bourbon reforms of 1784-1785, the viceroyalty was divided into *intendencias*, and *intendencias* were, in turn, divided into *partidos*.[20]

I assign longitude and latitude coordinates to each parish capital. For this, it is important to note that following independence from Spanish rule, provinces were the basis for the second administrative level in the country, and parishes were transformed into districts (third administrative level). I start by matching each parish to a modern district using the name and year of creation of the district, as well as the province to which the latter belonged. Then, I assign coordinates to each parish capital using a map from the Peruvian Ministerio del Ambiente (MINAM) that provides the name and coordinates of all existing population centers within each district. In most cases, the old parish capital remains the district capital. For districts where this is not the case (i.e., where the capital was changed after independence), I assign the coordinates corresponding to the parish capital.

Using a combination of historical sources, I check for the presence of priests in charge of religious indoctrination in each parish. In many cases, it is possible to know the names of such priests and whether they were part of the regular or the secular clergy.[21] Following the

[20]The census excludes parishes from the *intendencia* of Puno because it was under the jurisdiction of the Audiencia of Charcas (modern Bolivia), in the Viceroyalty of Río de la Plata, until 1795 (real cédula of February 1, 1796). See Lynch (1962, p. 67-68) for more details on the case of Puno. A summary of the census was published as an appendix to Manuel Fuentes' *Memorias de los virreyes que han gobernado el Peru* (1859, vol. 6, Ap., p. 6-9). The document was signed by José Ignacio de Lequanda and dated January 10, 1796. The whole census with figures at the parish level was later published in Vollmer (1967), where it is referred to as the Census of 1792. It is considered a baseline for the study of population figures just before independence from Spain (Gootenberg, 1991).

[21]See Lissón Chávez (1943), de Armas Medina (1953), Córdoba y Salinas

historical literature on Murra's model, the analysis focuses on parish capitals located in the highland region.[22] The analysis also excludes the two capital parishes of Cuzco and Arequipa, as well as six parishes that are now part of Chile. The final sample includes 336 parishes.

Ethnic diversity. The analysis aims to capture the ethnic origin of the populations that were forced to reside within the parish jurisdiction in the 16th century. Colonial descriptions of priests' walks from the parish capital commonly lie between 2 and 3 *leguas*.[23] Following Paz Soldán (1877), the colonial measure of 1 *legua* corresponded to approximately $3,340$ meters during the initial colonial period. I therefore construct a buffer of $10km$ radius (approximately 3 *leguas*) around each parish capital. When the distance between capitals is less than $10km$, I use equidistant boundaries to ensure that buffer polygons do not overlap each other. The mean buffer area is $240km^2$.

To measure ethnic diversity, I create a dummy variable that takes value 1 if there is an ethnic border within the $10km$ buffer from the parish capital, and 0 otherwise.[24] Figure 1.2 illustrates the exercise: parishes with ethnic diversity (in yellow) are those located close to ethnic borders, while those located further inside ethnic homelands are parishes without ethnic diversity (in blue). Following this definition, approximately 35 percent of parishes in the sample have ethnic diversity, while the remaining 65 percent have only one ethnicity

(1957)[1651] and García (1997).

[22]Excluding coastal parishes (0-500 meters above the sea level) at the same time alleviates concerns regarding potential population resettlements from the north to the south coast of Peru during the Inca period (Bongers et al., 2020). See also robustness checks related with the Inca period (Section 1.5.3).

[23]See, for example, *Relaciones Geográficas de Indias*, Vol 1., compiled by Marcos Jiménez de la Espada, Madrid: Ministerio de Fomento.

[24]A tribe is counted as part of the $10km$ buffer only if the area share of the tribe within the buffer is at least 1 percent. This accounts for lack of precision in ethnic borders, ensuring that there is at least one grid cell of $1km \times 1km$ with centroid inside the area of the tribe in the buffer.

within the $10km$ buffer. Figure 1.3 shows the spatial variation in ethnic diversity. Importantly, the construction of this variable relies on the map of native groups at the time of the Spanish conquest (Rowe, 1946). Section 1.3.2 validates ethnic borders using information on baptism records for the colonial period.

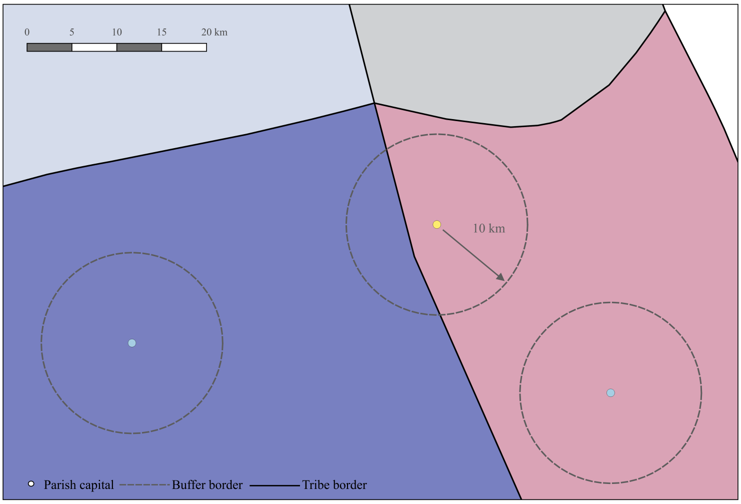


Figure 1.2

Within-group heterogeneity. Within-group heterogeneity is captured by diversity in ecologically specialized production zones. Ecological or production zones are defined according to elevation intervals following a standard classification for the area of interest (Pulgar Vidal, 1941): Yunga (500-2,300 m], Quechua (2,300-3,500 m]; Suni or Jalca (3,500-4,000 m]; Puna (4,000-4,800 m]; and Janca (4,800-6,768 m], where figures refer to elevation in meters above the sea level.[25] There

[25]There are different approaches to study the territory of highland Peru. The traditional classification by Pulgar Vidal is preferred in this application because it was developed by taking into account local geographical knowledge, including native folklore. See Pulgar Vidal (2012, p. 29) and Tapia (2013).

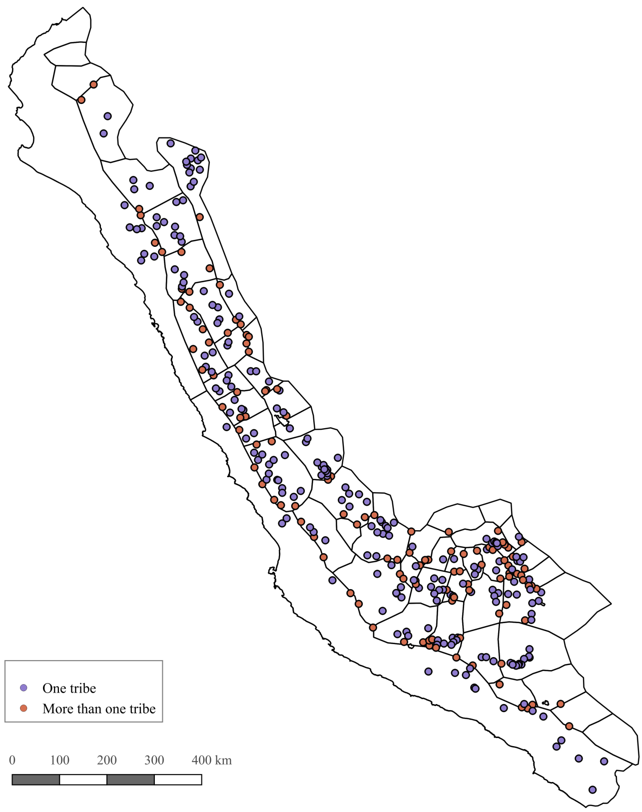


Figure 1.3

Notes. Polygon borders in black represent the approximate extent of tribes under the Inca empire at the time of the Spanish conquest (Rowe, 1946). Dots represent parish capitals; parishes with more than one tribe are those with an ethnic border within a 10km buffer from the parish capital.

are 49 ethnic groups in the analysis. Figure 1.4 displays the composition of elevation zones within each ethnic polygon. The homelands of most groups (63 percent) include all elevation zones, but in different proportions, see Table 1.A.1.[26]

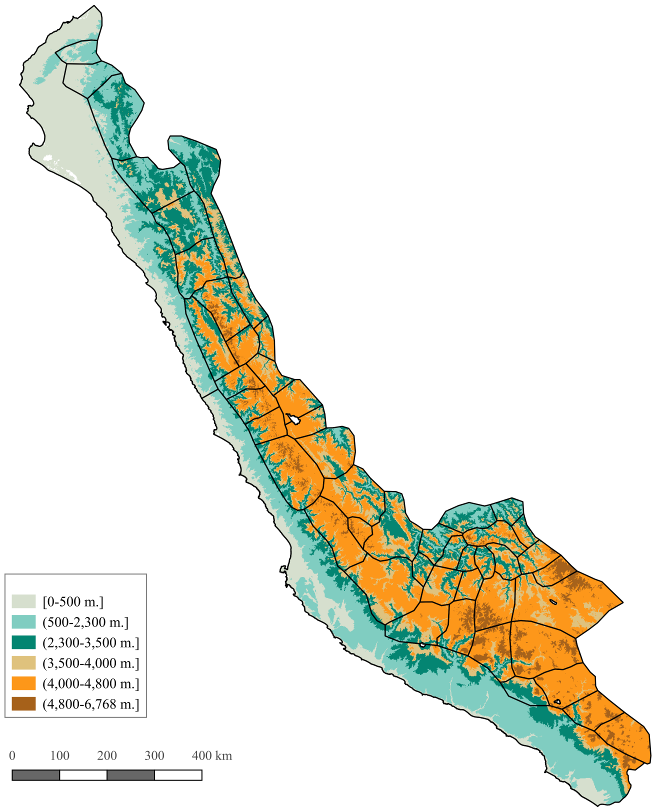


Figure 1.4

Notes. Polygon borders in black represent the approximate extent of tribes under the Inca empire at the time of the Spanish conquest (Rowe, 1946). The figure displays the different elevation zones within the territory of each tribe following the classification in Pulgar Vidal (1941). For elevation data, I use version 1.2 of the Harmonized World Soil Database (FAO).

[26]Table 1.E.1 shows the number of parishes by elevation zone of the parish capital. The proportion of parishes with ethnic diversity ranges from 31 percent in the Yunga region to 79 percent in the Suni region.

I use a diversity index that sums over elevation zones. The reciprocal of the Simpson or Herfindahl index is a common diversity measure in ecology (Magurran, 2004). It has also been used in urban studies to measure diversity in sectors of economic activity (Duranton and Puga, 2000). It takes the following form:

$$H_e = \frac{1}{\sum_j s_{ej}^2}$$

where s_{ej} is the area share of elevation zone j within the homeland of ethnic group e. The index increases as the composition of elevation zones within an ethnic group's territory becomes more diverse. I have normalized the index to take value 1 for the group with the highest diversity at the end of the pre-colonial period. Elevation data come from version 1.2 of the Harmonized World Soil Database (FAO), which provides 30 arc-second raster data (grid cells of approximately $1km \times 1km$ at the equator) with median elevation based on information from the NASA Shuttle Radar Topographic Mission (SRTM). After classifying each grid cell with centroid within the ethnic polygon into an elevation zone, I can compute the area share of each zone j within the homeland of that ethnicity. Figure 1.D.1 shows the density of the normalized index at the ethnic group level. Approximately 20 percent of the groups have an index value below 0.5, while the index for the remaining 80 percent ranges from 0.5 to 1, with similar mean (0.666) and median (0.676) values.[27]

Finally, for each parish, I compute the weighted average of within-group heterogeneity within the $10km$ buffer as:

$$\overline{H}_p = \sum_e w_{pe} H_e$$

[27]Using information on the area planted with native crops from the 2012 national agricultural census, Table 1.E.3 shows that the measure of within-group heterogeneity is positively and significantly correlated with crop diversity.

where w_{pe} is the area share of ethnic group e within the $10km$ buffer from the parish capital (p). It aims to capture the average level of within-group heterogeneity to which native populations in a parish were exposed before colonization. The mean value of the average level of within-group heterogeneity in the sample of 336 parishes is 0.674.

1.3.2 *Validating Ethnic Borders*

Should we trust ethnic borders? Using data from baptism records (1605-1780), I explore whether surname heterogeneity among native populations was significantly higher in parishes with ethnic diversity, as captured by the spatial analysis, compared to parishes with only one ethnicity within the $10km$ buffer.

Surname diversity. In certain contexts, measures based on the frequency distribution of surnames can shed light on the biological relationship between human populations. Provided that surnames are inherited, the underlying idea of this approach is that surname commonality between individuals (isonymy) can be used to trace common ancestry (Lasker, 1980, 1985; Colantonio et al., 2003). Specifically, two main diversity indices have been applied to surnames:

$$D = 1 - \sum_{k=1}^{K} p_k^2\,, \qquad S = -\sum_{k=1}^{K} p_k \ln(p_k)$$

where p_k represents the proportion of individuals with surname k in the population and K is the total number of different surnames. The first index, $D \in [0, 1]$, relies on the Simpson or Herfindahl index. As long as any two individuals with the same surname inherited it from a common ancestor, the index can be interpreted as the probability that two individuals taken at random from the population have different ancestry. The second index, $S \in [0, \ln(K)]$, is known as the Shannon index and takes its theoretical basis from information theory (Shannon, 1948).[28] In the context of surnames, S can be interpreted as the average uncertainty in predicting ancestry. The idea is that if each surname has the same relative frequency in the population (surnames are evenly distributed across individuals), the uncertainty in predicting the most probable ancestor of a randomly selected individual will be high. In contrast, a more uneven distribution in which a few surnames are shared by a large portion of the population (e.g., an isolated community characterized by endogamous marriages) implies lower uncertainty in predicting ancestry.[29]

Introduction of surnames in Peru. Isonymy methods make a strong assumption (i.e., surname commonality directly translates into common ancestry). This assumption does not hold in contexts where one surname can have multiple origins (e.g., non-related individuals with a common surname due to their ancestors sharing the same occupation) or in contexts where surname changes are permitted for non-genetic reasons (e.g., illegitimacy or adoption). Are isonymy methods, therefore, appropriate for this application?

Historical chronicles describe the social unit at the time of the Spanish conquest as an endogamous group of several extended families with ancestry traced through the male line (Rowe, 1946). Before the expansion of the Inca empire, groups claimed descent from a mythical ancestor, usually an animal or some element of nature, which was worshiped and sometimes honored with rites and sacrifices (see Garcilaso de la Vega (1960)[1609], first book). Evidence suggests that no system of family names existed prior to the arrival of the Spanish,

[28]The Shannon index is an entropy measure that has also been applied to genetic diversity (Lewontin, 1972) and to species diversity (Magurran, 2004).

[29]Appendix 1.B plots each index for different numbers of groups of equal size. Both indices grow with the number of groups, but the S index grows faster than the D index.

but rather first names related to the mythical ancestor. The system of family names was introduced by the Catholic Church with the purpose of religious indoctrination. At least since the First Council of Lima in 1551-52, one of the main tasks of Spanish priests was the baptism of children and adults (de Armas Medina, 1953, ch. 10). To my knowledge, there were no specific instructions regarding the choice of first names and surnames. While this approach may be limited by the adoption of Hispanic surnames over time, qualitative evidence suggests that the common practice was for priests to choose a Hispanic first name, with the native first names of the parents adopted as surnames (RENIEC, 2012).[30] Garcilaso de la Vega (1960)[1609] also suggests that surnames adopted by native populations were initially related to their ethnic origin.[31] Given the practice of endogamy and the short history of family names, this application focuses on the early common origin of surnames representing common ancestry through the male line.

Surnames from baptism records. The website FamilySearch.org contains baptism records for colonial Peru. The organization, which seeks to help trace users' ancestry, seeks volunteers from around the world to make indexed genealogical records freely available. For the purpose of this analysis, each baptism record includes information on three key characteristics of the individual: full name, name of the parish, and date of baptism.[32] The original handwritten record has also been uploaded in some cases and can be easily accessed.

I created a dataset of 112,340 individuals with native first surname covering the period 1605-1780.[33] The dataset includes information

[30]Each individual inherits two surnames in the Hispanic system of family names: the first surname corresponds to the first surname of the father, while the second surname is the first surname of the mother.

[31]See **?** for further details on the introduction of surnames in Peru.

[32]As an example, Appendix 1.B displays a baptism record from the website.

[33]The records also provide information on gender: 50.32 percent of individuals

for 66 parishes, of which 20 percent are parishes with ethnic diversity according to the spatial exercise. To identify native surnames, I constructed a dictionary of native linguistic roots and looked for the occurrence of these roots within surnames; see Appendix 1.B for further details. It is important to note that, since not all records have survived, the number of parishes with information varies by year. Furthermore, the number of individuals with surname information in each parish depends on recovered historical records, and thus the results should be interpreted with caution. Appendix 1.B reports the total number of individuals, the number of parishes with information on baptized individuals, and other descriptive statistics for disaggregated time periods. The mean parish in the dataset of baptisms comprises 1,702 individuals with native first surname, of which 846 are males, relative to a sample mean of 1,603 individuals per parish according to the census of 1792 (of which 758 are males). The number of individuals with native first surname per parish has a right-skewed distribution, with a median of 562 individuals. Data from the census of 1792 are less skewed, with a median of 945 individuals.

Results. Table 1.1 presents the results from regressing surname diversity measures on the ethnic diversity dummy variable. In each column, the dependent variable is either the S index or the D index, constructed using individuals with native first surname. All variables except the indicator for ethnic diversity are standardized to have mean 0 and standard deviation 1. The results for the subsample of parishes with available information suggest that, on average, parishes located close to ethnic borders exhibited higher surname diversity among native populations (between 0.42 and 0.55 standard deviations), compared to parishes located at the interior of ethnic homelands.

with native first surname are females, while the remaining 49.68 percent are males.

Panel A shows baseline results. For each surname diversity index, the first column shows the unconditional correlation. The second column adds the log total number of individuals found in the records of the parish and the share of individuals with non-native first surname as control variables. The third column includes geographic controls and log distance to the closest mining center during the colonial period. The last column includes ecclesiastical jurisdiction fixed effects, accounting for potential differences in the administration of baptism across colonial bishoprics. The coefficient on the ethnic diversity dummy variable is always positive and statistically significant. Panel B shows that the results are similar after dropping individuals whose surnames only occur once in the dataset.[34] Finally, Panel C shows that the results are robust to using groups of similar surnames (instead of raw surnames) in order to compute surname diversity indices. This approach takes into account potential changes in the writing of surnames over time.[35]

1.3.3 *Contemporary Outcomes*

I use several outcomes that capture contemporary living standards. Specifically, I look at local economic activity and access to public infrastructure. Table 1.E.2 reports summary statistics for the full sample and separately by parishes with and without ethnic diversity.

Since high quality data on income per capita is not available at the local level, I follow the empirical literature in using luminosity data from satellite images at night as a proxy for local economic activity (Michalopoulos and Papaioannou, 2018). The NOAA's National Geophysical Data Center provides yearly raster data on the average

[34] Doing so decreases the sample of individuals with native first surname from 112,343 to 106,124 individuals.

[35] Specifically, I link surnames if only one change (deletion, insertion, or substitution) is required to transform one surname into the other. This results in a decrease in the total number of different surnames (K) in the dataset from 308 to 234.

Table 1.1: Ethnic Diversity and Surname Heterogeneity (1605-1780)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dep. Variable:							
	S Index	S Index	S Index	S Index	D Index	D Index	D Index	D Index
Panel A: Baseline								
Ethnic diversity (dummy)	0.536**	0.456**	0.543**	0.528**	0.507***	0.466**	0.552**	0.484**
	[0.208]	[0.180]	[0.213]	[0.205]	[0.167]	[0.178]	[0.217]	[0.223]
Panel B: Drop surnames of frequency 1								
Ethnic diversity (dummy)	0.487**	0.418**	0.503**	0.487**	0.481***	0.446**	0.521**	0.455**
	[0.205]	[0.157]	[0.191]	[0.188]	[0.170]	[0.175]	[0.210]	[0.215]
Panel C: Grouped surnames								
Ethnic diversity (dummy)	0.507**	0.426**	0.507**	0.501**	0.488***	0.445**	0.527**	0.468**
	[0.211]	[0.182]	[0.212]	[0.203]	[0.169]	[0.177]	[0.214]	[0.219]
Observations	66	66	66	66	66	66	66	66
Ln total pop.	No	Yes	Yes	Yes	No	Yes	Yes	Yes
% Non-native surnames	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Geography	No	No	Yes	Yes	No	No	Yes	Yes
Ln dist to colonial mine	No	No	Yes	Yes	No	No	Yes	Yes
Ecclesiastical Jurisd. FE	No	No	No	Yes	No	No	No	Yes

Notes. OLS estimates. The unit of observation is the parish. Robust standard errors in brackets. The dependent variable is one measure of surname heterogeneity, either the Shannon index (S index) or one minus the Herfindahl index (D index), constructed using individuals with native first surname. Ethnic diversity is a dummy variable that takes value 1 if there is more than one tribe within a 10km buffer from the parish capital, and 0 otherwise. Geographic controls include mean elevation, standard deviation of elevation, mean pre-1500CE caloric suitability, standard deviation of pre-1500CE caloric suitability, log distance to river, and a quadratic polynomial in longitude-latitude. The ecclesiastical jurisdiction is the colonial bishopric in charge of the parish (Lima, Arequipa, Huamanga, Trujillo, or Cuzco). Columns (2) and (6) add the log total number of individuals found in baptism records and the share of individuals with non-native first surname (1605-1780). All variables except ethnic diversity are standardized to have mean 0 and standard deviation 1.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

intensity of nighttime lights at a resolution of 30 arc-seconds.[36] I compute average light intensity per capita for the period 2000-2003 using luminosity data from satellite F15.[37] Specifically, the sum of light intensity across all grid cells with centroid within the $10km$ buffer is divided by the total population within the same buffer. Population data for the year 2000 come from version 4.10 of the Gridded Population of the World (CIESIN). These data are also mapped at a 30 arc-second resolution with population counts based on census data and adjusted to match the United Nation's estimated population counts at the country level. Following the empirical literature, I log transform the measure of light intensity per capita and add 0.01 before computing the logarithm (Henderson et al., 2012; Hodler and Raschky, 2014; Michalopoulos and Papaioannou, 2013, 2014).

A second proxy for local economic activity is non-subsistence agriculture. Subsistence farming has traditionally been a widespread practice in the Andean highlands. The 1994 national agricultural census provides district-level data on the number of agricultural producers that devoted most of the harvest to sale or trade in local markets rather than to own consumption. I assign the data of the corresponding contemporary district to each parish. On average, 75 percent of agricultural producers in a district reserved most of their harvests for their own consumption. Using this information, I construct an indicator for non-subsistence agriculture taking value 1 if the share of producers devoting most of the harvest to sale or trade was above the median value in the sample ($P_{50} = 0.03$), and 0 otherwise.

To measure access to public infrastructure, I use district-level data

[36]After removing observations with clouds, each grid cell is assigned an integer from 0 to 63, with higher values indicating more intense light. Ephemeral events (e.g., fires) are discarded and background noise is set to zero. The objective of the NOAA's data processing is to capture human-induced lighting (lights from human settlements, towns, and cities). More details on data processing can be found here.

[37]I try to minimize measurement error by averaging yearly data from the same satellite.

from the 1993 population and housing census on the share of occupied dwellings with access to public sanitation (i.e., having a connection to the public sewer system) and to the public network of water supply. Starting in 1962, a new law on rural access to water and sanitation established that the state would provide the necessary infrastructure, but communal organizations in each district would be responsible for operating and managing the systems. Through communal assemblies, local people managed the repair, cleaning, and disinfection of the infrastructure in order to keep the systems running.[38] On average, only 12 percent of occupied dwellings in a district had access to public sanitation.[39] The mean share of dwellings with access to the public water supply in a district was relatively higher (24 percent).

1.4 EMPIRICAL STRATEGY

Location of parishes. I use variation in the location of parishes with respect to ethnic borders as a source of quasi-random variation in ethnic diversity. The analysis relies on the assumption that the location of parishes with respect to ethnic borders, which leads to variation in ethnic diversity across parishes, was not determined by factors related to pre-existing characteristics of native populations or the environment that could influence post-resettlement economic development.

What determined the location of parishes? Although the regulation enacted by Toledo in 1569-1570 described appropriate locations, the extent to which Spanish officials applied the recommendations is unclear. (Pease, 1989).[40] Nonetheless, the regulation included three

[38]Law 13997 of 1962. Check here for an official report for the implementation of the law.

[39]Rural access to sanitation facilities in Peru was among the lowest in the world by the year 2000; see the World Bank Natural Rural Water Supply and Sanitation Project for Peru.

[40]See "Instrucción General para los Visitadores" in Lohmann Villena (1986), Appendix III in de La Espada (1881) and Medina (1974b) for details on the 16th century

main characteristics. The first was land abundance. The village had to be surrounded by enough land to be worked by native families following their own rules of crop rotation. Plots of land were thought to be the main source for the payment of tribute, which initially took the form of a tax paid in agricultural output by all native males aged 18 to 50.[41] The second characteristic was access to water sources. Proximity to surface water, which in this context meant access to the system of river basins, was a key advantage that would allow the irrigation of land and the possibility to sustain populations that mainly depended on subsistence agriculture. Finally, in order to facilitate religious indoctrination, villages should be far away from *huacas*, sacred native shrines that generally honored nature. Local officials were also tasked with destroying the houses where native families used to live before the resettlement. Shortly after the creation of new jurisdictions, families refusing to relocate were to be punished and forced to move.

In the first part of the empirical analysis (Section 1.5.1), I examine balance in geographic characteristics between parishes located close to ethnic borders (*with ethnic diversity*) and those located at the interior of ethnic homelands (*without ethnic diversity*). Unfortunately, no comprehensive data on *huacas* exists to test if distance to sacred native shrines varies with proximity to ethnic borders.

Empirical specification. I explore whether the effects of ethnic diversity depend on the degree of within-group heterogeneity to which native populations were exposed before colonization. Specifically, I am interested in the interaction effect of ethnic diversity and the average level of within-group heterogeneity (β_3) in the following

regulation.

[41] It was paid on a collective basis. Although the amount to be paid was individual, the responsibility for the payment of tribute fell collectively on the families of native males (Sánchez-Albornoz, 1978; Wachtel, 1976).

specification:

$$y_p = \beta_0 + \beta_1 Ethnic\, div_p + \beta_2 Av.\ within\text{-}group\ H_p + \beta_3 \left(Ethnic\, div_p \times Av.\ within\text{-}group\ H_p\right) + X_p^{'}\gamma + \upsilon_p \tag{1.1}$$

where y_p is a measure of contemporary living standards in parish p, $Ethnic\ div_p$ is a dummy variable indicating whether there is an ethnic border within a $10km$ buffer from the parish capital, and $Av.\ within\text{-}group\ H_p$ is the weighted average of within-group heterogeneity within the $10km$ buffer ($\overline{H}$). I start with the unconditional relationship and then sequentially add control variables (X_p) to the specification. Geographic controls include mean elevation, variation in elevation, mean pre-colonial caloric suitability, variation in pre-colonial caloric suitability, log distance to river, and a quadratic polynomial in longitude-latitude of the parish capital.[42] Following the previous literature (Michalopoulos and Papaioannou, 2013, 2014), I also control for the log of contemporary population density as to capture the effect of ethnic diversity on contemporary living conditions beyond agglomeration. I then add colonial controls. Specifically, I include log tributary population at the time of the resettlement policy (1575), log distance to the closest mining center involving native populations (Dell, 2010), and a vector of demographic characteristics reflecting the composition of the population at the end of the colonial period.[43] Finally, I add ecclesiastical jurisdiction fixed effects that account for the colonial bishopric to which the parish belonged. I also show results accounting for the religious order in charge of the parish and from an alternative specification using fixed effects at the level of

[42]Elevation and caloric suitability measures refer either to the average or to the standard deviation across grid cells within the corresponding contemporary district. See the data appendix.

[43]The historical literature has noted the potential decline of native populations in areas under high tributary and mining pressure (Sánchez-Albornoz, 1978). The vector of demographic characteristics includes separate variables for the shares of indigenous, mestizo, slave, and Spanish populations by 1792.

the administrative province instead of the ecclesiastical jurisdiction.[44] All data sources and definitions are reported in the appendix.

Rather than looking at the effect of ethnic diversity on individual outcomes, I report the standardized average effect size (AES) across contemporary outcomes following the methodology of Kling et al. (2004) and Clingingsmith et al. (2009). The AES averages the standardized individual effects estimated from a seemingly-unrelated regression framework, accounting for the covariance across estimates. Results for individual outcomes are reported in the appendix.

1.5 RESULTS

Section 1.5.1 presents the results from balance tests and explores the correlates of within-group heterogeneity. Section 1.5.2 presents the results from estimating equation 1.1. Section 1.5.3 describes robustness checks. Section 1.5.4 presents the results for mid-term development outcomes and Section 1.5.5 examines the mechanism.

1.5.1 *Pre-Resettlement Characteristics*

Balance tests for ethnic diversity. I start by examining balance in geography, tributary population at the time of the resettlement policy, and distance to colonial mines. Regarding geography, I consider the following characteristics within the $10km$ buffer from the parish capital: mean elevation, variation in elevation, mean pre-colonial caloric suitability, variation in pre-colonial caloric suitability, and log distance to river.

[44] The ecclesiastical jurisdictions are Lima, Arequipa, Huamanga, Trujillo, and Cuzco. There are seven categories under the religious order fixed effect: one of the regular orders (Santo Domingo, La Merced, San Francisco, San Agustín, and Compañía de Jesús), more than one religious order, and secular clergy if no specific order was in charge of the parish during most of the colonial period. Administrative province fixed effects account for 44 colonial provinces. The ecclesiastical jurisdiction varies at the province level.

Table 1.2 presents the results from balance tests. I report robust standard errors in brackets and standard errors corrected for spatial dependence with a distance cutoff of $50km$ in parentheses (Conley, 1999). Overall, there are no systematic differences in geography between parishes located at the interior of ethnic homelands and those located close to ethnic borders (columns 1-5). Columns (6) and (7) explore proxies for initial wealth. Column (6) shows that log tributary population at the beginning of the colonial period is balanced, while column (7) shows that there is no statistically significant difference in distance to mines between parishes with and without ethnic diversity.

Relevant characteristics do not vary with proximity to ethnic borders, supporting that colonial officials did not systematically concentrate populations of mixed ethnic origin in places that were inherently different in terms of geography or initial wealth. Moreover, column (8) shows that ethnic diversity, created as a result of the Spanish intervention, is not significantly correlated with the average level of within-group heterogeneity to which native populations were exposed before colonization. This result is consistent with the idea that parishes located close to ethnic borders during the 16th-century resettlement did not systematically concentrate populations from more heterogeneous ethnic groups.

Correlates of within-group heterogeneity. Table 1.3 explores the correlates of within-group heterogeneity. The analysis is run at the ethnic group level. It presents OLS estimates for individual regressions with the following dependent variables: mean elevation, standard deviation of elevation, mean pre-colonial caloric suitability, standard deviation of pre-colonial caloric suitability, log river density, total land area, and the log of approximate population density at the time of the Spanish conquest.

Unsurprisingly, since within-group heterogeneity in specializations

Table 1.2: Balance Tests

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dep. Variable:							
	Mean Elevation	Variation in Elevation	Mean Caloric Suit.	Variation in Caloric Suit.	Ln Dist. to River	Ln Pop. (1575)	Ln Dist. to Mine	Av.Within Group H
Ethnic div (dummy)	0.110	0.174	-0.028	0.032	-0.066	-0.045	-0.048	0.141
	[0.104]	[0.116]	[0.113]	[0.118]	[0.114]	[0.114]	[0.115]	[0.112]
	(0.125)	(0.135)	(0.136)	(0.131)	(0.127)	(0.131)	(0.137)	(0.133)
Observations	336	336	336	336	336	336	336	336

Notes. OLS estimates. The unit of observation is the parish. Robust standard errors in brackets; Conley standard errors corrected for spatial dependence with a distance cutoff of 50km in parentheses. Each column indicates a dependent variable. The table reports the coefficient on the ethnic diversity dummy variable, taking value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. Av. Within-Group H refers to the weighted average of the within-group heterogeneity index, computed using the area share of each ethnic group within the 10km buffer as weight. All dependent variables are standardized to have mean 0 and standard deviation 1.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.3: Correlates of Within-Group Heterogeneity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dep. Variable:							
	Mean Elevation	Variation in Elevation	Mean Caloric Suit.	Variation in Caloric Suit.	Ln River Density	Group Area	Ln Group Area	Ln Pop. Density (1532)
Within-Group H	-0.109	0.658***	0.139	0.319***	0.154	-0.152	-0.105	0.188
	[0.103]	[0.106]	[0.107]	[0.080]	[0.113]	[0.122]	[0.145]	[0.149]
Observations	49	49	49	49	49	49	49	48

Notes. OLS estimates. The unit of observation is the ethnic group. Robust standard errors in brackets. Each column indicates a dependent variable. All variables are standardized to have mean 0 and standard deviation 1. Regressions include a quadratic polynomial in longitude-latitude of the ethnic group's centroid.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

is measured as a diversity index that sums over elevation zones, it is positively and significantly correlated with variation in elevation and in the pre-colonial caloric suitability of land (columns 1 to 5). The correlation between within-group heterogeneity and total land surface is not statistically significant, and log transforming surface does not change the result (columns 6 and 7). Finally, the correlation with log population density, which reflects comparative development in the period prior to 1500CE (Ashraf and Galor, 2011, 2013), is positive but not statistically significant (column 8). In robustness exercises, I account for the main correlates of within-group heterogeneity as well as for other observable characteristics of ethnic groups.

1.5.2 *Main Results*

For comparison with the previous literature, I first look at the overall effect of ethnic diversity, comparing average living standards between parishes with ethnic diversity and those with similar baseline characteristics in which only one ethnic group was concentrated (Table 1.4).

Looking at the standardized AES across contemporary outcomes, I find that ethnic diversity is robustly associated with lower living standards in the long run (between -0.16 and -0.22 standard deviations relative to parishes without ethnic diversity). Column (1) shows that the unconditional AES (-0.21 standard deviations) is statistically significant at the 1 percent level. Columns (2) to (4) show that the magnitude and statistical significance are not affected by the inclusion of geography controls, population density, initial tributary population, distance to colonial mines, and demographic controls that reflect the composition of the population by the end of the colonial period. Including ecclesiastical jurisdiction fixed effects results in a decrease of the AES from -0.21 to -0.16 standard deviations (column 5), though it remains statistically significant at the 1 percent level. For comparison, column (6) reports the estimated effect without accounting for population density, which results in an AES of -0.17 (significant at the 5 percent level). The results are in line with the literature on the costs of ethnic diversity (e.g., Miguel and Gugerty, 2005; Hjort, 2014). However, they highlight the persistent effects of forced ethnic diversity at the local level: after almost two hundred years of independence from Spanish rule, parishes whose initial populations were ethnically diverse tend to be worse off than parishes with an ethnically homogeneous founding population.[45]

Table 1.5 shows the results for the interaction effect of ethnic diversity and average within-group heterogeneity (equation 1.1). Columns (1) to (5) follow the same structure as Table 1.4, sequentially adding baseline controls and ecclesiastical jurisdiction fixed effects to the unconditional specification. The results exhibit a robust pattern: while the estimated coefficient on ethnic diversity is negative, its interaction with native groups' average within-group heterogeneity is positive. Both coefficients are statistically significant at the 1 percent level, showing that the costs of ethnic diversity tend to be overcome among populations from more heterogeneous ethnic groups. The estimates are unchanged when including fixed effects that account for the religious order in charge of the parish (column 6). In column (7), I include fixed effects at the level of the colonial province instead of the ecclesiastical jurisdiction, showing that both coefficients remain significant at the 1 percent level when accounting for the administrative province. The last column reports the AES without population density as control variable and shows that the same pattern arises.[46]

Figure 1.5 plots the estimated AES and 95 percent confidence inter-

[45]Tables 1.E.4 and 1.E.5 report the results separately for each contemporary outcome. Table 1.E.6 reports the AES using a standard measure of ethnic diversity based on the Herfindahl index, instead of the ethnic diversity dummy variable.

[46]Tables 1.E.7 and 1.E.8 present the results separately for each contemporary outcome.

Table 1.4: Overall Effect of Ethnic Diversity

	(1)	(2)	(3)	(4)	(5)	(6)
	Contemporary Living Standards (AES)					
Ethnic diversity (dummy)	-0.205***	-0.222***	-0.221***	-0.212***	-0.159***	-0.168**
	[0.076]	[0.065]	[0.065]	[0.065]	[0.060]	[0.066]
Observations	336	336	336	336	336	336
Geography	No	Yes	Yes	Yes	Yes	Yes
Ln pop. density	No	Yes	Yes	Yes	Yes	No
Ln tributary pop. ($\sim$ 1575)	No	No	Yes	Yes	Yes	Yes
Ln distance to colonial mine	No	No	Yes	Yes	Yes	Yes
Demographic controls 1792	No	No	No	Yes	Yes	Yes
Ecclesiastical Jurisd. FE	No	No	No	No	Yes	Yes

Notes. The unit of observation is the parish. Robust standard errors in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. The table presents the standardized average effect size (AES) for four outcomes: log average light intensity per capita (2000-2003), indicator for non-subsistence agriculture (1994), share of dwellings with access to public sanitation (1993), and share of dwellings with access to the public water network (1993). Geographic controls include mean elevation, standard deviation of elevation, mean pre-1500CE caloric suitability, standard deviation of pre-1500CE caloric suitability, log distance to river, and a quadratic polynomial in longitude-latitude. Demographic controls include separate variables for the shares of indigenous, mestizo, slave, and Spanish populations by 1792. The ecclesiastical jurisdiction is the colonial bishopric in charge of the parish (Lima, Arequipa, Huamanga, Trujillo, or Cuzco).
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.5: Ethnic Diversity, Within-Group Heterogeneity and Development

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Contemporary Living Standards (AES)							
Ethnic diversity (dummy)	-1.064***	-1.131***	-1.168***	-1.145***	-0.967***	-0.931***	-0.809***	-0.713**
	[0.328]	[0.281]	[0.284]	[0.280]	[0.263]	[0.259]	[0.259]	[0.287]
Ethnic diversity (dummy)	1.258***	1.335***	1.392***	1.370***	1.186***	1.182***	1.129***	0.974**
× Av. Within-Group H	[0.459]	[0.390]	[0.393]	[0.385]	[0.375]	[0.370]	[0.365]	[0.410]
Observations	336	336	336	336	336	336	336	336
p-value for joint significance	0.001	0.000	0.000	0.000	0.000	0.001	0.008	0.045
Geography	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ln pop. density	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Ln tributary pop. ($\sim$ 1575)	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Ln distance to colonial mine	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Demographic controls 1792	No	No	No	Yes	Yes	Yes	Yes	Yes
Ecclesiastical Jurisd. FE	No	No	No	No	Yes	Yes	No	No
Religious Order FE	No	No	No	No	No	Yes	Yes	Yes
Colonial Province FE	No	No	No	No	No	No	Yes	Yes

Notes. The unit of observation is the parish. Robust standard errors in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. Av. Within-Group H refers to the weighted average of the within-group heterogeneity index, computed using the area share of each ethnic group within the 10km buffer as weight. The table presents the standardized average effect size (AES) for four outcomes: log average light intensity per capita (2000-2003), indicator for non-subsistence agriculture (1994), share of dwellings with access to public sanitation (1993), and share of dwellings with access to the public water network (1993). Geographic controls include mean elevation, standard deviation of elevation, mean pre-1500CE caloric suitability, standard deviation of pre-1500CE caloric suitability, log distance to river, and a quadratic polynomial in longitude-latitude. Demographic controls include separate variables for the shares of indigenous, mestizo, slave, and Spanish populations by 1792. The ecclesiastical jurisdiction is the colonial bishopric in charge of the parish (Lima, Arequipa, Huamanga, Trujillo, or Cuzco). Religious order fixed effects refer to Santo Domingo, La Merced, San Francisco, San Agustín, Compañía de Jesús, more than one order, or secular clergy. Colonial province fixed effects account for 44 administrative provinces. The *p*-value refers to the joint significance of ethnic diversity terms.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

vals after baseline controls, religious order fixed effects, and colonial province fixed effects (column 7). On average, the negative association between ethnic diversity and contemporary living standards decreases (from -0.47 to -0.13 standard deviations relative to parishes without ethnic diversity) as average within-group heterogeneity reaches the median value ($\overline{H}_{50} = 0.67$) and turns positive (from 0.21 to 0.32 standard deviations) for parishes above the 90th percentile ($\overline{H}_{90} = 0.88$). Table 1.E.9 additionally reports the estimated AES of within-group heterogeneity for the whole sample and separately for parishes with and without ethnic diversity. The results show that there is a positive association between exposure to a high level of within-group heterogeneity and contemporary living standards in the subsample of parishes with ethnic diversity. The next section addresses concerns regarding measurement and omitted characteristics of ethnic groups.

1.5.3 *Robustness Checks*

I start with a series of robustness checks to make sure that the previous pattern is not driven by omitted group characteristics. All robustness exercises are shown for columns (6) and (7) of Table 1.5 (i.e., with baseline controls, religious order fixed effects, and either ecclesiastical jurisdiction or colonial province fixed effects). First, is within-group heterogeneity as captured by diversity in specializations or is just variation in any geographic characteristic? Table 1.6 shows that the pattern of results is robust to accounting for the main correlates of within-group heterogeneity (i.e., weighted average of ethnic-level variation in elevation and in pre-colonial caloric suitability within the $10km$ buffer) and their interaction with ethnic diversity. Thus, although my measure of within-group heterogeneity in specializations is based on elevation zones, it is not capturing the same pattern as variation in geographic elevation or in the caloric suitability of land.

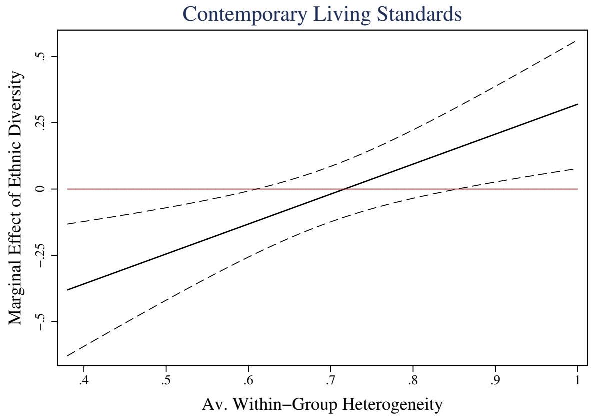


Figure 1.5

Notes. The solid line represents the standardized average effect size (AES) across contemporary outcomes (ln average light intensity per capita −2000-2003−, indicator for non-subsistence agriculture −1994−, share of dwellings with access to public sanitation −1993−, and share of dwellings with access to the public water network −1993−) after baseline controls, religious order fixed effects, and colonial province fixed effects. Dashed lines represent 95% confidence intervals.

Second, is within-group heterogeneity or other ethnic characteristic? Gains from trade as a consequence of ecological diversity could predict state centralization (Fenske, 2014). Although information on pre-Inca institutions is scarce, to the best of my knowledge there is no evidence on complex states in the region of analysis before the expansion of the Inca empire. Table 1.7 shows that the same pattern of results is observed when accounting for the interaction of ethnic diversity and different group characteristics that could be related with stronger ethnic development, like the average land area of ethnic groups (columns 1 and 2), approximate population density at the time of the Spanish conquest (columns 3 and 4), and land suitability for maize, a cereal grain characterized by its high caloric content and known to be available in Peru prior to the conquest (columns 5 and 6).[47]

[47]The availability of appropriable cereal crops over roots and tubers could predict

Table 1.6: Robustness I - Variation in Elevation and in Pre-Colonial Caloric Suitability

	(1)	(2)	(3)	(4)	(5)	(6)
	Contemporary Living Standards (AES)					
Ethnic diversity (dummy)	-0.747***	-0.725***	-0.876***	-0.779***	-0.701***	-0.705***
	[0.269]	[0.265]	[0.256]	[0.248]	[0.268]	[0.261]
Ethnic div × Av. Within-Group H	1.229***	1.117***	1.020**	1.024***	1.068***	1.046***
	[0.388]	[0.374]	[0.398]	[0.360]	[0.393]	[0.373]
Ethnic div × Av. Variation in Elevation	-0.355	-0.143			-0.348	-0.156
	[0.332]	[0.323]			[0.332]	[0.321]
Ethnic div × Av. Variation in Caloric Suit.			0.169	0.122	0.182	0.114
			[0.233]	[0.192]	[0.203]	[0.193]
Observations	336	336	336	336	336	336
Ecclesiastical Jurisd. FE	Yes	No	Yes	No	Yes	No
Colonial Province FE	No	Yes	No	Yes	No	Yes
All controls column (7) of Table 1.5	Yes	Yes	Yes	Yes	Yes	Yes

Notes. The unit of observation is the parish. Robust standard errors in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. Av. Within-Group H refers to the weighted average of the within-group heterogeneity index, computed using the area share of each ethnic group within the 10km buffer as weight. Similarly, average variation in elevation and in pre-1500CE caloric suitability refer to the weighted average of group-level characteristics, normalized as to take value 1 for the group with the highest value. The table presents the standardized average effect size (AES) for four outcomes: log average light intensity per capita (2000-2003), indicator for non-subsistence agriculture (1994), share of dwellings with access to public sanitation (1993), and share of dwellings with access to the public water network (1993). The ecclesiastical jurisdiction is the colonial bishopric in charge of the parish (Lima, Arequipa, Huamanga, Trujillo, or Cuzco). Colonial province fixed effects account for 44 administrative provinces.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.7: Robustness II - Land Area, Population Density, and Maize Suitability

	(1)	(2)	(3)	(4)	(5)	(6)
	Contemporary Living Standards (AES)					
Ethnic diversity (dummy)	-0.741**	-0.702**	-0.680**	-0.685**	-0.837***	-0.752***
	[0.315]	[0.321]	[0.273]	[0.270]	[0.260]	[0.260]
Ethnic div × Av. Within-Group H	0.953**	0.991**	0.932**	1.029***	1.138***	1.075***
	[0.409]	[0.420]	[0.375]	[0.371]	[0.355]	[0.346]
Ethnic div × Av. Land Area	-0.001	-0.001				
	[0.003]	[0.003]				
Ethnic div × Ln Av. Population Density (∼ 1532)			0.163**	0.101		
			[0.079]	[0.080]		
Ethnic div × Av. Suit. for Maize					-0.185	-0.078
					[0.198]	[0.201]
Observations	336	336	336	336	336	336
Ecclesiastical Jurisd. FE	Yes	No	Yes	No	Yes	No
Colonial Province FE	No	Yes	No	Yes	No	Yes
All controls column (7) of Table	Yes	Yes	Yes	Yes	Yes	Yes

Notes. The unit of observation is the parish. Robust standard errors in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. Av. Within-Group H refers to the weighted average of the within-group heterogeneity index, computed using the area share of each ethnic group within the 10km buffer as weight. Similarly, average land area ($km^2/1000$), the log of average population density by 1532 and average suitability for maize refer to the weighted average of group-level characteristics. The table presents the standardized average effect size (AES) for four outcomes: log average light intensity per capita (2000-2003), indicator for non-subsistence agriculture (1994), share of dwellings with access to public sanitation (1993), and share of dwellings with access to the public water network (1993). The ecclesiastical jurisdiction is the colonial bishopric in charge of the parish (Lima, Arequipa, Huamanga, Trujillo, or Cuzco). Colonial province fixed effects account for 44 administrative provinces.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.8 implements additional robustness checks. Columns (1) and (2) show that the results exhibit the same pattern when controlling for an extended set of (uninteracted) ethnic characteristics. Specifically, I include the weighted average of ethnic-level land area, mean elevation, variation in elevation, mean pre-colonial caloric suitability, variation in pre-colonial caloric suitability, log river density, and log population density at the time of the Spanish conquest.[48] Columns (3) and (4) include fixed effects for the majority ethnic group, defined as the group with the highest area share within the $10km$ buffer.[49] The coefficients exhibit the same pattern and remain statistically significant at the 1 percent level. Finally, columns (5) and (6) show that the results are not affected by excluding parishes in which the majority ethnic group is a coastal group (approximately 10 percent of parishes). Coastal groups also tend to occupy larger surface areas than groups from the highlands.

The appendix reports the results from using alternative variable definitions. In Table 1.E.10, I use a standard measure of diversity based on the Herfindahl index to quantify ethnic fractionalization ($1 - \sum_e w_{pe}^2$), where w_{pe} is the area share of ethnic group e within a $10km$ buffer from the parish capital p. In Table 1.E.11, I use the same diversity index to measure within-group heterogeneity in specializations ($1 - \sum_j s_{ej}^2$), where s_{ej} refers to the area share of elevation zone j within the homeland of ethnic group e. The same pattern arises, showing that the results are not sensitive to specific variable definitions. Table 1.E.12 presents estimates from using a robust version of the ethnic diversity

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the emergence of more complex hierarchies (Mayshar et al., 2020). On the caloric content of crops, see, for instance, the USDA Nutrient Database for Standard Reference and Galor and Özak (2016).

[48]The weighted average uses the area share of each ethnic group within the $10km$ buffer as weight.

[49]Out of the 49 ethnic groups, 46 are represented as a majority group in the analysis. The median and mean number of parishes per majority group are six and seven parishes, respectively. There are four groups with only one parish.

Table 1.8: Robustness III - Group Characteristics, Majority Group FE, and Coastal Groups

	(1)	(2)	(3)	(4)	(5)	(6)
	Contemporary Living Standards (AES)					
Ethnic diversity (dummy)	-0.777***	-0.744***	-0.913***	-0.731***	-0.843***	-0.743**
	[0.246]	[0.248]	[0.257]	[0.260]	[0.312]	[0.314]
Ethnic div $\times$ Av. Within-Group H	0.972***	1.043***	1.201***	1.088***	1.136***	1.060**
	[0.350]	[0.350]	[0.361]	[0.372]	[0.430]	[0.436]
Observations	336	336	336	336	301	301
Av. Group Characteristics	Yes	Yes	No	No	No	No
Majority Group FE	No	No	Yes	Yes	No	No
Excluding Coastal Groups	No	No	No	No	Yes	Yes
Ecclesiastical Jurisd. FE	Yes	No	Yes	No	Yes	No
Colonial Province FE	No	Yes	No	Yes	No	Yes
All controls column (7) of Table	Yes	Yes	Yes	Yes	Yes	Yes

Notes. The unit of observation is the parish. Robust standard errors in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. Av. Within-Group H refers to the weighted average of the within-group heterogeneity index, computed using the area share of each ethnic group within the 10km buffer as weight. The table presents the standardized average effect size (AES) for four outcomes: log average light intensity per capita (2000-2003), indicator for non-subsistence agriculture (1994), share of dwellings with access to public sanitation (1993), and share of dwellings with access to the public water network (1993). The vector of average group characteristics includes the weighted average of group area, mean elevation, variation in elevation, mean pre-1500CE caloric suitability, variation in pre-1500CE caloric suitability, log river density, and log population density by 1532, computed using the area share of each ethnic group within the 10km buffer as weight. The majority group refers to the ethnic group with the highest area share within the 10km buffer. Columns (5)-(6) exclude parishes in which the ethnic group with the highest area share within the 10km buffer is a coastal group. The ecclesiastical jurisdiction is the colonial bishopric in charge of the parish (Lima, Arequipa, Huamanga, Trujillo, or Cuzco). Colonial province fixed effects account for 44 administrative provinces.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

dummy variable that accounts for imprecise ethnic borders. Specifically, it requires the area share of each ethnic group within the $10km$ buffer to be at least 10 percent (approximately $30km^2$).

I report further robustness checks in the appendix. First, to examine influential observations, Figure 1.D.2 displays point estimates and confidence intervals for the baseline specification after excluding parishes one by one. Second, I report OLS results from using a living standards index as outcome variable (standardized score of the first principal component for the four contemporary outcomes, all with positive factor loadings; see Table 1.E.13). Third, Table 1.E.14 reports standard errors corrected for spatial dependence with different distance cutoffs (Conley, 1999). Additional robustness checks related with the Inca period are reported in Table 1.E.15.

Finally, did the formation of administrative provinces after the Spanish conquest rely on previous ethnic borders? A one-to-one correspondence between the homeland of ethnic groups and the jurisdiction of 16th-century Spanish provinces would be inconsistent with the natural experiment. A map of early provinces (*corregimientos* in Cook, 1982) suggests that this was not the case, as only 13 percent of parishes have a $10km$ buffer that intersects both an ethnic border and a *corregimiento* border.[50] Furthermore, excluding such parishes from the analysis does not change the results (Table 1.E.16). To conclude, I report results from a placebo test using *corregimiento* borders instead of ethnic borders (1.E.17). Specifically, I run equation 1.1 using (i) a dummy variable for whether there is a *corregimiento* border within the $10km$ buffer from the parish capital and (ii) the weighted average of within-*corregimiento* heterogeneity. Estimates are small and not statistically significant.

Overall, these robustness checks alleviate concerns regarding poten-

[50]There are 44 *corregimientos* in the region of analysis.

tial confounding variation and measurement issues. They support that, beyond the direct effect of geography, having belonged to an ethnic group with more heterogeneous subpopulations prior to the conquest helps overcome the negative effects of ethnic diversity in the long run.

1.5.4 *Mid-Term Outcomes*

This section provides evidence that the documented pattern of development was accompanied by a shift in the structure of economic activity, from agriculture toward local manufacturing, retail and services, and by improved literacy rates. The 1876 population census provides detailed data on occupations. I classify the 318 different occupations in my sample by sector of economic activity and then compute the share of male employment in each sector. The data reveal that, overall, parishes continued to be predominantly agricultural in the late 19th century, with 80 percent of the male population employed in the primary sector, on average. The remaining 20 percent of the labor force was composed of local manufacturers working in activities like pottery and carpentry, among other occupations of the secondary sector, followed by a minority employed in retail and services (tertiary sector).

Columns (1) to (6) of Table 1.9 report the results from estimating equation 1.1 using the share of male employment in the primary, secondary, and tertiary sectors as dependent variables. For each sector, the first column presents estimates from regressions without control variables, while the second column reports estimates after including baseline controls as well as ecclesiastical jurisdiction and religious order fixed effects. Regressions are weighted by total male population in 1876. I find that parishes built on ethnically diverse populations in the 16th century, compared to those built on a single ethnic group, tend to be more oriented toward secondary and tertiary activities, to the detriment of the agricultural sector, as average within-group heterogeneity increases. Columns (7) and (8) show estimates from using the literacy rate of the male population (those who can read and/or write) as outcome variable. By 1876, ethnically diverse parishes were also associated with better literacy rates, relative to those without ethnic diversity, the higher the average within-group heterogeneity among their ancestors.

1.5.5 *Mechanism*

This section explores potential mechanisms. Section 1.5.5.1 provides evidence on cultural transmission. First, I briefly highlight historical evidence that supports the role of an Andean culture of cooperation in native societies. I then provide empirical evidence on contemporary associations and examine whether, in line with the cultural transmission mechanism, previous exposure to within-group heterogeneity favored inter-group contact during the colonial period. Section 1.5.5.2 explores the role of economic complementarities in the subsample of parishes with ethnic diversity.

1.5.5.1 Cultural Transmission Mechanism

Historical studies on the Andean culture of cooperation. Historical evidence suggests that the subsistence strategy based on complementarities between vertical production zones was sustained by engaging in reciprocities between individuals of the same ethnic group. For example, Stern (1995, p. 76) writes that "In general, Andean rules of reciprocity and redistribution served to govern the exchanges" and emphasizes "Andean peoples sought self-sufficiency ... by engaging in reciprocities enabling the collective kin or ethnic group to directly produce diverse goods in scattered ecological zones."

There are also references to pro-social behavior under the Inca empire. For example, early chronicles document that during Inca times "if it

Table 1.9: Structural Change and Literacy Rate (1876 Population Census)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dep. Variable:							
	Share of Emp. in Primary Sector		Share of Emp. in Secondary Sector		Share of Emp. in Tertiary Sector		Literacy Rate	
Ethnic div (dummy)	0.406***	0.395***	-0.219*	-0.231**	-0.187***	-0.164***	-0.245***	-0.130**
	[0.150]	[0.134]	[0.124]	[0.116]	[0.060]	[0.054]	[0.084]	[0.051]
Ethnic div (dummy)	-0.531**	-0.529***	0.290*	0.310**	0.240***	0.219***	0.270**	0.143**
× Av. Within-Group H	[0.219]	[0.187]	[0.165]	[0.148]	[0.091]	[0.081]	[0.115]	[0.070]
Observations	282	282	282	282	282	282	282	282
Mean Dep. Var.	0.791	0.791	0.137	0.137	0.072	0.072	0.151	0.151
Geography	No	Yes	No	Yes	No	Yes	No	Yes
Ln tributary pop. (∼ 1575)	No	Yes	No	Yes	No	Yes	No	Yes
Ln dist. to colonial mine	No	Yes	No	Yes	No	Yes	No	Yes
Dem. controls 1792	No	Yes	No	Yes	No	Yes	No	Yes
Ecclesiastical Jurisd. FE	No	Yes	No	Yes	No	Yes	No	Yes
Religious Order FE	No	Yes	No	Yes	No	Yes	No	Yes

Notes. OLS estimates. The unit of observation is the parish. Robust standard errors in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. Av. Within-Group H refers to the weighted average of within-group heterogeneity, computed using the area share of each ethnic group within the 10km buffer as weight. Outcomes in columns (1)-(6) refer to the share of male population in employment. In columns (7) and (8), the outcome is the literacy rate of the male population (those who can read and/or write). Regressions are weighted by total male population in 1876. Geographic controls include mean elevation, standard deviation of elevation, mean pre-1500CE caloric suitability, standard deviation of pre-1500CE caloric suitability, log distance to river, and a quadratic polynomial in longitude-latitude. Tributary population refers to $\sim$ 1575. Demographic controls include separate variables for the shares of indigenous, mestizo, slave, and Spanish populations by 1792. The ecclesiastical jurisdiction is the colonial bishopric in charge of the parish (Lima, Arequipa, Huamanga, Trujillo, or Cuzco). Religious order fixed effects refer to Santo Domingo, La Merced, San Francisco, San Agustín, Compañía de Jesús, more than one order, or secular clergy.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

was necessary for someone to do something else in an emergency, like war or some other urgent matter, the other Indians of the community worked the fields of the absent man without asking or receiving any compensation beyond their food, and, this done, each cultivated his own fields. This assistance which the community rendered to its absent members caused each man to return home willingly when he had finished his job, for he might find on his return after long absence that a harvest which he had neither sown nor reaped was gathered into his house"(in Rowe 1946, p. 266).[51]

Evidence on contemporary associations. Exposure to within-group heterogeneity may have contributed to the formation of cooperative behavior and more open attitudes toward out-group members. One possibility is that the transmission of this culture favored positive interactions between individuals of different ethnic origin during the colonial period and, transmitted over generations, contributed to sustain long-run performance. Following recent literature on the transmission of cultural traits (e.g., Guiso et al., 2016), Table 1.10 provides evidence on contemporary associations.[52]

In columns (1) and (2), the dependent variable is a dummy indicating the presence of neighborhood associations (*Registro Nacional de Municipalidades* for the year 2002). In columns (3) and (4), I look at the share of land managed by farmers in agricultural associations (1994 agricultural census). For each outcome, the first column displays unconditional estimates, while the second column displays estimates after including baseline controls as well as ecclesiastical jurisdiction and religious order fixed effects. Previous studies show that ethnic

[51]See also Murra (1975, p. 27-28) and Wachtel (1976, p. 96-97) for further evidence supporting the presence of cooperative relations between community members before and during the Inca empire, respectively.

[52]Unfortunately, Peruvian household surveys do not contain questions on generalized trust (e.g., *Would you say that you can trust most people?*) and Latinobarometer surveys only cover 48 of the districts in my the sample.

diversity is associated with lower social engagement (e.g., Alesina and La Ferrara, 2000). Consistent with cultural transmission, I find that this negative association decreases the higher the average level of native groups' within-group heterogeneity. Table 1.E.18 shows supporting evidence from household-level survey data using participation in neighborhood associations and unions as dependent variables.

Societal integration during the colonial period. Does exposure to within-group heterogeneity favor inter-group interaction? I explore inter-group contact and integration during the colonial period (1605-1780) using the sample of baptized individuals. Following recent literature, I focus on inter-ethnic unions as a proxy for societal integration (Bazzi et al., 2019). However, since I do not observe ethnicity, but only surnames, I use a measure of linguistic distance between the first surname of each individual's mother and father in order to detect potential inter-ethnic unions. Specifically, I use a standard measure, called Levenshtein distance (L), equal to the minimum number of changes (i.e., deletions, insertions or substitutions) required to transform one surname into the other.

The sample contains 26,925 individuals with native roots in the first surname of both the mother and the father, covering 61 parishes, of which 13 are parishes with ethnic diversity. Figure 1.6 shows the bin-scatterplot between the average level of within-group heterogeneity and the share of unions with linguistic distance above the 75th percentile (L_{75}=7), separately for parishes with and without ethnic diversity. As an example, the surname *Guaman* has Levenshtein distance 7 with surnames like *Ispilco* or *Chuquili*. Using this threshold, the mean share of unions between linguistically distant individuals in a parish is 0.297. Although the limited coverage of the data remains a concern, the results suggest a positive correlation between within-group heterogeneity and the share of potential inter-ethnic unions,

Table 1.10: Cultural Transmission Mechanism: Contemporary Associations

	(1)	(2)	(3)	(4)
	Dep. Variable:			
	Presence of Neigh. Associations (2002)		Share of Land Managed by Agr. Associations (1994)	
Ethnic diversity (dummy)	-0.327**	-0.313**	-0.365**	-0.393**
	[0.151]	[0.154]	[0.151]	[0.155]
Ethnic div × Av. Within-Group H	0.476**	0.470**	0.431**	0.459**
	[0.237]	[0.235]	[0.211]	[0.218]
Observations	333	333	334	334
Mean Dep. Var.	0.129	0.129	0.295	0.295
Geography	No	Yes	No	Yes
Ln tributary pop. (∼ 1575)	No	Yes	No	Yes
Ln distance to colonial mine	No	Yes	No	Yes
Demographic controls 1792	No	Yes	No	Yes
Ecclesiastical Jurisd. FE	No	Yes	No	Yes
Religious Order FE	No	Yes	No	Yes

Notes. OLS estimates. The unit of observation is the parish. Robust standard errors in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. Av. Within-Group H refers to the weighted average of within-group heterogeneity, computed using the area share of each ethnic group within the 10km buffer as weight. In columns (1)-(2), the dependent variable is a dummy indicating the presence of neighborhood associations (2002 national registry of municipalities). In columns (3)-(4), the dependent variable is the share of land managed by agricultural associations (1994 agricultural census). Geographic controls include mean elevation, standard deviation of elevation, mean pre-1500CE caloric suitability, standard deviation of pre-1500CE caloric suitability, log distance to river, and a quadratic polynomial in longitude-latitude. Demographic controls include separate variables for the shares of indigenous, mestizo, slave, and Spanish populations by 1792. The ecclesiastical jurisdiction is the colonial bishopric in charge of the parish (Lima, Arequipa, Huamanga, Trujillo, or Cuzco). Religious order fixed effects refer to Santo Domingo, La Merced, San Francisco, San Agustín, Compañía de Jesús, more than one order, or secular clergy.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

while no relationship is found in the subsample of parishes without ethnic diversity.

Table 1.E.19 presents estimates for equation 1.1 using the share of unions between linguistically distant individuals as outcome variable. Column (1) shows the unconditional correlation. Column (2) accounts for the log total number of individuals and the mean share of potential partners, defined as people in the parish with whom the individual has L distance above the 75th percentile. Column (3) includes baseline geography controls and log distance to colonial mines. Column (4) adds ecclesiastical jurisdiction and religious order fixed effects and column (5) uses population weights. Consistent with the graphical evidence, the results suggest that having been part of a more heterogeneous ethnic group facilitated integration in parishes with ethnic diversity.

Finally, in line with societal integration, additional results from contemporary survey data show the same pattern when looking at the formation of identity. When asked *Which group do you identify most with?*, the descendants of populations in parishes with ethnic diversity, as compared to those from parishes built on a single ethnicity, tend to identify more strongly with the administrative region to which they belong than with their own ethnicity, race, or native community, the higher the average within-group heterogeneity among their ancestors (Table 1.E.20).

1.5.5.2 Cultural Transmission or Economic Complementarities?

Does it matter whether within-group heterogeneity comes from the majority or the minority ethnic group? Previous sections have focused on the average level of within-group heterogeneity in a parish. I now explore the role of the minority and majority ethnic groups in parishes with ethnic diversity. On the one hand, recent papers emphasize the role of economic complementarities for peaceful inter-

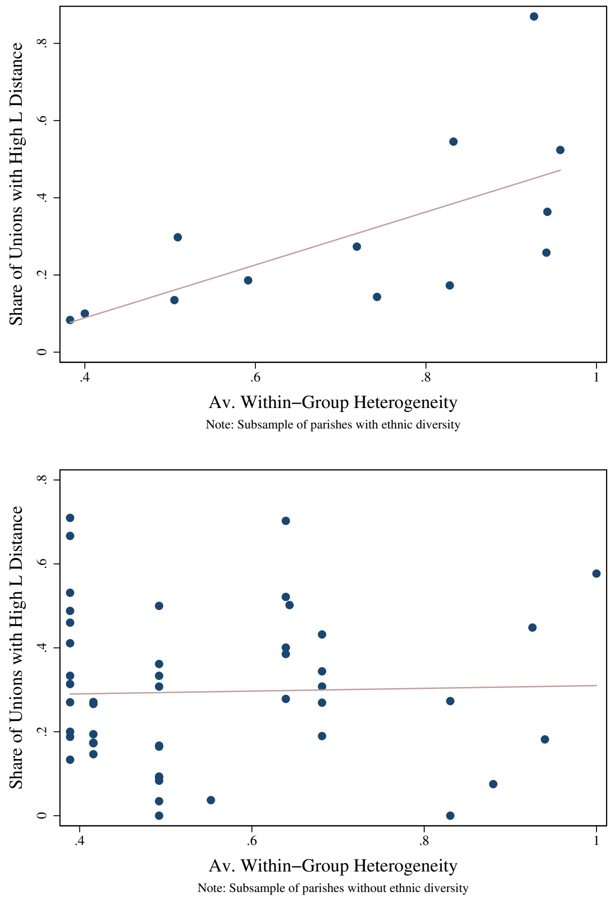


Figure 1.6

Notes. Bin-scatterplot between average within-group heterogeneity and share of unions with Levenshtein distance $\geq$ 75th percentile ($L_{75} = 7$), separately for parishes with and without ethnic diversity.

ethnic coexistence (Jha, 2013, 2018; Becker and Pascali, 2019). In this setting, if the ethnic majority in the parish comes from an ethnic group of low within-group heterogeneity, the ethnic minority may be able to more easily integrate if they have historically been highly heterogeneous (i.e., the majority may try to enjoy any complementary skill of the minority ethnic group). On the other hand, positive inter-ethnic interactions due to cultural transmission may be more likely in parishes where both the minority and the majority come from ethnic groups with high within-group heterogeneity (i.e., they are already used to social interactions in diverse environments).

I construct a dummy variable indicating whether the majority ethnicity (the one with the highest area share within the $10km$ buffer) belonged to an ethnic group with high within-group heterogeneity. Specifically, the dummy variable takes value 1 if within-group heterogeneity is above the 75th percentile ($H_{75} = 0.82$), and 0 otherwise. I then construct an analogous dummy variable for high within-group heterogeneity of the ethnic minority.[53] Looking at the sample of parishes with ethnic diversity, 24 percent have a highly heterogeneous ethnic majority, 17 percent have a highly heterogeneous ethnic minority, and approximately 10 percent are parishes where both the minority and the majority ethnic groups were highly heterogeneous during the pre-colonial period.

I then examine whether the mid-term composition of occupations and contemporary living standards differ depending on which ethnic group drives within-group heterogeneity. Table 1.11 presents the results from estimating the coefficients on the two dummy variables and their interaction. I first explore occupations among the male population using the 1876 population census. In columns (1) to (6), the outcome variables are the log number of different occupations in the primary (columns 1 and 2), secondary (columns 3 and 4) and tertiary (columns 5 and 6) sectors. For each sector, the first column presents the results without control variables, while the second column includes

[53]Most parishes with ethnic diversity (approximately 85 percent) have two ethnic groups within the $10km$ buffer. For the remaining 15 percent of parishes (all of which have three ethnic groups, except for a single parish with four groups), I focus on the ethnic groups with the highest (ethnic majority) and the lowest (ethnic minority) area shares within the buffer.

Table 1.11: Cultural Transmission or Economic Complementarities?

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Ln(number of occupations) in 1876						Contemporary	
	Primary Sector		Secondary Sector		Tertiary Sector		Living Standards (AES)	
High minority	0.043	0.131	0.546***	0.524***	0.709***	0.581***	0.506**	0.447**
	[0.138]	[0.141]	[0.175]	[0.175]	[0.205]	[0.182]	[0.200]	[0.196]
High majority	0.032	-0.011	0.440*	0.220	0.307*	0.122	0.170	0.329**
	[0.107]	[0.115]	[0.251]	[0.279]	[0.173]	[0.198]	[0.144]	[0.149]
High min. × High maj.	-0.032	-0.245	-0.381	-0.762**	-0.734**	-0.871**	0.145	0.134
	[0.210]	[0.233]	[0.344]	[0.358]	[0.349]	[0.402]	[0.307]	[0.294]
Observations	97	97	97	97	97	97	117	117
Mean # of occupations	2.990	2.990	12.268	12.268	7.433	7.433		
Geography	No	Yes	No	Yes	No	Yes	No	Yes
Ln tributary pop.	No	Yes	No	Yes	No	Yes	No	Yes
Ln dist. to colonial mine	No	Yes	No	Yes	No	Yes	No	Yes
Dem. controls 1792	No	Yes	No	Yes	No	Yes	No	Yes
Ecclesiastical Jurisd. FE	No	Yes	No	Yes	No	Yes	No	Yes
Religious Order FE	No	Yes	No	Yes	No	Yes	No	Yes

Notes. OLS estimates. The unit of observation is the parish. Robust standard errors in brackets. Regressions for the subsample of parishes with ethnic diversity. High majority is a dummy variable indicating whether the within-group heterogeneity value of the ethnic majority (ethnicity with the highest area share within the 10km buffer) is above the 75th percentile, and 0 otherwise. High minority refers to the analogous dummy variable for the ethnic minority (ethnicity with the lowest area share within the 10km buffer). Outcomes in columns (1)-(6) refer to log(1+number of occupations) from the 1876 population census; available for 97 parishes. Columns (7) and (8) report the standardized average effect size (AES) for four outcomes: log average light intensity per capita (2000-2003), indicator for non-subsistence agriculture (1994), share of dwellings with access to public sanitation (1993), and share of dwellings with access to the public water network (1993). Geographic controls include mean elevation, standard deviation of elevation, mean pre-1500CE caloric suitability, standard deviation of pre-1500CE caloric suitability, log distance to river, and a quadratic polynomial in longitude-latitude. Tributary population refers to $\sim$ 1575. Demographic controls include separate variables for the shares of indigenous, mestizo, slave, and Spanish populations by 1792. The ecclesiastical jurisdiction is the colonial bishopric in charge of the parish (Lima, Arequipa, Huamanga, Trujillo, or Cuzco). Religious order fixed effects refer to Santo Domingo, La Merced, San Francisco, San Agustín, Compañía de Jesús, more than one order, or secular clergy.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

baseline controls as well as ecclesiastical jurisdiction and religious order fixed effects.

Consistent with the positive role of complementarities, the results suggest that there is an economic advantage over time in parishes where economic complementarities are more likely. The economic advantage comes from parishes with a majority of low within-group heterogeneity but a highly heterogeneous ethnic minority: (i) having a minority from a highly heterogeneous ethnic group is associated with a greater variety of non-primary occupations among parishes in which the majority ethnic group exhibited low within-group heterogeneity, and (ii) in parishes in which the majority also comes from a highly heterogeneous ethnic group, this effect tends to be offset.[54] Unfortunately, no data on mid-term income exist to asses whether this variety translated into economic gains. Nonetheless, the AES across contemporary outcomes (columns 7 and 8) provides consistent results.

1.6 CONCLUSION

I present evidence that ethnic diversity need not spell poor development outcomes−a history of within-group heterogeneity can turn ethnic diversity into an advantage for development. By showing that the effects of ethnic diversity depend on previous exposure to within-group heterogeneity, this paper's results provide insights for future research and policy-making. Specifically, the heterogeneity of subpopulations within societies or ethnic groups has received little attention. The findings suggest that a deeper understanding of this dimension can help shed light on the features that shape comparative economic growth and development. They also invite us

[54]Table 1.E.21 shows the results controlling for the log of total population in 1876 and using a Herfindahl index to measure diversity in occupations.

to consider this pre-condition when studying the consequences of voluntary population movements in the context of globalization, as well as the forced displacement of individuals belonging to a certain ethnicity, race, religion, or nationality. I provide evidence that the transmission of cooperative behavior and more open attitudes toward out-group members is a likely channel when looking at average exposure to within-group heterogeneity. Furthermore, in exploring which ethnic group drives within-group heterogeneity (i.e., the majority or the minority ethnic group), the results suggest that inter-group complementarities can also play an important role.

Appendix

1.A ETHNIC GROUPS

Table 1.A.1 displays the names of native groups in the analysis. Alternative forms of native names in parentheses are from Rowe (1946) and Tello (1939). Columns present the share of area of each production zone within the ethnicity's homeland, following the classification of Pulgar Vidal (1941). Groups from Rowe (1946) that were not under the Viceroyalty of Peru are not part of the analysis. Most of these groups were under the jurisdiction of the Audiencia of Charcas (modern Bolivia) at the time of the census. In particular, the following groups are not covered: Aymaran groups of *Pacasa* or *Pacaje*, *Caranga* or *Caranca*, *Charca*, *Quillaca* or *Quillagua*, *Omasuyo*, and *Collahuaya* (modern Bolivia); non-Aymaran groups of *Cochapampa*, *Yamparä́*, *Chicha*, *Lipe*, and *Uru* (modern Bolivia); *Tarapacá* (modern Chile); and the *Lupaca* and *Colla* Aymaran groups (Department of Puno, modern Peru). The *Moyopampa* group, in the Amazonian region of Pulgar Vidal (1941), also lies outside the area of interest. Finally, the groups of *Tarata* and *Calva* do not intersect with any parish buffer.

Table 1.A.1: Tribes and Provinces of the Inca Empire (*circa* 1530)

Name	Yunga	Quechua	Suni	Puna	Janca
Angará (*Ankara*)	0.0294	0.2057	0.2768	0.4856	0.0025
Arequipa (*Ariquepa, Ariquipay*)	0.1554	0.4725	0.2087	0.1358	0.0277
Atavillo (*Atauillo, Atabillo*)	0.0695	0.1459	0.0642	0.6682	0.0522
Ayavaca (*Ayabaca, Ayauaca, Ayawaka*)	0.9422	0.0578	-	-	-
Aymará (*Aymaraes, Aymarays*)	0.0037	0.1868	0.3063	0.5024	0.0008
Cajamarca (*Caxamarca, Caxamalca, Cassamarca*)	0.2368	0.5581	0.1867	0.0184	-
Cajatampo (*Caxatambo*)	0.0748	0.2009	0.1326	0.5231	0.0685
Cana (*Kana*)	-	0.0092	0.2188	0.6915	0.0805
Canchi (*Kanchi*)	-	0.0176	0.1233	0.4664	0.3926
Caruma	0.0100	0.0712	0.0602	0.6960	0.1627
Cavana (*Cabana, Cauana*)	0.0293	0.1058	0.1169	0.5095	0.2385
Cavina (*Cauina, Cabina, Caviña, Cauiña*)	-	0.1391	0.3580	0.4789	0.0241
Chachapoya (*Chacha*)	0.2324	0.5294	0.2064	0.0318	-
Chanca (*Changa, Chanka*)	0.2334	0.4006	0.2247	0.1385	0.0028
Chilque (*Chillque, Chilqui, Chillke*)	0.0013	0.3197	0.3814	0.2966	0.0010
Chimu	0.7966	0.1614	0.0394	0.0026	-
Chinchaycocha (*Chinchaykocha*)	0.0036	0.0931	0.1738	0.7279	0.0017
Choclococha	-	0.0071	0.0726	0.8145	0.1057
Chocorvo (*Chocoruo, Chocorbo, Chucurpu*)	0.0099	0.0851	0.1288	0.7253	0.0509
Chumpivilca (*Chumbivilca, Chumpi-willka*)	-	0.0255	0.1694	0.6054	0.1997
Collagua (*Kollawa*)	0.0002	0.0111	0.0331	0.7617	0.1939
Conchuco (*Conchucu, Konchuko*)	0.0650	0.2635	0.2262	0.3522	0.0932
Contisuyo (*Condesuyo, Cuntisuyu, Condes*)	0.0240	0.1137	0.0724	0.6159	0.1740
Cotapampa (*Cotabamba, Kotapampa*)	0.0424	0.3976	0.2558	0.3038	0.0004
Cusco (*Cuzco, Cozco, Inca, Inga*)	0.0221	0.2260	0.2859	0.4180	0.0480
Huacrachuco (*Huacrachucu, Wakrachuko*)	0.0349	0.3595	0.3836	0.2221	-
Huamachuco (*Guamachuco, Wamachuko*)	0.1567	0.3846	0.2479	0.2103	0.0005
Huamalí (*Guamali*)	0.0343	0.2594	0.3247	0.3817	-
Huambo (*Guambo, Wambo*)	0.4111	0.4643	0.1243	0.0003	-
Huanca (*Guanca, Wanka*)	0.0594	0.2058	0.2943	0.4349	0.0057
Huancapampa (*Huancabamba, Wankapampa*)	0.6222	0.3661	0.0117	-	-
Huayla (*Guayla, Huaylla, Wayla*)	0.1539	0.3266	0.1751	0.3359	0.0085
Huánuco (*Guanuco, Huanucu, Wanuku*)	0.0009	0.1393	0.3557	0.5025	0.0017
Lare (*Lari*)	0.3341	0.4772	0.1688	0.0199	-
Ocro (*Okro*)	0.1521	0.2159	0.1121	0.4537	0.0662
Omasayo (*Omasuyo, Vmasuyu*)	-	0.1115	0.2177	0.6690	0.0018
South Paracas	0.6913	0.2006	0.0533	0.0450	0.0098
Parinacocha (*Parihuanacocha*)	0.0568	0.2364	0.2295	0.4752	0.0021
Paucartampo (*Paucartambo, Paucartampu*)	0.0210	0.3169	0.3643	0.2977	-
Pinco (*Pinko*)	-	0.1000	0.1794	0.6470	0.0737
Quechua (*Quichua, Quichiua, Kichiwa*)	0.1560	0.3479	0.2223	0.2666	0.0072
Rucana (*Lucana, Rukana*)	0.0052	0.1348	0.2798	0.5799	0.0002
Sora	0.0400	0.4635	0.3254	0.1711	-
Tarma (*Tarama*)	0.0017	0.1034	0.2220	0.6728	-
Ubina	-	0.0027	0.0457	0.9043	0.0473
Vilcapampa (*Vilcabamba*)	0.4852	0.4012	0.1013	0.0122	-
Vilcas (*Villcas, Bilcas, Vilcasguaman*)	0.0497	0.3615	0.2920	0.2907	0.0060
Yanahuara (*Yanaguara*)	0.0925	0.4487	0.2012	0.2520	0.0056
Yauyo	0.0612	0.1677	0.1021	0.5802	0.0888

Notes. The classification of elevation zones follows Pulgar Vidal (1941): Yunga (500-2,300 m], Quechua (2,300-3,500 m]; Suni or Jalca (3,500-4,000 m]; Puna (4,000-4,800 m]; and Janca (4,800-6,768 m]. Alternative forms of tribal names are from Rowe (1946) and Tello (1939). Following Rowe (1946), *Cusco* refers to Inca tribal lines either by blood or by priviledge. The *Chimu kingdom* refers to the individual valleys of: *Tumbez* (*Tumbes*, *Tumpiz*, *Tumpis*); *Chira*; *Piura*; *Olmos*; *Lambayeque*; *Pacasmayo* or *Jequetepeque* (*Xequetepeque*); *Chicama*; *Chimú* (*Chimo*); *Virú*; *Chao*; *Chimbote* or *Santa* (*Sancta*); *Nepeña* or *Guambacho*; *Casma*; *Huarmey* (*Guarmey*); and *Parmunca* (*Paramonga*). *South Paracas* refers to the individual valleys of: *Huaura* (*Guaura*); *Chancay*; *Lima* (*Rima*, *Rimac*); *Lurin*; *Chilca* (*Chillca*); *Mala*; *Huarco* (*Guarco*); *Chincha*; *Pisco*; *Ica*; *Nazca*; *Acari*; *Yauca*; *Atico*; *Caraveli*; *Ocoña*; *Camana*; *Quilca* (*Quillca*); *Tampo* (*Tambo*); *Moquehua* (*Moquegua*); *Locumba*; *Sama*; and *Arica*.

1.B SURNAMES FROM COLONIAL RECORDS

Identification of native surnames. Hispanic and foreign surnames are excluded from the analysis. The main source for the identification of Hispanic surnames is Platt (1996), which includes an index of Hispanic surnames developed in Latin America and the United States. The author writes "the word Hispanic refers to individuals born in Latin America or the United States, whose parents speak Spanish and whose principal cultural background was Spanish." This source includes the list of surnames in Carraffa and Carraffa (1963), the traditional reference for Hispanic surnames.[55] I complement Basque surnames using a list of surnames provided by the Real Academia de la Lengua Vasca.

In order to identify native surnames, I constructed a dictionary of linguistic roots from the Quechuan and Aymaran language families. There is not a unique source for the identification of surnames from these families. The transformation of native surnames over time (*castellanización*), as well as the presence of many regional varieties of Quechua and Aymara, make necessary the combination of different (temporal and regional) sources. For Quechua, the main sources are the classic dictionary by González Holguín (1952)[1608] and a recent dictionary compiled by the Academia Mayor de la Lengua Quechua (2005). I also include the list of names provided by the Peruvian *Registro Nacional de Identificación y Estado Civil* (RENIEC, 2012). For Aymara, the main sources are the classic dictionary by Bertonio (2011)[1612], the list of surnames provided by De Lucca (1983), and a recent dictionary compiled by CONADI (2011). I complement the analysis using two additional sources: (1) *Vocabulario Políglota Incaico*, originally compiled by Franciscan missionaries in Peru, which

[55] Check suggestions by the Biblioteca Nacional de España (BNE) here. The list of surnames in Carraffa and Carraffa (1963) can also be accessed through The Library of Congress.

provides an extensive list of words in four dialects of Quechua (varieties of Cuzco, Ayacucho, Junín and Ancash) and Aymara, see Fide (1998)[1905]; and (2) the *An Crúbadán-Corpus Building for Minority Languages* project, which provides downloadable text datasets for different dialects of Quechua and Aymara based on online text resources, including translations of the Bible and the Universal Declaration of Human Rights.

Figure 1.B.1: Baptism Record from FamilySearch.org

URL

https://familysearch.org/ark:/61903/1:1:FJFK-J97

Información indexada

Ocultar

Imagen no disponible

Nombre	**Catharina Huaman**
Sexo	Female
Fecha de bautismo	01 May 1743
Lugar de bautismo	San Juan Bautista, Yanahuara, Arequipa, Peru
Fecha de nacimiento	30 Apr 1743
Nombre del padre	Ramon Huaman
Nombre de la madre	Pasquala Machaca

Cita

"Perú, bautismos, 1556-1930," database, *FamilySearch* (https://familysearch.org/ark:/61903/1:1:FJFK-J97 : 10 February 2018), Catharina Huaman, 30 Apr 1743; citing San Juan Bautista, Yanahuara, Arequipa, Peru, reference v 2 p 53, index based upon data collected by the Genealogical Society of Utah, Salt Lake City; FHL microfilm 1,155,316.

Table 1.B.1: Descriptive Statistics - Dataset of Baptisms

By period	# Individuals	# Parishes	Mean # Individuals	Median # Individuals
[1605, 1625]	848	8	106	16.5
(1625, 1650]	5,039	19	265.211	145
(1650, 1675]	8,033	30	267.767	125.5
(1675, 1700]	19,195	40	479.875	209
(1700, 1725]	17,947	49	366.265	197
(1725, 1750]	21,172	46	460.261	205
(1750, 1780]	40,106	63	636.603	184
Full period				
	112,340	66	1,702.121	561.5

Notes. Statistics refer to individuals with native first surname. The first panel reports statistics by time period: number of individuals, number of parishes, and number of individuals in the mean and median parish. The second panel reports analogous statistics for the full period.

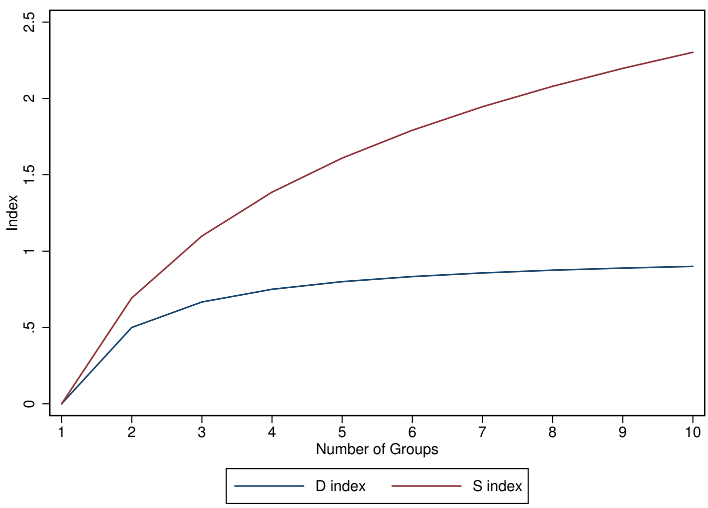


Figure 1.B.2: S and D Indices

Notes. The figure plots each index for different numbers of groups of equal size. For example, when the x-axis is 5, each index is computed for $K = 5$ groups, each of them with a proportion of 0.2 in the population.

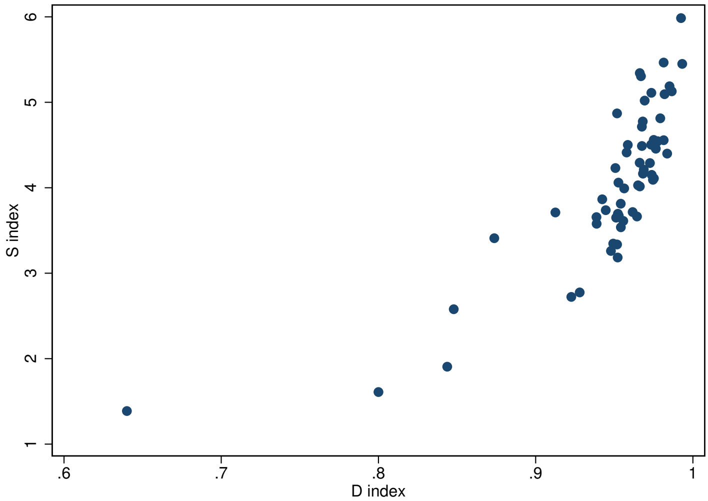


Figure 1.B.3: S and D Indices in the Data

Notes. The figure plots the relationship between the D and S indices in the data (66 parishes), computed using the sample of individuals with native first surname.

1.C DATA SOURCES AND DEFINITIONS

Geographic characteristics

Mean elevation. Average elevation across all grid cells with centroid within the unit of analysis. Source: author's computation using version 1.2 of the Harmonized World Soil Database (FAO). It provides 30 arc-second raster data with median elevation (in meters) based on information from the NASA Shuttle Radar Topographic Mission.

Variation in elevation. Standard deviation of elevation across all grid cells with centroid within the unit of analysis. Source: author's computation using version 1.2 of the Harmonized World Soil Database (FAO). It provides 30 arc-second raster data with median elevation (in meters) based on information from the NASA Shuttle Radar Topographic Mission.

Mean pre-1500CE caloric suitability. Average caloric suitability in the pre-1500 period across all grid cells with centroid within the unit of analysis. Source: author's computation using the Caloric Suitability Index (Galor and Özak, 2016). They provide 5 arc-minute raster data with average potential crop yield given the set of available crops in the pre-1500 period.

Variation in pre-1500CE caloric suitability. Standard deviation of caloric suitability in the pre-1500 period across all grid cells with centroid within the unit of analysis. Source: author's computation using the Caloric Suitability Index (Galor and Özak, 2016). They provide 5 arc-minute raster data with average potential crop yield given the set of available crops in the pre-1500 period.

Ln distance to river. Natural log of the geodesic distance (km) from the parish capital to the closest permanent river. Source: author's computation using watercourse and inland water area features from version 10.0 of the Seamless Digital Chart of the World.

Characteristics of Ethnic groups

Group area. Total land area of the ethnic group (km^2). Source: author's computation after georeferencing the approximate extent of ethnic groups at the time of the Spanish conquest (Rowe, 1946).

Ln river density. Natural log of total river length (km, only permanent rivers) within the ethnic homeland divided by total land area (km^2). Source: author's computation using watercourse and inland water area features from version 10.0 of the Seamless Digital Chart of the World.

Ln population density of ethnic group by 1532. Natural log of approximate population divided by total land area (km^2). Source: author's computation using population figures in Cook (1982, 2010). I add the first estimate of tributary population between 1532 and 1575 for all population centers within the ethnic homeland. The resulting population estimates cover 48 out of the 49 ethnic groups used in the analysis.

Suitability for maize. Average potential caloric yield of maize across all grid cells with centroid within the ethnic homeland. Source: author's computation using 5 arc-minute raster data with the potential caloric yield of maize under rain-fed low-input agriculture provided by Galor and Özak (2016).

Contemporary outcomes

Ln light intensity per capita. Natural log of 0.01 plus average light intensity per capita for the period 2000-2003. The average sum of light intensity values across all grid cells with centroid within the $10km$ buffer (yearly average for 2000-2003) is divided by total population within the same buffer (year 2000). By adding a small constant before computing the logarithm, parishes for which light intensity is reported to be zero (86 parishes) are not dropped from the analysis. The minimum estimate of population for parishes with zero nightlight is of 440 individuals, approximately. Sources: average cloud free coverages of the DMSP-OLS Nighttime Lights Time Series (30 arc-second raster data from satellite F15) produced by the NOAA's National Geophysical Data Center; 30 arc-second raster data with population counts for the year 2000 come from version 4.10 of the Gridded Population of the World (Center for International Earth Science Information Network−CIESIN). The gridded population counts of GPWv4 are developed through the uniform areal-weighting method using census data adjusted to match United Nation's population counts at the country level.

Indicator for non-subsistence agriculture. Dummy variable taking value 1 if the share of agricultural producers devoting most of the harvest to sale or trade in local markets rather than to own consumption is above the median value in the sample ($P_{50} = 0.03$), and 0 otherwise. Source: 1994 national agricultural census, conducted by the National Institute of Statistics (INEI).

Access to public sanitation. Share of occupied dwellings with access to the public sewer system (inside or outside the dwelling unit). Source: 1993 national population and housing census, conducted by the National Institute of Statistics (INEI).

Access to public water network. Share of occupied dwellings with access to the public network of water supply (inside or outside the dwelling unit). Source: 1993 national population and housing census, conducted by the National Institute of Statistics (INEI).

Presence of neighborhood associations. Dummy variable indicating the presence of neighborhood associations in 2002. Source: *Registro Nacional de Municipalidades*, provided by the National Institute of Statistics (INEI).

Share of land managed by agr. associations. Share of land managed by farmers in agricultural associations. Source: 1994 national agricultural census, conducted by the National Institute of Statistics (INEI).

Mid-term outcomes

Share of employment by economic sector. Share of male employment in the primary, secondary and tertiary sectors. Source: author's computation using data from the 1876 population census (*Censo General de la República del Perú formado en 1876*, published: Lima, 1878).

Ln number of occupations by economic sector. Natural log of 1 plus number of occupations among the male population, separately for the primary, secondary and tertiary sectors. Source: author's computation using data from the 1876 population census (*Censo General de la República del Perú formado en 1876*, published: Lima, 1878).

Literacy rate. Literacy rate of the male population (those who can read and/or write). Source: 1876 population census (*Censo General de la República del Perú formado en 1876*, published: Lima, 1878).

Control variables

Demographic characteristics 1792. Separate variables for the shares of indigenous, mestizo, slave and Spanish population. Source: census of Viceroy Gil de Taboada y Lemos (1791-95), published in Vollmer (1967). It provides information at the parish level on the number of individuals by caste category (indigenous, mestizo, free, slave and Spanish), separately by gender, as well as on the number of individuals related with the ecclesiastical system, including priests.

Ln tributary population by 1575. Natural log of approximate tributary population by 1575. Source: Cook (1982, 2010). The data exist for 128 out of 336 parishes used in the analysis; for the remaining parishes the data is imputed using the mean tributary population of the colonial province to which the parish belonged.

Ln distance to colonial mine. Natural log of the geodesic distance (km) from the parish capital to the closest mining center during the colonial period (i.e., either Huancavelica or Potosí mines). Source: author's computation using coordinates of mining centers from Dell (2010).

Ln population density. Natural log of total population per square kilometer. Source: 1993 national population and housing census, conducted by the National Institute of Statistics (INEI).

Ecclesiastical jurisdiction. Colonial bishopric to which the parish belonged (Lima, Arequipa, Huamanga, Trujillo and Cuzco). Source: Unanue, J. H, (1797): *Guía Política, Eclesiástica y Militar del Virreynato del Perú para el Año de 1797*.

Religious order. One of the regular orders (Santo Domingo, La Merced, San Francisco, San Agustín, Compañía de Jesús), more than one religious order, or secular clergy if no specific order was in charge of the parish during most of the colonial period. Sources: Lissón Chávez (1943), de Armas Medina (1953), Córdoba y Salinas (1957)[1651], and García (1997).

Colonial province. Administrative province (*partido*) to which the parish belonged by the end of the 18th century (44 provinces). Source: census of Viceroy Gil de Taboada y Lemos (1791-95), published in Vollmer (1967).

1.D FIGURES

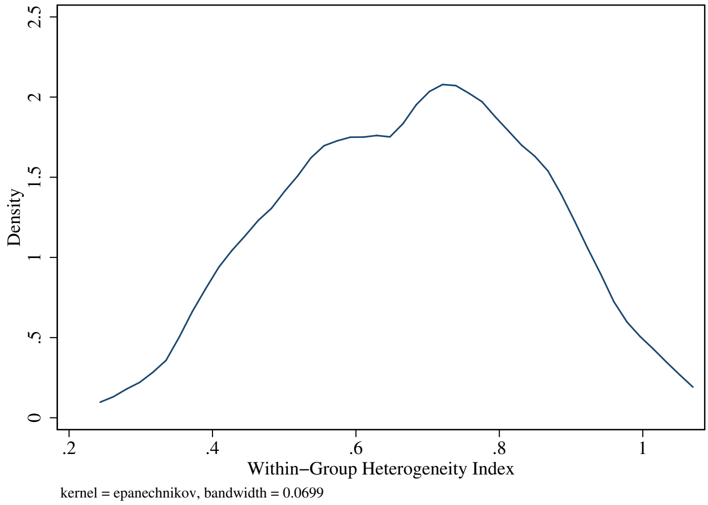
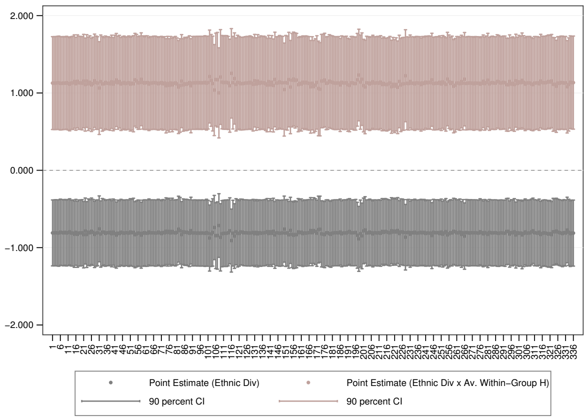
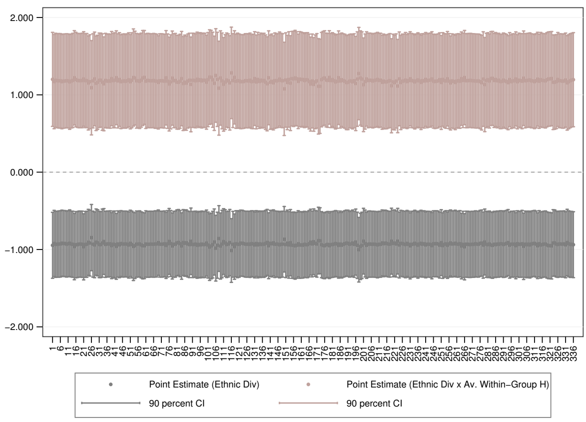


Figure 1.D.1: Density of Within-Group Heterogeneity

Notes. Kernel density of within-group heterogeneity at the ethnic group level. Within-group heterogeneity equals the inverse Herfindahl index $H_e = 1/\sum_j s_{ej}^2$, where s_{ej} is the area share of ethnic group e in elevation zone j. The index is normalized as to take value 1 for the group with the highest within-group heterogeneity.



(a) Colonial Province FE



(b) Ecclesiastical Jurisdiction FE

Figure 1.D.2: Robustness - Excluding Parishes One by One

Notes. The figure displays point estimates and 90% confidence intervals for the coefficients on ethnic diversity and on ethnic diversity × average within-group heterogeneity after excluding parishes one by one (i.e., each regression in the x-axis excludes one parish). Specifically, the figure reports the standardized average effect size (AES) across contemporary outcomes (ln average light intensity per capita, indicator for non-subsistence agriculture, share of dwellings with access to public sanitation, and share of dwellings with access to the public water network) after baseline controls, religious order fixed effects, and either colonial province (panel a) or ecclesiastical jurisdiction (panel b) fixed effects.

1.E TABLES

Table 1.E.1: Parishes by Elevation Zone of the Parish Capital

	Yunga (500-2,300 m]	Quechua (2,300-3,500 m]	Suni or Jalca (3,500-4,000 m]	Puna (4,000-4,800 m]	Total
Ethnic div = 0	26	159	29	5	219
Ethnic div = 1	8	84	23	2	117
Total	34	243	52	7	336

Table 1.E.2: Descriptive Statistics

	Whole sample			Ethnic div = 1			Ethnic div = 0		
	obs.	mean	sd	obs.	mean	sd	obs.	mean	sd
Contemporary variables									
Total light intensity per capita (2000-2003)	336	0.035	0.063	117	0.019	0.026	219	0.044	0.074
Non-subsistence agriculture (1994)	336	0.105	0.158	117	0.094	0.138	219	0.111	0.168
Public sanitation (1993)	336	0.122	0.169	117	0.090	0.135	219	0.138	0.182
Public water network (1993)	336	0.238	0.212	117	0.211	0.192	219	0.252	0.221
Total number of dwellings (1993)	336	1755.542	2716.989	117	1658.880	2244.647	219	1807.183	2941.980
Population density (1993)	336	40.054	93.976	117	32.918	55.442	219	43.865	109.058
Geography variables									
Mean elevation	336	3432.450	670.576	117	3480.341	529.292	219	3406.865	734.882
Variation in elevation	336	459.078	182.124	117	479.734	188.314	219	448.043	178.185
Mean caloric suitability	336	696.912	938.347	117	679.946	911.994	219	705.976	954.068
Variation in caloric suitability	336	614.852	656.938	117	628.710	700.915	219	607.448	633.730
Distance to river (km)	336	3.676	5.494	117	3.615	6.000	219	3.709	5.218
Latitude	336	-12.270	2.892	117	-12.493	2.602	219	-12.151	3.034
Longitude	336	-74.690	2.467	117	-74.482	2.419	219	-74.801	2.490

Notes. The unit of observation is the parish. Total light intensity per capita (from 30 arc-second raster data) refers to the sum of light intensity across all grid cells with centroid within a 10km buffer from the parish capital divided by total population within the same buffer. Elevation (from 30 arc-second raster data) and pre-1500CE caloric suitability (from 5 arc-minute raster data) measures refer to the mean or variation (sd) across all grid cells with centroid within the 10km buffer. Longitude and latitude correspond to the parish capital. Non-subsistence agriculture, access to public infrastructure, the total number of dwellings and population density in 1993 refer to the corresponding contemporary district. Distance to river is the geodesic distance from the parish capital to the closest permanent river. Data sources and definitions for all variables are reported in Appendix 1.C.

Table 1.E.3: Within-Group Heterogeneity and Crop Diversity

	(1)	(2)	(3)	(4)
	Dep. Variable: Crop Diversity			
Within-Group H	0.207***	0.288***	0.494***	0.492***
	[0.076]	[0.067]	[0.167]	[0.179]
Observations	49	49	49	49
Adjusted R-squared	0.094	0.272	0.581	0.558
Ethnic group area	No	Yes	Yes	Yes
Geography	No	No	Yes	Yes
Zone profile FE	No	No	No	Yes

Notes. OLS estimates. The unit of observation is the ethnic group. Robust standard errors in brackets. The index of crop diversity is defined as 1/Herfindahl index, normalized as to take value 1 for the group with the highest crop diversity. Data on native crops come from the 2012 national agricultural census. Geography controls include mean elevation, standard deviation of elevation, mean pre-1500CE caloric suitability, standard deviation of pre-1500CE caloric suitability, log river density (total river length/group area), and a quadratic polynomial in longitude-latitude of the ethnic group's centroid. The zone profile FE accounts for ethnic groups with presence of the same elevation zones within the group's area.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Crop data. The 2012 national agricultural census, conducted by the National Institute of Statistics (INEI), provides information on the area planted with each crop at the moment of the census for the whole national territory. In order to apply the census form, the territory within each district was divided into several units (*Sector de Enumeración Agropecuario*, SEA), each one comprising on average 100 agricultural producers. Using the map of territorial units provided by INEI, I assign agricultural producers to the homelands of ethnic groups. I focus on native crops (see Tapia, 2013) and compute a measure of crop diversity at the ethnic group level using the share of area planted with each crop group (roots and tubers, cereals, fruit trees, vegetables, and pulses) within the ethnic homeland.

Table 1.E.4: Overall Effect of Ethnic Diversity on Local Economic Activity

	(1)	(2)	(3)	(4)	(5)
	Dep. Variable: Ln Light Intensity per capita (2000-2003)				
Ethnic diversity (dummy)	-0.383***	-0.364***	-0.366***	-0.365***	-0.327***
	[0.097]	[0.089]	[0.090]	[0.088]	[0.088]
Mean Dep. Var.	-3.613	-3.613	-3.613	-3.613	-3.613
	Dep. Variable: Non-Subsistence Agriculture (1994)				
Ethnic diversity (dummy)	-0.017	-0.038**	-0.038**	-0.036**	-0.027*
	[0.017]	[0.015]	[0.015]	[0.015]	[0.014]
Mean Dep. Var.	0.500	0.500	0.500	0.500	0.500
Observations	336	336	336	336	336
Geography	No	Yes	Yes	Yes	Yes
Ln pop. density	No	Yes	Yes	Yes	Yes
Ln tributary pop. ($\sim$ 1575)	No	No	Yes	Yes	Yes
Ln distance to colonial mine	No	No	Yes	Yes	Yes
Demographic controls 1792	No	No	No	Yes	Yes
Ecclesiastical Jurisd. FE	No	No	No	No	Yes

Notes. OLS estimates. The unit of observation is the parish. Robust standard errors in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. The dependent variables are log average light intensity per capita (2000-2003) in the first panel and the share of agricultural producers devoting most of the harvest to sale or trade in local markets (1994 agricultural census) in the second panel.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.E.5: Overall Effect of Ethnic Diversity on Access to Public Infrastructure

	(1)	(2)	(3)	(4)	(5)
	Dep. Variable: Sanitation (1993)				
Ethnic diversity (dummy)	-0.048***	-0.050***	-0.049***	-0.046***	-0.037**
	[0.018]	[0.016]	[0.016]	[0.016]	[0.015]
Mean Dep. Var.	0.122	0.122	0.122	0.122	0.122
	Dep. Variable: Water Network (1993)				
Ethnic diversity (dummy)	-0.041*	-0.035*	-0.036*	-0.034	-0.022
	[0.023]	[0.021]	[0.021]	[0.021]	[0.020]
Mean Dep. Var.	0.238	0.238	0.238	0.238	0.238
Observations	336	336	336	336	336
Geography	No	Yes	Yes	Yes	Yes
Ln pop. Density	No	Yes	Yes	Yes	Yes
Ln tributary pop. ($\sim$ 1575)	No	No	Yes	Yes	Yes
Ln distance to colonial mine	No	No	Yes	Yes	Yes
Demographic controls 1792	No	No	No	Yes	Yes
Ecclesiastical Jurisd. FE	No	No	No	No	Yes

Notes. OLS estimates. The unit of observation is the parish. Robust standard errors in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. The dependent variables are the share of occupied dwellings with access to public sanitation in the first panel and the share of occupied dwellings with access to the public network of water supply in the second panel, both from the 1993 population and housing census.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.E.6: Overall Effect of Ethnic Fractionalization

	(1)	(2)	(3)	(4)	(5)
	Contemporary Living Standards (AES)				
Ethnic fractionalization	-0.565***	-0.522***	-0.519***	-0.486***	-0.340**
	[0.186]	[0.160]	[0.160]	[0.161]	[0.146]
Observations	336	336	336	336	336
Geography	No	Yes	Yes	Yes	Yes
Ln pop. density	No	Yes	Yes	Yes	Yes
Ln tributary pop. ($\sim$ 1575)	No	No	Yes	Yes	Yes
Ln distance to colonial mine	No	No	Yes	Yes	Yes
Demographic controls 1792	No	No	No	Yes	Yes
Ecclesiastical Jurisd. FE	No	No	No	No	Yes

Notes. The unit of observation is the parish. Robust standard errors in brackets. Ethnic fractionalization is a Herfindahl index computed using the area share of each ethnic group within a 10km buffer from the parish capital. The table presents the standardized average effect size (AES) for four outcomes: log average light intensity per capita (2000-2003), indicator for non-subsistence agriculture (1994), share of dwellings with access to public sanitation (1993), and share of dwellings with access to the public water network (1993).
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.E.7: Ethnic Diversity, Within-Group Heterogeneity and Local Economic Activity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dep. Variable: Ln Light Intensity per capita (2000-2003)						
Ethnic diversity (dummy)	-1.856***	-1.855***	-1.852***	-1.875***	-1.706***	-1.641***	-1.323***
	[0.470]	[0.416]	[0.415]	[0.414]	[0.417]	[0.421]	[0.467]
Ethnic div × Av. Within-Group H	2.192***	2.191***	2.185***	2.215***	2.016***	1.973***	1.638**
	[0.657]	[0.592]	[0.593]	[0.586]	[0.592]	[0.601]	[0.667]
Mean Dep. Var.	-3.613	-3.613	-3.613	-3.613	-3.613	-3.613	-3.613
	Dep. Variable: Non-Subsistence Agriculture (1994)						
Ethnic diversity (dummy)	-0.849***	-0.702***	-0.631***	-0.629***	-0.458**	-0.443*	-0.401*
	[0.320]	[0.267]	[0.243]	[0.238]	[0.233]	[0.232]	[0.227]
Ethnic div × Av. Within-Group H	1.110***	1.008***	0.935***	0.919***	0.686**	0.693**	0.648**
	[0.424]	[0.353]	[0.326]	[0.321]	[0.327]	[0.328]	[0.325]
Mean Dep. Var.	0.500	0.500	0.500	0.500	0.500	0.500	0.500
Observations	336	336	336	336	336	336	336
Geography	No	Yes	Yes	Yes	Yes	Yes	Yes
Ln pop. density	No	Yes	Yes	Yes	Yes	Yes	Yes
Ln tributary pop. ($\sim$ 1575)	No	No	Yes	Yes	Yes	Yes	Yes
Ln distance to colonial mine	No	No	Yes	Yes	Yes	Yes	Yes
Demographic controls 1792	No	No	No	Yes	Yes	Yes	Yes
Ecclesiastical Jurisd. FE	No	No	No	No	Yes	Yes	No
Religious Order FE	No	No	No	No	No	Yes	Yes
Colonial Province FE	No	No	No	No	No	No	Yes

Notes. OLS estimates. The unit of observation is the parish. Robust standard errors in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. Av. Within-Group H refers to the weighted average of within-group heterogeneity, computed using the area share of each ethnic group within the 10km buffer as weight. The dependent variables are log average light intensity per capita (2000-2003) in the first panel and a dummy variable taking value 1 if the share of agricultural producers devoting most of the harvest to sale or trade in local markets is above the median value (1994 agricultural census) in the second panel. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.E.8: Ethnic Diversity, Within-Group Heterogeneity and Access to Public Infrastructure

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Dep. Variable: Sanitation (1993)			
Ethnic diversity (dummy)	-0.462**	-0.359***	-0.365***	-0.348***	-0.301***	-0.294***	-0.136*
	[0.207]	[0.106]	[0.104]	[0.096]	[0.096]	[0.092]	[0.076]
Ethnic div × Av. Within-Group H	0.553*	0.475***	0.490***	0.475***	0.399***	0.391***	0.199*
	[0.299]	[0.168]	[0.159]	[0.148]	[0.144]	[0.140]	[0.109]
Mean Dep. Var.	0.122	0.122	0.122	0.122	0.122	0.122	0.122
				Dep. Variable: Water Network (1993)			
Ethnic diversity (dummy)	-0.382*	-0.290***	-0.266**	-0.262**	-0.216**	-0.216**	-0.080
	[0.202]	[0.106]	[0.109]	[0.104]	[0.102]	[0.099]	[0.091]
Ethnic div × Av. Within-Group H	0.444	0.384**	0.359**	0.361**	0.286*	0.289*	0.111
	[0.294]	[0.163]	[0.162]	[0.154]	[0.149]	[0.148]	[0.127]
Mean Dep. Var.	0.238	0.238	0.238	0.238	0.238	0.238	0.238
Observations	336	336	336	336	336	336	336
Geography	No	Yes	Yes	Yes	Yes	Yes	Yes
Ln pop. Density	No	Yes	Yes	Yes	Yes	Yes	Yes
Ln tributary pop. (∼ 1575)	No	No	Yes	Yes	Yes	Yes	Yes
Ln distance to colonial mine	No	No	Yes	Yes	Yes	Yes	Yes
Demographic controls 1792	No	No	No	Yes	Yes	Yes	Yes
Ecclesiastical Jurisd. FE	No	No	No	No	Yes	Yes	No
Religious Order FE	No	No	No	No	No	Yes	Yes
Colonial Province FE	No	No	No	No	No	No	Yes

Notes. OLS estimates. The unit of observation is the parish. Robust standard errors in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. Av. Within-Group H refers to the weighted average of within-group heterogeneity, computed using the area share of each ethnic group within the 10km buffer as weight. The dependent variables are the share of occupied dwellings with access to public sanitation in the first panel and the share of occupied dwellings with access to the public network of water supply in the second panel, both from the 1993 population and housing census. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.E.9: Within-Group Heterogeneity and Contemporary Development

	(1)	(2)	(3)	(4)	(5)	(6)
	Contemporary Living Standards (AES)					
	Whole Sample		Ethnic div = 1		Ethnic div = 0	
Dummy (Av. Within-Group H > 75 percentile)	0.242***	0.204**	0.517***	0.719***	0.164	0.053
	[0.086]	[0.098]	[0.160]	[0.227]	[0.105]	[0.135]
Ln pop. Density	No	No	No	No	No	No
Dummy (Av. Within-Group H > 75 percentile)	0.131	0.120	0.369***	0.431**	0.051	-0.003
	[0.081]	[0.089]	[0.140]	[0.195]	[0.100]	[0.134]
Ln pop. Density	Yes	Yes	Yes	Yes	Yes	Yes
Observations	336	336	117	117	219	219
Ecclesiastical Jurisd. FE	Yes	No	Yes	No	Yes	No
Colonial Province FE	No	Yes	No	Yes	No	Yes
Geography	Yes	Yes	Yes	Yes	Yes	Yes
Ln tributary pop. ($\sim$ 1575)	Yes	Yes	Yes	Yes	Yes	Yes
Ln distance to colonial mine	Yes	Yes	Yes	Yes	Yes	Yes
Demographic controls 1792	Yes	Yes	Yes	Yes	Yes	Yes
Religious Order FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes. The unit of observation is the parish. Robust standard errors in brackets. The table presents the standardized average effect size (AES) for four outcomes: log average light intensity per capita (2000-2003), indicator for non-subsistence agriculture (1994), share of dwellings with access to public sanitation (1993), and share of dwellings with access to the public water network (1993).
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.E.10: Ethnic Fractionalization, Within-Group Heterogeneity and Development

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Contemporary Living Standards (AES)						
Ethnic fractionalization	-1.944**	-2.460***	-2.523***	-2.399***	-1.935***	-1.835***	-1.565**
	[0.797]	[0.658]	[0.664]	[0.662]	[0.649]	[0.633]	[0.648]
Ethnic frac × Av. Within-Group H	2.047*	2.895***	3.000***	2.859***	2.388**	2.338**	2.081**
	[1.116]	[0.942]	[0.955]	[0.949]	[0.940]	[0.913]	[0.932]
Observations	336	336	336	336	336	336	336
Geography	No	Yes	Yes	Yes	Yes	Yes	Yes
Ln pop. density	No	Yes	Yes	Yes	Yes	Yes	Yes
Ln tributary pop. ($\sim$ 1575)	No	No	Yes	Yes	Yes	Yes	Yes
Ln distance to colonial mine	No	No	Yes	Yes	Yes	Yes	Yes
Demographic controls 1792	No	No	No	Yes	Yes	Yes	Yes
Ecclesiastical Jurisd. FE	No	No	No	No	Yes	Yes	No
Religious Order FE	No	No	No	No	No	Yes	Yes
Colonial Province FE	No	No	No	No	No	No	Yes

Notes. The unit of observation is the parish. Robust standard errors in brackets. Ethnic fractionalization is a Herfindahl index computed using the area share of each ethnic group within a 10km buffer from the parish capital. Av. Within-Group H refers to the weighted average of within-group heterogeneity, computed using the area share of each ethnic group within the 10km buffer as weight. The table presents the standardized average effect size (AES) for four outcomes: log average light intensity per capita (2000-2003), indicator for non-subsistence agriculture (1994), share of dwellings with access to public sanitation (1993), and share of dwellings with access to the public water network (1993).
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.E.11: Ethnic Diversity, Within-Group Heterogeneity (1-Herf.) and Development

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Contemporary Living Standards (AES)						
Ethnic diversity (dummy)	-1.307***	-1.368***	-1.428***	-1.402***	-1.176***	-1.088***	-1.022***
	[0.419]	[0.375]	[0.382]	[0.376]	[0.355]	[0.347]	[0.357]
Ethnic div × Av. Within-Group H	1.845***	1.923***	2.028***	1.998***	1.708***	1.615***	1.645***
	[0.686]	[0.611]	[0.623]	[0.612]	[0.590]	[0.576]	[0.584]
Observations	336	336	336	336	336	336	336
Geography	No	Yes	Yes	Yes	Yes	Yes	Yes
Ln pop. density	No	Yes	Yes	Yes	Yes	Yes	Yes
Ln tributary pop. ($\sim$ 1575)	No	No	Yes	Yes	Yes	Yes	Yes
Ln distance to colonial mine	No	No	Yes	Yes	Yes	Yes	Yes
Demographic controls 1792	No	No	No	Yes	Yes	Yes	Yes
Ecclesiastical Jurisd. FE	No	No	No	No	Yes	Yes	No
Religious Order FE	No	No	No	No	No	Yes	Yes
Colonial Province FE	No	No	No	No	No	No	Yes

Notes. The unit of observation is the parish. Robust standard errors in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. Av. Within-Group H refers to the weighted average of within-group heterogeneity (1-Herfindahl index), computed using the area share of each ethnic group within the 10km buffer as weight. The table presents the standardized average effect size (AES) for four outcomes: log average light intensity per capita (2000-2003), indicator for non-subsistence agriculture (1994), share of dwellings with access to public sanitation (1993), and share of dwellings with access to the public water network (1993).
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.E.12: Ethnic Diversity (Robust Dummy), Within-Group Heterogeneity and Development

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Contemporary Living Standards (AES)						
Ethnic diversity (robust dummy)	-0.795**	-1.113***	-1.149***	-1.089***	-0.901***	-0.846***	-0.664**
	[0.357]	[0.319]	[0.321]	[0.317]	[0.295]	[0.291]	[0.299]
Ethnic div × Av. Within-Group H	0.836*	1.336***	1.394***	1.327***	1.126***	1.074***	0.883**
	[0.498]	[0.444]	[0.448]	[0.442]	[0.421]	[0.416]	[0.423]
Observations	336	336	336	336	336	336	336
Geography	No	Yes	Yes	Yes	Yes	Yes	Yes
Ln pop. density	No	Yes	Yes	Yes	Yes	Yes	Yes
Ln tributary pop. (∼ 1575)	No	No	Yes	Yes	Yes	Yes	Yes
Ln distance to colonial mine	No	No	Yes	Yes	Yes	Yes	Yes
Demographic controls 1792	No	No	No	Yes	Yes	Yes	Yes
Ecclesiastical Jurisd. FE	No	No	No	No	Yes	Yes	No
Religious Order FE	No	No	No	No	No	Yes	Yes
Colonial Province FE	No	No	No	No	No	No	Yes

Notes. The unit of observation is the parish. Robust standard errors in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital (robust version: area share of ethnic group within buffer $\geq$ 10 percent), and 0 otherwise. Av. Within-Group H refers to the weighted average of within-group heterogeneity, computed using the area share of each ethnic group within the 10km buffer as weight. The table presents the standardized average effect size (AES) for four outcomes: log average light intensity per capita (2000-2003), indicator for non-subsistence agriculture (1994), share of dwellings with access to public sanitation (1993), and share of dwellings with access to the public water network (1993).
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.E.13: Living Standards Index (PCA)

	(1)	(2)	(3)	(4)
	Dep. Variable: Living Standards Index			
Ethnic diversity (dummy)	-1.277***	-1.021**	-1.741***	-1.039**
	[0.384]	[0.414]	[0.490]	[0.438]
Ethnic div × Av. Within-Group H	1.592***	1.391**	2.291***	1.420**
	[0.547]	[0.586]	[0.743]	[0.618]
Observations	336	336	336	336
Population Weights	No	No	Yes	Yes
Ecclesiastical Jurisd. FE	Yes	No	Yes	No
Colonial Province FE	No	Yes	No	Yes
Geography	Yes	Yes	Yes	Yes
Ln pop. Density	Yes	Yes	Yes	Yes
Ln tributary pop. (∼ 1575)	Yes	Yes	Yes	Yes
Ln distance to colonial mine	Yes	Yes	Yes	Yes
Demographic controls 1792	Yes	Yes	Yes	Yes
Religious Order FE	Yes	Yes	Yes	Yes

Notes. OLS estimates. The unit of observation is the parish. Robust standard errors in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. Av. Within-Group H refers to the weighted average of within-group heterogeneity, computed using the area share of each ethnic group within the 10km buffer as weight. The dependent variable is contemporary living standards, as proxied by the standardized score of the first principal component for the following outcomes: ln average light intensity per capita (2000-2003), indicator for non-subsistence agriculture (1994), share of dwellings with access to public sanitation (1993), and share of dwellings with access to the public water network (1993). Columns (3) and (4) are weighted by the total number of dwellings in 1993.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.E.14: Conley Standard Errors

	(1)	(2)	(3)	(4)
	Dep. Variable: Living Standards Index			
	Distance Cutoff:			
	$30km$		$50km$	
Ethnic diversity	-1.277***	-1.021***	-1.277***	-1.021***
	[0.370]	[0.372]	[0.354]	[0.354]
Ethnic div $\times$ Av. Within-Group H	1.592***	1.391***	1.592***	1.391***
	[0.521]	[0.524]	[0.495]	[0.500]
Observations	336	336	336	336
Ecclesiastical Jurisd. FE	Yes	No	Yes	No
Colonial Province FE	No	Yes	No	Yes
Geography	Yes	Yes	Yes	Yes
Ln pop. Density	Yes	Yes	Yes	Yes
Ln tributary pop. ($\sim$ 1575)	Yes	Yes	Yes	Yes
Ln distance to colonial mine	Yes	Yes	Yes	Yes
Demographic controls 1792	Yes	Yes	Yes	Yes
Religious Order FE	Yes	Yes	Yes	Yes

Notes. OLS estimates. The unit of observation is the parish. Conley standard errors corrected for spatial dependence with a distance cutoff of 30km (columns 1-2) or 50km (columns 3-4) in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. Av. Within-Group H refers to the weighted average of within-group heterogeneity, computed using the area share of each ethnic group within the 10km buffer as weight. The dependent variable is contemporary living standards, as proxied by the standardized score of the first principal component for the following outcomes: ln average light intensity per capita (2000-2003), indicator for non-subsistence agriculture (1994), share of dwellings with access to public sanitation (1993), and share of dwellings with access to the public water network (1993).
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.E.15: Inca-Period Robustness Checks

	(1)	(2)	(3)	(4)	(5)	(6)
	Contemporary Living Standards (AES)					
Ethnic diversity (dummy)	-0.869***	-0.815***	-0.915***	-0.801***	-0.878***	-0.669**
	[0.253]	[0.259]	[0.257]	[0.256]	[0.308]	[0.314]
Ethnic div $\times$ Av. Within-Group H	1.067***	1.133***	1.141***	1.098***	1.212***	0.938**
	[0.359]	[0.364]	[0.369]	[0.362]	[0.427]	[0.435]
Observations	336	336	336	336	275	275
Inca region (*suyu*) FE	Yes	Yes	No	No	No	No
Ln distance to Inca site	No	No	Yes	Yes	No	No
Excluding potential Inca-affected groups	No	No	No	No	Yes	Yes
Ecclesiastical Jurisd. FE	Yes	No	Yes	No	Yes	No
Colonial Province FE	No	Yes	No	Yes	No	Yes
Geography	Yes	Yes	Yes	Yes	Yes	Yes
Ln pop. Density	Yes	Yes	Yes	Yes	Yes	Yes
Ln tributary pop. ($\sim$ 1575)	Yes	Yes	Yes	Yes	Yes	Yes
Ln distance to colonial mine	Yes	Yes	Yes	Yes	Yes	Yes
Demographic controls 1792	Yes	Yes	Yes	Yes	Yes	Yes
Religious Order FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes. The unit of observation is the parish. Robust standard errors in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. Av. Within-Group H refers to the weighted average of the within-group heterogeneity index, computed using the area share of each ethnic group within the 10km buffer as weight. The table presents the standardized average effect size (AES) for four outcomes: log average light intensity per capita (2000-2003), indicator for non-subsistence agriculture (1994), share of dwellings with access to public sanitation (1993), and share of dwellings with access to the public water network (1993). Columns 1-2 include fixed effects accounting for the four major Inca regions (*suyus*) into which the empire was divided (Zuidema and Poole, 1982). Columns 3-4 control for log distance to the closest pre-Hispanic site, including Inca administrative centers, connected by the Inca road network (Qhapaq Ñan); see *Guía de Identificación y Registro del Qhapaq Ñan* (Ministerio de Cultura). The fact that the study is focused on parishes located in the highland region alleviates concerns regarding potential Inca resettlements from the north to the south coast of Peru (Bongers et al., 2020). Columns 5-6 exclude parishes with presence of other groups potentially affected by Inca resettlements according to the historical literature (Rowe, 1946; de La Espada, 1881). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.E.16: *Corregimiento* Robustness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Contemporary Living Standards (AES)						
Ethnic diversity (dummy)	-1.255***	-1.297***	-1.347***	-1.333***	-1.194***	-1.120***	-0.974***
	[0.386]	[0.327]	[0.326]	[0.323]	[0.293]	[0.294]	[0.279]
Ethnic div × Av. Within-Group H	1.597***	1.627***	1.701***	1.684***	1.544***	1.458***	1.346***
	[0.541]	[0.446]	[0.444]	[0.437]	[0.418]	[0.421]	[0.396]
Observations	293	293	293	293	293	293	293
Geography	No	Yes	Yes	Yes	Yes	Yes	Yes
Ln pop. density	No	Yes	Yes	Yes	Yes	Yes	Yes
Ln tributary pop. ($\sim$ 1575)	No	No	Yes	Yes	Yes	Yes	Yes
Ln distance to colonial mine	No	No	Yes	Yes	Yes	Yes	Yes
Demographic controls 1792	No	No	No	Yes	Yes	Yes	Yes
Ecclesiastical Jurisd. FE	No	No	No	No	Yes	Yes	No
Religious Order FE	No	No	No	No	No	Yes	Yes
Colonial Province FE	No	No	No	No	No	No	Yes

Notes. The unit of observation is the parish. Robust standard errors in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. Regressions exclude parishes for which the buffer intersects an ethnic border and a *corregimiento* border at the same time. Av. Within-Group H refers to the weighted average of within-group heterogeneity, computed using the area share of each ethnic group within the 10km buffer as weight. The table presents the standardized average effect size (AES) for four outcomes: log average light intensity per capita (2000-2003), indicator for non-subsistence agriculture (1994), share of dwellings with access to public sanitation (1993), and share of dwellings with access to the public water network (1993). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.E.17: *Corregimiento* Placebo

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Contemporary Living Standards (AES)						
Corregimiento Dummy	0.781*	-0.178	-0.178	-0.059	0.051	-0.002	-0.095
	[0.409]	[0.348]	[0.349]	[0.349]	[0.321]	[0.321]	[0.287]
Corregimiento Dummy ×	-1.187**	0.150	0.143	0.009	-0.057	0.069	0.183
Av. Within-*Corregimiento* H	[0.537]	[0.456]	[0.456]	[0.456]	[0.426]	[0.429]	[0.383]
Observations	336	336	336	336	336	336	336
Geography	No	Yes	Yes	Yes	Yes	Yes	Yes
Ln pop. density	No	Yes	Yes	Yes	Yes	Yes	Yes
Ln tributary pop. ($\sim$ 1575)	No	No	Yes	Yes	Yes	Yes	Yes
Ln distance to colonial mine	No	No	Yes	Yes	Yes	Yes	Yes
Demographic controls 1792	No	No	No	Yes	Yes	Yes	Yes
Ecclesiastical Jurisd. FE	No	No	No	No	Yes	Yes	No
Religious Order FE	No	No	No	No	No	Yes	Yes
Colonial Province FE	No	No	No	No	No	No	Yes

Notes. The unit of observation is the parish. Robust standard errors in brackets. The *Corregimiento* dummy takes value 1 if there is more than one *corregimiento* within a 10km buffer from the parish capital, and 0 otherwise. Av. Within-*Corregimiento* H refers to the weighted average of within-*corregimiento* heterogeneity, computed using the area share of each *corregimiento* within the 10km buffer as weight. The table presents the standardized average effect size (AES) for four outcomes: log average light intensity per capita (2000-2003), indicator for non-subsistence agriculture (1994), share of dwellings with access to public sanitation (1993), and share of dwellings with access to the public water network (1993).
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.E.18: Household-Level Survey Data (2004-2017)

	(1)	(2)	(3)	(4)
	Dep. Variable: Participation in			
	Neigh. Associations		Unions	
Ethnic diversity (dummy)	-0.111*	-0.084**	-0.068*	-0.072**
	[0.062]	[0.039]	[0.036]	[0.031]
Ethnic div $\times$ Av. Within-Group H	0.133	0.112**	0.103**	0.108**
	[0.085]	[0.056]	[0.040]	[0.043]
Observations	52,494	52,494	52,494	52,494
Number of districts	280	280	280	280
Mean Dep. Var.	0.075	0.075	0.062	0.062
Year FE	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes
Geography	No	Yes	No	Yes
Ln tributary pop. ($\sim$ 1575)	No	Yes	No	Yes
Ln distance to colonial mine	No	Yes	No	Yes
Demographic controls 1792	No	Yes	No	Yes
Ecclesiastical Jurisd. FE	No	Yes	No	Yes
Religious Order FE	No	Yes	No	Yes

Notes. OLS estimates. Standard errors in brackets are clustered at the parish level. The dependent variable takes value 1 if some household member participates in a certain type of association, and 0 otherwise (ENAHO household survey). Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. Av. Within-Group H refers to the weighted average of within-group heterogeneity, computed using the area share of each ethnic group within the 10km buffer as weight. All regressions include year fixed effects, personal characteristics of the household head (gender, age, age squared, years of schooling, civil status and mother tongue) and log total associations per capita in the district.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.E.19: Inter-Group Unions (1605-1870)

	(1)	(2)	(3)	(4)	(5)
	Dep. Variable:				
	Share of Unions between Linguistically-Distant Individuals				
Ethnic diversity (dummy)	-0.463***	-0.436***	-0.341*	-0.352	-0.536**
	[0.151]	[0.155]	[0.176]	[0.216]	[0.218]
Ethnic div × Av. Within-Group H	0.653**	0.622**	0.554*	0.618*	0.679*
	[0.273]	[0.282]	[0.309]	[0.342]	[0.350]
Observations	61	61	61	61	61
Mean Dep. Var.	0.297	0.297	0.297	0.297	0.297
Ln total pop. (1605-1780)	No	Yes	Yes	Yes	Yes
Potential partners (1605-1780)	No	Yes	Yes	Yes	Yes
Geography	No	No	Yes	Yes	Yes
Ln distance to colonial mine	No	No	Yes	Yes	Yes
Ecclesiastical Jurisd. FE	No	No	No	Yes	Yes
Religious Order FE	No	No	No	Yes	Yes
Population Weights	No	No	No	No	Yes

Notes. OLS estimates. The unit of observation is the parish. Robust standard errors in brackets. Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. Av. Within-Group H refers to the weighted average of within-group heterogeneity, computed using the area share of each ethnic group within the 10km buffer as weight. The dependent variable is the share of unions with Levenshtein distance $\geq$ 75th percentile ($L_{75} = 7$). Column (2) controls for the log total number of individuals (1605-1780) and for the mean share of potential partners,defined as people in the parish with whom the individual has L distance $\geq L_{75}$. Column (5) is weighted by total population in 1605-1780.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.E.20: Ethnic Diversity, Within-Group Heterogeneity and Identity Formation

(2004-2017 Household-Level Survey Data)

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. Variable: *Which group do you identify most with?*					
	Administrative Region		Ethnicity or Race		Native Community	
Ethnic diversity (dummy)	-0.190**	-0.190***	0.017	0.038**	0.255***	0.167***
	[0.086]	[0.060]	[0.021]	[0.017]	[0.094]	[0.060]
Ethnic div × Av. Within-Group H	0.228**	0.240***	-0.023	-0.046*	-0.307**	-0.232***
	[0.116]	[0.082]	[0.028]	[0.024]	[0.130]	[0.083]
Observations	52,494	52,494	52,494	52,494	52,494	52,494
Number of districts	280	280	280	280	280	280
Mean Dep. Var.	0.504	0.504	0.039	0.039	0.214	0.214
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
Geography	No	Yes	No	Yes	No	Yes
Ln tributary pop. (∼ 1575)	No	Yes	No	Yes	No	Yes
Ln distance to colonial mine	No	Yes	No	Yes	No	Yes
Demographic controls 1792	No	Yes	No	Yes	No	Yes
Ecclesiastical Jurisd. FE	No	Yes	No	Yes	No	Yes
Religious Order FE	No	Yes	No	Yes	No	Yes

Notes. OLS estimates. Standard errors in brackets are clustered at the parish level. The dependent variable takes value 1 if the individual answers that she/he is most identified with a certain group (administrative region/ethnicity or race/native community), and 0 otherwise (ENAHO household survey). Ethnic diversity is a dummy variable that takes value 1 if there is more than one group within a 10km buffer from the parish capital, and 0 otherwise. Av. Within-Group H refers to the weighted average of within-group heterogeneity, computed using the area share of each ethnic group within the 10km buffer as weight. All regressions include year fixed effects and personal characteristics (gender, age, age squared, years of schooling, civil status and mother tongue).
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.E.21: Cultural Transmission or Economic Complementarities?

	(1)	(2)	(3)	(4)	(5)	(6)
	Primary Sector		Secondary Sector		Tertiary Sector	
	Ln(occupations)	Frac occupations	Ln(occupations)	Frac occupations	Ln(occupations)	Frac occupations
High minority	0.130	-0.011	0.487***	0.098**	0.551***	0.046
	[0.138]	[0.069]	[0.182]	[0.044]	[0.192]	[0.071]
High majority	-0.011	-0.035	0.213	0.053	0.116	0.023
	[0.115]	[0.077]	[0.279]	[0.050]	[0.199]	[0.056]
High min. $\times$ High maj.	-0.245	-0.006	-0.747**	-0.127**	-0.860**	-0.176
	[0.233]	[0.145]	[0.360]	[0.062]	[0.409]	[0.116]
Observations	97	97	97	97	97	97
Mean number of occupations	2.990	2.990	12.268	12.268	7.433	7.433
Ln male pop. 1876	Yes	No	Yes	No	Yes	No
Geography	Yes	Yes	Yes	Yes	Yes	Yes
Ln tributary pop. ($\sim$ 1575)	Yes	Yes	Yes	Yes	Yes	Yes
Ln distance to colonial mine	Yes	Yes	Yes	Yes	Yes	Yes
Demographic controls 1792	Yes	Yes	Yes	Yes	Yes	Yes
Ecclesiastical Jurisd. FE	Yes	Yes	Yes	Yes	Yes	Yes
Religious Order FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes. OLS estimates. The unit of observation is the parish. Robust standard errors in brackets. Regressions for the subsample of parishes with ethnic diversity. High majority is a dummy variable indicating whether the within-group heterogeneity value of the ethnic majority (ethnicity with the highest area share within the 10km buffer) is above the 75th percentile, and 0 otherwise. High minority refers to the analogous dummy variable for the ethnic minority (ethnicity with the lowest area share within the 10km buffer). Outcomes in columns (1)-(6) refer to log(1+number of occupations) from the 1876 population census; available for 97 parishes. Columns (7) and (8) report the standardized average effect size (AES) for four outcomes: log average light intensity per capita (2000-2003), indicator for non-subsistence agriculture (1994), share of dwellings with access to public sanitation (1993), and share of dwellings with access to the public water network (1993).
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Chapter 2

Accountability, Political Capture, and Selection Into Politics: Evidence from Peruvian Municipalities

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2.1 INTRODUCTION

In most democratic systems, different mechanisms and institutions can be used to increase voters' control over politicians, among them, reelection incentives, free press, and impeachment and recall mechanisms. The objective of these institutions is to improve government quality and the provision of public goods by disciplining elected politicians or punishing the inefficient or corrupt ones, or both (Persson and Tabellini, 2000; Barro, 1973; Ferejohn, 1986). These mechanisms not only have effects over politicians' actions, but also on their selection: by holding them accountable, they affect the expected value of office (Besley, 2007). However, in countries with low state capacity, where accountability institutions are at risk of being captured or manipulated by political elites or special interest groups, these objectives can be distorted.

In this paper, we study how accountability institutions affect the type of politicians who decide to run for office and show the way in which these institutions can lead to a negative selection when they are misused (through legal channels) by a group with political interests, that is, when they are prone to political capture. Using a comprehensive dataset on the characteristics and background of candidates running for mayor in the last three rounds of municipal elections in Peru, we implement a close election regression discontinuity design, comparing the characteristics of candidates who decide to run for mayor in municipalities where the incumbent lost a recall referendum by a small margin with those running in places where the previous mayor barely survived the recall. We hypothesize that having a mayor recalled from office in a municipality affects the expected value of office for potential candidates by updating their beliefs about the probability that they are recalled for political purposes, that is, irrespective of their performance in office (a similar mechanism as in Avis et al., 2018). In this framework, high-ability politicians and those who derive a high level of utility from providing public goods (especially to their coethnics) refrain from running, lowering the quality of the pool of candidates in the next regular election cycle and negatively affecting representation.

Our empirical results show that having a mayor ousted through a referendum in the previous period causes a reduction in the quality of candidates running for mayor: candidates in treated municipalities have about half a year less education and are 22% less likely to be university educated, and the proportion of candidates with only secondary education is higher. Looking at other dimensions correlated with politicians' quality and policymaking, we find that candidates in municipalities where a mayor was recalled also have less experience in elected office; in particular, they have 0.4 fewer years serving as municipal mayor, have less experience working in the public sector, and are less likely to have served in a party office. Importantly, these candidates are not less likely to belong to a national political party. These characteristics are negatively correlated with policy outcomes in our setting, suggesting that overall high-ability candidates are selecting out of the race and instead lower-quality candidates are entering politics. Additionally, we show that candidates in municipalities in which the mayor was ousted from office are not less likely to have an indigenous background on average (as measured by a novel classification of surnames), but we do observe a decrease in representativeness in municipalities with an indigenous majority. Finally, we show that despite the negative selection of candidates, elections still play an important role, and the negative effects on the pool of candidates are mostly offset by voters, who select the most qualified politicians among a lower-quality pool. However, relevant policy outcomes are still negatively affected by the lower quality of candidates.

Recall referenda are a direct democracy institution widely used around the world that allows voters to hold politicians accountable outside the regular election terms (Serdült and Welp, 2012). In Peru, recall referenda are pervasive at the local level (Welp, 2015). For example, in the 2010 electoral period, 20% of mayors in the country faced a recall election, and one-fourth of them were ousted from office. Importantly, it has been documented that recall referenda are often used as a political tool, and this is true around the world (Altman, 2010; McCoy, 2006) as well as in our study setting (Welp, 2015; Holland and Incio, 2019; Tuesta Soldevilla, 2014).

We present a simple framework where an increase in accountability allows voters to punish low-quality and corrupt politicians, reducing their expected term length and generating a positive selection. However, the political use of accountability mechanisms generates the possibility that high-quality and policy-motivated candidates are punished by voters, regardless of their performance, deterring some of them from running for office, leading to negative selection. When accountability institutions are at risk of being captured, as is often the case in settings with low state capacity, well-intended institutions can backfire. In the analysis, we show evidence consistent with the hypothesized mechanisms. The negative selection of candidates is almost entirely driven by municipalities where the main promoter of the recall referendum is a politician who ran for office in the previous election. Our effects are independent of the previous mayor's performance in office, and we show that candidates who select into the race after a mayor was recalled have a lower opportunity cost. Our results are not driven by preexisting differences in the characteristics of the incumbents or their opponents or time-variant characteristics of the political situation of the municipality at the moment of the recall referendum, or related to the absence of an incumbent mayor in municipalities where she was recalled.

Our interpretation of the results relies on the assumption that potential candidates are uninformed about the prevalence of politically motivated recalls and update their beliefs when they observe a mayor being recalled in their municipality. More than 90% of recall elections take place in municipalities with fewer than 5,000 voters (Welp, 2015), which are rarely covered by national media. We empirically provide evidence consistent with this information transmission mechanism. We analyze the patterns of candidate selection in municipalities that did not have a recall election, but had a close neighbor where a close recall election took place, comparing municipalities in which a close neighbor had the mayor ousted with those where the neighbor's mayor barely survived the recall. The results are entirely consistent with our main hypotheses.

Finally, in our empirical analysis, we investigate whether having a lower-quality pool of candidates affects the quality of elected mayors and their policy outcomes. Our findings, though suggestive due to a reduced sample size, show that elections mostly offset the negative effect of recalls on the candidate pool, and elected mayors in treated areas are only slightly less educated (not significant) than those who win the election in municipalities where a mayor barely survived the recall referendum. Even though there are no major differences in the mayors' characteristics, we observe that municipalities that had the incumbent recalled in the previous period spend less and collect less revenue, which could be explained by, for example, the lower quality of the opposition and less oversight.

Peruvian municipalities provide an ideal setting for studying the effects of accountability institutions on candidate selection. First, unlike other contexts where information on the characteristics of politicians is available only for those who are elected, the national electoral office collects and publishes detailed data on all candidates running for any public office, from the presidency down to the municipal council. These data allow us to look not only at the effects on the number of candidates and political competition, like previous studies, but, importantly, to who decides to run for office and who is deterred, emphasizing characteristics that are likely to cause better performance in office, as education and previous experience in the public and private sectors. Second, it is not often the case that one can observe variation in accountability (and the misuse of these institutions) at the local level, and when one does, it is not easy to disentangle observed or unobserved factors that determine the level of accountability and other outcomes to study. In our setting, close results in recall elections allow us to identify the effect of being exposed to (and learning from) an accountability institution that can be used for political purposes, and therefore causes a shorter expected term in office that is unrelated to performance or individual characteristics. Finally, recall referenda in Peru are at risk of being captured by political interest groups, a claim supported by qualitative and statistical evidence, allowing us to shed light on the mechanisms that explain why accountability can lead to a negative selection of candidates.

Our work contributes to and bridges the literature studying the effects of voter control mechanisms and the one analyzing the motivations and selection of politicians. First, we contribute to the literature looking at the broad question of politicians' motivations and selection (e.g. Diermeier et al., 2005; Dal Bó et al., 2017). In this paper, we show empirically a specific mechanism that affects the selection of politicians, which sheds light on their motivation for running for office.

Second, a large body of theoretical literature shows that increases in accountability allow voters to discipline politicians, for instance, in the form of reelection incentives, term limits, and information availability (Barro, 1973; Ferejohn, 1986). Most political agency models predict that these information asymmetries have effects on the incidence of both moral hazard and adverse selection; however, the empirical work analyzing the effects of accountability institutions has focused on the former.[1] Avis et al. (2018) show that Brazilian mayors exposed to a random audit are less likely to engage in corruption or mismanagement. As the framework in our paper argues, mayors are misinformed, and when an audit takes place, they update their priors. The main hypothesis presented in our paper is in a similar vein and assumes that mayors do not have perfect information about the probability of having a politically motivated recall, and update their beliefs when they observe a mayor being recalled in their municipality.

The selection of politicians who decide to run for office is as important as their behavior, since their honesty, competence, and motivation determine the quality of public policies implemented, either directly (Martinez-Bravo, 2017; Besley et al., 2011, 2005) or through their effects on political competition and more generally on the political equilibrium (Acemoglu et al., 2013; Besley et al., 2010). Few empirical papers so far have looked at the effects of accountability institutions on the selection of candidates.[2] Unlike these papers, we analyze an accountability institution that is used for political purposes, which distorts its objectives and hence generates negative selection.

More closely related to the predictions of agency models, as well as highlighting the importance of considering endogenous selection into politics (in the spirit of citizen candidate models, e.g., Osborne and Silvinski, 1996 and Besley and Coate, 1997), a group of papers analyze the effects of monetary incentives on politicians' selection and performance (Ferraz and Finan, 2011b; Gagliarducci and Nannicini, 2013; Pique, 2019). Others investigate the role of natural resource

[1]Examples of this literature are Besley and Case (1995), Ferraz and Finan (2011a), List and Sturm. (2006), Ferraz and Finan (2008), Besley and Burgess (2002), Bobonis et al. (2016), and Casey (2015), who study the effects of different accountability mechanisms on government responses and reelection of incumbents.

[2]Some notable recent exceptions are Alt et al. (2011), Fisman et al. (2017), Cavalcanti et al. (2018), Drago et al. (2014), and Gamalerio (2019).

revenues and institutional rules on the selection of candidates (Brollo et al., 2013; Beath et al., 2016). Similar to these papers, we use detailed data on candidates to analyze the effects of a treatment that affects the expected value of office. Our results complement those from Dal Bó and Rossi (2011), who show the effects of different lengths in office on the performance of legislators in Argentina, holding selection constant. We add to this literature by documenting that institutions intended to increase citizen control of politicians can have negative consequences when they are likely to be captured by specific interest groups.

2.2 INSTITUTIONAL BACKGROUND

2.2.1 *Local Governments in Peru*

Municipalities (also referred to as districts) are the lowest administrative level in Peru. The highly decentralized structure of the country gives significant decision power to municipal governments, which execute a large share of the national budget and are in charge of basic public goods provision−street pavement, local security, trash collection, and street cleaning, among others. Municipal budgets account for more than 20% of the national budget and around 45% of the country's total public investment (Pique, 2019).

During our study period, municipal mayors and their councilors were elected for four-year terms with the option of reelection (which was banned in 2015). The mayor is elected by simple majority, and the party that gets the largest share of votes automatically earns the majority in the council, with the rest of the seats being assigned to other political parties, proportional to their vote shares. Local-level politics are fragmented. A significant number of candidates run for independent parties, which have few links outside the municipality and are often seen as election vehicles centered around the candidate rather than a political program or ideology (see Bland and Chirinos, 2014). For example, in the 2014 municipal election, the average municipality had 7.26 candidates running for office, and only 36.9% of them represented a national political party.

2.2.2 *Recall Elections*

Peruvian citizens have the right to recall any local elected official (mayors, councilors, and regional presidents but not MPs or the president). The introduction of this direct democracy mechanism in 1993 followed a set of similar reforms in other Andean countries (Colombia, Ecuador, and Bolivia) and emulated already existing ones elsewhere in the world (e.g., the United States, Poland, and Uganda). The main objective of this institution is to hold politicians accountable outside regular election times.

A recall referendum can be called in the second or third year of the mayor's term. To initiate a recall procedure, the promoter has to (a) buy a "recall kit", which includes the official forms to collect signatures from supporters; (b) name the authorities subject to recall and provide a reason for recalling them; and (c) collect valid signatures of 25% of eligible voters in the constituency. Figure 2.B.1 shows the timing of elections and the steps required to call a recall referendum. Once these requirements are fulfilled, the national electoral commission (JNE) calls the referendum. Voters are able to vote for the recall of each authority under scrutiny. An incumbent is recalled if turnout is at least 50%, and at least 50% plus 1 of the valid votes are cast in favor of the recall. Recall referenda are common in Peruvian politics. Between 1997 and 2013, there were more than 20,000 recall attempts (kits purchased), and more than 5,000 officials faced a recall referendum in 45% of all municipalities in the country (747 out of 1,645).[3]

[3]While Peru is the country where recall referenda are used most often (followed by the United States and Poland), there is an increasing use of this institution around

When a mayor is recalled, the first councilor from the list takes office until the next regular election cycle. If the mayor and at least a third of the council are recalled, there are new elections, and the elected mayor serves in office until the end of the original term. Over our sample period, these new elections in the middle of the term take place in less than 18% of cases.

2.2.3 *Recall Elections and Political Capture*

Recall elections are direct democracy mechanisms intended to increase accountability; however they are often used as political tools. Given the large number of candidates running for office and the absence of runoff elections, it is not uncommon that mayors are elected with a very low percentage of votes. For example, in the 2014 election, the average mayor was elected with 35.1% of the votes, and in municipalities with above-median political competition (as measured by the number of candidates), this number drops to 29.4%. It is therefore not hard for losing candidates to put together a coalition with enough support to promote a recall referendum (Bland and Chirinos, 2014). The JNE shows that in the 2012 recall cycle, 22% of the promoters of a recall referendum were candidates who lost in the preceding election. If one considers that many times, politicians have political operators representing them as the official person promoting the recall, we should expect the true number to be even larger. These statistics, on top of the fact that the number of recall referenda has varied widely across years, add to the uncertainty any candidate has about the probability of being ousted from office through a recall referendum due to politi-

the world. Welp (2015) reports that "recall referendums have become one of the most intensively used mechanisms of citizen participation in South America, particularly in the Andean countries. To give just a few examples, between 2008 and 2010 more than 700 recall attempts were registered in Ecuador of which more than 100 resulted in a referendum. Hundreds of attempts have been registered in Bolivia since 2012 and Colombia has seen a large number of recall attempts since its legal introduction in 1991, including a process against the Mayor of Bogota, Gustavo Petro, in 2012."

cal grievances (i.e., independent of their performance in office). The political use of impeachment and recall procedures and their failure to achieve effective accountability are not unique to Peruvian politics. A number of examples of high-profile recalls have been linked to elite power grabs.[4]

Two papers provide detailed accounts of how Peruvian recall elections are often used as a tool to pursue political goals. Holland and Incio (2019) quantitatively analyze the determinants of recall elections. Using data for the same period as our study, they find that "losing politicians organize recall referenda, but office performance matters when citizens vote to retain their politicians." As evidence of the political use of recalls, they document that (a) 18% of the recall requests are filed by former political competitors, (b) the most common reasons given for these recall requests are unverifiable claims (e.g., failure to fulfill electoral promises, incompetence, poor management), and (c) more than 50% of recall petitions are filed as soon as legally possible, providing little time to evaluate the incumbent's performance. Welp (2015) argues that the combination of low institutionalization of political parties and the relative ease with which recall referenda are activated generate incentives for political opposers to use these mechanisms to undermine the incumbent.

It is important to highlight that after almost twenty years that recall elections had been in place and hundreds of politicians had faced recall referenda, policymakers and experts in the area in Lima were not aware of the prevalence of the political capture of recall elections.[5]

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[4] Altman (2010) (as cited in Holland and Incio, 2019), in a global study of direct democracy mechanisms, describes recalls as "motivated by political reasons" (p. 16). For additional references, see McCoy (2006); Helmke (2017); Pérez-Linan (2007); Breuer (2007); Welp and Milanese (2018); Miró-Quesada Rada (2013).

[5] This is evidenced by the fact that only in 2012, after a politically motivated recall attempt against the mayor of Lima (Miró-Quesada Rada, 2013; Vásquez Oruna, 2014), a change in the regulation was introduced to reduce the benefits for political opposers from having a mayor recalled. This new regulation allowed every elected mayor

This is mostly due to the fact that most of these recall referenda take place in small municipalities and national media rarely covers these processes. The JNE documents that between 1997 and 2012, 1,015 municipalities held a recall referendum and 91.7% of them had fewer than 5,000 registered voters (Welp, 2015). If policymakers and experts were not aware of these details of the effective implementation of the recall elections, it is safe to assume that potential candidates are also uninformed about the prevalence of political capture.

In Table 2.C.1, we provide quantitative evidence supporting the claims we have presented and regress the presence of a recall referendum on different covariates that presumably predict recall elections: the observable characteristics of the mayor and variables describing the political scenario of the previous election (turnout, number of candidates, and win margin). After including in the regression municipality and election fixed effects, the variables that have more predictive power are those related to the level of political competition. Importantly, none of the mayor's characteristics have economically or statistically significant effects on the probability of a recall election taking place. This is consistent with the claim that the recall referenda are used as a political tool rather than as a citizen control mechanism.[6]

Presumably, the political objective of a recall referendum is to weaken the incumbent for a future election. In municipalities where a recall petition was initiated through a signature collection, the incumbent runs for reelection in 79.7% of cases (compared to 68%, where there

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to handpick her successor in case of a recall, therefore blocking political opponents from gaining access to the municipal seat. The effect of this change was that in the electoral period 2014-2018, only 29 districts in the entire country had a recall election.

[6]In a similar analysis, we consider the correlates of recall attempts (i.e., buying a "kit"). The results also point in the same direction. Municipalities with a lower win margin have a higher probability of having someone attempting to recall the incumbent. On top of this, we see that some individual characteristics that are unlikely to be related to performance in office, for example, being a woman, the number of years in elected office or party affiliation, are also significantly associated with the probability of a recall attempt. These results are shown in Table 2.C.2.

was no signature collection at all). Incumbents who faced a referendum and survived it ran for reelection 72% of the time, and 18% of them won reelection. In contrast, 48% of incumbents who were recalled do run for reelection, but only 4.8% of them win these elections (see Table 2.C.3).

2.3 CONCEPTUAL FRAMEWORK AND EMPIRICAL STRATEGY

2.3.1 *Conceptual Framework*

In this section, we outline a simple framework to help conceptualize the expected effects of a politically captured accountability institution on political selection and guide the empirical analysis. In our framework, three dimensions characterize politicians: ability, office motivation, and corruption. High-ability politicians are also more productive in the private sector, and their opportunity cost of entering politics is higher (Besley, 2005). Politicians derive utility from delivering public goods, and their level of utility increases with coethnicity. This is consistent with empirical evidence on policies targeted toward the politician's identity group, both for welfare transfers and public goods (see, e.g., Pande, 2003; Burgess et al., 2015). Finally, corrupt politicians are motivated by extracting rents from office (Ferraz and Finan, 2011a). The introduction of a well-functioning control and accountability mechanism increases the cost of rent extraction and inefficient policymaking, deterring corrupt and low-quality candidates from entering the political arena (Persson and Tabellini, 2000).

How does the political capture of an accountability institution (recall elections) affect the decision to run for office? When a politician learns about the political capture of an accountability institution, there is a reduction in her expected term length, and this reduction is unrelated to her potential performance in office. This in turn leads to a decline in the direct benefits from office in the form of wages earned or ego rents, for example. The first implication derived from this simple framework is that at the margin, potential politicians with a higher opportunity cost are more likely to be deterred from running for office when they learn about the political use of recall elections. Conversely, we would see low-ability politicians entering the race. One proxy for the opportunity cost is the candidate's level of education.

A shorter term in office implies that the opportunities to take on public works and deliver public goods are reduced. On top of this, a recall referendum implies that the incumbent has to spend time campaigning, displacing time otherwise devoted to policymaking. The second implication of the framework is that upon learning about the political use of recall elections, policy-motivated politicians would be less likely to run for office. Moreover, if we consider that the utility politicians derive from public good delivery is increasing in the level of coethnicity of the recipients, we should expect that more representative politicians (i.e., indigenous politicians in localities with a high proportion of Quechua or Aymara speakers) to be less likely to run. Finally, the prediction in terms of the selection of corrupt politicians is ambiguous, since a shorter term implies fewer opportunities for rent extraction, but also the recall itself lowers reelection incentives, lowering the cost of engaging in corruption. In the next sections, we test the first two predictions; unfortunately, data availability constraints prevent us from testing the last one.

2.3.2 *Empirical Strategy*

In the ideal experiment to test the predictions of our framework, we would randomly allocate information about the political capture of an existing institution that allows voters to hold elected officials accountable. Obviously, random variation of this sort is nearly impossible to find (or generate), since we would need to know ex-ante the set of municipalities where the institution has actually been captured and provide evidence on this. Instead, we rely on the observation that the political use of the accountability institution is not likely to be public knowledge and exploit quasi-random variation in events that are likely to reveal information about political capture.

In a sample of municipalities where the accountability institution is active (i.e. where a recall election took place in the previous period), we compare the characteristics of candidates running for office in municipalities where the mayor barely survived a recall with those running in a municipality where the mayor was ousted from office by a small margin. The underlying assumption is that the fact that a mayor is recalled is a salient event that reveals information about the political use of the recall election. In additional tests, we provide evidence consistent with the information acquisition story.[7]

Following the description of the ideal experiment, our identification strategy uses a sharp regression discontinuity design (Lee and Lemieux, 2010; Imbens and Lemieux, 2008), which relies on the assumption that municipalities in which the mayor was barely ousted are similar in observable and unobservable characteristics to those in which the mayor barely managed to stay in office. Our main regression equation is as follows:

[7] The revelation of information about the political use of recall elections can take place at two stages: when the referendum occurs and when the mayor is recalled. We indeed see these two steps as a continuous signal revelation process in which potential candidates learn something about the motives for the recall at both stages. However, we view the actual recall of a mayor as a more salient event that highlights the potential consequences of the recall and in which the performance of the incumbent is observed and the motives of the proponents of the recall are evident. Additionally, note that a comparison between municipalities where there was a recall referendum with those where the referenda did not take place would confound the effects of the referenda and (limited information of) political capture. Instead, the comparison we make isolates the effect of the information on political capture. Given that some information is revealed when the recall election is initiated, our estimates should be considered as a lower bound for the real effect of a captured political institution on the selection of candidates.

$$Y_{ijt} = \alpha + \beta Recalled_{jt-1} + \gamma f(VoteShare_{jt-1}) + \varepsilon_{ijt} \tag{2.1}$$

where, Y_{ijt} are characteristics of candidate i running for office in municipality j in election t. In our main regressions, these characteristics include educational level, years of experience in private and public office, demographic characteristics, and whether the candidate is of an indigenous group and if she is representative. Our main interest lies in β, the coefficient associated with having a mayor recalled in electoral term $t-1$. The running variable is the share of votes in favor of the recall, and thus we include in all of our regressions a flexible polynomial of this variable $f(VoteShare_{jt-1})$. Our preferred specification uses a local linear regression with triangle kernel weights (we also show the results for other specifications for robustness). ε is the error term, which we cluster at the level of the treatment, municipality$\times$election level.

Given that we are comparing candidates in elections where a recall election was barely won or lost and consistent with the ideal experiment to test our predictions, our analysis sample is restricted to municipality$\times$election observations in which a recall election was held. In addition, we restrict the sample to municipality$\times$elections where the vote share in favor of the recall is close enough to the threshold, $VoteShare_{jt-1} \in [0.5-\varepsilon, 0.5+\varepsilon]$, where ε is determined with optimal bandwidth selection procedure based on Imbens and Kalyanaraman (2012). We also present robustness checks with alternative bandwidths.

To provide evidence that the reduced-form effects are consistent with our main hypotheses, namely, that a successful recall of a mayor informs potential candidates about the political capture of the accountability institutions, we use different strategies. First, we explore the heterogeneity of the results by variables that indicate that the recall was initiated for political purposes and not related to the mayor's performance in office. For example, we identify recall elections that were initiated by someone who was a candidate in the previous election (following Welp, 2015 and Holland and Incio, 2019) and use proxies of the mayor's performance (measured by the municipality's revenues and spending during her tenure). Second, potential candidates are likely to learn about the political use of recall elections not only through electoral results in their own municipality, but also from those that are close by. We test this by looking at the selection of candidates in municipalities that did not have a recall election, but had one occurring in a neighboring municipality (within two hours of travel time) and do a similar exercise as above.

2.4 DATA

2.4.1 *Data Sources*

Our main outcome variables are compiled from www.Infogob.com.pe, a government website that publishes all candidates' curriculum vitae (*Hoja de vida*). An example of the CVs posted online can be found in Figures 2.B.3-2.B.5. We scraped the website to assemble a novel and comprehensive dataset with the characteristics and background of candidates who ran for mayor in the 2002, 2006, 2010, and 2014 elections.

Despite the differences in the format and level of detail provided in the original datasets for different years, we compute a series of consistent variables related to the candidates' schooling: (a) ever attended university, (b) attended only up to technical education, (c) attended up to secondary school, and (d) attended up to primary school. From these variables, together with information on whether each level of schooling was completed, plus the number of years of schooling at the postsecondary level, we impute the number of years of education. The dataset also includes information on the candidates' work and political experience, as well as political party service, from where we compute the number of years of experience in (a) elected public office (mayor, councilor, or regional counselor), (b) the position of mayor, (c) service in the party office, and (d) whether a candidate is a member of a national political party, (e) has work experience in the public sector, or (f) has work experience in the private sector. Finally, we obtained information on the candidates' demographic characteristics (e.g., gender and age). While the CVs online have fields for previous convictions or open trails, and wealth, these are seldomly filled, and therefore we can't use them for our analysis.

While candidates are not legally mandated to submit their CVs to the national electoral office, conditional on reporting it, the information has to be truthful or they could face legal charges and even exclusion from the race. Overall, we have information on educational attainment for 94.7% of candidates running in the 2014 election and 93.9%, 84.8%, and 84.1% for those in contention for the mayor's seat for 2010, 2006, and 2002, respectively.[8]

To construct a measure of the ethnic background of candidates and the degree to which they are representative of the local population, we first do a text analysis of all candidates' surnames and classify them as indigenous (Quechua or Aymara) or other (Spanish or foreign). To do this, we use different dictionaries and we include the main Hispanic surnames used in Latin America and the United States. We identify Quechua and Aymara surnames by matching the linguistic roots of all surnames with the most established dictionaries containing

[8]While the website does not provide a direct link to the CVs of candidates running for the 2002 elections, we do have the list of their ID numbers. The information for the 2002 candidates is taken from the CVs reported in subsequent elections. Our main analysis is centered on the characteristics of candidates running in the 2006, 2010, and 2014 elections, and we use the information from 2002 for robustness and validity checks.

native roots. This classification is based on the procedure and data in Artiles (2020). Details on dictionary construction and sources are in the appendix. Once the origins of all candidates' surnames have been identified, we classify them as indigenous if they have at least one or two Quechua or Aymara surnames. To measure how representative candidates are of the local population, we use the 2007 census to compute the percentage of the municipality's population that has an indigenous language as their mother tongue and define a candidate as representative if she has some indigenous surname and at least 25%, 50%, or 75% of the municipality's population speaks an indigenous language.

Finally, we obtained from the national electoral office (ONPE) information on all relevant political outcomes at the municipality level, namely, the list of candidates running for each election, their party affiliations, and vote shares. These data allowed us to compute the win margin of the elected mayor. They also gave us access to data on the number of kits bought to attempt a recall, the names of the authorities they attempt to recall, the name and ID number of the person who filed the recall petition, and whether a recall referendum took place in a municipality (and its date) and its outcome. Data on the percent of budget executed, revenues, and expenditures of the municipality were obtained from the Ministry of Economy and Finance (MEF).

2.4.2 *Descriptive statistics*

Recall referenda are fairly common in Peru. Figure 2.B.2 shows the incidence of recall referenda over the previous three electoral periods. Recalls have been attempted (i.e., "kits" purchased) in 35% to more than 60% of municipalities, with a clear upward trend in time. These attempts have been successful in about 35% of cases in each period, meaning that between 10% and 20% of municipalities in the country had a recall referendum, leading to between 2% to 6% of municipalities having a recalled mayor. Our main analysis sample is drawn from the subset of municipalities×elections in which a recall referendum was held. Overall, the statistics from Figure 2.B.2 reinforce the fact that there is wide time variation in the incidence of recall referenda and that the probability of being recalled is quite uncertain.

Table 2.C.4 provides the basic descriptive statistics of our data for the full sample and the restricted sample of municipalities×elections in which the vote share in favor of recalling the mayor was around the 50% threshold. To select this sample, we use the optimal bandwidth selection criteria in Imbens and Kalyanaraman (2012). Candidates running for mayor in Peruvian municipalities have a relatively high level of education: 39% of candidates in our RD sample attended university, and they have on average fourteen years of education. Similarly, around 7% of candidates during the analysis period have primary education or less, while around 34% have attended only secondary school. Candidates that ended up elected as mayors have on average extremely similar educational levels. In terms of their previous experience, elected mayors are also similar to the ones facing a recall election. They have on average 1.9 years of experience in elected office, of which about 70% comes from their experience as mayors in the past. A relatively low number of candidates (slightly less than 40%) belong to a political party that nationally competes in elections. The fact that the majority of candidates run for a regional or local party or movement illustrates the fragmentation of the political and party system in Peru at the municipal level.

Mayor elections are strongly contested, with on average more than seven candidates running for office. We compute a measure of political competition as the effective number of candidates. For this, we take the inverse of the sum of squared vote shares of each running candidate within an electoral race. If all candidates have the same vote share, then this measure is equal to the actual number of candidates. If one candidate wins all votes, the effective number of candidates is one. The average effective number of candidates (below five) is smaller than the actual number of candidates. In conjunction with the other electoral measures and the high level of voter mobilization (85%), this demonstrates that elections for mayor are in many instances extremely competitive.

Overall, the average municipality in the country has around 29% of people who speak a native language as their mother tongue. A comparison between the average share of indigenous people, as measured by the share of population with a native mother tongue (29%) and the average share of elected mayors who are classified as having an indigenous background according to their two surnames (only 8%) speaks about the political underrepresentation of this historically disadvantaged group.

2.5 RESULTS: ACCOUNTABILITY AND CANDIDATE SELECTION

2.5.1 *Candidate Education, Experience, and Representativeness*

Figure 2.1 shows our main results using nonparametric plots with breaks at the 50% vote share. Candidates who run in elections in municipalities where a mayor was recalled in the previous electoral period have fewer years of education, are less likely to have attended university, and are more likely to have attended only up to secondary education. In Table 2.1, we formally test for the magnitude and significance of the observed effects from Figure 2.1, showing the results of regression equation (2.1). Panel A shows our preferred specification, where we run the regression discontinuity using a local linear regression for the running variable and triangle kernel weights. All results are shown restricting the sample to an optimal bandwidth, but

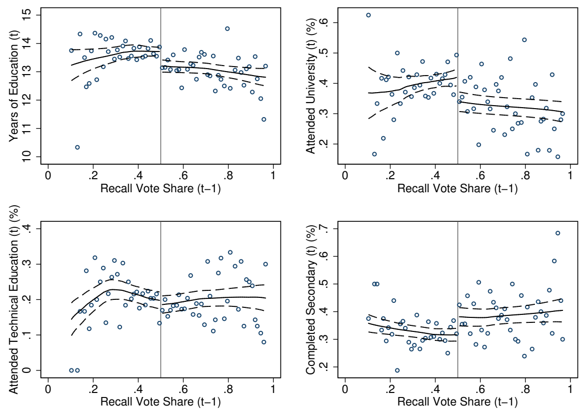


Figure 2.1: Non-Parametric RD Plot: Candidate's Education

Note: The figures show the results from kernel-weighted local polynomial smoothing plots with epanechnikov kernels and the 95% confidence intervals for our main outcome variables.

they are not sensitive to the choice of bandwidth in each regression.[9] Candidates running in municipalities with a higher salience of the recall institution have 0.5 fewer years of education and are 22% less likely to have attended university. The proportion of candidates with just a technical education is unchanged, but there is a sharp increase of 23% in the proportion of candidates who attended only secondary education. Panels B and C of Table 2.1 show a specification check in which we use a linear or quadratic polynomial, and the results remain unchanged. Generally, the qualitative and quantitative results are not sensitive to the choice of bandwidth or polynomial specification (see tables Tables 2.C.6, 2.C.7, and 2.C.8).

[9]Table 2.C.5 shows the results of a naive OLS regression on the sample of municipalities×elections where a recall referendum took place (panel A). The results are of a similar magnitude as the ones in our RD approach (if anything, slightly larger). We also run a similar regression to analyze the correlation between having a recall election and the educational level of candidates running in the following election. These results are shown in panel B of 2.C.5. Consistent with the idea that the different steps of the recall process are a continuous signal revelation process, we see that places where a recall election took place have candidates with lower

Table 2.1: Accountability and Candidates' Education

	Dependent Variable:			
	Years Edu	University	Technical	Secondary
	PANEL A: Local Linear Regression			
Recalled Incumbent in t-1	-0.5241*	-0.0849**	-0.0006	0.0795*
	(0.2964)	(0.0410)	(0.0356)	(0.0479)
Triangle Kernel	Yes	Yes	Yes	Yes
Observations	3390	3698	2962	3394
Mean Dep.	13.511	0.388	0.191	0.342
	PANEL B: Linear Polynomial Regression			
Recalled Incumbent in t-1	-0.5398**	-0.0744**	-0.0198	0.0788*
	(0.2655)	(0.0363)	(0.0296)	(0.0405)
Linear Polynomial	Yes	Yes	Yes	Yes
Observations	3390	3698	2962	3394
Mean Dep.	13.511	0.388	0.191	0.342
	PANEL C: Quadratic Polynomial Regression			
Recalled Incumbent in t-1	-0.5183*	-0.0652*	-0.0222	0.0882**
	(0.2679)	(0.0365)	(0.0300)	(0.0417)
Quadratic Polynomial	Yes	Yes	Yes	Yes
Observations	3390	3698	2962	3394
Number Municipality×Election	611	679	538	612
Mean Dep.	13.511	0.388	0.191	0.342

Note: Regression equations follow Equation (2.1) in the paper. In each regression, the sample considered is based on the optimal bandwidth, following Imbens and Kalyanaraman (2012). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustered standard errors at the municipality×election level.

While there seems to be a robust relationship between the leader's educational level and economic performance, a leader's quality is a multidimensional concept. Our data allow us to look at other characteristics that are also presumably related to the mayor's performance in office. Using our preferred specification, the results in the first two panels of Table 2.2 show the selection effects for the candidates' experience before deciding to stand for office and their demographic characteristics. Candidates who decide to stand for election in municipalities where a referendum recalled the incumbent in the previous period have fewer years of experience in elected office (not significant); in particular, they have 0.4 fewer years serving as a district mayor. There is also suggestive evidence that they are less likely to have experience holding an office in a political party (0.2 years fewer, not statistically significant). Importantly, having a recalled mayor in the past does not have differential effects on the proportion of candidates affiliated with national political parties. We also find that candidates in the treatment group are 11 percentage points less likely to have any experience working in the public sector (from a base of 55%), and they are a year and a half younger (not significant).

Office-motivated politicians derive utility from the delivery of public services and the level of utility derived is higher when the public goods are provided to coethnics. Unfortunately, we do not have a good measure of public service motivation in our data. However, we can study whether having a mayor recalled in the previous period affects the proportion of candidates coming from historically disadvantaged ethnic groups (Quechua and Aymara) and if the ef-

levels of education in the next election. Using an alternative identification strategy exploiting the discontinuity provided by the number of signatures needed to hold a recall referendum, we find effects similar to those in the OLS regression. However, this identification is weaker than the one shown for the main results of this paper since opposers could submit signatures to the electoral office multiple times, thus generating a larger mass of observations on one side of the discontinuity and raising concerns about selection into the treatment. These results are available upon request.

Table 2.2: Accountability, Candidate Characteristics, and Representation

	Dependent Variable:				
	PANEL A				
	Num. years elected office	Num. years as mayor	Num. years party experience	National Party Affiliation	
Recalled Incumbent in t-1	-0.3035	-0.3711**	-0.2260	0.0212	
	(0.3362)	(0.1859)	(0.2308)	(0.0492)	
Triangle Kernel	Yes	Yes	Yes	Yes	
Observations	2502	3849	2902	3047	
Number Municipality×Election	430	666	500	514	
Mean Dep.	1.329	0.897	0.618	0.394	
	PANEL B				
	Public Sector Experience	Private Sector Experience	Age	Female	
Recalled Incumbent in t-1	-0.1133**	-0.0389	-1.5026	0.0134	
	(0.0522)	(0.0551)	(0.9998)	(0.0178)	
Triangle Kernel	Yes	Yes	Yes	Yes	
Observations	2093	2703	3058	4865	
Number Municipality×Election	347	453	515	842	
Mean Dep.	0.566	0.427	45.984	0.075	
	PANEL C				
	At least one native surname	Two native surnames	Representative (25 percent)	Representative (50 percent)	Representative (75 percent)
Recalled Incumbent in t-1	-0.0178	-0.0231	-0.0431	-0.0605	-0.1143**
	(0.0709)	(0.0283)	(0.0639)	(0.0693)	(0.0450)
Triangle Kernel	Yes	Yes	Yes	Yes	Yes
Observations	2028	2478	2478	1892	2466
Number Municipality×Election	341	425	425	316	422
Mean Dep.	0.331	0.062	0.151	0.132	0.078

Note: Regression equations follow Equation (2.1) in the paper. In each regression, the sample considered is based on the optimal bandwidth, following Imbens and Kalyanaraman (2012). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustered standard errors at the municipality×election level.

fects are more or less important in municipalities where they are more representative−namely, those with a larger share of the population of the same ethnic background. To do this, we create a new measure of the politician's ethnicity based on her surnames and exploit information from the census on the percentage of people who speak Quechua or Aymara as their mother tongue. Columns 1 and 2 in panel C of Table 2.2 show that having a mayor recalled in the previous electoral cycle does not affect the number of candidates with at least one or two indigenous surnames, respectively. We define an indigenous candidate (someone with at least one indigenous surname) as being representative if she is running for mayor in a municipality where more than 25%, 50%, or 75% of the population have the Quechua and/or Aymara languages as mother tongue (columns 3–5, respectively). In municipalities with a large proportion of Quechua and/or Aymara population (over 75%), having a mayor recalled in the past does have a large effect on the proportion of indigenous candidates who decide to run for office.

Overall, the results indicate that candidates who decide to run in elections after a mayor was recalled are not only less educated; they also seem to be new entrants to politics and to the public sector in general: they have less experience in elected office and work in the public sector and are younger. Additionally, they are less representative of the indigenous population.

More educated leaders have been shown to cause better public good provision and economic growth (Martinez-Bravo, 2017; Besley et al., 2005, 2011). However, the relationship between the other observed characteristics of politicians and their performance in office is less clear. We use data on municipal finances for the period of analysis to evaluate at the correlational level how candidate characteristics are associated with relevant policy outcomes. Table 2.C.9 shows the result of OLS regressions with municipality and electoral period fixed effects in which we include variables related to the mayor's education and experience. The dependent variables are the log of expenditures and revenues over the past three years of the mayor's term. Mayors with higher levels of education (measured in years or as level dummies) on average show higher levels of expenditures and revenues during their tenure. Similarly, more years of experience serving in a political party and experience working in the public sector are associated with more revenue and spending, while younger politicians tend to spend and collect less money. While correlational, this evidence suggests that the characteristics that we find to be relevant in our selection analysis are associated with important policy outcomes at the municipality level, and therefore they support the idea that generally the quality of candidates falls in municipalities where the previous mayor was recalled by a small margin.

2.5.2 *Identification Assumptions*

The identification assumption in our empirical design is that observations at both sides of the threshold are comparable along observable and unobservable characteristics. Figures 2.B.6 through 2.B.10 show the continuity tests for different municipality×election observable characteristics. We focus on variables related to (a) the educational level (Figure 2.B.6) and (b) previous experience and characteristics of the incumbent during the period when the recall referendum took place (Figure 2.B.7), (c) variables related to the political process in the previous electoral period (Figure 2.B.8), and (d) educational level and the characteristics of the runner-up in the previous electoral period (Figures 2.B.9 and 2.B.10, respectively). There are no significant jumps along the threshold in most of the variables of interest. We formally test the continuity assumption in a regression framework in Table 2.C.10.

A second important assumption of a regression discontinuity design is that there is no sorting into the treatment. One indication that units could be sorting into the treatment is that the density of observations is discontinuous at the threshold (McCrary, 2008). Figure 2.B.11 shows a graphical depiction of the McCrary (2008) test, and, as expected, the density of observations is continuous around the 50% vote share threshold. This ensures that selection into treatment is not a concern.

Overall, the robustness and specification checks implemented provide assurance that our results are not driven by selection and that there is a causal relationship between having a recalled mayor in the municipality in the previous electoral period and the quality of the candidates who decide to run for office.

2.6 WHAT DRIVES THE NEGATIVE SELECTION OF CANDIDATES?

How could it be that an institution that increases voters' ability to hold politicians accountable while in office generates a negative selection of candidates? We argue that having a mayor recalled in a certain municipality updates potential candidates' priors about the probability that they are recalled from office for political reasons, and unrelated to their performance (a similar mechanism as in Avis et al., 2018). An increase in the perceived probability of being recalled decreases the expected value of office and therefore affects the selection of candidates.[10]

While there could be other mechanisms at play in this selection process, in this section we provide evidence that the incentives given by

[10] An alternative interpretation with similar reduced-form predictions is that the salience of the accountability institution and, more specifically, politically motivated recalls, raise the perceived probability of being removed from office. This is consistent with evidence showing that people overestimate the probability of an event right after it has occurred (e.g., sales of flood insurance increase after a hurricane, or the number of beachgoers drops after a shark attack at that beach).

the expected rents from office for potential candidates are the main drivers of the reduced-form effects. We first test whether our main effects are driven by politically motivated recall referenda. Testing for a hypothesis involving the *intentions* of the recall promoters is inherently difficult; therefore, we proxy for this using data on whether the recall petition was initiated by someone who was a political contender in the previous electoral period (as argued in Welp, 2015 and Holland and Incio, 2019). In panel A of Table 2.3, we show the results of our baseline regression, interacting the main treatment variable with a dummy for whether the recall petition was initiated by a former political contender. A large share of the main effect of the presence of a recalled mayor on the educational level of the candidates running in the next election is driven precisely by elections where the recall was promoted by a political opponent.

Our hypothesis implies that the negative selection should be driven by elections where the potential candidates perceive that they could be recalled from office regardless of their performance. In panel B of Table 2.3, we directly test this implication by interacting our main treatment variable with a proxy for the performance in office of the incumbent subject to a recall: the percentage of the budget executed. The negative selection of candidates is unrelated to the performance of the incumbent in office, since the coefficient of the interaction is small in magnitude and statistically insignificant. Table 2.C.11 shows a similar result for other measures of the incumbent's performance.[11]

An important assumption in our analysis is that the reason that the

[11]While imperfect, the percentage of the budget executed is commonly used in the popular press as an indicator of performance. Budget execution is typically low, and it is not rare to see that a local government manages to spend only half of its budget by the end of the fiscal year. For some examples of press reports highlighting this issue and explicitly taking the percent of the budget execution as a proxy for performance, see https://elcomercio.pe/lima/invirtio-obras-distrito-contamos-155429 or http://larepublica.pe/sociedad/1155111-regiones-y-municipios-no-pudieron-gastar-todo-su-presupuesto-este-ano.

Table 2.3: Mechanisms

	Dependent Variable:			
	Years Edu	University	Technical	Secondary
	PANEL A: Political Opponents			
Recalled Incumbent in t-1	-0.2346	-0.0360	-0.0163	0.0473
	(0.2526)	(0.0347)	(0.0312)	(0.0423)
Recalled in t-1 ×	-0.5696*	-0.0793*	-0.0229	0.0704
Political Opp. in t-1	(0.3088)	(0.0436)	(0.0349)	(0.0449)
Linear Polynomial	Yes	Yes	Yes	Yes
Observations	3385	3693	2957	3389
Number Municipality×Election	610	678	537	611
Mean Dep.	13516	388	191	341
	PANEL B: Performance prior Recall			
Recalled Incumbent in t-1	-0.5860**	-0.0875**	-0.0339	0.0942**
	(0.2748)	(0.0379)	(0.0305)	(0.0458)
Recalled in t-1 ×	0.1343	0.0276	-0.0203	-0.0068
% Budget Executed	(0.1337)	(0.0250)	(0.0161)	(0.0268)
Linear Polynomial	Yes	Yes	Yes	Yes
Observations	2565	2791	2237	2565
Number Municipality×Election	384	422	336	384
Mean Dep.	13.439	0.381	0.180	0.355
	PANEL C: Recalled Neighbours			
Recalled Neighbour	-0.9264***	-0.1327***	-0.0015	0.1301***
Incumbent in t-1	(0.2541)	(0.0400)	(0.0180)	(0.0333)
Triangle Kernel	Yes	Yes	Yes	Yes
Observations	6225	5902	10003	5591
Number Municipality×Election	1018	958	1704	895
Mean Dep.	14.289	0.498	0.185	0.270
	PANEL D: Opportunity Costs Dependent Variable: Predicted Wage			
Recalled Incumbent in t-1	-139.0638***	-137.8319**		
	(52.2649)	(58.7260)		
Linear Polynomial	Yes	No		
Local Linear Regression	No	Yes		
Observations	3608	3608		
Number Municipality×Election	661	661		
Mean Dep.	1234.929	1234.929		

Note: Regression equations follow Equation (2.1) in the paper. In each regression, the sample considered is based on the optimal bandwidth, following Imbens and Kalyanaraman (2012). The share of budget executed refers to the de-meaned version of the variable. Opportunity costs are imputed based on Enaho survey data on income from individuals' primary job and observable characteristics from the candidates' CV: age, age-squared, gender, education, and a dummy for urban area. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustered standard errors at the municipality×election level.

observed candidate selection pattern arises after observing a mayor being recalled is that potential candidates learn that the accountability institution is used for political purposes, updating their beliefs about their own expected term length. To indirectly test this, we analyze other events in which this information can be transmitted. When a neighboring municipality holds a recall election and the mayor is ousted, the information travels, and potential candidates in other municipalities learn about political capture. We define neighboring municipalities as those that share a border and for which the travel time by car between the two municipal capitals is less than two hours (the results are robust to using other definitions, e.g., one hour). We collect the travel time information using Google Maps Services.[12]

In panel C of Table 2.3 we run our main RD regression, using a sample of municipalities$\times$elections that did not have a recall process, but for which at least one of her neighbors had a close recall election, and compare the selection pattern that arises when the mayor of the neighboring municipality was barely recalled versus when she survived the referendum. The running variable in these RD regressions therefore corresponds to the vote share in favor of the recall in the neighboring municipality with the closest result. The results shows a robust negative effect of having a recalled mayor in a neighboring municipality on the level of education of the candidates who decide to run for office in the next election.[13] Moreover, the magnitude of these effects is even larger than the ones shown in Table 2.1, which is consistent with the hypothesis that having a mayor recalled is a more salient event, yet the recall election in itself also reveals information about the motives for the recall. This evidence is hard to reconcile with

[12]Note that the definition of neighboring municipalities is time invariant. Information on travel time using the Google Maps Distance Matrix API was accessed in May 2019.

[13]Table 2.C.12 shows the results for alternative functional form specifications, obtaining similar results. The results also remain unchanged if we limit the sample to municipalities that only had one neighbor with a recall referendum, that is, excluding municipalities that received conflicting signals (more than one neighboring municipality with recall referendum in $t-1$, resulting in one successful recall and one non-successful recall). See Table 2.C.13.

alternative mechanisms unrelated to the information being revealed through the recall of a mayor.[14]

A final piece of evidence consistent with our main hypothesis is presented in panel D of Table 2.3, where we check if it is indeed the case that potential candidates with high ability, and therefore high opportunity cost, are the ones who are self-selecting out of the electoral race. In the absence of data on the opportunity cost of the candidate, we assume that the wage that one would earn in the private sector represents this opportunity cost. We use information from the Peruvian Standards Measurement Survey (ENAHO) to generate a predicted wage in the private sector for each candidate. To do this, we run a Mincer regression for people who report working in the private sector and use as regressors all the variables that are also available on the candidates' CVs (age, age squared, gender, rural/urban, and education dummies). Using the coefficients from this regression, we generate a predicted value of the opportunity cost for each candidate, which we use as the dependent variable in the regressions in panel D of Table 2.3. The results using specifications with different functional forms show that candidates running for office in municipalities that had a mayor recalled in the previous term have a lower opportunity cost of around 11%.

2.6.1 *Alternative Mechanisms*

While many alternative mechanisms are consistent with our reduced-form results from Section 2.5, in this section we provide evidence rejecting some of these potential stories and in support of our main hypothesis.

A first concern with our results is that in municipalities that had a

[14]We can use this neighbor's specification to replicate all the main tables in the paper, obtaining very similar results and leaving all the qualitative conclusions of the study unchanged. These results are available upon request.

mayor recalled, the mayor's seat was taken by someone else, generating policy changes that could have affected the incentives for potential candidates to enter the race. However, this argument does not hold for municipalities that did not have a recall election, as those included in the results shown in panel C of Table 2.3. Instead, in these municipalities, the only thing that changes between the treatment and control municipalities is the recall of the mayor of a neighboring municipality.

Second, in municipalities where there is a lower-quality mayor, the chances that voters oppose her in a referendum are higher, and thus opponents have larger incentives to campaign for a recall. This implies that municipalities with low-quality mayors are more likely to lose a recall election, introducing concerns about omitted variables and selection. However, as shown in Figures 2.B.6 and 2.B.7, incumbents in municipalities at both sides of the threshold are similar in terms of their educational achievement, previous job experience, and demographics. In Figure 2.B.11, we showed that the density is continuous around the threshold; hence, candidates are not sorting differentially at the threshold. Further, in panel A of Table 2.C.14, we include in our preferred specification controls for the characteristics of incumbent mayors (educational level, experience, age, and gender), and our main results are not only qualitatively similar, but also the magnitude of the coefficients is very stable (though some coefficients are no longer significant).

Third, certain political scenarios might increase the chances of a successful recall and at the same time deter specific types of candidates to run for election. For example, when an election is more contested, the chances of a successful recall are higher and promoters will work harder to get the mayor recalled. Again, all available political controls are balanced across the threshold (Figure 2.B.8), and including these variables in the main regression (panel B in Table 2.C.14) does not significantly affect our results.

Fourth, the presence of a strong incumbent who has high chances of being reelected might provide more incentives for proponents to campaign against the mayor and therefore weaken the incumbent's reelection prospects. If high-quality incumbents decide not to run for office because they have been recalled while other low-quality incumbents who barely survived a recall referendum are still up for reelection, we would have a lower quality pool of candidates in places where a mayor was recalled. Panel A of Table 2.C.15 excludes from the regression sample all incumbents (i.e., including those who survived the recall), and the results are robust to this exclusion. In a related argument, some people could be better at running campaigns to recall mayors. If politically motivated recalls are run by those who lost previous elections, we should expect that including these characteristics affects the main estimates. First, we observe that the characteristics of the runners-up are continuous across the threshold (Figures 2.B.9 and 2.B.10), and including these characteristics in the main regressions keep the results unchanged (panel B in Table 2.C.15).

Finally, an alternative hypothesis explaining our results is that political competition determines the quality of candidates who run for office. Lower-quality politicians are deterred from running when an incumbent is in the race. Instead, when the incumbent loses the recall election, they face an open seat election and decide to run for office. Unfortunately, we are unable to test empirically this conjecture, since only 4.8% of recalled mayors run for office. However, it is unlikely that this hypothesis explains our results. Unlike in the United States, incumbents in Peru (and in many developing countries) do not seem to have an incumbency advantage (Uppal, 2009; Klašnja and Titiunik, 2017; Córdova and Incio, 2013). While between 60% and 80% of mayors run for reelection, a very low proportion of those (18% to 20%) get reelected.

2.6.2 *Candidate Entry or Exit?*

Candidates running in elections after a mayor was recalled in a referendum are, on average, less educated, have less experience in the public sector, and are less representative of the indigenous population, and the evidence presented at the start of Section 2.6 suggests that the effect runs through a reduction in the expected term length, which differentially affects the incentives to run for different types of politicians. One question that remains is whether it is indeed the case that high-quality candidates who would have otherwise run are not entering the race or that lower-quality candidates are the ones entering the political arena.

To look into this question, as well as how the political landscape is affected in municipalities that had a recall election in the previous period, in Table 2.4 we analyze the effects of having a recalled mayor on turnout, the number of candidates, win margin, and political competition. Voter participation in elections does not change significantly after a recall referendum. The results in columns 2 and 5 show that the number of candidates and effective candidates in these elections does not change significantly either, suggesting a reshuffling in the candidate pool: while high-ability candidates are being deterred from running, some low-ability ones are entering races that they would have otherwise not participated in. Consistent with the entry of low-ability candidates in the pool, we observe that the win margin does not change significantly, but the level of political competition remains unchanged. These results are consistent with the framework discussed above.

Table 2.4: Accountability and Political Outcomes

	Dependent Variable: Turnout	Candidates	Win Margin	Eff. Num. Candidates
Recalled Incumbent in t-1	-0.7000	0.0947	-1.4477	0.1431
	(1.0067)	(0.3907)	(1.2230)	(0.1839)
Triangle Kernel	Yes	Yes	Yes	Yes
Observations	527	748	476	833
Number Municipalities	425	563	390	608
Mean Dep.	86.040	6.820	8.784	4.447

Note: Regression equations follow Equation (2.1) in the paper. In each regression, the sample considered is based on the optimal bandwidth, following Imbens and Kalyanaraman (2012). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust to heterogeneous and serially correlated standard errors.

2.7 DO RECALLS LEAD TO LOWER QUALITY MAYORS?

Does the lower average quality of the pool of candidates imply that the elected mayor will also be of lower quality? To explore this question, we run a similar analysis as before, comparing the characteristics of elected mayors in municipalities that had a mayor recalled or not in the previous term. The results of this analysis are reported in Table 2.5. Due to the lower number of observations, we have lower statistical power. Overall, the point estimates in these regressions indicate that, if anything, the effects of having a recalled mayor in the past on the selection of candidates is significantly reduced when looking at the characteristics of elected mayors. For example, elected mayors have 0.15 fewer years of education and are 3 percentage points less likely to have attended university (not significant). In Table 2.C.16 we explore the effects on past political and job experience, as well as other characteristics. Overall, we do not see that having a mayor recalled in the past leads to elected mayors who have lower experience in public office. Despite the lower average quality of the pool of candidates, it seems that elections still serve as a mechanism to elect high-quality

Table 2.5: Accountability, Winners' Characteristics, and Policy

	PANEL A			
	Dependent Variable:			
	Years Edu	University	Technical	Secondary
Recalled Incumbent in t-1	-0.1557	-0.0301	-0.0728	0.1422
	(0.4469)	(0.0861)	(0.0712)	(0.0981)
Triangle Kernel	Yes	Yes	Yes	Yes
Observations	706	593	597	479
Number Municipalities	547	478	480	398
Mean Dep.	13.833	0.417	0.204	0.317
	PANEL B			
	Dependent Variable:			
	Ln(Exp)	Ln(Revenues)		
Recalled Incumbent in t-1	-0.4019**	-0.4902**		
	(0.1821)	(0.2062)		
Triangle Kernel	Yes	Yes		
Observations	491	421		
Number Municipalities	402	356		
Mean Dep.	15.964	16.259		

Note: Regression equations follow Equation (2.1) in the paper. In each regression, the sample considered is based on the optimal bandwidth, following Imbens and Kalyanaraman (2012). In panel B, regressions include municipality and election fixed effects. In column (1), the dependent variable is the log of the budget executed during the last three years of the mayor's term. In column (2), the dependent variable is the log of the total revenues received during the last three years of the mayor's term. The information is provided by the Peruvian Ministry of Economy and Finance. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust to heterogeneous and serially correlated standard errors.

politicians.

Finally, in panel B of Table 2.5, we study whether having a mayor recalled in the past causally affects relevant policy outcomes. In particular, we analyze the effects on total expenditures and revenues. Municipalities where the previous mayor was recalled have lower expenditures and revenues. However, the interpretation of these results is not obvious, since the reduced-form effects could reflect the causal effect of having a (marginally) lower-quality mayor, less political competition, or a lower quality of the opposition.

2.8 SUMMARY AND DISCUSSION

All democratic systems have mechanisms intended to allow citizens to hold politicians accountable for their actions in office. However, accountability institutions not only affect the behavior of politicians while in office, but also have an effect on potential politicians' decision of whether to run. Most of the empirical literature analyzing the effects of accountability institutions has focused on their discipling effects. Unlike these studies, in this paper we analyze how accountability affects the selection of politicians (candidates) and highlight the pervasive effects generated by the capture of accountability institutions by political interest groups. We study the effects of recall referenda in Peru, a direct democracy mechanism that allows voters to recall elected mayors from office, and compare the characteristics of candidates who decide to run in municipalities that had a mayor recalled from office in the previous term with those who run in municipalities where the mayor was not recalled. The fact that a mayor was recalled in a referendum in a municipality updates potential candidates' information about the prevalence of politically motivated recalls and therefore increases the perceived probability that, if elected, one could be ousted from office independent of the performance.

Using a close election regression discontinuity design, our results show that candidates who run in municipalities that had a recall referendum in the last period are of lower quality, as measured by their educational attainment and previous experience. They are also less likely to have held elected office in the past and, in particular, to have served as mayor. These candidates also have a lower likelihood of having worked in the public sector. All in all, the results suggest that having a recalled mayor in the past lowers the quality of the candidate pool, while new entrants to politics are more likely to run. Additional results indicate that in municipalities that had a recalled mayor, candidates are less representative of the indigenous population.

We provide qualitative and quantitative evidence that recall elections are often used as a political tool, with candidates who lost the elections in the previous period being the promoters of the recall election. If this is the case, the probability of being ousted is independent of the elected mayor's performance, discouraging politicians who have a high opportunity cost or are motivated by a public good provision (and especially to their coethnics).

Finally, we analyze whether the availability of an average pool of candidates of poorer quality leads to the election of lower-quality mayors. Our results show that despite having a pool of candidates that is on average lower, elections are still doing their job, and voters select the best out of the available candidates; hence, mayors in municipalities where an incumbent was recalled in the previous period have levels of education and experience similar to those who run in municipalities where the mayor barely survived the recall referendum. However, policies are still affected, and in these municipalities, expenditures and revenues are lower.

Our results have far-reaching consequences for the design of citizen control mechanisms. While these institutions are supposed to increase the chances that voters exert control over public and elected office, and deter poor-quality and corrupt politicians from standing for office, when they are at risk of being captured, their initial objectives can be distorted, leading to a poorer quality of the government and public service provision. These institutions should incorporate safeguards to prevent capture. For example, as in the cases of presidential impeachment, promoters have to present plausible evidence of mismanagement or poor performance, which is evaluated before proceeding to the vote. These types of mechanisms could help avoid the political use of an otherwise well-intended mechanism of citizen control.

Appendix

2.A SURNAMES

In this appendix, we briefly describe the sources for classifying last names as Quechua, Aymara or Hispanic. We follow the procedure originally developed in Artiles (2020), for more precise explanations and original sources, please refer to this paper. We identify Hispanic surnames using the dictionary suggested by the Biblioteca Nacional de España (Platt, 1996), which includes an index of Hispanic surnames developed in Latin America and the United States. As stated by the author, "the word Hispanic refers to individuals born in Latin America or the United States, whose parents speak Spanish and whose principal cultural background was Spanish." This source includes the list of surnames in Carraffa and Carraffa (1963), the traditional reference for Hispanic surnames. The list of surnames in Carraffa and Carraffa (1963) can also be accessed through The Library of Congress. We complement Basque surnames using a list of surnames provided by the Real Academia de la Lengua Vasca. For the identification of native surnames, we look for the presence of linguistic roots from the Quechua and Aymara language families (the two most popular ethnic groups in Peru) within surnames. For the Quechuan language family, the main sources are the classic dictionary by González Holguín (1952)[1952] and a recent dictionary compiled by the Academia Mayor de la Lengua Quechua (2005). We also include the list of names provided by the Peruvian Registro Nacional de Identificación y Estado Civil (RENIEC, 2012). For the Aymara family, the main sources are the classic dictionary by Bertonio (2011)[2011], the list of surnames provided by De Lucca (1983), and a recent dictionary compiled by CONADI (2011). Finally, the analysis is complemented with two additional sources: (1) *Vocabulario Políglota Incaico*, originally compiled by Franciscan missionaries in Peru, which provides an extensive list of words in four dialects of Quechua (varieties of Cuzco, Ayacucho, Junín and Ancash) and Aymara, see Religiosos Franciscanos Misioneros de los Colegios de Propaganda Fide del Perú (1998)[1998]; and (2) the *An Crúbadán-Corpus Building for Minority Languages* project, which provides downloadable text datasets for different dialects of Quechua and Aymara based on online text resources, including translations of the Bible and the Universal Declaration of Human Rights.

2.B FIGURES

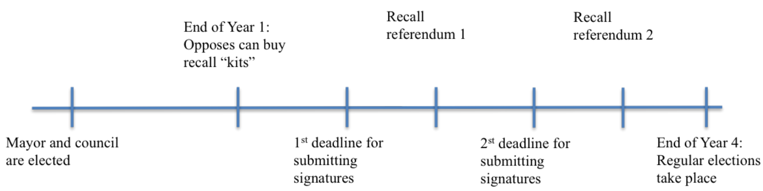


Figure 2.B.1: Timing for Recall Referenda

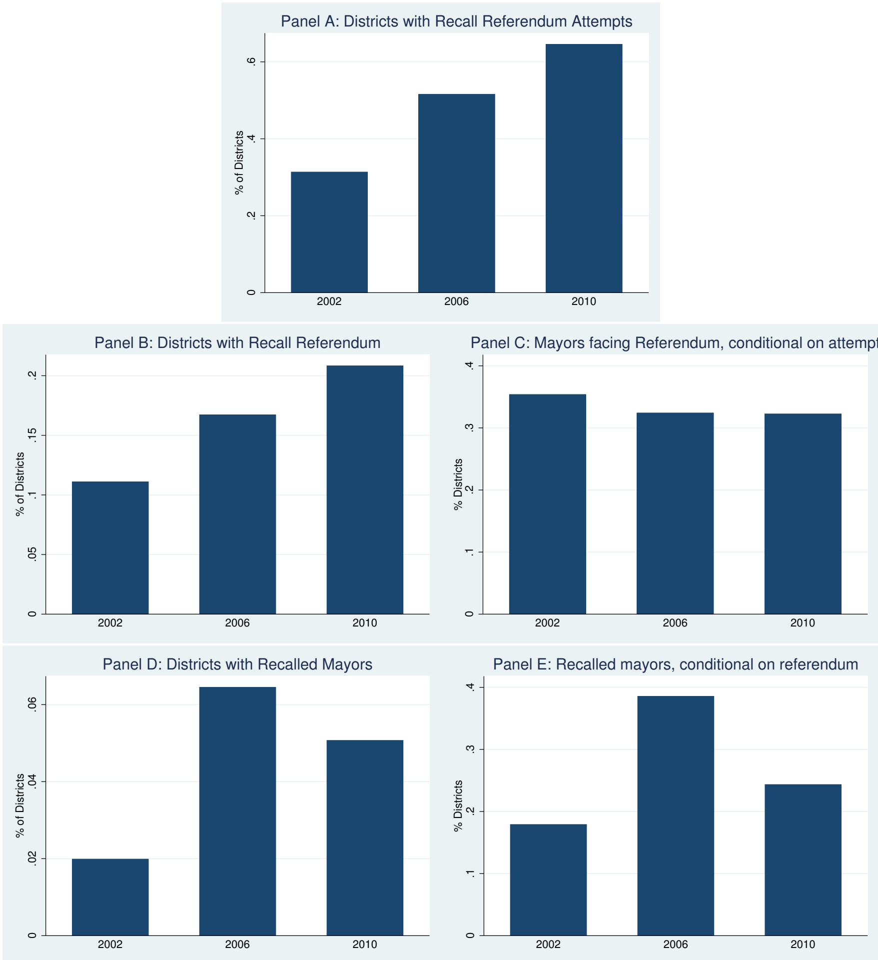
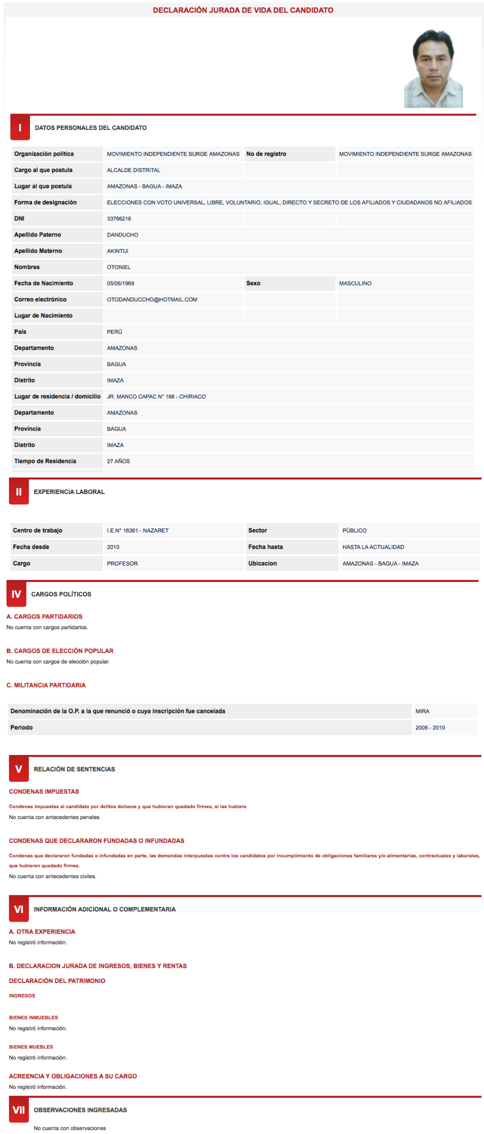


Figure 2.B.2: Incidence of Recall Referenda

Note: The figures show for each electoral term (A) the proportion of municipalities in which a recall kit was purchased in order to initiate a recall process against the incumbent mayor, (B) the proportion of municipalities in which the incumbent mayor faced a recall referendum, (C) the conditional probability of having a recall referendum on the mayor if a recall kit was purchased, (D) the proportion of municipalities in which the mayor was recalled, and (E) the conditional probability of an incumbent mayor being recalled if a recall referendum took place.



DECLARACIÓN JURADA DE VIDA DEL CANDIDATO

I DATOS PERSONALES DEL CANDIDATO

Organización política	MOVIMIENTO INDEPENDIENTE SURGE AMAZONAS	No de registro	MOVIMIENTO INDEPENDIENTE SURGE AMAZONAS
Cargo al que postula	ALCALDE DISTRITAL		
Lugar al que postula	AMAZONAS - BAGUA - IMAZA		
Forma de designación	ELECCIONES CON VOTO UNIVERSAL, LIBRE, VOLUNTARIO, IGUAL, DIRECTO Y SECRETO DE LOS AFILIADOS Y CIUDADANOS NO AFILIADOS		
DNI	33766216		
Apellido Paterno	DANDUCHO		
Apellido Materno	AKINTUI		
Nombres	OTONIEL		
Fecha de Nacimiento	05/06/1969	Sexo	MASCULINO
Correo electrónico	OTODANDUCCHO@HOTMAIL.COM		
Lugar de Nacimiento			
País	PERÚ		
Departamento	AMAZONAS		
Provincia	BAGUA		
Distrito	IMAZA		
Lugar de residencia / domicilio	JR. MANCO CAPAC N° 168 - CHIRIACO		
Departamento	AMAZONAS		
Provincia	BAGUA		
Distrito	IMAZA		
Tiempo de Residencia	27 AÑOS		

II EXPERIENCIA LABORAL

Centro de trabajo	I.E.N° 16361 - NAZARET	Sector	PÚBLICO
Fecha desde	2010	Fecha hasta	HASTA LA ACTUALIDAD
Cargo	PROFESOR	Ubicacion	AMAZONAS - BAGUA - IMAZA

IV CARGOS POLÍTICOS

A. CARGOS PARTIDARIOS

No cuenta con cargos partidarios.

B. CARGOS DE ELECCIÓN POPULAR

No cuenta con cargos de elección popular.

C. MILITANCIA PARTIDARIA

Denominación de la O.P. a la que renunció o cuya inscripción fue cancelada	MIRA
Periodo	2006 - 2010

V RELACIÓN DE SENTENCIAS

CONDENAS IMPUESTAS

Condenas impuestas al candidato por delitos dolosos y que hubieran quedado firmes, si las hubiere

No cuenta con antecedentes penales.

CONDENAS QUE DECLARARON FUNDADAS O INFUNDADAS

Condenas que declararon fundadas o infundadas en parte, las demandas interpuestas contra los candidatos por incumplimiento de obligaciones familiares y/o alimentarias, contractuales y laborales, que hubieren quedado firmes.

No cuenta con antecedentes civiles.

VI INFORMACIÓN ADICIONAL O COMPLEMENTARIA

A. OTRA EXPERIENCIA

No registró información.

B. DECLARACION JURADA DE INGRESOS, BIENES Y RENTAS

DECLARACIÓN DEL PATRIMONIO

INGRESOS

BIENES INMUEBLES

No registró información.

BIENES MUEBLES

No registró información.

ACREENCIA Y OBLIGACIONES A SU CARGO

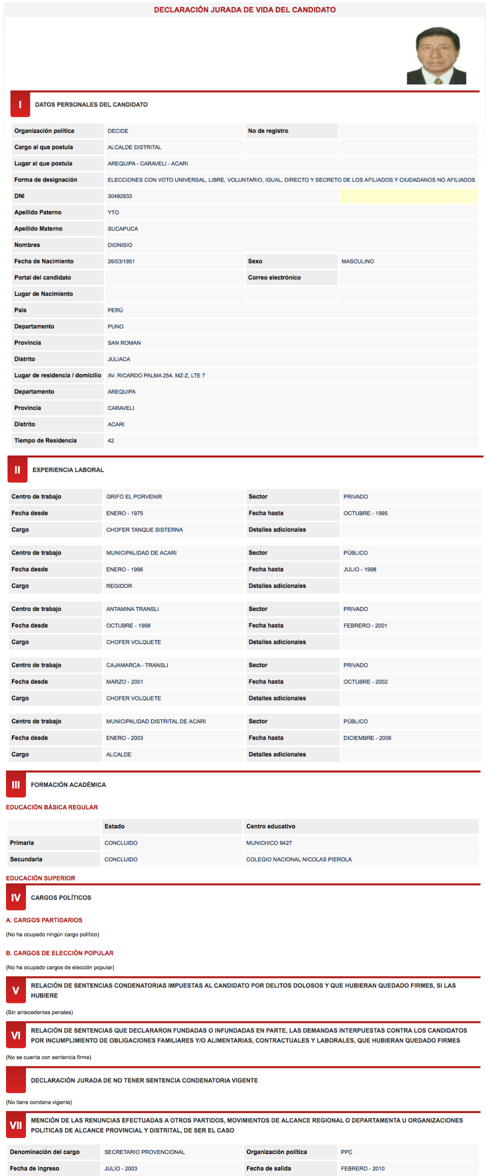
No registró información.

VII OBSERVACIONES INGRESADAS

No cuenta con observaciones

Figure 2.B.3: Example from CV data 1 (2014 elections)

Source: Example extracted from http://www.infogob.com.pe.



DECLARACIÓN JURADA DE VIDA DEL CANDIDATO

I DATOS PERSONALES DEL CANDIDATO

Organización política	DECIDE	No de registro	
Cargo al que postula	ALCALDE DISTRITAL		
Lugar al que postula	AREQUIPA - CARAVELI - ACARI		
Forma de designación	ELECCIONES CON VOTO UNIVERSAL, LIBRE, VOLUNTARIO, IGUAL, DIRECTO Y SECRETO DE LOS AFILIADOS Y CIUDADANOS NO AFILIADOS		
DNI	30482933		
Apellido Paterno	YTO		
Apellido Materno	SUCAPUCA		
Nombres	DIONISIO		
Fecha de Nacimiento	26/03/1951	Sexo	MASCULINO
Portal del candidato		Correo electrónico	
Lugar de Nacimiento			
País	PERÚ		
Departamento	PUNO		
Provincia	SAN ROMAN		
Distrito	JULIACA		
Lugar de residencia / domicilio	AV. RICARDO PALMA 254, MZ-Z, LTE 7		
Departamento	AREQUIPA		
Provincia	CARAVELI		
Distrito	ACARI		
Tiempo de Residencia	42		

II EXPERIENCIA LABORAL

Centro de trabajo	GRIFO EL PORVENIR	Sector	PRIVADO
Fecha desde	ENERO - 1975	Fecha hasta	OCTUBRE - 1995
Cargo	CHOFER TANQUE SISTERNA	Detalles adicionales	
Centro de trabajo	MUNICIPALIDAD DE ACARI	Sector	PÚBLICO
Fecha desde	ENERO - 1996	Fecha hasta	JULIO - 1998
Cargo	REGIDOR	Detalles adicionales	
Centro de trabajo	ANTAMINA TRANSLI	Sector	PRIVADO
Fecha desde	OCTUBRE - 1998	Fecha hasta	FEBRERO - 2001
Cargo	CHOFER VOLQUETE	Detalles adicionales	
Centro de trabajo	CAJAMARCA - TRANSLI	Sector	PRIVADO
Fecha desde	MARZO - 2001	Fecha hasta	OCTUBRE - 2002
Cargo	CHOFER VOLQUETE	Detalles adicionales	
Centro de trabajo	MUNICIPALIDAD DISTRITAL DE ACARI	Sector	PÚBLICO
Fecha desde	ENERO - 2003	Fecha hasta	DICIEMBRE - 2006
Cargo	ALCALDE	Detalles adicionales	

III FORMACIÓN ACADÉMICA

EDUCACIÓN BÁSICA REGULAR

	Estado	Centro educativo
Primaria	CONCLUIDO	MUNICHICO 9427
Secundaria	CONCLUIDO	COLEGIO NACIONAL NICOLAS PIEROLA

EDUCACIÓN SUPERIOR

IV CARGOS POLÍTICOS

A. CARGOS PARTIDARIOS

(No ha ocupado ningún cargo político)

B. CARGOS DE ELECCIÓN POPULAR

(No ha ocupado cargos de elección popular)

V RELACIÓN DE SENTENCIAS CONDENATORIAS IMPUESTAS AL CANDIDATO POR DELITOS DOLOSOS Y QUE HUBIERAN QUEDADO FIRMES, SI LAS HUBIERE

(Sin antecedentes penales)

VI RELACIÓN DE SENTENCIAS QUE DECLARARON FUNDADAS O INFUNDADAS EN PARTE, LAS DEMANDAS INTERPUESTAS CONTRA LOS CANDIDATOS POR INCUMPLIMIENTO DE OBLIGACIONES FAMILIARES Y/O ALIMENTARIAS, CONTRACTUALES Y LABORALES, QUE HUBIERAN QUEDADO FIRMES

(No se cuenta con sentencia firme)

DECLARACIÓN JURADA DE NO TENER SENTENCIA CONDENATORIA VIGENTE

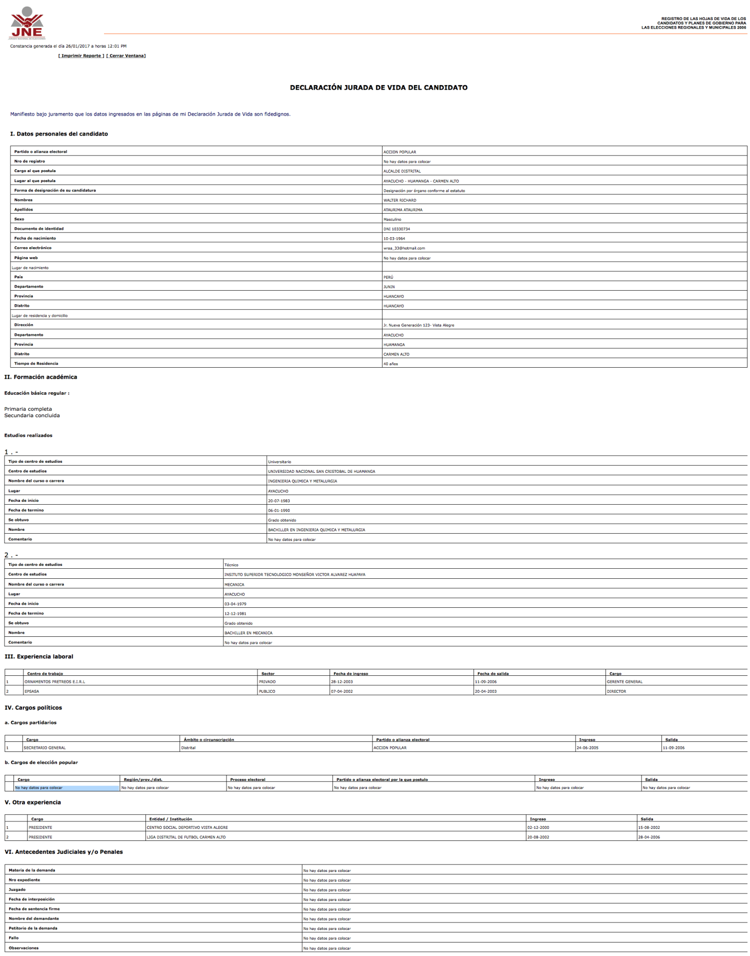
(No tiene condena vigente)

VII MENCIÓN DE LAS RENUNCIAS EFECTUADAS A OTROS PARTIDOS, MOVIMIENTOS DE ALCANCE REGIONAL O DEPARTAMENTA U ORGANIZACIONES POLITICAS DE ALCANCE PROVINCIAL Y DISTRITAL, DE SER EL CASO

Denominación del cargo	SECRETARIO PROVENCIONAL	Organización política	PPC
Fecha de ingreso	JULIO - 2003	Fecha de salida	FEBRERO - 2010

Figure 2.B.4: Example from CV data 2 (2010 elections)

Source: Example extracted from http://www.infogob.com.pe.



REGISTRO DE LAS HOJAS DE VIDA DE LOS CANDIDATOS Y PLANES DE GOBIERNO PARA LAS ELECCIONES REGIONALES Y MUNICIPALES 2006

Constancia generada el día 26/01/2017 a horas 12:01 PM

[Imprimir Reporte] [Cerrar Ventana]

DECLARACIÓN JURADA DE VIDA DEL CANDIDATO

Manifiesto bajo juramento que los datos ingresados en las páginas de mi Declaración Jurada de Vida son fidedignos.

I. Datos personales del candidato

Partido o alianza electoral	ACCION POPULAR
Nro de registro	No hay datos para colocar
Cargo al que postula	ALCALDE DISTRITAL
Lugar al que postula	AYACUCHO - HUAMANGA - CARMEN ALTO
Forma de designación de su candidatura	Designación por órgano conforme al estatuto
Nombres	WALTER RICHARD
Apellidos	ATAURIMA ATAURIMA
Sexo	Masculino
Documento de identidad	DNI 10330734
Fecha de nacimiento	10-03-1964
Correo electrónico	wraa_33@hotmail.com
Página web	No hay datos para colocar
Lugar de nacimiento	
País	PERÚ
Departamento	JUNIN
Provincia	HUANCAYO
Distrito	HUANCAYO
Lugar de residencia y domicilio	
Dirección	Jr. Nueva Generación 123- Vista Alegre
Departamento	AYACUCHO
Provincia	HUAMANGA
Distrito	CARMEN ALTO
Tiempo de Residencia	40 años

II. Formación académica

Educación básica regular :

Primaria completa
Secundaria concluida

Estudios realizados

1 . -

Tipo de centro de estudios	Universitario
Centro de estudios	UNIVERSIDAD NACIONAL SAN CRISTOBAL DE HUAMANGA
Nombre del curso o carrera	INGENIERIA QUIMICA Y METALURGIA
Lugar	AYACUCHO
Fecha de inicio	20-07-1983
Fecha de termino	06-01-1990
Se obtuvo	Grado obtenido
Nombre	BACHILLER EN INGENIERIA QUIMICA Y METALURGIA
Comentario	No hay datos para colocar

2 . -

Tipo de centro de estudios	Técnico
Centro de estudios	INSITUTO SUPERIOR TECNOLOGICO MONSEÑOR VICTOR ALVAREZ HUAPAYA
Nombre del curso o carrera	MECANICA
Lugar	AYACUCHO
Fecha de inicio	03-04-1979
Fecha de termino	12-12-1981
Se obtuvo	Grado obtenido
Nombre	BACHILLER EN MECANICA
Comentario	No hay datos para colocar

III. Experiencia laboral

	Centro de trabajo	Sector	Fecha de ingreso	Fecha de salida	Cargo
1	ORNAMENTOS PRETREOS E.I.R.L	PRIVADO	28-12-2003	11-09-2006	GERENTE GENERAL
2	EPSASA	PUBLICO	07-04-2002	20-04-2003	DIRECTOR

IV. Cargos políticos

a. Cargos partidarios

	Cargo	Ámbito o circunscripción	Partido o alianza electoral	Ingreso	Salida
1	SECRETARIO GENERAL	Distrital	ACCION POPULAR	24-06-2005	11-09-2006

b. Cargos de elección popular

	Cargo	Región/prov./dist.	Proceso electoral	Partido o alianza electoral por la que postulo	Ingreso	Salida
	No hay datos para colocar	No hay datos para colocar	No hay datos para colocar	No hay datos para colocar	No hay datos para colocar	No hay datos para colocar

V. Otra experiencia

	Cargo	Entidad / Institución	Ingreso	Salida
1	PRESIDENTE	CENTRO SOCIAL DEPORTIVO VISTA ALEGRE	02-12-2000	15-08-2002
2	PRESIDENTE	LIGA DISTRITAL DE FUTBOL CARMEN ALTO	20-08-2002	28-04-2006

VI. Antecedentes Judiciales y/o Penales

Materia de la demanda	No hay datos para colocar
Nro expediente	No hay datos para colocar
Juzgado	No hay datos para colocar
Fecha de interposición	No hay datos para colocar
Fecha de sentencia firme	No hay datos para colocar
Nombre del demandante	No hay datos para colocar
Petitorio de la demanda	No hay datos para colocar
Fallo	No hay datos para colocar
Observaciones	No hay datos para colocar

Figure 2.B.5: Example from CV data 3 (2006 elections)

Source: Example extracted from http://www.infogob.com.pe.

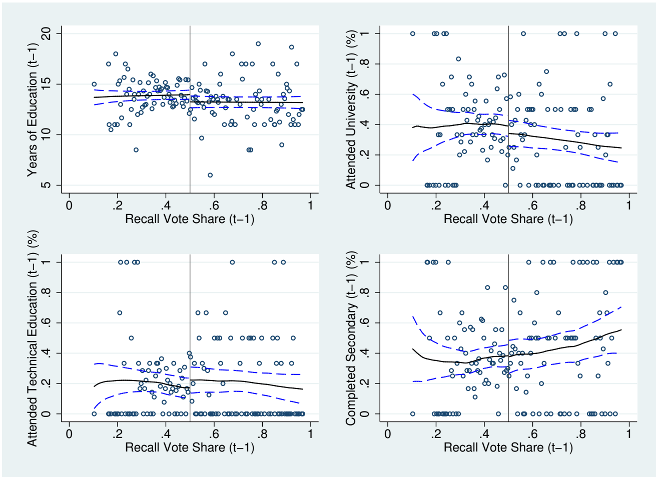


Figure 2.B.6: Continuity Test: Incumbent's Education

Note: The figures show the results from kernel-weighted local polynomial smoothing plots with epanechnikov kernels and the 95% confidence intervals for incumbents' education.

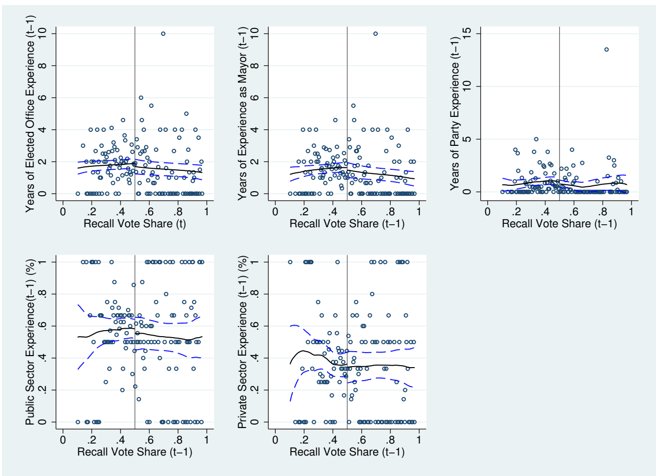


Figure 2.B.7: Continuity Test: Incumbent's Experience

Note: The figures show the results from kernel-weighted local polynomial smoothing plots with epanechnikov kernels and the 95% confidence intervals for incumbents' experience.

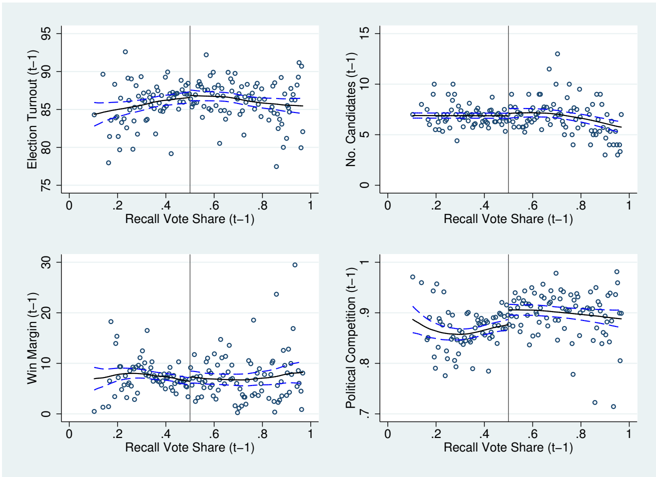


Figure 2.B.8: Continuity Test: Political Variables

Note: The figures show the results from kernel-weighted local polynomial smoothing plots with epanechnikov kernels and the 95% confidence intervals for political variables.

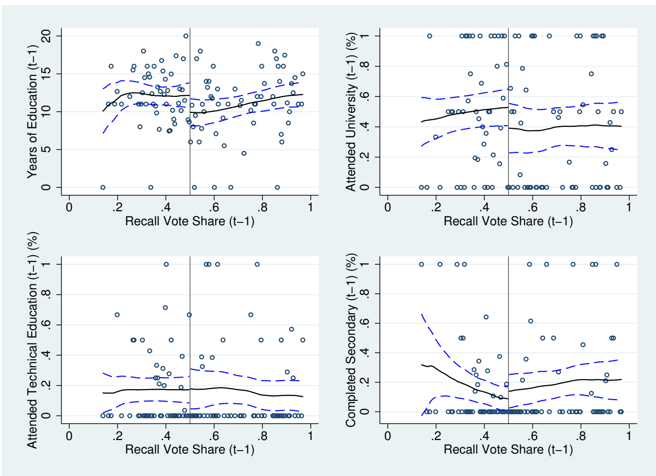


Figure 2.B.9: Continuity Test: Runners Up, Education

Note: The figures show the results from kernel-weighted local polynomial smoothing plots with epanechnikov kernels and the 95% confidence intervals for the education of candidates who finished second or third in the previous election.

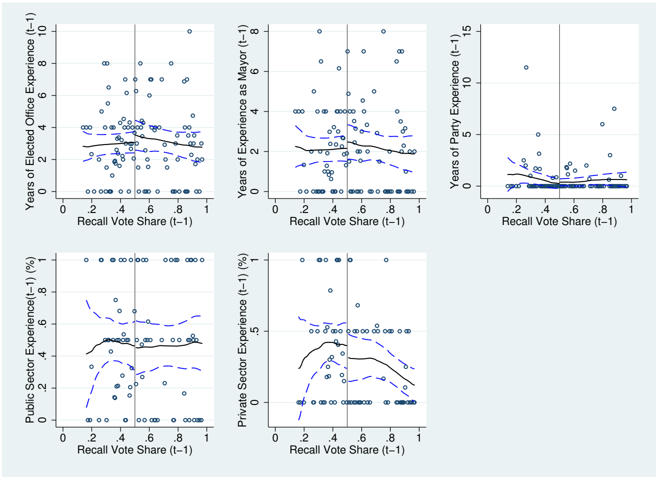


Figure 2.B.10: Continuity Test: Runners Up, Experience

Note: The figures show the results from kernel-weighted local polynomial smoothing plots with epanechnikov kernels and the 95% confidence intervals for the experience of candidates who finished second or third in the previous election.

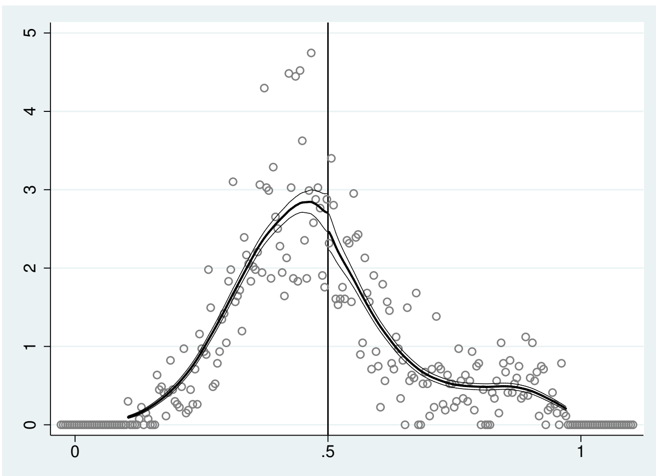


Figure 2.B.11: McCrary Density Test

Note: The figure shows the McCrary test for discontinuities in the density of the running variable (referendum vote share in favour of a recall of the mayor) at the 50% value (McCrary 2008). The estimated density is depicted by the thick black line.

2.C TABLES

Table 2.C.1: Predicting Recall Elections

	Dependent Variable: Recall Referendum		
Political Variables			
Win Margin (%)	-0.0042***	-0.0043***	-0.0042***
	(0.0007)	(0.0007)	(0.0007)
Turnout (%)	0.0076**	0.0076**	0.0076**
	(0.0033)	(0.0033)	(0.0033)
Number of Candidates	-0.0081**	-0.0081**	-0.0082**
	(0.0033)	(0.0033)	(0.0033)
Incumbent's Characteristics			
University		0.0083	0.0105
		(0.0069)	(0.0072)
Technical		0.0078	0.0093
		(0.0076)	(0.0077)
Secondary		0.0076	0.0084
		(0.0066)	(0.0067)
Age			0.0002
			(0.0001)
Female			-0.0055
			(0.0038)
Public sector experience			-0.0028
			(0.0029)
Private sector experience			-0.0034
			(0.0027)
Num. years elected office			-0.0005
			(0.0015)
Num. years party experience			0.0001
			(0.0005)
Num. years as mayor			-0.0013
			(0.0018)
National party affiliation			0.0076***
			(0.0029)
Election FEs	Yes	Yes	Yes
Municipality FEs	Yes	Yes	Yes
Observations	17517	17517	17517
Number Municipalities	1832	1832	1832
Number Municipality×Election	3555	3555	3555

Note: The dependent variable takes value 1 if there was a recall referendum, and 0 otherwise. Clustered standard errors at the municipality×election level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.C.2: Predicting Recall Attempts

	Dependent Variable: Recall Attempt		
Political Variables			
Win Margin (%)	-0.0065***	-0.0065***	-0.0065***
	(0.0011)	(0.0011)	(0.0011)
Turnout (%)	0.0003	0.0003	0.0002
	(0.0040)	(0.0040)	(0.0040)
Number of Candidates	-0.0024	-0.0024	-0.0026
	(0.0051)	(0.0051)	(0.0051)
Incumbent's Characteristics			
University		0.0000	-0.0006
		(0.0083)	(0.0085)
Technical		0.0009	0.0007
		(0.0092)	(0.0093)
Secondary		0.0006	0.0001
		(0.0081)	(0.0081)
Age			-0.0001
			(0.0002)
Female			-0.0094*
			(0.0054)
Public sector experience			-0.0009
			(0.0038)
Private sector experience			0.0013
			(0.0036)
Num. years elected office			-0.0058***
			(0.0021)
Num. years party experience			-0.0000
			(0.0006)
Num. years as mayor			0.0052**
			(0.0025)
National party affiliation			0.0080**
			(0.0039)
Election FEs	Yes	Yes	Yes
Municipality FEs	Yes	Yes	Yes
Observations	17517	17517	17517
Number Municipalities	1832	1832	1832
Number Municipality×Election	3555	3555	3555

Note: The dependent variable takes value 1 if there was a recall attempt (the promoter buys a "recall kit"), and 0 otherwise. Clustered standard errors at the municipality×election level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.C.3: Overview of Incumbents and Reelection Probabilities

		Probability Running for Reelection	Probability Winning Reelection
Incumbent Recalled	Probability	48.4%	4.8%
	N	250	250
Incumbent survived Referendum	Probability	72.8%	18.6%
	N	644	644
Incumbent faced Recall Petition	Probability	79.7%	20.0%
	N	1806	1806
Incumbent without Recall Process	Probability	68.0%	22%
	N	2787	2787

Note: The table shows the probabilities of incumbents to re-run for election and to win such an election, conditional on various stages of the recall processes during the previous period. Row 1 shows the probabilities of incumbents who were recalled in the previous election term. Row 2 shows the probabilities of incumbents who survived a recall referendum during the previous election term. Row 3 shows the probabilities of incumbents against whom a recall process was initiated but no referendum took place during the previous election term. Row 4 then shows the probabilities for all other incumbents.

Table 2.C.4: Descriptive Statistics

		Full Sample	RD Sample	Full Sample	RD Sample
		Winners' Characteristics		Candidates' Characteristics	
Primary or less	Mean	0.051	0.059	0.055	0.070
	N	6076	424	37854	2801
Secondary	Mean	0.290	0.317	0.291	0.342
	N	6076	479	37854	3394
Technical	Mean	0.183	0.204	0.186	0.191
	N	6076	597	37854	2962
University	Mean	0.476	0.417	0.468	0.388
	N	6076	593	37854	3698
Years of education	Mean	14.181	13.833	14.068	13.511
	N	6076	706	37854	3390
Num. years elected office	Mean	2.501	1.937	1.548	1.329
	N	6521	572	41115	2502
Num. years party exp.	Mean	0.908	0.667	0.760	0.618
	N	6521	818	41115	3849
Num. years as mayor	Mean	1.966	1.683	0.999	0.897
	N	6521	588	41115	2902
National party affiliation	Mean	0.410	0.375	0.433	0.394
	N	6578	435	42557	3047
Public sector experience	Mean	0.630	0.605	0.588	0.566
	N	5056	522	33818	2093
Private sector experience	Mean	0.417	0.404	0.445	0.427
	N	5056	670	33818	2703
Age	Mean	43.993	44.258	45.629	45.984
	N	6578	539	42557	3058
Female	Mean	0.030	0.050	0.064	0.075
	N	6578	661	42557	4865
At least one native surname	Mean	0.301	0.334	0.301	0.331
	N	6572	605	41641	2028
Two native surnames	Mean	0.080	0.074	0.079	0.062
	N	6572	541	41641	2478
		District Characteristics			
Number of Candidates	Mean	7.415	6.820		
	N	7316	748		
Win Margin (%)	Mean	8.983	8.784		
	N	7250	476		
Eff. Number of candidates	Mean	4.658	4.447		
	N	7243	833		
Turnout (%)	Mean	84.565	86.040		
	N	7315	527		
Ln(Revenues in N. Soles)	Mean	16.502	16.259		
	N	6542	421		
Ln(Expenditures in N. Soles)	Mean	16.252	15.964		
	N	6542	491		
Native mother tongue (%)	Mean	28.792	23.710		
	N	7300	560		

Note: Information on incumbent's characteristics is taken from the CV data of political candidates in Peruvian municipal elections provided by government sources, as described in the data section. The source for the district characteristics is the Peruvian national electoral office (ONPE). The four columns present the number of observations and the mean values for the main dependent and control variables. Columns 1 and 2 show the characteristics of elected mayors for (i) the full sample and (ii) the RD sample. Columns 3 and 4 show the characteristics of candidates running for mayor (i) in the full sample and (ii) the RD sample. At the bottom of the table, district characteristics are presented for the (i) full sample and (ii) the RD sample. In each case, the RD sample is based on the optimal bandwidth proposed by Imbens and Kalyanaraman (2012).

Table 2.C.5: Accountability and Candidates' Education - Correlation

	Dependent Variable:			
	Years Edu	University	Technical	Secondary
		PANEL A: Recalled Incumbent		
Recalled Incumbent in t-1	-0.8955***	-0.1102***	0.0061	0.0739***
	(0.0883)	(0.0126)	(0.0090)	(0.0132)
Observations	37371	37371	37371	37371
Mean Dep.	14.072	0.468	0.185	0.292
		PANEL B: Recall Referendum		
Recall Referendum in t-1	-0.5721***	-0.0754***	0.0194***	0.0379***
	(0.0651)	(0.0087)	(0.0065)	(0.0086)
Observations	37371	37371	37371	37371
Mean Dep.	14.072	0.468	0.185	0.292

Note: OLS estimates. All regressions control for the previous election's turnout, win margin and number of candidates running for mayor. Clustered standard errors at the municipality×election level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.C.6: Accountability and Candidates' Education - Specification Checks

	Dependent Variable:			
	Years Edu	University	Technical	Secondary
	PANEL A: Cubic Polynomial Regression			
Recalled Incumbent in t-1	-0.4090	-0.0777	0.0050	0.0417
	(0.3469)	(0.0479)	(0.0405)	(0.0548)
Cubic Polynomial	Yes	Yes	Yes	Yes
Observations	3390	3698	2962	3394
Mean Dep.	13.511	0.388	0.191	0.342
	PANEL B: Quartic Polynomial Regression			
Recalled Incumbent in t-1	-0.4087	-0.0818*	0.0015	0.0447
	(0.3469)	(0.0481)	(0.0410)	(0.0559)
Quartic Polynomial	Yes	Yes	Yes	Yes
Observations	3390	3698	2962	3394
Number Municipality×Election	611	679	538	612
Mean Dep.	13.511	0.388	0.191	0.342

Note: Regression equations follow Equation (2.1) in the paper. In each regression, the sample considered is based on the optimal bandwidth, following Imbens and Kalyanaraman (2012). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustered standard errors at the municipality×election level.

Table 2.C.7: Accountability and Candidates' Education - Calonico et al. (2014)

	Dependent Variable:			
	Years Edu	University	Technical	Secondary
	PANEL A: Bias-Corrected RD Estimates			
Recalled Incumbent in t-1	-0.5231	-0.1176*	0.0610	0.0510
	(0.3953)	(0.0631)	(0.0527)	(0.0635)
Triangle Kernel	Yes	Yes	Yes	Yes
Observations	3417	3143	2637	3568
Mean Dep.	13.519	0.393	0.192	0.344
	PANEL B: Linear Polynomial Regression			
Recalled Incumbent in t-1	-0.5449**	-0.0740*	-0.0100	0.0712*
	(0.2636)	(0.0400)	(0.0322)	(0.0392)
Linear Polynomial	Yes	Yes	Yes	Yes
Observations	3417	3143	2637	3568
Mean Dep.	13.519	0.393	0.192	0.344
	PANEL C: Quadratic Polynomial Regression			
Recalled Incumbent in t-1	-0.5415**	-0.0736*	-0.0139	0.0740*
	(0.2657)	(0.0407)	(0.0326)	(0.0402)
Quadratic Polynomial	Yes	Yes	Yes	Yes
Observations	3417	3143	2637	3568
Number Municipality×Election	617	567	486	654
Mean Dep.	13.519	0.393	0.192	0.344

Note: Regression equations follow Equation (2.1) in the paper. In each regression, the sample considered is based on the optimal bandwidth, following Calonico et al. (2014). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustered standard errors at the municipality×election level.

Table 2.C.8: Accountability and Candidates' Education - Arbitrary Bandwidth

	Dependent Variable:			
	Years Edu	University	Technical	Secondary
	PANEL A: Linear Polynomial Regression			
Recalled Incumbent in t-1	-0.5415	-0.1556*	0.0532	0.1065
	(0.5074)	(0.0801)	(0.0640)	(0.0847)
Linear Polynomial	Yes	Yes	Yes	Yes
Observations	792	792	792	792
Mean Dep.	13.451	0.383	0.186	0.366
	PANEL B: Quadratic Polynomial Regression			
Recalled Incumbent in t-1	-0.5599	-0.1495*	0.0447	0.1107
	(0.5034)	(0.0804)	(0.0644)	(0.0852)
Quadratic Polynomial	Yes	Yes	Yes	Yes
Observations	792	792	792	792
Mean Dep.	13.451	0.383	0.186	0.366
	PANEL C: Cubic Polynomial Regression			
Recalled Incumbent in t-1	-0.4218	-0.1940*	0.0632	0.1526
	(0.6156)	(0.1040)	(0.0883)	(0.1090)
Cubic Polynomial	Yes	Yes	Yes	Yes
Observations	792	792	792	792
Number Municipality×Election	137	137	137	137
Mean Dep.	13.451	0.383	0.186	0.366

Note: Regression equations follow Equation (2.1) in the paper. In each regression, the sample considered is based on an arbitrary bandwidth of 3 percentage points above and below the threshold. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustered standard errors at the municipality×election level.

Table 2.C.9: Mayor Characteristics and Policy Outcomes

	Dependent Variable:			
	Ln(Expenditures)		Ln(Revenues)	
Years of Education		0.008***		0.008***
		(0.002)		(0.003)
Secondary	0.038		0.045	
	(0.034)		(0.036)	
Technical	0.057		0.056	
	(0.036)		(0.038)	
University	0.078**		0.086**	
	(0.034)		(0.037)	
Num. years elected office	0.005	0.005	0.009**	0.009**
	(0.004)	(0.004)	(0.004)	(0.004)
Num. years party experience	0.006***	0.006***	0.007***	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)
Num. years as mayor	-0.005	-0.005	-0.008	-0.008
	(0.004)	(0.004)	(0.005)	(0.005)
National party affiliation	-0.004	-0.003	0.005	0.006
	(0.013)	(0.013)	(0.015)	(0.015)
Public sector experience	0.053***	0.049***	0.055***	0.049***
	(0.014)	(0.014)	(0.015)	(0.015)
Private sector experience	0.015	0.016	0.017	0.018
	(0.013)	(0.013)	(0.015)	(0.015)
Age	-0.004***	-0.004***	-0.003***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
Female	-0.002	-0.006	0.015	0.012
	(0.037)	(0.036)	(0.040)	(0.040)
Election FEs	Yes	Yes	Yes	Yes
Municipality FEs	Yes	Yes	Yes	Yes
Observations	4770	4770	4770	4770
Number Municipalities	1831	1831	1831	1831

Note: In columns (1) and (2), the dependent variable is the log of the budget executed during the last three years of the mayor's term. In columns (3) and (4), the dependent variable is the log of the total revenues received during the last three years of the mayor's term. The information is provided by the Peruvian Ministry of Economy and Finance. All regressions include municipality and election fixed effects .* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust to heterogeneous and serially correlated standard errors.

Table 2.C.10: Continuity Tests: Incumbent's Education and Experience

	PANEL A			
	Dependent Variable:			
	Years Edu	University	Technical	Secondary
Recalled Incumbent	-0.3745	-0.0240	0.0229	-0.0436
	(0.5922)	(0.1054)	(0.1050)	(0.0845)
Triangle Kernel	Yes	Yes	Yes	Yes
Observations	552	401	340	552
Number Municipalities	458	350	302	458
Mean Dep.	13.763	0.379	0.179	0.368
	PANEL B			
	Dependent Variable:			
	Num. years elected office	Num. years as mayor	Num. years party experience	National Party Affiliation
Recalled Incumbent	0.2110	0.1949	-0.1317	-0.1521
	(0.7045)	(0.5710)	(0.3648)	(0.1250)
Triangle Kernel	Yes	Yes	Yes	Yes
Observations	447	423	484	339
Number Municipalities	378	362	403	299
Mean Dep.	1.949	1.704	0.808	0.490
	PANEL C			
	Dependent Variable:			
	Public Sector Experience	Private Sector Experience	Age	Female
Recalled Incumbent	-0.0709	0.0309	-2.1327	-0.0164
	(0.1026)	(0.1141)	(1.7533)	(0.0537)
Triangle Kernel	Yes	Yes	Yes	Yes
Observations	420	355	400	458
Number Municipalities	379	326	346	387
Mean Dep.	0.576	0.346	46.002	0.059

Note: In each regression, the sample considered is based on the optimal bandwidth, following Imbens and Kalyanaraman (2012). Local linear non-parametric regressions. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust to heterogeneous and serially correlated standard errors.

Table 2.C.11: Robustness - Mechanisms: Performance in Office

	Dependent Variable:			
	Years Edu	University	Technical	Secondary
	PANEL A: Performance prior Recall – Revenues			
Recalled Incumbent in t-1	-0.4393*	-0.0739**	-0.0181	0.0848**
	(0.2525)	(0.0354)	(0.0297)	(0.0415)
Recalled in t-1 * Ln(Revenues)	0.0803	-0.0132	0.0077	0.0131
	(0.1157)	(0.0186)	(0.0136)	(0.0184)
Linear Polynomial	Yes	Yes	Yes	Yes
Observations	3184	3450	2777	3188
Number Municipality×Election	559	617	491	560
Mean Dep.	13.543	0.390	0.191	0.341
	PANEL B: Performance prior Recall – Expenditures			
Recalled Incumbent in t-1	-0.4556*	-0.0763**	-0.0185	0.0878**
	(0.2531)	(0.0356)	(0.0297)	(0.0415)
Recalled in t-1 * Ln(Expenditures)	0.0470	-0.0156	0.0065	0.0172
	(0.1202)	(0.0192)	(0.0138)	(0.0192)
Linear Polynomial	Yes	Yes	Yes	Yes
Observations	3184	3450	2777	3188
Number Municipality×Election	559	617	491	560
Mean Dep.	13.543	0.390	0.191	0.341

Note: Regression equations follow Equation (2.1) in the paper. In each regression, the sample considered is based on the optimal bandwidth, following Imbens and Kalyanaraman (2012). Linear polynomial regressions. In panels A and B, ln(revenues) and ln(expenditures) refer to the demeaned version of the variables. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustered standard errors at the municipality×election level.

Table 2.C.12: Accountability and Candidates' Education - Recalled Neighbours

	Dependent Variable:			
	Years Edu	University	Technical	Secondary
	PANEL A: Linear Polynomial Regression			
Recalled Neighbour Incumbent in t-1	-0.8695***	-0.1257***	-0.0076	0.1152***
	(0.2306)	(0.0361)	(0.0156)	(0.0296)
Linear Polynomial	Yes	Yes	Yes	Yes
Observations	6225	5902	10003	5591
Mean Dep.	14.289	0.498	0.185	0.270
	PANEL B: Quadratic Polynomial Regression			
Recalled Neighbour Incumbent in t-1	-0.7925***	-0.1094***	-0.0071	0.1033***
	(0.2362)	(0.0364)	(0.0159)	(0.0300)
Quadratic Polynomial	Yes	Yes	Yes	Yes
Observations	6225	5902	10003	5591
Number Municipality×Election	1018	958	1704	895
Mean Dep.	14.289	0.498	0.185	0.270

Note: In each regression, the sample considered is based on the optimal bandwidth, following Imbens and Kalyanaraman (2012). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustered standard errors at the municipality×election level.

Table 2.C.13: Accountability and Candidates' Education - Robustness for Recalled Neighbours

	Dependent Variable:			
	Years Edu	University	Technical	Secondary
	PANEL A: Local Linear Regression			
Recalled Neighbour Incumbent in t-1	-1.0810***	-0.1625***	-0.0109	0.1726***
	(0.2743)	(0.0423)	(0.0202)	(0.0346)
Triangle Kernel	Yes	Yes	Yes	Yes
Observations	6147	6364	8388	5618
Mean Dep.	14.395	0.514	0.184	0.257
	PANEL B: Linear Polynomial Regression			
Recalled Neighbour Incumbent in t-1	-0.8391***	-0.1329***	-0.0210	0.1620***
	(0.2405)	(0.0353)	(0.0173)	(0.0306)
Linear Polynomial	Yes	Yes	Yes	Yes
Observations	6147	6364	8388	5618
Mean Dep.	14.395	0.514	0.184	0.257
	PANEL C: Quadratic Polynomial Regression			
Recalled Neighbour Incumbent in t-1	-0.9536***	-0.1394***	-0.0295*	0.1708***
	(0.2627)	(0.0390)	(0.0176)	(0.0337)
Quadratic Polynomial	Yes	Yes	Yes	Yes
Observations	6147	6364	8388	5618
Number Municipality×Election	1042	1090	1449	929
Mean Dep.	14.395	0.514	0.184	0.257

Note: In each regression, the sample considered is based on the optimal bandwidth, following Imbens and Kalyanaraman (2012). Municipalities that received conflicting signals (more than one neighbour municipality with recall referendum in $t-1$, resulting in one recalled incumbent and one non-recalled incumbent) are excluded from the sample. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustered standard errors at the municipality×election level.

Table 2.C.14: Robustness Checks

	Dependent Variable: Years Edu	University	Technical	Secondary
	PANEL A **Controlling for Incumbent's Characteristics**			
Recalled Incumbent in t-1	-0.4308	-0.0646*	-0.0058	0.0595
	(0.2649)	(0.0382)	(0.0346)	(0.0452)
Triangle Kernel	Yes	Yes	Yes	Yes
Incumbent's Characteristics	Yes	Yes	Yes	Yes
Observations	3377	3685	2949	3381
Number Municipality×Election	610	678	537	611
Mean Dep.	13.497	0.386	0.192	0.343
	PANEL B **Controlling for Political Situation in t-1**			
Recalled Incumbent in t-1	-0.4443*	-0.0735*	-0.0055	0.0728
	(0.2563)	(0.0376)	(0.0352)	(0.0451)
Triangle Kernel	Yes	Yes	Yes	Yes
Political Controls	Yes	Yes	Yes	Yes
Observations	3372	3677	2944	3376
Number Municipality×Election	608	675	535	609
Mean Dep.	13.512	0.388	0.190	0.341

Note: Regression equations follow Equation (2.1) in the paper. In each regression, the sample considered is based on the optimal bandwidth, following Imbens and Kalyanaraman (2012). Both panels present local linear non-parametric regression with triangle kernels. Panel A controls for the incumbent's education, experience (political and work experience) and other characteristics (age, gender). Panel B controls for the previous election's turnout, win margin and number of candidates running for mayor, as well as the municipality's population. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustered standard errors at the municipality×election level.

Table 2.C.15: Robustness Checks

	Dependent Variable:			
	Years Edu	University	Technical	Secondary
		PANEL A **Dropping re-running Incumbents**		
Recalled Incumbent in t-1	-0.4733	-0.0775*	-0.0130	0.0818*
	(0.2906)	(0.0400)	(0.0349)	(0.0476)
Triangle Kernel	Yes	Yes	Yes	Yes
Re-running Incumbents	No	No	No	No
Observations	3063	3460	2939	3060
Number Municipality×Election	609	711	584	608
Mean Dep.	13.488	0.384	0.195	0.348
		PANEL B **Controlling for Characteristics of Runners-up**		
Recalled Incumbent in t-1	-0.4622	-0.0837**	-0.0121	0.0878*
	(0.2884)	(0.0411)	(0.0342)	(0.0510)
Triangle Kernel	Yes	Yes	Yes	Yes
Runners Up Characteristics	Yes	Yes	Yes	Yes
Observations	2382	2573	2086	2382
Number Municipality×Election	351	384	309	351
Mean Dep.	13.453	0.381	0.183	0.346

Note: Regression equations follow Equation (2.1) in the paper. In each regression, the sample considered is based on the optimal bandwidth, following Imbens and Kalyanaraman (2012). Both panels present local linear non-parametric regression with triangle kernels. Panel A drops incumbents who return for election from the sample. Panel B controls for the education, experience (political and work experience) and other characteristics (age, gender) of the two runners up in the preceding election. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Clustered standard errors at the municipality×election level.

Table 2.C.16: Accountability and Winners' Characteristics

		PANEL A Dependent Variable:		
	Num. years elected office	Num. years as mayor	Num. years party experience	National Party Affiliation
Recalled Incumbent in t-1	-0.2253	-0.4170	-0.2209	0.0225
	(0.6352)	(0.4208)	(0.3455)	(0.1034)
Triangle Kernel	Yes	Yes	Yes	Yes
Observations	572	818	588	435
Number Municipalities	455	607	466	362
Mean Dep.	1.937	1.683	0.667	0.375
		PANEL B Dependent Variable:		
	Public Sector Experience.	Private Sector Experience	Age	Female
Recalled Incumbent in t-1	-0.0403	-0.0985	-1.0264	0.0560*
	(0.0772)	(0.0663)	(1.4998)	(0.0318)
Triangle Kernel	Yes	Yes	Yes	Yes
Observations	522	670	539	661
Number Municipalities	430	526	432	516
Mean Dep.	0.605	0.404	44.258	0.050

Note: Regression equations follow Equation (2.1) in the paper. In each regression, the sample considered is based on the optimal bandwidth, following Imbens and Kalyanaraman (2012). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust to heterogeneous and serially correlated standard errors.

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