Tribal Diversity, Political Patronage and the Yemeni Decentralization Experiment

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Abstract

Patronage is a tool used throughout the world to reward political allies. In this paper I create a dataset of Yemeni tribes to explore their role in an educational patronage network that accounts for upwards of 6% of the entire Yemeni government budget. My analysis has two key results. First, conditional on a rich set of controls, I find that the number of tribes has a significant impact on the quantity of patronage. This impact is negative between regions, though positive within regions, as regions with more tribes have less patronage while sub-regions with more tribes have more patronage. The contrast between these effects illustrates the differing influence of tribes in local and national politics. Second, I find no evidence that a recent decentralization reform affected this patronage network. The paper provides insight into how pre-Islamic institutions have an important role in the development outcomes of the Muslim Middle East and why decentralization reforms proposed for countries similar to Yemen, such as Afghanistan and Somalia, may be ineffective in weakening the power of local elites.

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1 Introduction

A vast patronage network plays a key role in the governance strategy of Ali Abdullah Saleh, the president who has led Yemen for the past 30 years. This patronage system is one of the most important forms of corruption in Yemen and, as such, has likely contributed to Yemen's weak economic growth and development.[1] Even though patronage systems are prevalent in many other developing countries, ability to study these systems has been limited by the lack of a systematic way of measuring patronage.[2] In this paper I study how traditional elites can affect this important form of corruption and whether decentralization reforms are an effective way of reducing it.

Tribes are a traditional elite group that have been co-opted into the modern Yemeni state by a patronage network with two key components.[3] The first component of that network is formal, though secretive, with the Ministry of Tribal Affairs paying salaries, both in cash and in kind, to nearly 6,000 tribal sheikhs throughout the country (Phillips 2008). The second component functions through the schools and health facilities and provides both "ghost" employee contracts, in which a salary is paid to a non-working employee, as well as direct cash transfers (ARD 2006).[4] Patronage in the education sector alone accounts for over 6% of the entire Yemeni government budget.[5]

In this paper I develop an empirical approach for studying the role of the education sector in Yemen's tribal patronage network. First, I create a dataset of unique tribal affiliations in nearly 700 administrative units in northern Yemen. Second, I estimate two measures of the prevalence of patronage: the number of excess pupils and the number of excess teachers. These are calculated as the difference between the values reported by the Ministry of Education in educational surveys and estimates of the true values available in the population census.

My dataset of tribal affiliations provides a tool for measuring tribal diversity. Drawing

[1] A variety of authors have discussed how corruption can contribute to weak economic growth and development (cf. Shleifer and Vishny 1993, Mauro 1995, Bardhan 1997, Meon and Sekkat 2005)

[2] See Odhiambo, Mittulah, and Akivaga (2005) and Kodi (2007) for discussions in Kenya and the DRC, respectively.

[3] The resulting political system has been called a 'tribal republic' because of the important role that tribal alliances play in sustaining a relatively weak central government (DRI 2008). The political system has also been referred to as 'pluralistic authoritarianism' by Posusney and Angrist (2005) who suggest that the president and a few key tribal leaders have overwhelming power.

[4] "Ghost" employees are particularly common in the school and health sectors throughout the developing world. See Reinikka and Svennson (2006) for a review. Robinson and Verdier (2003) indicate that employment is an ideal method for the distribution of patronage.

[5] Based on the fact that school employee salaries account for approximately 15% of the total national budget and 40% of school employees are believed to be ghost employees, ghost employees alone account for approximately 6% of the total budget (ARD 2006, World Bank 2006).

on the fact that neighboring tribes in Yemen are typically antagonistic towards one another, tribal diversity is measured as the number of unique tribes in a given area (Dresch 1986, Dresch 1989; Weir 2007).

I use this dataset to construct measures of tribal diversity. These measures are constructed for districts and sub-districts, the two smallest of the three basic administrative structures in Yemen. Sub-district tribal diversity is calculated as the number of tribes within a sub-district, which contain an average of 13 villages, 6,500 residents and 5 tribes. As governmental funding is distributed by district-level offices, this represents the impact of tribal diversity on the ability of a cluster of villages to attract patronage. District tribal diversity is calculated as the number of tribal confederations – a supra-tribal structure containing 2 or more tribes – within a district, which contain an average of 100 villages, 50,000 residents and 9 tribal confederations. Since tribal confederations play an important role in politics at the governorate-level, the third and largest administrative structure, this measures the impact of tribal diversity on the ability of a district to extract patronage from the governorate.

Access to educational facility data and population censuses provides a tool for measuring patronage. A first measure is the number of ghost pupils in each village. Villages receive funding for new schools, materials and teachers based on the official number of pupils and thus benefit financially when this number is exaggerated. The number of ghost, or excess, pupils is calculated as the difference between the number of pupils reported in the educational facility data and an estimate of the true number of pupils available in the population census.

A second measure of patronage is the number of ghost teachers. I estimate the number of actual teachers in a village as the product of the true number of pupils, from the population census, and the governorate teacher-pupil ratio which is calculated from the educational survey data. The number of ghost teachers is then the difference between the reported number of teachers and this estimate of the probable number of teachers.

My empirical strategy is based on the two steps of the Ministry of Education's funding mechanism. In the first step, district-level authorities prepare budgets of educational resources needed for each village. In order to study the impact of tribal diversity on this budgeting process, I create sub-district aggregates of each measure of patronage. I then estimate the impact of sub-district tribal diversity on these aggregates using a regression that includes district fixed effects and economic, population and topographic controls.

In the second step of this funding process, Ministry of Education offices in each governorate review district budgets and allocate funding to each district. Using the same sub-district aggregates of patronage, I estimate a regression including governorate fixed effects, district and sub-district tribal diversity, and a variety of economic, population and topo-

graphic controls. The point estimate on district-level diversity measures the impact of this diversity on the aggregate patronage obtained by that district.

I find that district-level diversity has a significant negative impact on both measures of patronage. Thus, districts with more tribal confederations have fewer ghost pupils and ghost teachers. This suggests that districts with more tribes face difficulties in forming unified coalitions to extract patronage from the state.

I also find evidence that sub-district diversity increases the quantity of ghost pupils and ghost teachers within districts. The contrast between this result and the previous result suggests that tribes play a different role in district and governorate politics. Most tribes have limited power in governorate-level politics. However, each tribe within a district has significant influence as they can make credible threats to disrupt local economic activity.[6] District authorities will thus allocate relatively equal quantities of patronage to each tribe to minimize the chances of conflict and sub-districts with more tribes will receive a larger share of the total patronage allocated by a district.[7]

Throughout the analysis, identification rests on the assumption that the number of tribes and tribal confederations is exogenous to the patronage system. The validity of this assumption is supported by the fact that the educational patronage system developed very recently. Since the first rural schools did not appear until the 1960s, and very few rural areas had schools before the mid-1970s, it is unlikely that the educational system affected the borders of the of sub-districts that were demarcated during the 1930s-1960s and have remained largely stable since then (Phillips 2008). Similarly, the tribal order has been quite stable for at least 1,000 years, despite repeated Ottoman occupations, the rule of several Imams and the arrival of the Republic. It is unlikely therefore that the education system has had a significant impact on its structure (Dresch 1989, Weir 2007).

That no unobserved factor is driving both the number of tribes as well as educational outcomes is impossible to fully verify. However, the empirical analysis contains most variables that could plausibly influence both outcomes, e.g. controls for population density, total population, number of villages, government services, agricultural conditions, and ruggedness of the terrain.

An important change in the institutional framework in my sample period was a decen-

[6] An important and common example of this is the blockading of roads which is a key strategy used by tribes. As there is typically only one main road in a district and it travels through most sub-districts, any tribe along the route could effectively blockade the road (at least for some time). The reason that this is not as valuable a technique in governorate-level politics is two-fold. First, the larger roads that would be required for this type of threat travel through only a few districts and are generally well protected. Second, governorate-level conflict is very costly for all parties involved and only used as a last resort.

[7] The distribution of patronage is also likely observable locally, within districts, as they districts are quite small and there is a significant amount of participation of the tribes in district-level government offices.

tralization reform. This reform created popularly elected local councils designed to increase local oversight of centrally-funded development activities. It had been advocated by the government and foreign advisors as a way of reducing corruption and weakening the elite control of the distribution of development goods.[8] A significant concern is that these reforms benefited only tribal elites, as has been found in other developing country contexts.[9] Instead of giving power to local populations, most observers have indeed indicated that the elections accompanying the Yemeni decentralization reform served to empower the local, and typically tribal, elite (Boase 2001, DRI 2008, Phillips 2008). These local elites were, in effect, given the tools to engineer their desired electoral outcomes as they designed the boundaries of the electoral constituencies, had the exclusive right to disqualify potential candidates, and were actively involved in both voter fraud and intimidation without any risk of punishment (Spinelli 2003, IFES 2005).

I examine the impact of this reform on each of the two stages of the budgeting process. Since educational survey data is available for both before and after the reform, I pool all years of the data and augment my regression to include an interaction term between the year of the survey and the measures of tribal diversity.

I find no evidence that these reforms either attenuated or enhanced the influence of tribal elites. In particular, the relationship between tribal diversity and patronage does not change after the reform. I do find that the total quantity of patronage increased after the reform, though this may simply represent a secular increase in corruption in the education sector rather than a direct impact of the reform.

My analysis offers two other insights about the role of social institutions in development. First, it suggests that the ability of decentralization reforms to reduce local corruption and improve efficiency is limited. This is an important finding in the context of Yemen, as prominent Western scholars have called for continued decentralization arguing that the 2001 reform did not give local councils sufficient autonomy or control over resource distribution (Romeo and El Mensi 2008).[10] Decentralization reforms have also been proposed in many countries that are similar to Yemen, such as Afghanistan and Somalia.

My analysis also shows the important role that pre-Islamic institutions can play in the

[8] See "Control of Corruption and Transparency", Yemen News Agency (SabaNet), Abdul-Salam Al-Korary, September 11, 2005 for a discussion (downloaded from http://www.sabanews.net/en/news63365.htm on November 2, 2009). Boase (2001) discusses how these reforms could be a force for reducing local corruption, though he does also indicate that they could provide an opportunity for increased corruption.

[9] Crook (2003) discuss elite capture in Africa and Véron, Williams, Corbridge, and Srivastava (2006) provide a similar discussion for India. See Bardhan and Mookherjee (2005) for an overview of elite capture, corruption and decentralization.

[10] Admittedly, these authors discuss other possible benefits of decentralization in Yemen including improved state stability. However, there is also little empirical support offered for this possible effect.

modern development of countries of the Muslim Middle East. Most discussions of the role of institutions in development in the Middle East have focused on Islam (cf. Kuran 2004, Chaney 2008). However, Yemen had a developed tribal society before the arrival of Islam, as did many other Middle Eastern countries (Khoury and Kostiner 1990).[11] Additionally, while pre-Islamic institutions may have a direct impact on development, as I have shown here, they may also have indirect impacts.[12] Thus, a more careful examination of pre-Islamic institutions is important in understanding the effects of Islam on development.

In the following section I discuss the role and structure of tribes in the recent history of Yemen. Section 3 then discusses the empirical approach including a motivation and description of the empirical estimation, the identification strategy and the measure of heterogeneity employed. Section 4 describes the data. Section 5 discusses the structure of the education system and its role in the patronage system and then Section 6 analyzes the impact of tribal diversity on this component of the patronage system. Section 7 describes the decentralization reforms and presents my evidence that suggests that elite capture accompanied this process. Section 8 concludes.

2 The Tribes of Northern Yemen

As a vast literature has demonstrated, the tribes, bands of individuals who group together on the basis of territorially-based identities, are the central social organization in the mountains of rural Yemen (Dresch 1989, Weir 2007). The tribes of Yemen, which emerged to help communities diversify agricultural risk and provide economies of scale in defense, have existed in a very similar form for over a thousand years.[13] In the absence of a state that could effectively reach the rural, mountainous regions of Yemen, villages banded together to form small tribal states and elected leaders that governed in both local and external affairs. They continue to perform the same role today. They have recognized leaders, a functional legal system and a set of institutions designed to prevent internal and external conflict. And with semi-democratic elections for leaders, the ability to tax local populations and a near exclusive power over the use of military force within that tribe's territory, each tribe functions as its own nation-state.[14]

[11] In the apocryphal tale describing the arrival of Islam to Yemen, the Islamic cleric that eventually started Islam in Yemen came originally at the behest of two powerful tribes in order to settle a dispute.

[12] An important indirect impact is the effect that these pre-Islamic tribal institutions have had on the development of legal systems across the Middle East (cf. Charrad 2001, Weir 2007).

[13] The early roles of tribes is hinted at in the work of Weir 2007. This will be the focus of my following project about the Yemeni tribes.

[14] I am not the first to suggest that tribes be conceptualized as states. Weir (2007) proposed exactly that in her rejection of the segmentary lineage system (discussed below). While she does agree that the tribes

In the next four sub-sections I highlight the four aspects of the tribes which are key for the current analysis. The first motivates the idea of tribal diversity by describing how tribal identities are created and maintained. The second discusses the relationship of the tribes to the state with a particular focus on the tribal patronage system. The third discusses the stability of the tribes in Yemeni history, which is important for my identification strategy discussed in Section 3, and the fourth discusses the functionality of the tribes and the tribal confederations which are the two main types of tribal structures used in my analysis.

2.1 Tribal Diversity

Tribal identities in Yemen are constructed through mutual opposition with other tribes (Dresch 1986, Dresch 1989, Weir 2007). And while these types of identities are often conceptualized as bonds of kinship, in Yemen they are geographical and territorial. The implication of these observations is that political cooperation will be more difficult in areas with more tribes as their mutual opposition will prevent the easy formation of political alliances.

The mountains of northern Yemen are divided, politically, like a chessboard in that each tribe is a political unit that has hostile relations with its neighbors but is allied with its neighbors' neighbors.[15] And while each tribesman identifies with his own tribe, this identity only has meaning in opposition to the hostile tribes that are his neighbors (Dresch 1986, Dresch 1989). Importantly, however, is that these opposing tribes will often unify together if they are challenged by a tribe from a distant region that is not aligned with either of them.[16] This structure has often been referred to as the "segmentary model" as any individual tribe (segment) "sees itself as an independent unit in relation to another segment of the same section, but sees both segments as a unity in relation to another section" (Evans-Pritchard 1940, p. 147).[17]

That tribal identity in Yemen is based on geography and not kinship is in opposition to the standard conceptualization of tribes. Tribes are typically conceptualized as "large kin

do have many characteristics of a segmentary system - e.g. nested groups, political relations expressed in kinship groups, collective responsibility, mediation by religious specialists - she suggests that these tribes have several institutional features that are at odds with the segmentary model. In particular, she argues that the tribes have long-lasting and stable leadership, administrative and judicial structures in addition to durable treaties and written laws with clearly specified personnel and procedures for their enforcement. From this she instead proposes that the tribes be conceptualized as "tiny sovereign domains, each governed and represented by leaders with constitutional authority and powers of office" (p. 4).

[15]This chessboard-like political arrangement is a general phenomenon throughout the Middle East as discussed by Tapper (1990). Weir (2007) discusses this phenomenon in Yemen.

[16]This unification is the basis for the tribal confederations described in Section 2.5 below.

[17]Note that, while Dresch (1986) supports the applicability of the segmentary model to Yemen (though not the segmentary-lineage model), Weir (2007) rejects this characterization as it is rejects the notion that the tribes function as individual corporate bodies. I tend to agree with Weir (2007) and indeed the characterization of the tribe as a corporate body and state-like structure is the basis for a forthcoming paper.

groups, organized and regulated according to ties of blood or family lineage" (Khoury and Kostiner 1990, p.4). This idea is the basis for the segmentary lineage model of tribes, where tribesmen are linked genealogically in a hierarchical structure consisting of clans, tribes and tribal confederations (Gellner 1981 and Gellner 1991).[18]

However, this formulation of the tribes as a kinship network has been rejected for the Yemeni tribes by most scholars of Yemen (Stevenson 1985, Swagman 1988, Dresch 1989, Weir 2007). These authors provide a variety of evidence for this view including: (1) Marriages are predominantly either locally endogamous, in that people typically only marry from within their community, or within people from outside the tribe,[19] (2) communities can switch allegiance from one tribe to another, though this happens very rarely, and (3) members of these tribes cannot substantiate a genealogical relationship to the tribe when asked.[20]

2.2 Politics and the Tribes

> "The state is part of the tribes, and our Yemeni people is a collection of tribes."
>
> -President Ali Abdullah Saleh[21]

The President of the Yemen Arab Republic (North Yemen), provided this now famous response when the following question was posed to him in 1986: "To what extent has Yemen succeeded in moving from the stage of tribalism to that of the state?" President Ali Abullah Saleh, unlike his two predecessors who were eliminated by tribal elements, has maintained stability in the Yemen during his more than thirty year as president by successfully coercing the tribes.

The tribes are key to Yemeni politics, and play a central role in the stability of the Yemeni state. Described aptly as a 'tribal republic', a weak central government is supported by a network of alliances between key tribes, tribal leaders and the president (DRI 2008).[22] And an important reason that these tribes stay loyal to the central government is the existence of a vast patronage network that benefits the leaders and members of tribes that cooperate with the state.

[18] Many anthropologists have argued that this conceptual framework is broadly inappropriate for many of the tribes in the Middle East. See Weir (2007), p.4 and especially footnote 9 on this same page.

[19] The reason for the tribal endogamy is likely due to the Islamic inheritance law as this endogamy maintains property within the family. This idea was mentioned to me by several informants during my fieldwork but it is also mentioned by Mundy (1995) and Weir (2007) among others.

[20] Very few tribesmen can actually report more than one or two true ancestors (Weir 2007).

[21] This was part of an interview conducted in 1986 by *al-Majallah* (October 347, 1-7). The quote, as well as the question mentioned directly below, are from Dresch (1989) (p.7).

[22] Some observers have argued that the central government has deliberately tried to revitalize the tribes as a way of governing the country (Daair 2001).

The patronage network that is used to maintain these alliances has three pieces. The first is the Department of Tribal Affairs.[23] In addition to arranging the travel plans of tribal leaders and their meetings with representatives of the central government, this ministry is responsible for paying stipends to some 4-5,000 tribal sheikhs throughout the country. These sheikhs typically receive a cash stipend between $100 and $500, though many receive much more than this, in addition to a variety of non-cash payments including vehicles, business deals or even houses (Phillips 2008).

The second is a political system that highly favors tribal leaders as popular sheikhs were, and are, encouraged to contest parliamentarian elections. In the first multi-party elections of 1993, the President made a deliberate effort to co-opt these charismatic local leaders to join his party and thus support his government which was on the eve of a civil war.[24] Since then, influential tribal leaders continue to contest elections with either the support of the President's party or the support of the lead opposition party, which is also tribal. By contesting these elections, these tribal leaders are able to secure employment for many of their followers as well as receive preferential access to development goods through their role as parliamentarians.

The third component of this patronage network is employment in a variety of government positions. While this includes jobs with active responsibilities, such as guards, it also includes a variety of "ghost" employment where an individual is paid though never expected to work. These positions, which are typically provided through either the Ministry of Education or the Ministry of Health are typically given to family members or key allies of tribal leaders (ARD 2006, Phillips 2008) . A more thorough description of Ministry of Education "ghost" employees is provided in Section 5.

2.3 The Stability of the Tribes in Yemeni History

Tribal stability is essential to my identification strategy as my data on tribal affiliations is recent, from 2009, while I am studying their relationship to a patronage system that has developed over the past 30. This stability is supported by the fact that the tribes of northern Yemen have borders that are well-defined, mutually recognized and change relatively rarely. Though border clashes did, and continue to, occur as tribes compete for scarce resources, there is no historical evidence that tribes would ever take territory from another tribe by force. Ambitious tribal leaders, and tribes, instead expand their power and influence by

[23] Which is administered through the Ministry of Local Affairs.

[24] The value of the support of the tribes was demonstrated by their support for the President in the civil war that followed soon after these elections. Note that there is a debate in the literature on whether the tribes played an active role in supporting President Ali Abdullah Saleh during the civil war. See Dresch (1995) and Day (2001) for dissenting views.

proving their political savvy and ability to negotiate to end potentially destabilizing border conflicts.

The tribes, and the borders between these tribes, are well-defined and have been for at least several hundred years, if not longer. Drawing on a chronicle of the Yemeni tribes from the beginning of the 10th century, Dresch (1986, 1989) argues that the borders of these tribes have been largely stable for a millennia or more. Weir (2007) uses internal tribal documents to similarly conclude that the tribal borders among the tribes that she studied had been stable for at least four centuries.

Though there are often disputes over borders, which are often caused by competition over resources such as grazing rights or water sources close to the borders between two tribes, there is no evidence that these conflicts affect the borders.[25] Unlike other historical contexts, where leaders and states typically expanded their influence and prestige through the use of coercion and force, the ability to negotiate and prevent conflicts is the most prized ability for a leader in the Yemeni tribal system. A successful leader typically rose to power, instead, through success in arbitration and negotiation, as he would use this ability to expand his wealth - as these leaders were paid handsomely for arbitration - and prestige. And while conflicts do turn violent, the violence is usually relatively limited and these conflicts do not affect the results of arbitration (Weir 2007).[26] Importantly, this system likely played an important role in the prolonged stability of the tribal borders.

2.4 Tribes

Though the initial emergence of the tribes has not been well studied, it is likely that economies of scale in defense and agricultural production played a key role. Villages are a relatively small political unit. While this allows the maintenance of stability with relatively primitive institutions, the village unit is too small for the development of cost-effective defense and is also too small to allow the amount of economic diversification that is likely optimal. As high variance in rainfall, with the resulting water scarcity that can span an entire region, is a very strong impetus for the use of violence, the survival of a village was dependent upon linkages with a larger organization. In particular, this organization could provide both insurance against these shocks as well as protection if another neighboring

[25]These disputes often lead to prolonged conflict between neighboring tribes that can last for upwards of 50 years NDI (2007).

[26]The conflicting parties will continue to appeal the decision of arbitration to higher and higher tribal authorities, in a way that is not dissimilar from a Western legal system, until the cost of additional arbitration outweighs the possible benefit of a favorable verdict. The cost of arbitration increases over time as more and more influential tribal personalities, often from other tribes or confederations, are involved in the case. Note that this conclusion about the choice to conclude arbitration is my own based on my reading of legal cases discussed by a variety of authors.

village or region experience a negative shock and turned to violence.

The tribes were this organization. First, they organized local defense, which have important economies of scale, and formed a variety of defense agreements with other regional tribes.[27] Second, they developed a variety of institutions that allowed relatively sophisticated risk-sharing relationships within and across villages of the tribe. These risk-sharing arrangements extended to financial borrowing, sharing of labour during periods of cultivation, artisanal activities, investment in energy generation, informal automobile associations and, importantly, allowed for the existence of corporate bodies (Weir 2007).[28] Third, they facilitated external relations and trade by insuring members of their tribes in external affairs. For any crime or damage committed outside the tribe, the entire tribe would share responsibility and a local tax would be collected in order to make good on the resulting debt or damage.[29]

2.5 Tribal Confederations

While the tribe is of central importance in the lives of rural Yemenis, tribal confederations play an important role in the interaction of the tribes and the central government. These tribal confederations, which are also an important part of an individual's tribal identity, are a tribal structure that emerged to link groups of tribes together and played a particularly important role in extra-tribal economic interactions. The primary role of these confederations was the protection of trade routes and markets.[30] The local tribe was held responsible for any crime committed on a road, as well as against any guests and travelers, and the punishments for either of these crimes was usually double.[31] A similar protection was given to markets,

[27] See Nugent and Sanchez 1999 for a discussion of the economies of scale in defense.

[28] Though Islam does not have provisions for the existence of corporate bodies as described by Kuran (2004), tribal law in many cases did indeed develop specific provisions for their existence. Interestingly, while these economic arrangements could exist without a bureaucracy such as the tribe with all its associated costs, there is a strong bias toward forming economic links with members of the same tribe. The reason for this bias, as reported by Weir (2007), is that disputes over the arrangements are much more easily solved within the tribe where the legal structure is well understood, which suggests the important role that the tribal law plays in mediating these corporate-type bodies.

[29] Weir (2007) (p.149) reports that the "the tribe is united whatever expenses, misfortunes, deaths, or retribution might afflict it", with the only exception being if the individual committed a crime with clear intent in which case he forfeits the support of his fellow tribesmen (e.g adultery, assassinations). The importance of this institution of mutual responsibility in regulating extra-tribal affairs is highlighted by a variety of authors (e.g. Meissner 1987, p.253; Dresch 1989, p.131, 210-211; Mundy 1995).

[30] Weir (2007) argues emphatically that trade and the value of markets are the *raison d'être* behind the existence of intertribal relationships.

[31] The punishment for any crime or infraction committed against guest and travelers or on the road is typically doubled, as the host tribe of the guest is also insulted and this insult must be repaid. In practice, the host of the guest or the traveler is the responsible party for recovering any compensation for damages or for exacting revenge if necessary.

though they also served as an important source of wealth and prestige for the tribes.[32] A second role was the sharing of important resources across tribes. In particular, while most tribes maintained wilderness land for the grazing of animals and water facilities, the existence of tribal confederations as a mechanism to share these resources during times of hardship was an important institution to prevent violence between tribes.

3 Empirical Approach

In this section I elaborate my empirical approach in three sub-sections. First, I motivate and present the general empirical specification that is used for examining the impact of tribal diversity on the number of ghost employees. Second, I discuss the two measures of tribal diversity. And in the third sub-section, which discusses my identification strategy, I explain why it is appropriate to treat the tribal structure as exogenous to educational outcomes.

3.1 Estimating the Impact of Diversity on Patronage

I calculate two measures of local corruption using the available educational and population data. Both measures are based on three key variables: (1) the *reported* number of pupils, (2) the *reported* number of teachers and (3) the *true* number of pupils. The first two variables are from Ministry of Education surveys and are expected to include both real and ghost pupils and teachers. The third variable is from a population census of the Central Statistical Office (CSO) and reflects an estimate of the true value as the CSO enumerators have no incentive to inflate the numbers.

The first measure of patronage is the number of excess, or ghost, pupils. This is calculated directly as the difference between the official and true number of pupils:

$$\text{Ghost Pupils} = Pupils^{\text{reported}} - Pupils^{\text{true}} + \epsilon_R^P + \epsilon_T^P$$

where ϵ_R^{GP} represents the measurement error of the reported number of pupils and ϵ_T^{GP} is the measurement error in the estimate of the true number of pupils. For the main estimation, the error in the estimate of the true number of pupils is assumed to be idiosyncratic and independent of tribal diversity. However, as there may be a systematic relationship between tribes and the reporting in the population census, a robustness section considers the robustness of my results under weaker assumptions.

[32] While markets were sometimes run by a single tribe, that there were limited areas that were suitable for markets and the economies of scale probably played an important role in limiting the number of functional markets.

The second measure of corruption is the number of ghost teachers. This measure requires an added assumption: governorate level offices of the Ministry of Education aim to provide an equal teacher-student ratio in all areas on average. Thus, any deviations from this average reflect local rent-seeking. I first calculate the aggregate teacher-student ratio in a governorate, $\widehat{\frac{Teachers}{Students}}$, by dividing the total number of reported teachers by the total number of reported pupils in the Ministry of Education surveys. I then use this to estimate the number of ghost teachers as

$$\text{Ghost Teachers} = Teachers^{\text{reported}} - \widehat{\frac{Teachers}{Pupils}} \cdot Pupils^{\text{true}} + \epsilon_R^{GT} + \widehat{\frac{Teachers}{Pupils}}\epsilon_T^{GT}$$

where ϵ_R^T is the measurement error in the reported number of teachers and ϵ_T^P is, as above, the measurement error in the true number of pupils. The same assumptions discussed for the measurement error in the estimation of ghost pupils apply here.

The baseline specification is an ordinary least squares regression. The unit of observation is the sub-district and the dependent variables considered are the aggregates of each measure of patronage. This regression includes the number of tribes within the sub-district, a variety of sub-district and district controls, and district fixed effects.

This basic specification, which is used for studying the within district allocations, can then be written as

$$\text{Ghost}_{i,j,k} = \alpha_{i,j} + \beta_k \, TRIBES_{i,j,k} + \gamma' Z_{i,j,k} + \epsilon_{i,j,k} \tag{1}$$

where i indexes governorates, j indexes districts and k indexes sub-districts. $Ghost_{i,j,k}$ is the realization of either the number of ghost pupils or ghost teachers in sub-district k (which is in district j and governorate i), $\alpha_{i,j}$ is a district fixed effect, $TRIBES_{i,j,k}$ is the number of unique tribes within sub-district k, $Z_{i,j,k}$ is a vector of sub-district controls within sub-district k and $\epsilon_{i,j,k}$ is a sub-district specific error term that is assumed to be i.i.d.

A second specification, which is used for studying the within governorate allocations, augments this regression to include the district-level measure of tribal diversity. This can be written as

$$\text{Ghost}_{i,j,k} = \alpha_i + \beta_j \, CONFED_{i,j} + \beta_k \, TRIBES_{i,j,k} + \delta' X_{i,j} + \gamma' Z_{i,j,k} + \epsilon'_{i,j,k} \tag{2}$$

where α_i is a governorate fixed effect, $CONFED_{i,j}$ is the number of unique tribal confederations within district j, $X_{i,j}$ is a vector of district-level controls within the corresponding district j, and the rest of the parameters are defined above. Importantly, as Equation (2)

contains aggregate explanatory variables, i.e. district-level control variables that are simple sums of the same sub-district controls and district-level measures of the number of unique tribes, direct estimation can lead to serious biases (Moulton 1990). Thus, all the estimates reported using this second parameterization are clustered at the district level.

3.2 Tribal Diversity

Two measures of tribal diversity are used throughout this analysis. The first, tribal diversity at the sub-district level, was calculated as the number of different unique tribes in that sub-district. The second, the diversity at the district level, was calculated as the number of unique tribal confederations within a district. There are, on average, four tribes in each tribal confederation, though this number ranges from 1 to 27.

Both measures of diversity are calculated as the log of the number of unique tribes. This functional form captures the fact that the marginal impact of an additional tribe on diversity is increasing in the number of unique tribes.[33]

Figure 7 displays the sub-district tribal diversity data that is used throughout this analysis.[34] In this figure, the solid lines demarcate district and governorate borders while subdistrict borders can be discerned by the changing color representing the number of tribes in the subdistrict.

This figure demonstrates the dramatic variation in the degree of tribal diversity within an administrative area. All my analysis focuses on variation within governorates, as all specifications include governorate fixed effects, so the significant variation within these areas demonstrated in Figure 7 (the thick black lines) is particularly important.

3.3 Identification Strategy

Identification here rests on the central assumption that the number of observed tribes, and tribal confederations, within an administrative sub-district is exogenous to the development of Yemen's patronage system during the past 30 years. This assumption implies two things. First, it implies that the patronage system has not affected the number of tribal units within a sub-district during this period. Second, it implies that there is no third, unobserved, factor that is driving both the number of tribes as well as the development of the education system. In this sub-section I will discuss the variety of evidence that supports these two important assumptions.

[33]The results are not sensitive to this functional form specification.

[34]Note that there are some areas 'missing' in this figure. My population data does not include urban areas, so those are excluded. However, I am also missing some subdistricts in the governorates for which I have population data. I am working on filling in these missing observations.

The first piece of this assumption, that the education system has not affected the number of tribal units within a sub-district, requires two things. First it requires that the structure of the tribal order, and in particular the number of tribal units within an area, was not affected by the development of education system. And, second, it requires that the definition of the sub-district was not affected by the education system which would also create a mechanical relationship between the tribes and education. I will address each of these in turn.

The first, that the structure of the tribal order itself was not affected by educational outcomes, is substantiated by the remarkable stability of the tribes over time. Indeed, Dresch (1986, 1989) uses historical texts to show that many tribes have maintained the same borders for over a millennium. Weir (2007), who uses legal documents maintained by the tribe themselves in her analysis, similarly concludes that the tribes of her study, which do not overlap with those of Dresch, were stable for over four hundred years. The stability of the tribes is discussed at length in Section 2 above. And if these tribes were indeed stable despite the repeated Ottoman occupations, the rule of several Imams and the arrival of the Republic, it is fair to conclude that these structures would be largely unaffected by the very recent development of the education system which only first emerged in the 1960s and did not reach most rural areas until the 1970s at the earliest (See Appendix A for more details on the recent development of the education system).

The second, that the definition of sub-districts was not affected by the educational system, follows a similar argument in that sub-district borders were demarcated before the development of the education system. Though sub-districts are a relatively recent administrative unit, their demarcation was largely completed by the mid-1970s (CPO 1974). And though there are cases of sub-district borders being changed after that, most reports indicate that these changes was almost entirely to improve their alignment with tribal borders and that they had little impact on the actual day-to-day operations of these administrative units which had already been using the mutually recognized tribal boundaries. Thus, it is unlikely that the educational system affected the definitions of these sub-districts in any significant way.

The second piece of this assumption, that there is some unobserved factor that is driving both the number of tribes as well as educational outcomes is impossible to rule out entirely. Though the empirical analysis contains many of these variables that could plausibly influence both outcomes, e.g. controls for population density, total population, number of villages, government services, agricultural conditions, ruggedness of the terrain, it is in practice impossible to include every possible variable that might influence both these outcomes. However, as including increasingly extensive controls does not seem to weaken

the observed impacts of tribes, it seems unlikely that some other variable, which is certain to be highly correlated with the set of other variables included, could be driving the impact.

4 Data

In this section I describe the tribal and educational data that are at the core of this analysis. A description of the administrative structure and the variety of population, area, terrain, economic and agricultural controls use throughout the analysis is deferred to Appendix B though Table 4 provides key summary statistics for these variables.

4.1 Tribal Data

Tribal data was compiled for a total of 692 sub-districts in 84 districts in 6 governorates.[35] Though not fully representative of Yemen, these data include nearly one-third of rural Yemen and represent a diversity of tribal-state relationships. They include: (1) The governorate of Sa'ada, which borders Saudi Arabia and where the Yemeni government is now fighting a war against a rebellious tribal group, (2) Al-Jawf, in which the central government has had little penetration because of the power of the tribes,[36] (3) Amran, the home of the central political and tribal opposition to the President, (4) Hajjah, a key transit area in the Yemen-Saudi trade and an area where recent African migrants have assimilated into the tribes,[37] (5) Al-Mahweet, whose rugged terrain is covered with some of the most spectacular terraced agriculture in the country, as well as a variety of sophisticated tribal law to govern them, and (6) Ibb, the luscious agriculture lands of central Yemen that is home to many important technocrats who have served the Republic of Yemen (e.g. prime ministers, etc.) who had originated from the tribes.

For each sub-district, I created a list of all the unique tribes and tribal confederations. These lists were created by working with a group of Yemeni research assistants native to the regions studied and collected through a combination of field visits and conversations with friends and family members.

Table 1 reports statistics on the number of unique tribes and tribal confederations within various administrative divisions. In particular, it reports the average and standard deviation of the number of unique units of each tribal group per sub-district, per district,

[35] The final data set will consist of approximately 1,208 sub-districts in 150 districts in 9 governorates.

[36] Al-Jawf is unfortunately excluded from much of the current analysis as agricultural data is not available for this governorate (see Appendix B.3 below for more details).

[37] The observation of African migrants assimilating into the tribes is based on my own observations during fieldwork.

per governorate and overall.

This table illustrates the great diversity of tribes within even very small areas in Yemen. Indeed, the average number of tribes per sub-district, which have an average of 6,500 residents, is nearly 5. And the average district, which has around 50,000 residents, has nearly 35 tribes and almost 10 tribal confederations. Interestingly, there is no clear relationship between the size of the sub-districts and the number of tribes (correlation coefficient = 0.01).

4.2 Education Data

The education variables that are the primary outcome of interest in this analysis are drawn from two key sources: The first is a series of educational establishment surveys conduced during the 1999-2000, 2000-2001 and 2005-2006 school years. The second main source is the population censuses which were conducted in 1994 and 2004. Table 3 provides summary statistics for all the education variables used throughout the analysis.

The three educational establishment surveys used here provide a broad range of information for the universe of schools in Yemen at the time of the survey. Most important for the current analysis, however, is that they report the official values for both the number of teachers and students for each of the schools surveyed. Though the number of teachers and students is disaggregated by gender and school level, and the analysis could in principle be disaggregated by gender and level, the current analysis focuses on the aggregate number of male pupils and male school teachers. The focus on male teachers is largely pragmatic, as female positions are rarely given as patronage, and the aggregation of the different levels is only to simplify the analysis.

In addition to the total number of teachers and the teacher to student ratio, a key variable of interest is the number of teachers relative to the total population, or in this case, the total number of potential students in an area (i.e. the population of boys). Though not observable directly in this educational survey, I can calculate this variable by merging the survey data with the population data that is available in the population census. This could be done at the sub-district level using the aggregate numbers of teachers and population. However, as the variation of the teacher to population ratio within a given region is of particular interest, as it is a measure of the equity of the allocation of teachers, I calculated this ratio at the village level. As these schools do not have a unique village code that is directly matchable to the population censuses, I matched the names of governorates, districts, subdistricts and villages using Microsoft Access (that was able to match $\sim 70\%$ of the entries) and by hand (which matched an additional 20% of the schools).

The second set of data, the 1994 and 2004 population censuses, reports the enrollment

rate among boys and girls ages 6 to 15 at the village level.[38] The average and standard deviation of the enrollment rate for boys within a sub-district was calculated directly using the population of the boys in each village as a weight. The current analysis does not include girls, as they typically require female teachers which are not generally susceptible to patronage, though it should be mentioned that they do not exhibit the same strong relationship with tribal diversity observed among the boys.

A third type of educational data, educational facility censuses from 2007 and 2009, are also available. The first census provides data for just over 13,500 schools and the second for over 16,000. And while the latter only provides general data on each of the schools, the survey from 2007 provides relatively detailed information on the facility including the number of classrooms and the donor that funded their construction. However, while these were used to construct Figures 5 and 6 for the educational background section, they are not included in the quantitative analysis sections below as they do not offer any useful insights into either the educational patronage system or enrollment outcomes that are not available in the other surveys.

5 The Role of the Education System in Yemen's Patronage Network

This section discusses the role of the education system in Yemen's patronage network. Schools are an important part of the patronage network as they create prestige for the local community as well as employment opportunities for members of the local tribe as school administrators and teachers are typically drawn from the area of the school.[39] However, the focus of this section is the prevalence of ghost pupils and ghost teacher positions which are discussed in the first sub-section. The second sub-section then outlines the funding structure of the education system which is the basis for the empirical analysis analyzing the prevalence and distribution of these ghost teacher positions

[38]The population census data for 1994 is only available for 5 of the 6 governorates for which there is tribal data available. This is because the 1994 population census available to me does not have names and the 2001 agricultural census, which uses the 1994 village identifiers from 1994 and was used for matching, does not include Al-Jawf. See Appendix B.3 for more details.

[39]Stookey (1974) demonstrates that tribes understood the value of school facilities as early as the 1970s in his apocryphal tale of a tribal leader who first pressured a representative of the central government to build a schools and then organized a local effort to build the school with the implicit understanding that the central government would then pay the salaries of the school's staff.

5.1 The Role of Education in the Patronage System

The lack of any systematic monitoring and evaluation, and transparency, in the local budgeting process and its near ubiquitous presence throughout Yemen make the education system an ideal structure for distributing patronage. Patronage-type employment opportunities are probably the most important tool that the Ministry of Education uses for distributing patronage.

Overall, an estimated 40% of official Ministry of Education employees are "ghost workers", or workers that receive a paycheck though are never expected to work (ARD 2006). And many of these ghost workers are teachers (World Bank 2006).[40] Though there are no studies that examine this issue specifically, the lack of transparency in the allocation of teacher positions in rural areas, and in particular the influence that local elites and members of local councils play in creating school budgets as discussed above, suggests that these "ghost teacher" positions play an important role in the tribal patronage system.

5.2 School Financing and the Allocation of Teacher Positions

Both national and local governments are involved in the distribution of education funds. However, while the central government provides nearly the entire budget for the education system, governorates are responsible for the disbursement of over 80% of the budget.[41] Importantly, teachers' salaries are distributed almost entirely by governorate-level Ministry of Education offices though the actual allocations are decided by district-level offices.

The system for allocating teachers is a simple two-step process. First, district-level offices or representatives for the Ministry of Education prepare a budget of the teachers needed for each school in the district which is submitted to the governorate office. Second, governorate-level offices of the Ministry of Education work with the Governor to review these budgets, modify them if needed and then fund each district from the total amount

[40]There are different estimates of the prevalence of this phenomenon which was first publicized in the Yemen Times (see World Bank (2006) (p.22) for more details). Indeed, the estimates of World Bank (2006) of the importance of this phenomenon are significantly below those reported by (ARD 2006) though the approach used by World Bank (2006) seems to be flawed. Interestingly, I often encountered these ghost teachers as taxi drivers or elsewhere in the capital. They will often unabashedly report that they are indeed teachers in another village and that they only return home once every second week or once a month to collect a paycheck.

[41]In 2005, the Ministry of Education accounted for 17% of the total distribution of these funds which are spent primarily on construction projects and the provision of books (World Bank 2006). Interestingly, there is very significant variation in the amount of money that is allocated to each governorate. Indeed, in 2005 the governorates of former South Yemen received an average of just over 40,000 YR (US$200) per student while the governorates of former North Yemen received just under 28,000 YR (US$140) per student (World Bank 2006). Note that these estimates are not population weighted averages. and each governorate is given equal weight.

of funding that was given to that governorate by the central government. That the district offices exaggerate their needs is well known though the political economy of these allocation decisions is not well studied (World Bank 2006).

6 Results: Tribal Diversity and Patronage

This section examines how tribal diversity affects the two key political processes that determine the availability and distribution of ghost pupil and ghost teacher positions. First, I will examine the allocation decision that is made within these districts and the role that sub-district diversity has on the ability of a sub-district to extract patronage from the district. Second, I examine the allocation decision made by the governorate-level authorities to the districts. Here I will focus on how district-level diversity affects the total quantity of patronage that a district is able to obtain. In each case I will consider briefly the other socioeconomic factors that affect the prevalence of both the ghost pupil and ghost teacher positions, though the focus will be on the tribal diversity variables.

6.1 Diversity and Local Budgeting Decisions

I begin by focusing on the district allocation decisions. Decisions regarding the quantity of resources to be allocated to each school are typically made by a technocrat who works within the district but who is usually from somewhere else in the country. While this technocrat's responsibility is, ostensibly, to provide resources to schools based on need, these technocrats' are certainly affected by pressures from these villages as well as local and national politicians to exaggerate the needs of these schools. In this sub-section I first study how diversity and other socioeconomic factors affect this exaggeration by studying the prevalence of ghost pupils teachers within a sub-district.

Figure 8 provides a graphical representation of the key result. Here I plot the residuals from the regression of the number of ghost teachers against a variety of socioeconomic controls against the residuals of the same regression with the number of tribes in a sub-district as the dependent variable. This scatterplot contains all years of available data and demonstrates two things. First, it demonstrates that there is considerable variation in the number of ghost teachers. The second is that sub-district tribal diversity has a strong positive relationship with the number of ghost teachers in an area.

The positive impact of sub-district tribal diversity on the prevalence of both ghost pupils and ghost teachers within a sub-district is demonstrated in Table 5. Importantly, as these estimates include district fixed effects, the point estimates measures the relationship

between tribal diversity and patronage within a district. Thus, the significant point estimates that are observed across almost all years of data for both measures of patronage indicate that more diverse areas are able to obtain a larger share of the amount of total patronage received by a district.

The point estimates in Table 5 are large. For ghost pupils, these point estimates imply that a one standard deviation in tribal diversity would increase this measure of patronage by nearly one third-third of a standard devation. And a point estimate of 1, which is below the point estimates found in this table, implies that an elimination of tribal diversity within districts would reduce the number of ghost pupils by nearly 100 per sub-district. This is quite significant given the fact that the average total population of a sub-district is 6,500. The estimation of the impact of diversity on ghost teachers has a similar result, though the estimate effect is even larger.

Having examined the positive, significant and meaningful impact of sub-district tribal diversity on the within district allocation of patronage, I now examine the impact of other socioeconomic variables on the prevalence of this patronage. There are two interesting results that emerge from an examination of the sub-district of these controls variables reported in Table 6.

The first of these results is that two important classes of agriculture variables, i.e. the variables measuring agriculture wealth and the number of share of landholders with small plots, do not have a significant impact on either the number of teachers or the number of ghost teachers. The result for agriculture wealth is surprising as agricultural wealth is typically the most important component of local wealth and would be expected to affect the bargaining power of locals vis-a-vis the district-level decision making body. However, the result for land ownership is particularly striking as other authors have demonstrated for Yemen and elsewhere that can affect the prevalence of corruption.[42]

The second result is that, despite the fact that measures of agricultural wealth seem to have no impact, several of the other economic controls seem to have a significant impact on the number of ghost teachers. That only female illiteracy has a significant negative impact is interesting as this suggests that educational systems that have been dominated by men, i.e. that were educated the women of the villages when they were children, are more prone to this type of corruption.

While more educated areas seem to have more ghost teachers, the other three variables that have a significant impact suggest that ghost teachers are substitutable with other patronage-type goods and that poorer areas have fewer ghost teachers. This first result

[42]See Swagman 1988 for a discussion in the Yemeni context. Banerjee, Mookherjee, Munshi, and Ray 2001 provide a more general discussion.

is indicated by the fact areas with less access to sanitation and electricity have more ghost teachers suggests that these are also a type of patronage and that they function as substitutes for ghost teachers. The second is demonstrated by the fact that the number of households using traditional methods for cooking – which is perhaps the best proxy for local wealth – has a negative impact on ghost teachers.

6.2 Diversity and Governorate Budgeting Decisions

I now examine the governorate-level allocation decision. Having received detailed budgets from their district-level counterparts, which they know are likely to be exaggerated, the governorate-level authority chooses a total allocation of teachers that that district will receive. While these governorate-level authorities certainly respond to the needs of the communities, pressure and coercion from both above and below affect the final allocation decision that they make. This sub-section focuses on how district-level tribal diversity affects the decision making process that determines the total allocation of teachers, and in particular, the total allocation of ghost teachers.

Table 7 studies the factors affecting the total allocation of teachers for each of the three years of available data. This analysis demonstrates the negative impact of district-level tribal diversity on the prevalence of patronage. The point estimates on the district-level diversity are negative across every year and specification and are significant at the 1 or 5% level in every specification except for 1. And these point estimates are economically meaningful. Indeed, the point estimates from Table 7 imply that variation in tribal diversity can explain nearly one-third of the variation in the total number of ghost pupils and one-half of the variation in the total number of ghost teachers.

In Table Table 7 I then examine how other district-level variables might affect the governorate-level distribution of patronage. Here I find evidence that districts with smaller populations seem to be able to secure funding for a higher concentration of teachers. This observation provides insight about the possible mechanism driving the observed impact of tribal diversity. Though the ostensible goal of Ministry of Education is to provide a roughly equal coverage of teachers within governorates, this result provides clear evidence that this rule is not followed. In particular, this result suggests that representation during the allocation decision by the Ministry of Education may have an important impact on the final allocation decisions. As smaller districts have an equal amount of representation as larger districts, since each district has one representative, they are able to secure a higher per student number of teachers.

This result, and in particular the limited representation that is allowed for each of the

districts, indicates that the impact of tribal diversity represents weakened bargaining power vis-a-vis governorate-level authorities.

6.3 Robustness Checks

(forthcoming)

7 Yemen's Decentralization Experiment

The decentralization of control over development resources, which had been a development strategy of North Yemen in the 1960s and 1970s, was a key promise in the negotiations that led to the establishment of the Republic in 1990.[43] In 2001, after over a decade of waiting, it seemed that the promised decentralization would become a reality as elections for local councils, who would have significant budgetary control and oversight over development activities, were held for the first time. However, instead of giving power to local populations, most narrative evidence suggests that these elections served to have legitimized the local, and typically tribal, elite who were given the tools to engineer their desired electoral outcomes. In this section, in addition to reviewing the details of the reform and the risk of elite capture suggested by others, I provide empirical evidence that the reform had no significant impact on the tribal patronage network though the volume of corruption has increased over time.

In the following sub-section I discuss the creation of these local councils and the powers that were given to these councils. A second sub-section then discusses the elite capture that seems to have been widespread in these, and subsequent, elections. The final sub-section here draws on data available from before, during and after the reform to empirically estimate the plausible impact of the reform.

7.1 The Creation of Local Councils

In 2001, after nearly a decade of discussions and promises, the Yemeni government held the first elections for local governments. The Local Authority Law, which was passed in 2000 and called for elections a year later, authorized the creation of popularly elected local councils for both districts and governorates based on the pre-existing administrative structure. These district and governorate councils were given significant control over local budget allocations

[43] Decentralized control of development resources is not a new phenomenon in Yemen. During the 1970s and 1980s, Local Development Agencies played a key role in the development and maintenance of a variety of infrastructure projects (**?**). Projects were funded through a combination of remittances, *zakat*, local taxes and sometimes external funding.

and gave them the responsibility of monitoring the activities of the newly created local branches of key ministries (e.g. education, finance, etc.).

However, these local councils, which found themselves responsible for local education, sanitation, medical, taxation and security systems, were often relatively inexperienced (Boase 2001). This weakness has, arguably, left these local councils particularly susceptible to the influence of powerful local elites. And, indeed, even in areas that had competitive elections, the overall effectiveness of the elections in creating local and regional councils that increased local voice in the allocation of resources has been highly contested (DRI 2008, Phillips 2008, Romeo and El Mensi 2008).

7.2 Elite Control over the Local Council Elections

The decentralization process, from the very beginning, seemed to be designed to ensure capture by local elites. Election committees were dominated by local elites, irregularities in voter registration and the candidate nomination process were common and voter impersonation was widespread. Indeed, some observers of the election cautioned that there were indications that the decentralization and the creation of local councils was seen by tribal leaders as a way of "reinforcing their traditional authority" and led to the "institutionalization of tribes as political entities".[44] Importantly, the local capture that was endemic to these elections seems to have persisted into the 2003 parliamentary elections and beyond as a variety of similar difficulties were faced in subsequent elections.[45] Appendix C provides more details on the variety of weaknesses of this decentralization process.

7.3 Measuring the Impact of the Reform

In this sub-section I study the impact that the 2001 decentralization reform had on the relationship between tribal diversity and both the prevalence and distribution of patrongage. The approach used is relatively simple and is based on the availability of surveys of edu-

[44]The possibility of this elite capture, and in particular capture by the powerful and prevalent tribal elite, was cautioned by Boase (2001) who indicated that the decentralization experiment might hasten the spread of local corruption, rather than increase accountability, and that the tribal structure might be a particular impediment to the success of the exercise. The first quote is from Phillips (2008) (p. 78) and the second is from DRI (2008) (p. 39, fn. 82).

[45]First, the approach used for delineating the electoral constituencies for the 2003 elections remained suspect with maps drawn by hand that were reviewed by local officials, with these local officals allowed to propose suggestions for changes. Second, there were still significant concerns of partisanship in the Supreme Council for Elections and Reform (SCER), the organization that succeeded the SEC, which raised concerns of partisanship in the in the disqualification of candidates in local elections (DRI 2008). Indeed, local authorities seemed able to disqualify candidates with seeming and in 2006 where over 5,000 candidates had their nominations rejected without explanation (DRI 2008, p.51, fn. 117).

cational facilities before, during and after the reform (1999, 2001 and 2006). While there are other significant economic events happening during this period that would be likely to affect patronage, my identification relies on the fact that there are no events that would be expected to affect the local impact of tribal diversity.

In order to estimate the impact of the decentralization reform I pool the three years of data and estimate an augmented regression model that includes year fixed effects interacted with diversity. I first estimate the impact of the decentralization reform on the within district allocations in Table 9. This is analogous to the approach considered in Section 6.1 and regresses the number of ghost teachers and ghost pupils against sub-district diversity interacted with the year of the survey as well as a variety of controls.

Table 9 demonstrates that this reform had no net impact on the local ability of tribes in securing patronage. Indeed, while the point estimates on the impact of sub-district diversity on both the number of ghost pupils and teachers remain positive, meaningful and significant, there is no evidence that the size of this impact changed either during (in 2001) or after (in 2006) the reform. This is evidenced by the small and insignificant point estimates on the interaction terms.

In Table 10 I use the same approach to examine the affect of the reforms on the governorate-level allocation process. If decentralization did improve local voice, I would expect that the reform would attenuate the negative impact of district-level diversity found above. Here, again, I find no evidence of a significant effect as the coefficient estimates for all the interaction terms are a noisy zero.

While neither Table 9 nor Table 10 present evidence of an impact of the reform on the relationship between the tribes and the patronage network, they do suggest that corruption increased during this period. In particular, as demonstrated by the significant positive point estimates on the two year variables in columns (1) and (2), this table suggests that the number of ghost pupils increased during and after the reform. However, as the point estimates for both 2001 and 2006 are very significant, and the point estimate for 2006 is significantly larger than that in 2001, this is evidence of a secular increase in the amount of corruption rather than an impact of the reform.

8 Conclusion

This paper has made two contributions to our understanding of the functioning of patronage networks in the developing world. The first one is to demonstrate, using a new dataset of unique tribes that covers nearly one-third of rural Yemen, that a type of diversity that is neither religious, ethnic nor political can have a significant impact on the functioning of a

patronage network. This diversity affects both the average level of patronage received by a region as more diverse areas have less patronage employment opportunities.

These findings demonstrate that a pre-Islamic institution can have an important impact on development outcomes in a country of the Muslim Middle East. Current discussions of development in the Middle East are dominated by religion with little recognition of the diversity of historical experiences and the role that they might play in development. The inefficiency that can be caused by a non-Islamic institution, as development resources are diverted to rent-seeking tribal groups, underscores how an improved understanding of these structures is important for understanding development in the Middle East.

Second, my findings illuminate the patronage system that is key to the stability of Yemen's 'tribal republic'. While other observers have commented on the importance of the tribes in this patronage system, mine is the first to document the relationship between the tribes and the state. This relationship is of perhaps particular relevance given Yemen's stability during the last 30 years, despite its political, historical and geographical similarities to Afghanistan and Somalia. This suggests that embedding tribal elements in a patronage system may dominate the divide and rule approach to handling 'warlords' that are more commonly employed in these countries.

My second contribution is to demonstrate how a decentralization reform can enhance local corruption. While local tribal diversity did not have a significant relationship with the distribution of patronage before the reform, I find evidence that this effect increased after the election. Thus, a reform that was designed to weaken the power of the entrenched tribal elite seems to have done just the opposite. Understanding the implications of this elite capture is of particular importance as decentralization reforms are still being promoted as the panacea of modern development, in Yemen and other countries with a similarly powerful traditional elite.

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A The Recent Expansion of Yemen's Education System

The education system that exists today in the north of the Republic of Yemen is a very recent phenomenon. The first public schools did not open there doors until the early 1960s, and while the educational system did expand rapidly from the late 1970s until the present, the overall penetration of the education system into rural areas is still quite limited. Importantly, given its recent arrival and the stability and longevity of the tribes discussed above, it is unlikely that the education system has affected the structure of the tribe.

In northern Yemen in 1962, the year of the revolution which saw the removal of a religious monarchy, there were only 23 schools serving a population of over 4 million.[46] And while the education system did expand in the wake of the 1962 revolution, the real expansion of the education system did not happen until the late 1970s.[47] The delayed arrival of widespread access to education can be seen dramatically in the extremely high illiteracy rates among adults, shown in Figures 1 (men) and 2 (women), that exceed 60% in rural areas and are among the very highest in the world.[48]

The rapid expansion of the education system in the late 1970s, and its continued expansion through the 1980s and 1990s, is illustrated in Figures 5 and 6 which show, respectively, the construction of schools and classrooms during the 20th century.[49] Today, with over 16,000 schools in the education system, there is a school for every third village. However, despite the apparent widespread availability of schools, and the significant resources that are spent on education[50], enrollment rates are still quite low with 68% of eligible boys and 45% of eligible girls currently enrolled.[51] And, importantly, the relatively dramatic geographic variation in the enrollment rates in rural areas, as shown in Figures 3 and 4, demonstrates the variance in educational opportunities available to Yemeni children in these areas.

The recent expansion of the education system, which has occurred almost entirely in the last 20-25 years as demonstrated in Figures 5 and 6, is key to my identification assumption. Indeed, while the education system, and the patronage system that accompanies it as discussed in Section 5.1 below, has developed very recently, the tribal system is both old and stable as discussed in Section 2.3 above. It is thus unlikely that the education system would have impacted the basic tribal structure in any way.

[46]Under the rule of the Imam, education was done almost entirely in mosques, focused on religious study and the study of Islamic jurisprudence and was restricted to only the elite.

[47]Though Arab and other foreign countries did play an important role in the provision of teachers and the development of curriculum in the early years of this expansion, as is often discussed, local communities also played a central role (Alagbari 1992). Indeed, nearly 60% of the school capacity built in Yemen was built by local communities without the financial support of either the central government or foreign donors (author's calculations using the 2007 Education Census)

[48]The standard census definition of an adult in Yemen is defined as any individual over 15.

[49]The initial expansion of the education system was driven by the first oil boom as the remittances earned by Yemeni workers employed in Saudi Arabia and the Gulf surged. Alwashli (2007) provides a more expansive discussion of the expansion of the education system after the Revolution.

[50]Education is the largest component of current government expenditures and accounts for around 20% of the total budget (though the actual share varies substantially from year to year though it has remained between 15-25% of the budget in recent years).

[51]In addition to lack of access to educational facilities, two central explanations are usually offered for these low enrollment rates. The first is the high cost of education. Though school is purportedly freely provided, a variety of fees are typically charged to students which are often prohibitive (see Contin, Egel, Moore, and Ogleh (2009) for a discussion of this). Note that the Ministry of Education in cooperation with the World Bank and the European Council are currently experimenting with several conditional cash transfer programs to help alleviate this difficulty. The second is the particular severity of teacher absenteeism in Yemen with estimates of absenteeism ranging from 16% (World Bank 2006) to around 50% (Contin, Egel, Moore, and Ogleh 2009).

B Data Appendix

B.1 Yemen's Administrative Structure

The Republic of Yemen currently has three main levels in its administrative hierarchy.[52] The largest administrative structure is the governorate of which there are a total of 21, six of these are from the former People's Democratic Republic of Yemen and the remaining 15 are from the former Yemen Arab Republic (North Yemen). These 21 governorates are then sub-divided into a total of 333 districts which are further divided into nearly 2,200 sub-districts, the smallest official administrative structure. The nearly 40,000 villages, which are themselves composed of approximately 200,000, do not have any official status and are typically a locally defined concept.[53]

For the rural populations that are the focus of this study, the most recent population census from 2004 reported a total population of just over 14 million individuals residing in 38,736 villages.[54] The median district had a population of approximately 35,000, though there is significant variation in the population of these governorates as the smallest governorate had a population of under 2,000 while the largest had a population of nearly 200,000. And the median sub-district had 4,000 inhabitants though again there was relatively significant variation of over 8000 with sub-district populations ranging from only one hundred individuals to approximately 80,000.[55]

B.2 Population and Economic Controls

The population censuses from 1994 and 2004, which were used for the calculation of the true enrollment rate within an area, contain a variety of other important population and economic control variables. They report the size of the potential local student population as well as a variety of variables designed to measure the amount of public services available in these areas. The public services surveyed include (1) percent of citizens without access to sanitation, (2) percent of citizens without access to electricity, (3) percentage of households using wood, coal and kerosene for cooking, (4) percentage of households without water from a paper and (5) the educational enrollment rates of boys and girls ages 6-15. While these data are available at the village level, sub-district average/aggregates were calculated for the analysis considered here using the total population in a village as weights. The summary statistics for these variables are included in Table 4.

[52] A variety of other structures, such as sub-governorates, were used in the past but do not find much practical use today.

[53] It is thus impossible to calculate the actual number of villages in Yemen as villages are defined differently in different data sources. Indeed, while a particular hamlet may be reported in a census as part of another village by a local informant, the informant that is interviewed in another census may indicate that the local hamlet is actually another village. In general, the census officers and field workers defer to the judgement of the local informant which is typically a local elder or leader. In many cases this leads to settlements with only one household and 8-10 members being identified as a separate village in the census.

[54] The total population in 2004 was just over 20 million.

[55] In the southern govenorates, i.e. those of former South Yemen, sub-districts are much more rare and the district is often the smallest administrative structure above the village.

B.3 Agricultural Controls

Agriculture, which is the primary source of income in rural Yemen with the exception of migrant labor, undoubtedly had an impact on the development of the tribal structure. And as agricultural production continues to be an important source of local wealth, and an important cause of local inequality, it might be expected to affect modern economic and political outcomes. Access to cultivable land, the availability of water resources, the type of land sharing arrangements and the type of crops that can be supported by the local climate would all be expected to affect individual returns to education as well as the overall development of the community.

In order to control for the potential impact of agricultural factors on both tribes and educational variables, I include a variety of agricultural variables, drawn from the 2001 Agricultural Census. These variables include: the total amount of land owned by private individuals, the share of the land that is cultivable, the type of water access that is available, the size of land holdings, the amount of animal assets held and the amount of land devoted to grain, qat and cash crop production. This last variable is of particular important as *qat*, which requires significant amounts of water and grows only in specific climates, is the only true cash crop in Yemen. Though these data are available at the village level, as the primary unit of analysis here is the sub-district, I calculate sub-district averages for each of the variables using the total population in each village as the weight for that village. The full list of variables as well as their mean and standard deviation are included in Table 4.

The agricultural census does not include all of the governorates for which I have tribal data. The governorate of Al-Jawf was not included in the agricultural census as the Ministry of Agriculture and Central Statistical Office judged that the data from this governorate were systematically biased (i.e. residents of these areas were instructed to lie about their assets and land by their governor). This is a particular concern as the villages code that are used to match the 1994 population census are drawn from the agriculture census, and I am thus compelled to drop this governorate throughout my analysis.

B.4 Area and Terrain Controls

Both population density and terrain quality are likely to affect both educational outcomes and the tribal structure. Thus, my analysis includes measures of terrain ruggedness as well as the the area of the units of analysis. The latter variable corrects for the population density as all the analysis includes measures of the size of the local population. See Table 4 for the summary statistics of these variables.

Measures of area were drawn from two sources. The area of the administrative units of analysis themselves which was extracted from the ArcGIS maps that accompanied the 2004 population census, and the 2001 agriculture census reports the total amount of land claimed by the villages contained within an administrative unit. In all cases, the logarithm of area was calculated before it was included in the analysis.

For my measure of terrain ruggedness I use the vector ruggedness measure (VRM) of Sappington, Longshore, and Thompson (2007).[56] Though other studies in economics have

[56]The USGS GTOPO30 file 'e020n40', which reports the elevation at approximately one kilometer intervals for the Arabian peninsula and eastern Africa, was used for these calculations. It was downloaded from

focused on the terrain ruggedness index (TRI) of Riley, DeGloria, and Elliot (1999) (cf. Burchfield, Overman, Puga, and Turner 2006; Nunn and Puga 2009), there are two reasons that I have opted to use the VRM. The first is that the VRM is more appropriate for the current analysis as it quantifies ruggedness independently of slope. This is important because even steep terrain is relatively easy to traverse if it is not uneven and broken. Second, calculation of the VRM is facilitated by the availability of a publicly available toolbox for ArcGIS that is designed to calculate this measure.[57]

C Elite Capture during the Decentralization Process

Three aspects of the decentralization process gave local elites significant control over the results of this process. A first major concern was that the demarcation of the local council constituencies was particularly susceptible to manipulation by local, typically tribal, elites. Though the Local Authority Law did create relatively specific criteria for the size of the constituencies for the local elections, in that all constituencies within an administrative border must be within 5% of each other in terms of population, the Supreme Elections Committee (SEC) had neither sufficient time nor the capacity to properly delineate these constituencies. Indeed, as the law authorizing the elections was only passed in 2000, and the elections were held the following year, the SEC was left with the responsibility of creating nearly 7,000 new electoral districts within a year (NDI 2000). A daunting task without the added complication that the SEC did not (1) have the demographic data easily available for constructing these districts and (2) did not have the technical capability to use any sort of technology to help them in the process. The result was that the SEC became overly reliant on the the assistance of local, and often tribal, elites in creating these constituencies.

Second, there is an indication that voter registration and education for these elections was insufficient to guarantee democratic outcomes, and that their weakness gave local elites significant control over the outcome of elections. First, the voter registration system had a number of important deficiencies. These deficiencies included the disqualification of voters who were unregistered as of 1999, the existence of duplicate and false registrations,[58] and the ability of individuals to vote where they lived, worked or were born. More nefarious irregularities including voter intimidation and voter impersonation, which was relatively common, also occurred during these elections.[59] Second, the effectiveness of these local elections in selecting councils that are representative of the local populations is predicated on the existence of local populations that are both educated about the elections and their

http://eros.usgs.gov/#/Find_Data/Products_and_Data_Available/gtopo30_info.

[57]This toolbox is available from http://arcscripts.esri.com/details.asp?dbid=15423. It is important to note that the TRI measure also has a script available to facilitate calculation (http://arcscripts.esri.com/details.asp?dbid=12435). However, this script is in practice quite difficult to implement with ArcGIS desktop as it was developed for ArcInfo Workstation.

[58]The report from the National Democratic Institute (2000) noted the existence of both dead and fictitious people on voting rosters. And while nearly 200,000 of these names were cleansed from official registries before the local elections, it is certain that many more remained.

[59]The IFES (2005) report alludes to the coercion of voters in their recommendations for improvements in the voting system. Spinelli (2003) refers to the existence of significant amounts of voter impersonation in his recommendations.

implications. However, as the local elections were announced only a year before they took place, observers of the election were concerned that the SEC was largely incapable of meeting its legal responsibility to educate the public about the governorate and local council elections (NDI 2000).

A third concern is that the nomination process for candidates of local elections highly favored the existing elite. While, in principle, all local residents were qualified to contest elections for the local councils, two important factors served to restrict the candidate pool. The first is that local election committees would often reject nomination applications without explanation and without any possibility for that individual to appeal (IFES 2005). This issue is particularly significant as local election committees were appointed and typically from the local elite. The second is that individuals who were not supported by one of the major political parties faced difficulty in the nomination process as they were required to obtain signatures that needed to be validated by a member of the local elite (i.e. local elder, local judge) before their nomination would be accepted.

Figure 1: Illiteracy Among Men Ages 10 and Over in 1994 and 2004

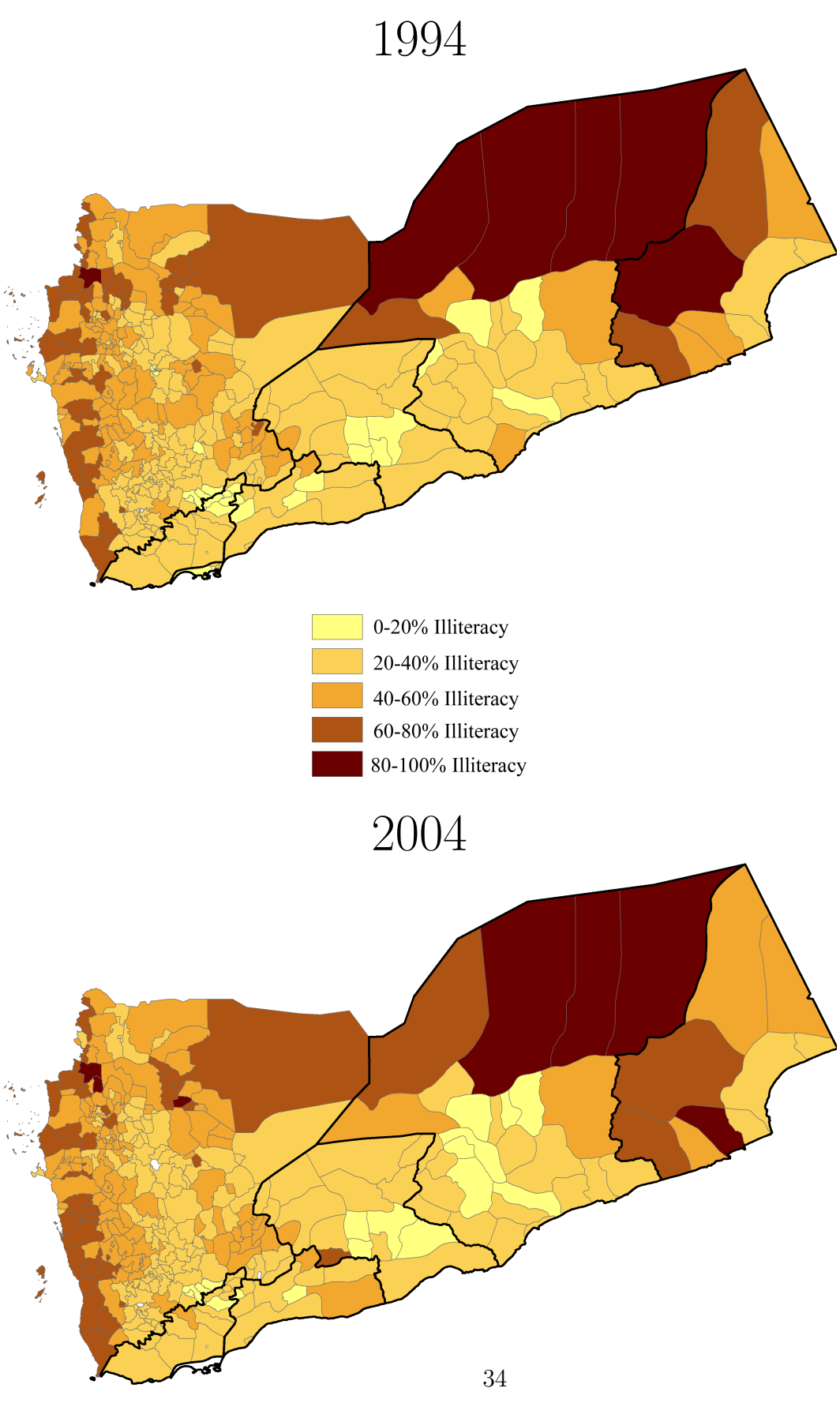

Figure 2: Illiteracy Among Women Ages 10 and Over in 1994 and 2004

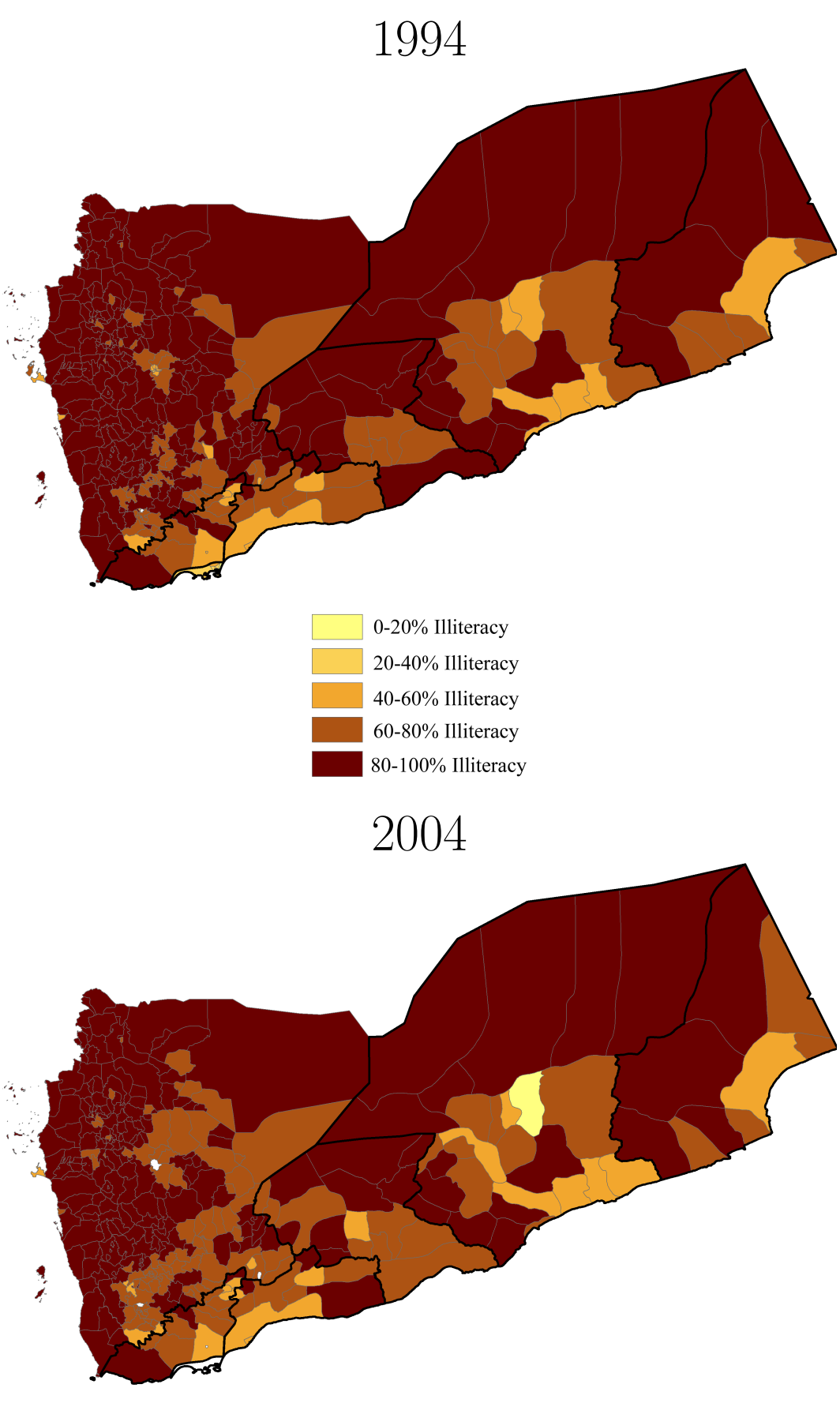

Figure 3: Male Enrollment Rates in 2004

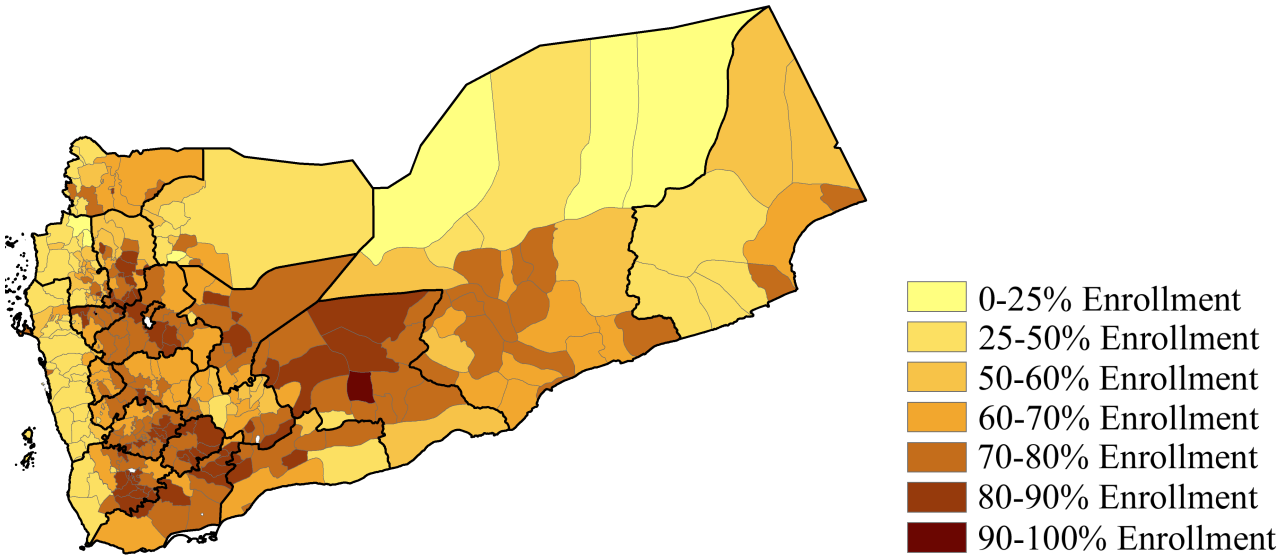

Figure 4: Female Enrollment Rates in 2004

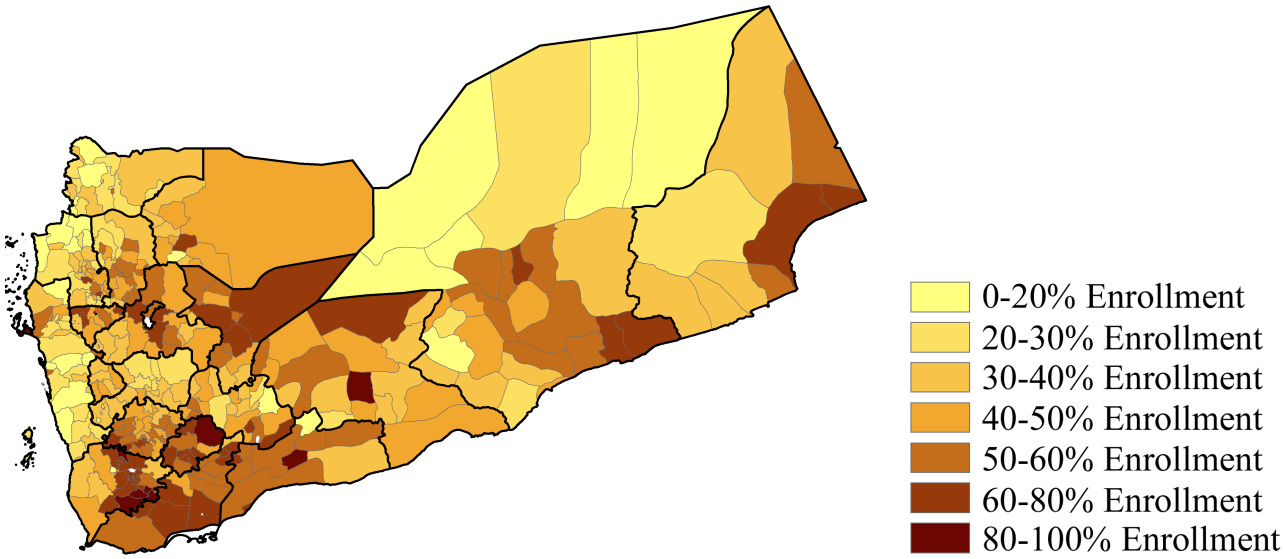

Figure 5: School Construction in the Northern Governorates

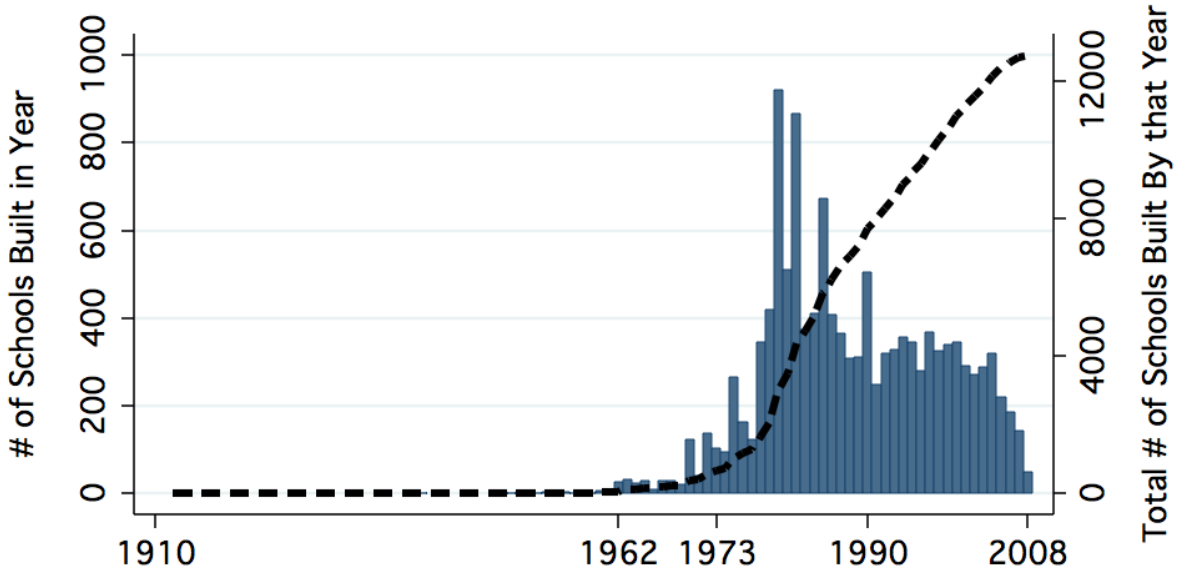

Figure 6: School Room Construction in the Northern Governorates

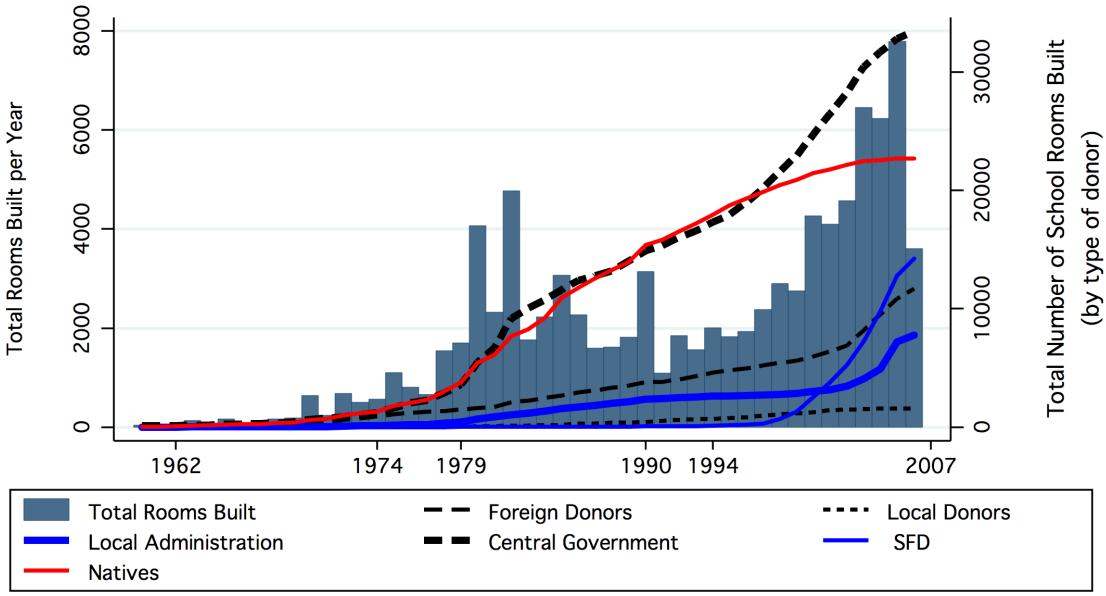

Figure 7: Tribal diversity in Six Governorates of Northern Yemen

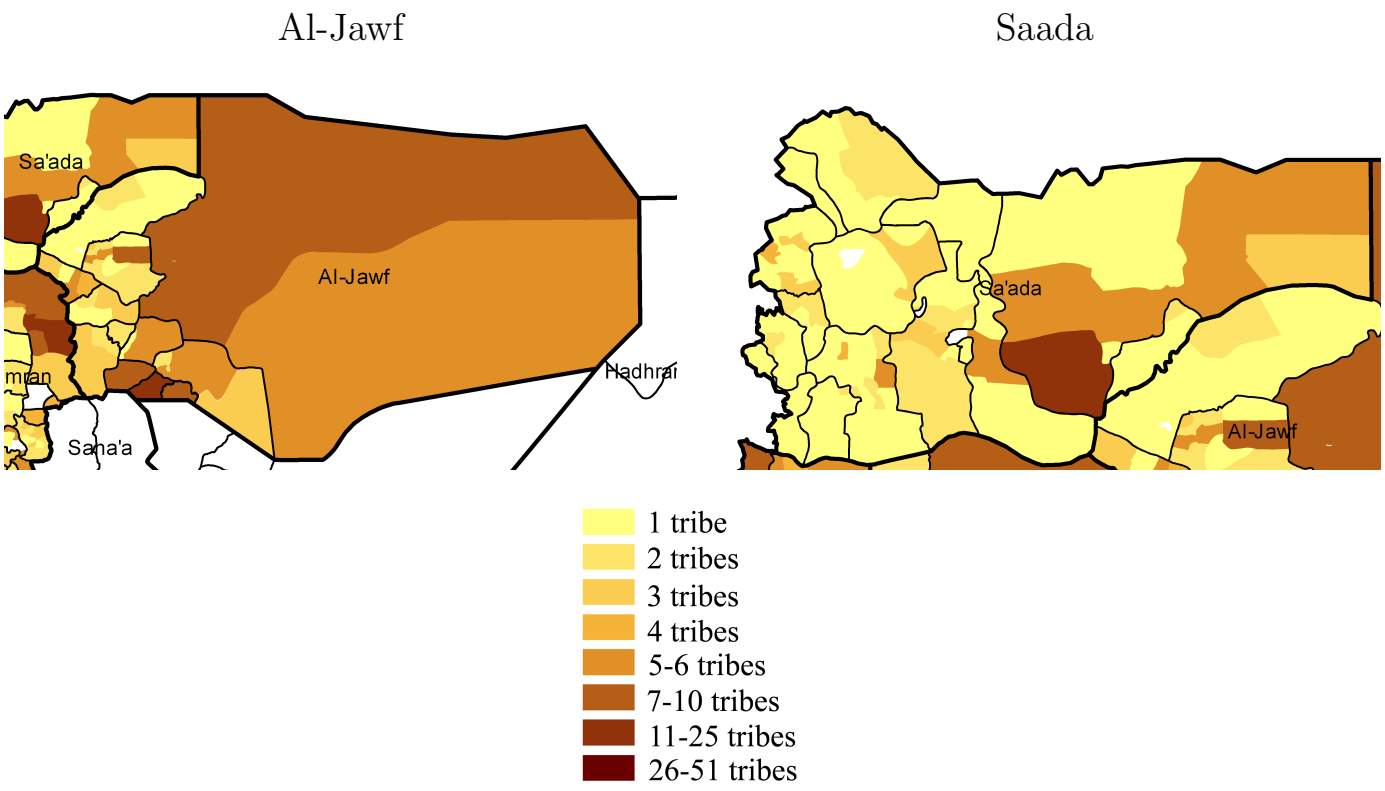

Figure 8: Scatter Plot of Ghost Teachers and Number of Tribes

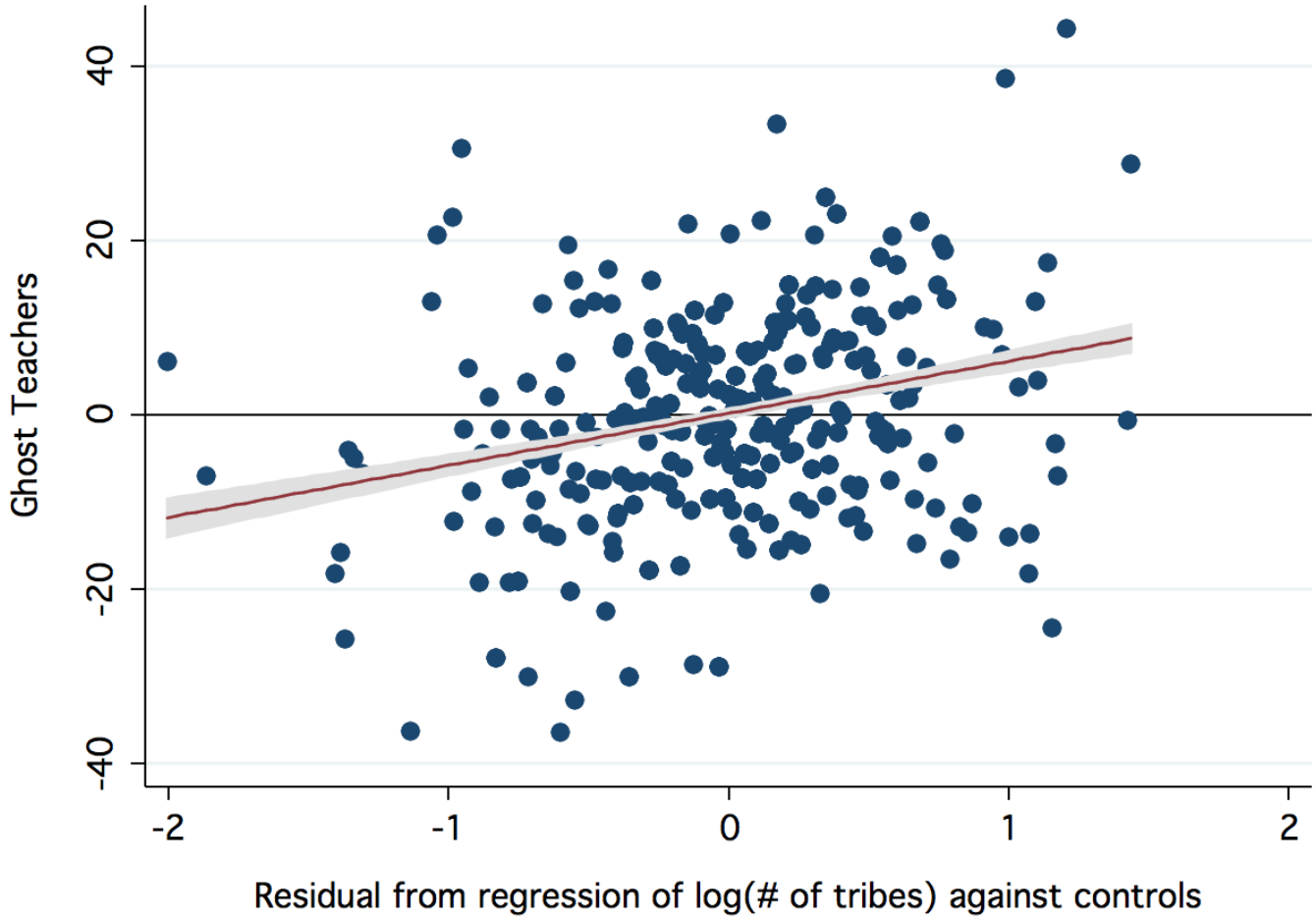

Table 1: Summary Statistics for Tribal Data

	Mean Number of Unique Tribes per…			
	Subdistrict	**District**	**Governorate**	**Overall**
# of Confederations	1.76	9.42	130.4	645
	(1.11)	(11.51)	(100.9)	
# of Tribes	4.69	34.38	426.4	2466
	(5.32)	(45.2)	(383.7)	
N =	679	84	6	1
Number of Villages =	10,993			
Number of Residents =	5,254,153			

Table 2: Measures of Tribal diversity

	Mean	**Standard Deviation**	**Observations**
log(# of tribes within SUB-DISTRICT)	1.09	0.92	665 (sub-districts)
log(# of tribal confederations within DISTRICT)	1.63	1.12	84 (districts)

Table 3: Summary Statistics for Key Educational Variables

Variable	Unit	Year	Mean	Standard Deviation	Observations
Reported Number of Male Teachers	Total	1999	3.7	6.8	633 (sub-districts)
		2001	3.8	7.0	633 (sub-districts)
		2006	4.8	8.5	641 (sub-districts)
Reported Ratio of Male Teachers to Male Students	Mean	1999	60.8	27.4	633 (sub-districts)
		2001	62.1	24.1	633 (sub-districts)
		2006	59.6	23.2	641 (sub-districts)
Number of Male Teachers per 1,000 School Age Boys	Mean	1999	36.1	23.8	633 (sub-districts)
		2001	41.4	27.0	633 (sub-districts)
		2006	43.9	27.3	641 (sub-districts)
Enrollment among Boys	Mean	1994	65.4	20.4	620 (sub-districts)
		2004	65.6	20.0	674 (sub-districts)
Estimated Number of Ghost Pupils (100s)	Mean	1999	2.4	4.7	633 (sub-districts)
		2001	3.0	4.8	633 (sub-districts)
		2006	3.4	4.9	641 (sub-districts)
Estimated Number of Ghost Teachers	Mean	1999	0.3	19.5	633 (sub-districts)
		2001	0.3	22.2	633 (sub-districts)
		2006	0.2	21.5	641 (sub-districts)

Table 4: Population, Area, Terrain, Economic and Agricultural Controls

		Mean	Standard Deviation	Observations
Population Controls	log(number of boys in the sub-district in 1994)	6.5	0.85	608 (sub-districts)
	log(number of boys in the sub-district in 2004)	6.6	0.80	659 (sub-districts)
	log(number of boys in the district in 1994)	8.9	0.67	70 (districts)
	log(number of boys in the district in 2004)	8.8	0.78	83 (districts)
	log(# villages in sub-district)	2.2	0.81	659 (sub-districts)
	log(# villages in district)	4.3	0.96	83 (districts)
Area and Terrain Controls	log(area of the sub-district)	17.1	1.3	659 (sub-districts)
	log(area of the district)	19.6	1.1	83 (districts)
	Ruggedness (VRM) in sub-district	0.37	0.11	659 (sub-districts)
	Ruggedness (VRM) in district	0.38	0.07	83 (districts)
Economic Controls	% Adult Males Illiterate (1994)	52.8	24.9	608 (sub-districts)
	% Adult Males Illiterate (2004)	51.5	25.0	656 (sub-districts)
	% Adult Females Illiterate (1994)	92.1	13.1	608 (sub-districts)
	% Adult Females Illiterate (2004)	87.1	15.7	656 (sub-districts)
	% of Households using Wood, Coal or Kerosense for Cooking (1994)	85.9	26.6	608 (sub-districts)
	% of Households using Wood, Coal or Kerosense for Cooking (2004)	46.1	42.0	656 (sub-districts)
	% of Households without Sanitation (1994)	88.8	23.1	608 (sub-districts)
	% of Households without Sanitation (2004)	87.4	23.7	656 (sub-districts)
	% of Households without Piped Water (1994)	86.6	29.2	608 (sub-districts)
	% of Households without Piped Water (2004)	84.3	32.4	656 (sub-districts)
	% of Households without Electricity (1994)	84.9	31.1	608 (sub-districts)
	% of Households without Electricity (2004)	75.2	38.7	656 (sub-districts)
Agricultural Controls	log(total area owned by villagers in sub-district)	12.5	1.2	610 (sub-districts)
	% of Land Cultivable	87.5	10.9	610 (sub-districts)
	% of Cultivable Land that is Rainfed	67.8	31.6	610 (sub-districts)
	% of Cultivable Land that is Fed from Wells	3.3	11.0	610 (sub-districts)
	% of households owning plots less than 5,000 square meters	59.7	26.3	610 (sub-districts)
	% of households owning plots 5,000-20,000 square meters	22.3	16.7	610 (sub-districts)
	Number of goats & sheep per household	7.2	10.5	610 (sub-districts)
	Number of cows per household	0.9	0.6	610 (sub-districts)
	% of land cultivated with grains	54.0	28.2	610 (sub-districts)
	% of land cultivated with qat	16.3	19.7	610 (sub-districts)
	% of land cultivated with cash crops	3.5	8.1	610 (sub-districts)

Table 5: Sub-district Tribal Diversity and Ghost Pupils and Teachers

Dependent Variable:	**Number of Ghost Pupils (100s)**			**Number of Ghost Teachers**		
Year	**1999**	**2001**	**2006**	**1999**	**2001**	**2006**
log(# of tribes in SUB-DISTRICT)	1.63***	1.28**	1.53	8.54**	9.60***	10.34***
	(0.60)	(0.54)	(0.93)	(3.37)	(2.80)	(2.85)
Population Controls[1]	Yes	Yes	Yes	Yes	Yes	Yes
Area and Terrain Controls[1]	Yes	Yes	Yes	Yes	Yes	Yes
Economic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Agricultural Controls	Yes	Yes	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.64	0.63	0.63	0.35	0.42	0.40
Number of Subdistricts	576	576	583	576	576	583
Number of Districts	70	70	70	70	70	70

Note: Regressions are weighted by the population of boys in each sub-district.

1: Includes sub-district controls.

Table 6: Relationship of Sub-District Socioeconomic Variables and Ghost Pupils and Teachers

	Dependent Variable:	**Number of Ghost Pupils (100s)**			**Number of Ghost Teachers**		
	Year:	**1999**	**2001**	**2006**	**1999**	**2001**	**2006**
Area and Terrain Controls	log(number of boys in the sub-district)	0.98	1.50	2.59	-9.58**	-12.47**	-7.66
		(1.07)	(1.02)	(1.61)	(4.73)	(5.20)	(5.64)
	log(# villages in sub-district)	4.05***	3.99***	4.29***	6.81*	10.26**	7.55*
		(0.75)	(0.78)	(0.92)	(3.68)	(4.21)	(4.21)
	log(area of the sub-district)	-0.40	-0.24	-0.86	3.94	3.91	3.57
		(0.59)	(0.62)	(0.75)	(2.89)	(3.34)	(2.89)
	Ruggedness (VRM) in sub-district	-1.85	-2.20	-2.30	11.02	28.64*	12.87
		(2.56)	(2.63)	(2.23)	(12.71)	(15.81)	(11.49)
Economic Controls	% Adult Males Illiterate	-0.02	-0.02	-0.03	0.06	0.06	-0.00
		(0.03)	(0.03)	(0.04)	(0.17)	(0.19)	(0.18)
	% Adult Females Illiterate	-0.07	-0.05	0.05	-1.22***	-1.40***	-1.22***
		(0.04)	(0.05)	(0.06)	(0.28)	(0.33)	(0.27)
	% of Households using Wood, Coal or Kerosense for Cooking	-0.00	-0.02	0.00	-0.18**	-0.25***	-0.10
		(0.01)	(0.01)	(0.02)	(0.08)	(0.09)	(0.07)
	% of Households without Sanitation	-0.03	-0.03	-0.08*	0.25*	0.28**	0.07
		(0.02)	(0.02)	(0.04)	(0.14)	(0.13)	(0.12)
	% of Households without Piped Water	-0.00	0.00	0.01	-0.10	-0.09	-0.07
		(0.01)	(0.01)	(0.02)	(0.08)	(0.08)	(0.08)
	% of Households without Electricity	0.01	0.01	-0.00	0.23***	0.28***	0.23***
		(0.01)	(0.01)	(0.02)	(0.08)	(0.09)	(0.07)
Agricultural Controls	log(total area owned by villagers in sub-district)	0.45	0.28	0.57	2.15	4.31***	3.80**
		(0.44)	(0.44)	(0.37)	(1.40)	(1.55)	(1.44)
	% of Land Cultivable	0.02	0.03	0.02	0.09	0.16	0.02
		(0.02)	(0.02)	(0.03)	(0.16)	(0.19)	(0.19)
	% of Cultivable Land that is Rainfed	0.03*	0.03*	0.01	0.22***	0.23***	0.07
		(0.01)	(0.01)	(0.02)	(0.07)	(0.08)	(0.09)
	% of Cultivable Land that is Fed from Wells	0.07	0.06	0.08**	0.26	0.16	0.10
		(0.04)	(0.04)	(0.04)	(0.20)	(0.17)	(0.22)
	% of households owning plots less than 5,000 square meters	0.04	0.03	0.01	0.09	0.04	0.12
		(0.02)	(0.02)	(0.02)	(0.11)	(0.12)	(0.13)
	% of households owning plots 5,000-20,000 square meters	0.01	0.00	-0.01	-0.10	-0.18	-0.14
		(0.04)	(0.04)	(0.04)	(0.13)	(0.15)	(0.15)
	Number of goats & sheep per household	0.02	0.01	0.02	-0.00	0.04	0.16
		(0.03)	(0.04)	(0.03)	(0.24)	(0.25)	(0.19)
	Number of cows per household	-0.73	-0.71	-0.75	-1.53	-4.58	-5.58
		(0.65)	(0.66)	(0.66)	(2.95)	(3.70)	(3.61)
	% of land cultivated with grains	-0.02	-0.04*	-0.02	-0.14	-0.21	-0.06
		(0.02)	(0.02)	(0.02)	(0.10)	(0.13)	(0.13)
	% of land cultivated with qat	-0.01	-0.03	-0.00	-0.14	-0.21	-0.08
		(0.03)	(0.02)	(0.04)	(0.12)	(0.14)	(0.14)
	% of land cultivated with cash crops	-0.03	-0.04	-0.04	-0.08	-0.09	0.05
		(0.04)	(0.04)	(0.03)	(0.19)	(0.23)	(0.20)
	District fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
	R^2	0.62	0.62	0.62	0.33	0.39	0.37
	Number of Subdistricts	576	576	583	576	576	583
	Number of Districts	70	70	70	70	70	70

Note: Regressions are weighted by the population of boys in each sub-district.

Table 7: District Tribal Diversity and Ghost Pupils and Teachers

Dependent Variable:	Number of Ghost Pupils (100s)			Number of Ghost Teachers		
Year	1999	2001	2006	1999	2001	2006
log(# of tribes in SUB-DISTRICT)	1.11***	0.74*	1.10**	5.81**	6.82***	7.55***
	(0.40)	(0.43)	(0.47)	(2.45)	(2.40)	(2.81)
log(# of tribal confederations in DISTRICT)	-0.80	-0.65	-0.39	-6.72**	-7.49**	-8.09***
	(0.50)	(0.74)	(0.37)	(3.07)	(3.35)	(2.77)
Population Controls[1]	Yes	Yes	Yes	Yes	Yes	Yes
Area and Terrain Controls[1]	Yes	Yes	Yes	Yes	Yes	Yes
Economic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Agricultural Controls	Yes	Yes	Yes	Yes	Yes	Yes
Governorate fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.59	0.55	0.59	0.25	0.27	0.26
Number of Subdistricts	576	576	583	576	576	583
Number of Districts	70	70	70	70	70	70

Note: Regressions are weighted by the population of boys in each sub-district. Estimates are clustered at the district level.
1: Includes sub-district and district controls.

Table 8: Relationship of District Socioeconomic Variables and Ghost Pupils and Teachers

Dependent Variable:	Number of Ghost Pupils (100s)			Number of Ghost Teachers		
Year	1999	2001	2006	1999	2001	2006
log(number of boys in the district)	-2.16*	-2.24**	-1.41	-8.64*	-12.91**	-7.58
	(1.13)	(1.10)	(1.54)	(4.67)	(5.47)	(5.43)
log(# villages in district)	1.51*	1.06	0.92	1.79	2.98	3.79
	(0.85)	(0.88)	(1.21)	(4.24)	(5.11)	(5.56)
log(area of the district)	0.16	0.55	0.25	0.96	0.02	-3.94
	(0.60)	(0.67)	(0.73)	(3.97)	(4.75)	(3.62)
Ruggedness (VRM) in district	-4.59	-6.02	-4.58	3.30	-9.03	-14.77
	(5.26)	(5.48)	(5.03)	(28.81)	(33.47)	(32.90)
Population Controls[1]	Yes	Yes	Yes	Yes	Yes	Yes
Area and Terrain Controls[1]	Yes	Yes	Yes	Yes	Yes	Yes
Economic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Agricultural Controls	Yes	Yes	Yes	Yes	Yes	Yes
Governorate fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.58	0.55	0.59	0.23	0.25	0.23
Number of Subdistricts	576	576	583	576	576	583
Number of Districts	70	70	70	70	70	70

Note: Regressions are weighted by the population of boys in each sub-district. Estimates are clustered at the district level.
1: Includes sub-district and district controls.

Table 9: The Decentralization Reform and the Local Allocation Decision

Dependent Variable:	**Number of Ghost Pupils (100s)**		**Number of Ghost Teachers**	
	(1)	**(2)**	**(3)**	**(4)**
log(# of tribes in SUB-DISTRICT)	1.48**	1.47**	9.50***	8.86***
	(0.62)	(0.59)	(2.47)	(2.69)
log(# of tribes in SUB-DISTRICT) * (Year = 2001)		-0.25		0.87
		(0.17)		(0.70)
log(# of tribes in SUB-DISTRICT) * (Year = 2006)		0.26		1.03
		(0.28)		(1.44)
Year = 2001	0.73***	1.03***	0.04	-1.01
	(0.16)	(0.32)	(0.72)	(1.04)
Year = 2006	1.75***	1.43***	1.23	-0.02
	(0.27)	(0.34)	(1.38)	(1.84)
Population Controls[1]	Yes	Yes	Yes	Yes
Area and Terrain Controls[1]	Yes	Yes	Yes	Yes
Economic Controls	Yes	Yes	Yes	Yes
Agricultural Controls	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes
R^2	0.63	0.63	0.42	0.42
Number of Subdistricts	1735	1735	1735	1735
Number of Districts	70	70	70	70

Note: Regressions are weighted by the population of boys in each sub-district. Estimates are clustered at the district level.

1: Includes sub-district controls.

Table 10: The Decentralization Reform and the Governorate Allocation Decision

Dependent Variable:	**Number of Ghost Pupils (100s)**		**Number of Ghost Teachers**	
	(1)	**(2)**	**(3)**	**(4)**
log(# of tribes in SUB-DISTRICT)	1.48**	1.32**	9.50***	8.34***
	(0.62)	(0.58)	(2.47)	(2.83)
log(# of tribes in SUB-DISTRICT) * (Year = 2001)		-0.09		1.07
		(0.17)		(0.99)
log(# of tribes in SUB-DISTRICT) * (Year = 2006)		0.55		2.41
		(0.40)		(2.05)
log(# of tribal confederations in DISTRICT)	0.48	0.68	-8.39***	-7.67***
	(0.66)	(0.68)	(2.54)	(2.62)
log(# of tribal confederations in DISTRICT) * (Year = 2001)		-0.22		-0.27
		(0.23)		(0.74)
log(# of tribal confederations in DISTRICT) * (Year = 2006)		-0.39		-1.85
		(0.31)		(1.26)
Year = 2001	0.73***	1.27**	0.04	-0.73
	(0.16)	(0.49)	(0.72)	(1.35)
Year = 2006	1.75***	1.85***	1.23	1.94
	(0.27)	(0.51)	(1.38)	(1.93)
Population Controls[1]	Yes	Yes	Yes	Yes
Area and Terrain Controls[1]	Yes	Yes	Yes	Yes
Economic Controls	Yes	Yes	Yes	Yes
Agricultural Controls	Yes	Yes	Yes	Yes
Governorate fixed effects	Yes	Yes	Yes	Yes
R^2	0.63	0.63	0.42	0.42
Number of Subdistricts	1735	1735	1735	1735
Number of Districts	70	70	70	70

Note: Regressions are weighted by the population of boys in each sub-district. Estimates are clustered at the district level.

1: Includes sub-district and district controls.