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Stream: Governance

The “Instituted Process” of Groundwater Exchange in Gujarat, India (Irrigation)

Introduction

The agricultural economy of South Asia and the livelihoods of millions are tied to current patterns of groundwater use. Groundwater currently irrigates between one half and three quarters of irrigated land in South Asia. This development has not, however, been brought about by the state, whose program of public tubewells has been widely acknowledged as a failure (Dhawan 1995). Instead, 95% of this water is pumped from privately owned wells, which supplies a burgeoning market in groundwater. In the ongoing ideological tussle between state and market-led approaches to resource development, this has been hailed as a victory by market triumphalists.¹ Today, there is a chorus of support for private ownership of wells in conjunction with sales of groundwater, a form of groundwater development that has reached its most sophisticated expression in the state of Gujarat, India (Shah 1993).² Advocates of this approach argue that the role of policy makers is simply to nudge the market toward greater competition. In this paper I take issue with this interpretation of groundwater markets in Gujarat, I argue that the system of exchange for groundwater in Gujarat is deeply embedded in social relations. I describe exchange systems that do not follow abstract laws of supply and demand nor bend completely to competitive forces, but that are forged collectively in the crucible of local politics. Markets for groundwater in Gujarat are, in Polanyi’s terms, an “instituted process”. To make policy, we need to understand this process. To understand the process, we need to explore the social and hydrological context of water exchange, and place this in historical perspective. This paper will undertake this task in two villages of North Gujarat.

Before embarking on a description of the first village and the exchange systems that prevail, it is worth clarifying the claims of the Gujarat model and the scope of this paper. Advocates of privatization as a means of resolving the “tragedy of the commons” emphasize the need for allocation of well-defined property rights over a resource. Private well-ownership in Gujarat is not, however, supported by a system of property rights over water. Instead, property rights are

¹ Indeed, a strength of the common property approach is the identification and study of community based management institutions that are “neither market nor state” (Ostrom 1994)

² Gujarat is arguably the most high-profile of several examples of water markets in South Asia. These include studies of Pakistan (Strosser and Meinzen-Dick 1994), Tamil Nadu (Janakarajan 1994) and Bihar (Wood 1995).

de facto conferred by well ownership in an open access regime, and water pumping is limited only by the supply of electricity or diesel for pumps. The end result is, as expected, over-pumping and degradation of the groundwater resource with annual declines of five to ten feet in some areas. With ill-defined property rights over groundwater, the Gujarat model advocates regulation of electricity supply as an indirect way of addressing the provision problem.³

In this paper, I do not explore the merits and demerits of the provision aspects of the problem which rests on the question of private property rights. Instead, I explore the contention of the Gujarat model that the “assignment problem” familiar to students of common pool resources (CPRs) has been effectively addressed by market discipline, and the corollary that the role of public policy is merely to stimulate market competition.

I begin by introducing the primary case village. I then describe the patterns of purchase and sale for water in this village and the degree of dependence on purchased groundwater. The next section describes the rules under which water is exchanged. A description of rules sets the stage for a discussion of how those rules are constructed and contested. Next, I briefly, sketch the operation of water markets in a nearby village that provides a stark contrasting case. The final section concludes by drawing implications for policy and theory.

An Introduction to Ratanpura

The village of Ratanpura (a fictional name) is located in the semi-arid plains of Mehsana district in North Gujarat. The village is dominated by one land-holding caste, the Patels, who own 97% of village land. Other, lower caste groups either work as wage labour -- although a lucky few are able to get land on tenancy -- or support themselves through trade and artisanal work.

The region sits above a large alluvial aquifer. Wells in the village pump water from about of 350 ft although many wells have been drilled to depths of 750 ft. The water is distributed to fields through a complex array of underground pipelines that criss-cross the village lands. Groundwater accounts for the vast majority of irrigation and all of the drinking water supply. In addition, Ratanpura is at the tail-end of a canal irrigation system that provides supplemental water erratically. The main crops cultivated are wheat, mustard, and castor, with some summer cultivation of millet.

Water Assignment through Exchange

I begin by exploring the pattern of well ownership, and the “thickness” and structure of the market for groundwater. Access to water mirrors the uneven distribution of land in Ratanpura. The dominant Patel community, which owns 97% of land, owns all the wells in the village. However, as the table below shows, there are substantial inequalities within this community. Well ownership can take three forms: sole ownership, shared family ownership, and partnership with several other households. The data suggest that large land-owners are more likely to be sole owners, and that small land-owners are unlikely to own a well. However, there are some

³ Ostrom et. al. (1994) describe an analytical typology for the study of CPRs. One set of problems relates to allocation of the flow -- appropriation problems -- and include appropriation externalities, assignment problems and technological externalities. Another set of issues surrounds ensuring that the stock of the resource is not unduly drawn down -- provision problems. In this paper I explore the former, with particular attention to assignment problems.

significant exceptions, where even medium to large land-owners do not have direct access to water.

Table 1: Ratanpura: Well Ownership by Land Class, Sample Survey 1996

Land ownership (bighas)	Sole owner	Family	Partnership	No well	Total
0	0	0	0	1	1
0.1 - 5.0	0	5	4	16	25
5.1 - 10.0	3	2	5	8	18
10.1 - 20.0	3	1	0	2	6
20.1 - 30.0	2	0	1	0	3
> 30.1	8	8	10	27	53

Note: 1 bigha = 0.6 acres

In this context, many farmers in Ratanpura rely on purchase of water from one or more well-owners. One measure of the “thickness” of the market is the volume of pumped water that is then sold. Of the 15 wells in Ratanpura, water from all but one is offered to other farmers for sale.⁴ On average, well-owners in Ratanpura sell 61% of the water they pump, and use only 39% on their own and their partners’ land.⁵ The maximum proportion of water sold is 86% and the minimum, 40%. If the partnership wells are excluded, this average proportion of sales rises to 66%, and if all transaction by partnership wells, including those to partners, are treated as sales, it rises to 71%. While what does and does not constitute a transaction are not simple to define, particularly for partnership wells, these figures do demonstrate that the sale and purchase of water is an important means by which Ratanpura farmers obtain irrigation.

Moreover, even well-owners resort to water purchases to irrigate their own lands that are distant from their wells. All but two of the 15 well-owners (or primary managers in the case of partnership wells) also purchase water. The proportion of well-owners’ land irrigated by purchased water ranges from 5% to a substantial 61%, with an average proportion of 31%.

The data above suggest that much of Ratanpura land is irrigated by purchased water. However, since land-holdings are not equal across households, this data does not necessarily indicate how many households are dependent on purchased water. This is the purpose of Table 2. First, almost half the village households (44%) rely exclusively on groundwater purchases for irrigation. Second, 90% of households are dependent, at least in part, on purchased water. Third, while none rely exclusively on canal water, 15% use it as a form of supplemental irrigation.⁶ Fourth, a very small proportion (4%) are able to meet irrigation needs exclusively from their own well.

⁴ The owner of the single well which does not engage in sale runs a small business in Visnagar town. He has given out his land and control over his well to a share tenant. This is an unusual arrangement in Ratanpura. In the summary statistics that follow, I have excluded consideration of this well. However, it is important to bear in mind that there are circumstances under which well-owners may choose not to engage in the water market.

⁵ In computing these figures I use the proportion of others’ land irrigated to own land irrigated as a good index of water sold. This assumes that well-owners’ land and buyers’ land is irrigated with the same intensity.

⁶ Note that no farmers use only canal irrigation, which reflects the unpredictability and inadequacy of canal irrigation. Seldom does the canal provide enough water for a full season. It is for this reason that I characterize canal water as supplemental.

Table 2: Means of Household Access to Water in Ratanpura

	Own well only	Buy g'water only	Canal only	Own + buy g'water	Own +canal	Buy g'water + canal	Own+ buy g'water + canal
# farmers	5	64	0	21	9	32	13
% farmers	4%	44%	0%	15%	6%	22%	9%

Source: Village census combined with farmer access to water drawn from a focus group of well managers in Ratanpura, 1996. The data are based on recall and should be read as indicative of broad patterns.

Note: Purchases here includes purchase by partners from a partnership well.

With such a high degree of dependence on purchased water, we might expect problems of timing and coordination in water supply. One measure of the complexity of the market is the number of plots irrigated per well. The higher this index, the more complex the problems of timing and coordinated delivery that are so central to irrigation. This index is by no means uniform across the village. However, in the central section of the village, a well irrigates, on average 44 plots, with a high of 97 and a low of 21. Under these circumstances, the assignment problems of allocating water effectively are considerable. Moreover, pipelines criss-cross each other and it is not unusual for one plot to have access to water from four or more wells, providing considerable scope for competition by well-owners for buyers.

Rules of Market Exchange

So far we have learned: well-ownership is unequally distributed across the village; a large proportion of village land, and a large percentage of village households are dependent on purchased water for some or all of their needs; and that the problems of coordination and timing in water delivery are considerable due to the combinatorial complexity of the water system. The question remains: how is order maintained in this potentially chaotic exchange system? In particular, how are the problems of timing and coordination overcome?

With such a high degree of dependence on purchased water, the term “market” has been uncritically applied to this set of exchanges along with all the theoretical presuppositions with which this term is laden. In particular, the presumption is that competitive processes are at work and supply the discipline necessary to ensure that buyers receive adequate and timely water.

Yet, evidence from Ratanpura does not support this proposition. There was very little evidence of competition, either in the price dimension or in quality of service. A survey of groundwater use and sales reveals that there is negligible variation in the price paid for water by different farmers.⁷ Neither caste nor class play a role in determining the stated price that was paid by water buyers. Indeed the response of farmers to the question was almost always to apply a set of stated village rules governing price -- often doing the arithmetic out loud -- to their particular crop and plot configuration. The actual amounts paid could vary slightly based on kin relations, adjustment for favors and so on. What is important, however, is that there was a shared conception of prevailing price which served as the cognitive basis for all transactions. As significant as the uniformity in stated terms is the way in which these terms are presented to the outsider. Price uniformity was

⁷ There is, however, considerable variation in the terms of exchange in use for different crops. I address this question of contractual choice elsewhere.

imbued with a moral content -- it would be unethical and divisive to charge different prices to different buyers.

This is a surprising outcome for at least two reasons. First, in Ratanpura, there are real differences in the final product -- water at the field -- in terms of water quality, seepage losses due to distance from the pipeline, and, not least, the timing of water and other aspects of the quality of service provided by the seller. We would expect this product heterogeneity to be reflected in price variation.

Second, the degree of market fragmentation varies considerably across the village. Models of fragmented markets are described in the agrarian institutions literature, where fragmentation, of credit markets for example, is based on asymmetric information of a borrower's trustworthiness (Bardhan 1984; Basu and Bell 1991). In this case, markets are spatially fragmented, with the degree of fragmentation readily apparent from the density of pipelines in different zones. Thus, markets in much of the village could be characterized as situations of "fragmented duopoly" where well-owners have both competitive and captive segments side by side, with considerable scope to exploit the opportunities for interlinkage this affords (Basu and Bell 1991). For example, we would expect large areas of competition in regions of excess supply and a high density of wells. Similarly, we should find captive regions where there is excess demand and low well density. Although these physical, structural conditions encourage price competition between sellers, we have seen that actual prices charged for water do not reflect this variation.

In addition to the absence of explicit price competition, there is little evidence of competitive pressures along other dimensions such as quality of service. Thus, only 4 of 38 buyers surveyed switched their source of water from one well to another between the 1994 and 1995 winter seasons. Moreover, in at least one case, this switch was an adjustment to technical problems with the original well. This is a relatively low turnover rate, and suggests that there is little competition to woo buyers with non-price incentives.

It is also intriguing that these pricing rules only hold for wells located within the village boundary.^{8, 9} The rules in neighboring villages differ systematically from those in Ratanpura even though crop and other agronomic conditions remain the same. This suggests a social component to price determination that is village specific.

Finally, the equivalent returns per hour of water delivered vary from crop to crop depending on the terms of exchange. For example, the fixed payment for irrigation of an acre of wheat for a season is larger than the total hourly payments for fennel added up over a season. The returns to water are not equalized over all crops, which suggests that sellers are not at liberty to shift water between buyers to seek the highest return.

⁸ I define the village lands to include not only the legal demarcation of the village boundary but also those areas of neighboring villages that are owned and cultivated by Ratanpura farmers.

⁹ The only exception reinforces the rule. In one case, a Ratanpura well-owner, finding no takers in the village for the highly saline water produced by his well, sells his water almost exclusively in a neighboring village, and follows the pricing structure prevailing in that village.

This evidence suggests that competitive processes are not at work here and do not provide the disciplining force holding together exchange in Ratanpura. I suggest, instead, that specifically village level rules support this system of exchange, and facilitate its smooth functioning. In the next section I flesh out these rules, and equally important, examine the processes through which they are constructed and contested.

The Social and Historical Construction of Market Institutions

That exchange of groundwater in Ratanpura is characterized more by the shared understandings of common rules than by the cut and thrust of negotiation and competition is illustrated by the process by which deals are struck. In one typical example, a farmer leaned over to a well-owner during the evening prayer and said that he needed water for his mustard crop. The well-owner nodded a silent yes. There was no explicit discussion of price, payment time, number of irrigations, timing of irrigations or volume of water per irrigation turn. Most of these stayed constant from year to year and were agreed upon by both sides. These instituted rules provide stability to the organization of exchange.

Yet, these rules did change from time to time, and it is at times of change that the underlying institutional formations and the politics behind them are best exposed. One such occasion occurred in the winter of 1997, when there was much discussion about changing the terms of exchange for water from the then current system of different rates for different crops to a standard (but increased) hourly rate for all crops. But this uncertainty did not derail the annual renewal of water sales.

Buyers made arrangements with sellers although the price had not as yet been determined. As one buyer laughingly put it: “when they come to take the money, we will know (the price)” (Suresh Prabhu). Sellers too, were unsure of what price to charge: “I don’t want a situation where the other sellers say I am charging Rs. 25 so they will too. I don’t want to be the pretext (for a price increase)” (Pasha, 11/10).

The terms and conditions of water, and particularly the price, is not a bilaterally determined issue in Ratanpura. It is socially structured at the village level. As the quote above suggests, there is a cost to sellers in terms of reputation to being perceived as the leader in a price rise. Under these circumstances, who makes the first move?

In Ratanpura, the two partnership bores, and, in particular, the older large partnership with fifteen members, (referred to in the village and here as “the old bore”) plays a leadership role in price formation. In the early years of electric pumps, this well irrigated over a fourth of the village land. Although its importance in terms of acreage has diminished, its role as the center of gravity in decision making has not. As in previous years, the old bore held their annual meeting in mid-October, before the start of the winter season. During the annual meeting the partners discuss the previous years accounts, hash out conflicts in management, and hold an internal auction to decide the manager for the subsequent year. Most important for our discussion here, the meeting

provides a forum to address ongoing management concerns. In 1997, a central issue was whether prices should be raised.¹⁰

A distinction repeatedly drawn in the discussion was that between partnership bores and “private” wells, such as those owned by individuals and families. Some private well-owners had talked about raising the hourly rate (used for some crops) from Rs. 20 to Rs. 30, a dramatic increment for a single year. There was more grumbling about private well-owners: “the private ones do as they like ...”, “the private owners keep whatever price they want ...”. A repeated refrain was that the price should not be “higher than others nor lower than others” (Navi bore meeting, 22/10). The largest partner, with 50% share in the well, reported that during his discussions, some private well-owners had been arguing for Rs. 30, while he had refused to go above Rs. 25.

Partners in group bores occupy a liminal ground between profit maximizing well-owners and buyers. In representing their own interests, partners also often represent the interests of other non-partner purchasers of water. The diversity of circumstances faced by partners mirrors that faced by buyers, and serves as an indirect vehicle of representation. Moreover, the larger the share in the well owned by a partner, and the smaller the amount of land irrigated by the well, the more the partner is likely to behave as an investor and urge high prices. By contrast, a small share-holder with much land irrigated by the well is likely to behave like a buyer and urge lower prices. As a partner in the new bore explained, the old bore gives water largely to partners and so they limit their price increases (Narain Shankar, 24/10). This cooperative interest limits the incentive to price gouge and may be a factor in explaining the strong legitimacy of the partnership bores as leaders in making rules and setting prices.

During meetings of the partners, village level rules are constantly invoked as a means of legitimating a particular point. For example, a weaker partner talked about the importance of getting water on time to buyers, and of the need to assure them an adequate supply of water. It later became clear that this was not an altruistic act. This partner felt he had not been receiving adequate service, and by invoking agreed upon rules he was able to make his point without antagonizing the primary (50%) partner. As he later told me, the majority share-holder runs the bore as “an occupation”, thinking only of returns to the well, while he thinks of farmer interests. By representing the accepted rights of long-time buyers in the meeting, this partner is able to express his own interests while reinforcing norms of timing and allocation of water.

The annual meetings of the partnership bores, then, form the mechanism around which institutionalization of water takes place in Ratanpura. Note that since these partnership bores began largely around networks of trust founded on kinship ties, this observation recalls Granovetter’s (1985) contention that “stable economic institutions begin as accretions of activity patterns around personal networks.” I have suggested that these annual meetings are accorded some legitimacy as a forum whereby broader interests are represented in a manner they are not in decisions of “private” or individual well-owners.

¹⁰ The meeting is a closed affair, and I was permitted to observe only a small part of it, which did not include the discussion on price. I was, however, present throughout the meeting of the second partnership bore (“the new bore”) -- held a week after that of the first bore -- which provides a window onto the concerns of partners and the decision making process.

Note here that large group partnership bores formed as a result of a particular set of historical conjunctures. Deep and falling water in the late 1960s led to a rash of failures of then common dug-cum-bore wells and enhanced perceptions of risk associated with well ownership. The transition to deep tubewell technology was made possible by state intervention in the form of electricity supply only in the early 1970s, after farmers had witnessed several well failures. The response was to share risk by grouping together. Caste and kinship network provided the initial social glue for shared investment and resolution of the institutional problems involved in managing a well that irrigated more than fifty different plots. Group owned bores, then, and the institutional stability they provide are the outcome of a particular coincidence of hydrology, state action and social conditions in the early 1970s.

The institutionalization of groundwater transactions and the process by which it is fine-tuned and changed is supported by what Fligstein (Fligstein 1996) calls a “conception of control” -- “understandings that structure perceptions of how a market works and that allow actors to interpret their world and act to control situations.” Stability in the water market in Ratanpura is facilitated by a conception of control that is shared among well-owners and buyers. What, then, are the elements in this shared understanding?

The glue binding the institutionalization of water in Ratanpura is the uniformity of terms and conditions of access to water across the village. This uniformity, institutionalized in village level price norms, is couched in moral terms. Sellers emphatically and approvingly stated that one price prevails across the village. When I told one seller that in other regions I had encountered well-owners who charge different prices to different buyers, he replied simply that it could not happen in Ratanpura. Buyers, when asked how much they paid for water, computed their payments in terms of a village price, demonstrating the cognitive hold of village norms. Village level price norms demonstrate a “grip on the mind” quality that Elster (1989) argues distinguishes such norms from outcome-oriented rules that are maintained purely by a structure of sanctions.

In addition to price uniformity, the level at which prices are set are also bound up in a moral calculus. Following Scott's (1976) injunction to examine the roots of subjective feelings of exploitation, I found that whether a price was considered fair or unfair turned on a cost-plus computation. When, for example, the new bore partners emerged from their 1997 annual meeting, one of their number was asked by a young farmer, his neighbor, what the hourly rate would be for that year. When he was told of the increase, he expressed polite surprise (befitting his junior position) and noted that the price of electricity had gone up. The partner responded that while this was true, the acreage under the lucrative mustard crop had gone down leading to a decrease in earnings. After the partner left, the young farmer openly expressed his outrage, repeating that without an increase in electricity prices, there was no basis for an increase in water price (Babu Shankar and chem student, 22/10). Some profit margin was acceptable, but arbitrary price increases without a corresponding cost increase was not.

In addition, there is a “moral economy” dimension to norms of access whereby regular users are guaranteed minimum water needs even in the event of a shortage. Sellers told me that in response to decreases in availability as a result of pump problems, or higher demands due to drought, they

reduced the amount of water to all users across the board, and emphasized that this rule included their own fields. Whether acted upon or not, the ethical basis for water distribution is strongly enshrined in village norms of water distribution.

This popular moral consensus on price and access serves a purpose. For sellers, the price norm prevents destructive price wars. This price stability has become particularly important since the shift to fixed tariffs for electricity in 1987. Faced with a rampant price war, sellers may not be able to cover their high fixed costs of supply.

To some extent the uniform price norm can also be interpreted as a moral cloak for price controls which maintain high prices and high profit margins for sellers. Indeed, it is tempting to dismiss the institutionalization of water delivery as the clever use of moral economy rhetoric by a cartel of sellers. And yet, if village norms are used only for strategic manipulation, why would buyers endow them with legitimacy? If they only represented narrow interests of sellers, their legitimacy over time would surely be eroded.

As I have argued earlier, the partnership bores are seen as representing buyer interests and provide some legitimacy to the institutionalization of price and rules of access. And, as the round of discussions in the winter of 1997 shows, this perception is founded in fact -- the partnership bores did play a role in limiting the price increase sought by some "private" bore owners. In addition, the reluctance of "private" well-owners to be perceived as the first mover on a price increase is a measure of the strength of the norm against arbitrary price increases. Norms on prices do act as somewhat of a defense against rampant price increases.

Moreover, market stability is also in the interests of the buyers. We have seen that the form of payment for water is part and parcel of a broader institutionalization of water delivery that includes norms of timing and coordination. It is crucial for successful irrigation that these be maintained. To the extent that predictable and assured access comes at the expense of some collusive behavior, it may be a price buyers are willing to pay.

At the same time, there are signs that the legitimacy of this shared understanding based on equal and fair prices is wearing thin. On three separate occasions buyers grumbled to me that sellers have become like a "union" (chem student, 22/10; Amrit Leela, 15/10; Jayanti Ishwer, 2/11). There is a clear resentment at coordinated price rises, particularly without a corresponding increase in seller costs.

The lack of competition in Ratanpura, then, is explained by a particular institutional form that supports stability in water use. Discipline, in this medium, is not brought about through the exit mechanism of the market, but through a shared understanding of market institutions with moral underpinnings. The creation, perpetuation and change of this understanding is a political process. This view of agrarian institutions emphasizes the competing and common understandings that inform exchange in agrarian societies. The struggle for acceptance of a particular understanding is, then, a political struggle. This view of instituted process as political also suggests that institutions are not static but contested as a result of which they undergo adjustment and, occasionally, seismic changes.

A Contrasting Case: Paldi

The village of Paldi located in neighboring Banaskantha district illustrates that markets for groundwater are not instituted in a uniform manner but vary with the underlying conditions. Several castes are represented in Paldi, although land ownership is skewed toward a few. As with Ratanpura, well ownership tracks land ownership fairly closely.

Paldi taps water from the same aquifer as does Ratanpura, but is located in a region where water is available at depths of about 150 ft. As a result of the lower depth, wells are cheaper and many farmers still use the older dug-cum-bore technology. The cropping patterns is very similar to that in Ratanpura, with the addition of substantial acreage under potato cultivation.

The physical layout of irrigation infrastructure shows some notable differences with Ratanpura. Since fixed costs are lower, many more farmers own wells than in Ratanpura. In addition, land is far less fragmented than in Ratanpura. These two factors combine to result in a relatively sparse network of pipelines, and a relatively thin market in groundwater. While Ratanpura well-owners sell, on average, 71% of their water, the average well-owner in Paldi sold 7% of their water and provided another 17% to their own tenants.¹¹ The majority, 77%, was used on their own fields. Yet, this volumetric measure conceals the importance of purchased water for poor, and typically lower caste, households. Tenancy is an important means of obtaining access to land, and, since water is very often bundled together with land in tenancy arrangements, a surprisingly large 61% of sampled households obtained water through tenancy or direct sale.

In this relatively thin market, competition is rampant. In the last few years, supply has increased rapidly as well-owners transition invest in deep tubewells, giving buyer's enhanced bargaining power. Large land-owners who purchase water for some of their land able to negotiate lower prices than those available to small land-owners. When buyer's perceive feasible alternative sources of supply, they are quick to play one off against the other. Sellers may sometimes invoke ties of kin or caste to bind buyers, but more often than not, these ties prove little obstacle to the compulsion of economic opportunity. Moreover, price competition is seen as perfectly acceptable behavior. In this competitive setting, it is the market that provides a disciplining device and ensures that water is received on a timely and adequate basis.

Conclusion: Implications for Policy and Theory

Exchange of groundwater in Ratanpura is a "market" in the sense that there is considerable reliance on purchased water as a means of accessing irrigation. However, this exchange regime bears little resemblance to the market clearing models of neo-classical theory. Both equilibrating forces of supply and demand, as well as oligopolistic forces operate through the filter of social relations. The result is exchange as an instituted process, through which stability and order are maintained in exchange. By contrast to the thick, and stable market in Ratanpura, Paldi represents a case of a thin market with unfettered competition.

¹¹ This data is drawn from a two-stage sample survey of wells and households in Paldi conducted in 1996 and 1997.

Why did a shared understanding around stability develop in Ratanpura while the reaction to greater supply in Paldi was uncoordinated and bilateral? First, while there are considerable benefits to coordination in Ratanpura, the market for water is rather small in Paldi and, as we have seen, thin. The potential gains from institutionalizing are commensurably small. Second, no obvious mechanism with anything near the center of gravity of the two partnership bores -- which at one point irrigated almost half the land in Ratanpura -- emerged in Paldi. Third, expressions of village coherence served as a vehicle for institutionalization at the village level in Ratanpura: "We are all Patels here." These expressions were far more muted in multi-caste Paldi.

These cases suggest that policy prescriptions that seek only to activate the disciplining force of competition are misguided. With village level price norms and rules of supply in force, competitive forces are blunted. Indeed, the policy prescription applied in Gujarat -- to apply a flat rate electricity tariff to encourage pumping and competition -- often only has the first effect and can result in wasteful use of water in villages such as Ratanpura.

This case study also helps make a theoretical point. The common property literature has emphasized the study and theoretical elucidation of a set of institutions to manage the commons that are "neither market nor state" (Ostrom 1994). The intellectual roots of this literature lie in a critique of the argument that a resolution of the "tragedy of the commons" requires either the heavy hand or the state or the carving up of the commons among private property holders who then operate in an unfettered market. The example of Ratanpura shows that in this case, the distribution problems associated with groundwater use have been solved through exchange, but that this market is socially embedded. It suggests that CPR theorists concede too much when they restrict themselves to the middle ground between state and market. Markets are also undergirded by supporting institutions, and the study of market institutions that support use of the commons are worthy of and amenable to study. I have argued that such studies must be historically rooted and embedded in the social context within which institutions form.

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