Political Economy of Electricity Subsidy: Evidence from Punjab

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The electricity subsidy distribution pattern needs to be scrutinised to assess whether the policy benefits small producers, a normative argument often made while granting any input subsidy. In Punjab, this policy is found to ignore equity considerations while granting non-discriminatory electricity subsidies to the agricultural sector. This study highlights the existence of disparities in the flow of electricity subsidy between the advanced and backward regions. While the medium and large farmers reap the major benefits of the subsidy, the poor small farmers, especially in the backward areas, remain excluded due to their non-possession of electricity connections. In a nutshell, this paper questions the justification for introducing such a policy and puts forward the case for user charges based on open access to electricity.

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The provision of agricultural subsidies has burdened Punjab's exchequer heavily. In such a situation, it is worth exploring whether the state's scarce resources are reaching the deserving groups. These input subsidies, on normative grounds, are provided either to raise production and productivity levels or to encourage small and marginal producers for adopting modern inputs. The inputs like electricity have cornered a significant share of agricultural subsidies in developing countries like India where the state, under the influence of pressure politics, ignores the economic lens to target beneficiaries, rather it adopts non-discriminatory policies to grant these subsidies. Such policies while benefiting the rich have compensated the poor inadequately. This paper focuses on this aspect of state policy. It, among other things, puts forward a policy action to benefit the non-beneficiaries. The first section focuses on the interest groups' politics and state's submission towards fulfilling their aspirations. It is followed by a brief review of available evidence on distribution patterns of various agricultural subsidies in the second section. The third section presents the distribution patterns of the electricity subsidy in Punjab. This evidence on electricity subsidy distribution is based on a primary survey. The state's inclination towards polarisation of electricity subsidy benefits is discussed in the fourth section. The fifth section highlights the demerits of polarising the subsidy benefits and thereby urges the need for a policy action. The scope for the policy change is explored in the sixth section. The seventh section considers the merits of this policy change to the farmers and the final section summarises the study.

I
State, Interest Groups and the Politics of Subsidies

The agricultural sector is the mainstay of today's dualistic developing economies that, in Rostow's (1960) terms, is yet to take-off. This sector is expected to facilitate the growth process by providing raw materials for industry, ensuring adequate food supply, acting as a market for industrial goods, releasing labour for industrial use, generating savings, etc. Obviously, due to the constraint posed by the relatively fixed supply of land, it can perform on these expected lines only by gaining on productivity fronts. But, the experience of these economies has been quite opposite. Schultz (1964) considers the traditional economic structure as the main hindrance to their growth. However, he argues that these economies can raise agricultural productivity by adopting quality inputs and applying the advances in knowledge and technology to a broad range of productive activities. Following Schultz, the first step should be to identify a technique of production capable of raising productivity at least cost to society. The Indian planners recognised this in the mid-1960s and attempts were made to raise agricultural productivity by adopting modern techniques of production. Such effort brought amazing results[1] by transforming food-deficit India into a food-surplus India. Among other intermediate inputs, the provision of adequate irrigation contributed significantly towards the success of this package of modern inputs.[2] In fact, irrigation remained a basic input on which the use of high-yielding variety (HYV) seeds, fertilisers, etc, depended significantly.

Irrigation is an important element of infrastructure. Here, the state[3] should play an active role as its provision involves market failure.[4] The state cannot play its role independently, rather its policies are affected by the intentions of various interest groups. These interest groups compete with each other to get a share of the state resources and privileges. They also bargain with the state, on the basis of their voting power, for more benefits and services [Becker 1983; Osborne and Silvinski 1996]. Kalecki (1967) points out that the state in developing countries is ruled by a class that rose to power upon independence after the second world war. This class is mainly the lower middle class and the rich peasantry. This type of state is subject to the pressure of interest group politics. In the Indian context, Bardhan expresses the view of state being the "intermediary", completely subordinated to pressures and pulls of interest groups as:

> The Indian economy has thus become an elaborate network of patronage and subsidies. The heterogeneous interest groups fight and bargain for their share in the spoils of the system and often strike compromises in the form of "log-rolling" in the usual form of pressure-group politics [as quoted in Ghosh 1995:176].

It reflects the subordination of the state in the intermediate regimes. The new political economy considers elected leaders as the agents who are always interested in remaining in power

and deriving rent by providing access to public goods, services and regulations. They have no principled position on any issue and generally take such policy actions that suit the whims of their vote banks and thus, in turn, increase their chance of staying in power [Dasgupta 1997]. It became evident in India when farmers – a large interest group in agricultural states – formed their unions and started participating actively in the electoral politics to pressurise the ruling parties to fulfil their demands. The political parties responded positively and introduced such policies that were quite uneconomic at their very outset. One such policy introduction is related with the supply of electricity to the agricultural sector for irrigation purposes. Dubash and Rajan (2001) point out that the first use of electricity subsidy as a political tool may have occurred during the 1977 elections when the Congress-led Andhra Pradesh offered flat-rate tariffs to farmers as an election promise to help. A similar event happened in Punjab where electricity was supplied without collecting any user charge in the second-half of the 1990s. This practice of selling electricity at the subsidised rates to the agricultural sector reveals nothing but the state's submission to interest group politics. These policies have been, by and large, non-discriminatory in nature. It has had a bearing on the distribution pattern of subsidies but before exploring the distribution pattern of electricity subsidy in Punjab, it would be better to review the available empirical evidence on the distribution pattern of agricultural subsidies.

II
Distribution of Agricultural Subsidies in India: Available Evidence

Agricultural subsidies, in Indian context, have attracted a lot of attention of researchers in recent past and consequently a vast literature on this issue has emerged. This literature can be classified broadly as over estimation, analysis, impact and distribution of subsidies. Here, we will discuss, in brief, the available evidence on distribution patterns of agricultural subsidies. There are studies evaluating the impact of incentive policies comprising various subsidies on rural development programmes [Subbarao 1985], questioning the justification for the continuation of a fertiliser subsidy [Namboodiri 1982], exploring inter-regional disparities in the use of agricultural subsidies [Singh and Chand 1986] and so on. There are also studies like Reddy (1992) analysing distribution of agricultural subsidies. This study found that the subsidies were benefiting more the small farmers than the large ones. But in the case of electricity subsidy, it found the large farmers as major beneficiaries. In line with this study, other studies like Karnik and Lalvani (1996), Howes and Murgai (2003) pointed out that a large chunk of the electricity subsidy goes to large and medium farmers whereas small farmers remain at large the non-beneficiaries.

But, we cannot take this evidence as such. It needs a reconsideration because the electricity subsidy for irrigation purposes is different from the subsidies on other inputs. The acquisition of this subsidy requires the possession of an electric connection in the farm. The available evidence on the distribution pattern of the electricity subsidy has ignored this peculiarity. One should consider the direction of flow of subsidy benefits rather than its magnitude[5] because the magnitude is subject to change depending upon the conditions of electricity supply. Also, from the policy perspective, it is worth exploring the direction in which the subsidy benefits are flowing. We have tried to explore the flow of electricity subsidy benefits among different farmer classes across the progressive and backward regions of Punjab.

Table 1: Distribution of Operational Landholdings

District	<=4 Acres	4-10 Acres	>10 Acres	Total Acres
Bathinda	54536	37396	10343	102275
	(53.22)	(36.56)	(10.12)	(100)
Ludhiana	24031	20681	5560	83110
	(68.42)	(24.88)	(6.69)	(100)

Note: Before April 13, 1992, Mansa district was part of Bathinda district. As the available data on operational landholding is for the year 1990-91, so this data of Bathinda district has been assumed same for Mansa district.
The figures in parentheses are the percentages of total acres.
Source: Agriculture Census (Punjab) 1990-91, printed in 2002 by the government of Punjab.

Table 2: Electrified Irrigation Pump-set Ownership in the Backward and Progressive Areas

Farmer Class	Backward Area				Progressive Area			
	Small	Medium	Large	Total	Small	Medium	Large	Total
Yes	2	23	10		54	25	7	
	(3.7)	(63.9)	(100)	35	(79.4)	(100)	(100)	86
No	52	13			14			
	(96.3)	(36.1)	–	65	(20.6)	–	–	14
Total	54	36	10	100	68	25	7	100
Chi-Square Test	x^2= 55.026, $x^2_{0.05}$ = 5.991, d f = 2				x^2= 7.661, $x^2_{0.05}$ = 5.991, d f = 2			

Note: The figures in parentheses are percentages of farmers within their class.
Source: Primary survey.

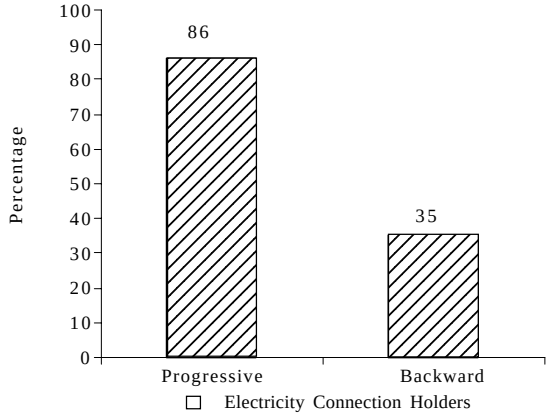
III
Beneficiaries of Electricity Subsidy

In Punjab, interest group politics is quite active. Here, the agrarian transformation has undergone three major phases: the British colonial rule, the post-green revolution period and the recent period when farmers' organisations shifted from non-electoral politics of pressure groups to participate actively in electoral politics [Mukherji 1998]. In the latter phase, the provision of electricity subsidy by the state commands attention.[6] The state pursued a non-discriminatory electricity subsidy policy. The opportunity of getting benefits for any farmer, under such a policy, depends a priori on her/his ability to own an electricity connection, availability of electricity supply in her/his farm and the nature of electricity supply. These factors may differ within and across regions due to various factors. As no secondary data source provides such micro level information, we have conducted a primary survey in two districts[7] viz, Mansa and Ludhiana to make a comparative study of the flow of electricity subsidy to different classes of the farmers. The basic idea behind this exercise is to examine the generality of "bigger-getting-best" evidence[8] by relating farm size to electricity access and availability.

Survey Methodology

The sample size is of 300 farm households (200 general households and 100 households having connections under the own your tubewell (OYT) scheme). We adopted the multistage sampling technique to select this sample size. It involved three stages. First of all, one district among each of the progressive and backward districts of Punjab was identified on the basis of its achievements in various socio-economic aspects of development. Following this, a few villages[9] were chosen from these districts. In the second stage, the required sample size was selected through the "proportionate sampling" method, for which the "operational land

Figure 1: Electricity Connection Holders in Punjab (Region-wise)



holding"[10] data served as the base. We had classified farmers with operational landholdings up to four acres, between four and 10 acres and above 10 acres as small, medium and large farmers, respectively (Table 1). We further assumed the same classification for selected villages in each district.

In the third stage, farmers' particulars collected from village 'patwari'[11] provided the basis for the random selection of farm households. After this, each household head was asked about the number of acres of land that she/he at that time was cultivating. This information facilitated the classification of selected households in the above categories. We followed this procedure till the required sample size within each farmer class from each selected village had been collected. While following this approach of sample selection, we noticed a few households having connections under the OYT scheme but we ignored such households for the sake of maintaining uniformity in selected sample size. The information of farmers having OYT connections was first collected from the electricity sub-stations and after this, some randomly selected households were surveyed in each village.

Survey Results

Presence of Electricity Connections

The presence of electricity connections in the farm is a prerequisite for having a access to electricity supply and hence electricity subsidy. We found an association between the area and the availability of electricity connections through a chi-square test (Table 2). The regional gaps are large. The proportion of farmers having electricity connections in the progressive area is 51 per cent higher than their counterparts in the backward area (Figure 1). This disparity thus, leaves no room for questioning the inference that a large quantum of electricity subsidy is flowing to the progressive area. This inference is bound to hold true even if there exist similar electricity supply conditions in both the areas.

The electricity connection ownership across these two districts, when analysed in relation to different farmer classes, shows its association with the farmer class (Table 2). The positions in both progressive and backward areas are almost similar regarding electricity connection ownership by medium and large farmers, but there exist differences between the two regions in case of small farmers. In the backward area, a very small proportion (3.7 per cent) of the farmers own electricity connections. In the progressive area, it has been very high (i e, 79.4 per cent). It can be noticed that unlike in the backward area, the farmers in all the classes owned electricity connections in the progressive area. This finding refutes the "bigger-getting-best" argument, rather it highlights the incidence of "better placed-getting-best".

Duration of Electricity Availability

The average duration of electricity availability on the farms also has a bearing on the flow of electricity subsidy. The survey results, by showing significant regional differences in duration of electricity availability during both peak time (i e, the time of sowing crops) and the off-peak time (i e, other times), indicate that the progressive area receive priority over the backward one in having a longer duration of electricity availability in the farm. All the farmers in the progressive area have reported that they are getting electricity for a minimum of eight hours during the peak period though the perception of a majority (i e, about 83 per cent) falls at 10 hours. The situation, on the contrary, is much different in the backward area where a majority of the farmers reported electricity availability between six and eight hours during this time. Here, a very small proportion of the farmers reported the electricity availability for nine to 10 hours – equal to that in the progressive area.

Though not equal to the peak period, an adequate availability of electricity is also needed during the off-peak period as well to ensure sufficient irrigation. There exist differences between the two areas on this account too. A majority of the farmers in the progressive area perceive electricity availability for eight hours during the off-peak period. But in the backward area, only 51 per cent of the farmers are reported to have electricity availability for five to six hours and all the farmers had an average availability of electricity for a minimum of three hours during this period. Such a difference in the availability of electricity has had implications for per unit cost of irrigation.

Quality of Electricity Supply

The quantum of electricity subsidy flow is also related to its quality as a greater flow of electricity subsidy can take place only if the electric motors work efficiently. This efficient operation of electric motors is dependent, to a large extent, upon the supply of quality electricity. This quality of electricity supply can be captured through its nature (i e, interrupted/uninterrupted) and the frequency of voltage fluctuations (Table 3).

Even in this respect, the survey results indicate that there exists an association between the area and the availability of quality electricity. The majority of the farmers in the progressive area reported they get uninterrupted electricity supply. At the same time only 40 per cent of the farmers in the backward area perceive the availability of such electricity. This means that in the backward area, the share of farmers getting interrupted electricity supply is quite high as compared to that in the progressive area. The incidence of voltage fluctuations also affects the flow of subsidy.

Table 3: Perceived Quality of Electricity Supply across Areas

Area	Quality of Electricity Supply						
	Interrupted Electricity Supply			Voltage Fluctuations			
	No	Yes	Total	Frequent	Moderate	Rare	Total
Progressive	77	9	86	3	30	53	86
	(89.5)	(10.5)	(100)	(3.5)	(34.9)	(61.6)	(100)
Backward	14	21	35	20	11	4	35
	(40.0)	(60.0)	(100)	(57.1)	(31.5)	(11.4)	(100)
Chi-Square Test	x^2= 32.735, $x^2_{0.05}$ = 3.841, d f = 1			x^2= 51.070, $x^2_{0.05}$ = 5.991, d f = 2			

Note: The figures in parentheses are the percentages of total.
Source: Primary survey.

We have found regional differences on this account too. In the progressive area, a very small proportion of the farmers observed frequent voltage fluctuations in electricity supply. But, the case was quite opposite in the backward area where a high proportion of the farmers perceived the presence of frequent and moderate voltage fluctuations in the electricity supply – the share of those reporting the frequent voltage fluctuations being the highest (i e, 57 per cent). Frequent voltage fluctuations damage electric motors. This has had implications for farmer's cost of production as the repair of electric motor involves both huge monetary cost and the opportunity cost of time. It also adds to unnecessary cost burden by forcing farmers to use voltage stabilisers.[12]

IV
OYT Scheme: Polarisation of Subsidy Benefits

Inadequate subventions deteriorated the financial soundness of the Punjab electricity board and following the state's directions, it had to initiate the OYT scheme by which it granted new electricity connections to only those farmers willing to bear the full cost. This new policy seems to be motivated by political economy concerns. Underground water is a common resource and everyone has the equal right to use it. But, it requires adequate means at one's disposal to harness this common resource that is becoming a scarce commodity due to the fast pace of underground water depletion [Bathla 1997]. The installation of new electricity connection involves a huge cost. The small farmers, who are not in a position to bear this cost, remain excluded from claiming any benefit under this scheme. The large farmers, as pointed out by our survey results, have cornered a major share of electricity connections in both the areas. In the backward area, a relatively high proportion (i e, 30 per cent) of medium farmers got electricity connections under the OYT scheme. The economic condition of these medium farmers in the backward area is becoming very similar to those of the small farmers because of declining agricultural productivity, frequent onslaught of floods, burgeoning debts, etc. These farmers had visualised this scheme as an opportunity to get the electricity connection, as most of them were not able to get it earlier either due to administrative restrictions or favouritism, etc. Keeping in view the trade-off between the dearer "diesel pump-set based" irrigation and free "electricity based" irrigation, they considered the installation of an electricity connection under this scheme as an asset. But, most of these farmers having relatively lower levels of income could not mobilise enough cash for the purchase of electricity connections and the banks were also not ready to provide them credit for building this infrastructure on their farm.[13] Consequently, they had to either depend on non-institutional sources or sell their assets. Such a practice of arranging resources reflects the nature of state policy. It was well known beforehand to the state that this scheme would either wipe out some classes of farmers or would force them to finance the electricity connection through the sale of assets. Similar has been the experience in the backward area [Jain 2003]. This practice has facilitated the concentration of land in few hands. This emerging trend of large inequalities in landownership points towards the turn of the Punjab's so-called capitalistic agriculture to a system similar to the feudal one where a few hands own the land and a large majority stays as landless, paying rent to the lord to get access to cultivation on her/his land!

Another political economy aspect is related to difficulties in getting the electricity connection. During the informal discussions with the farmers, we found farmers dissatisfied with Punjab state electricity board officials. Majority of the farmers had to either make use of some political approach or bribe the concerned staff of the electricity board to speed up the pace of getting effective electricity connections on their farm. The incidence has been relatively high in the backward area where all the farmers had used some sort of influence to get an electricity connection. The farmers have approached a number of authorities like the panchayat members, officials and the local politicians. The farmers who approached the local politicians did not bribe the officials but others had to do so. The bribe was made either in the form of cash alone or both cash and kind. This bribe in kind comprised liquor in most of the cases. A large set of farmers in the backward area gave bribes in both cash and kind whereas most of the farmers of the progressive area bribed the officials only with cash. A further exploration points out that those farmers who did not use any sort of influence had to wait for a relatively longer time to get the effective electricity connection on their field after the completion of all the prerequisites on their part. This finding reveals, in a sense, the correlation between bribes and the tendency of the officials to do work at the earliest.

V
Need for Policy Action

Demerits of Polarising Subsidy Benefits

Under state's non-discriminatory electricity subsidy policy, the farmers having economic and political power managed to have an early access to electricity connections and consequently, the surpluses arising from partial or full price concessions on sale of electricity to the agricultural sector benefited only these farmers. This trend has had a number of implications for the agricultural sector. Some of these implications are discussed below:

Divided society into haves and have-nots: The state's non-discriminatory policy of granting electricity subsidy for irrigation has caused large socio-economic disparities and divided the agricultural society into the classes of *haves* and *have-nots*. The *haves* possessing electricity connections with access to electricity of relatively better quantity and quality (as farmers of the progressive area) are better than the *have-nots* who either do not have access to electricity or are not getting its adequate supply (as farmers of the backward area) both in quantity and quality. It has been found that there exists a large gap in terms of the cost of production between the *haves* and the *have-nots* (see Appendix 2). This difference in the cost of production arises due to the differences in the means by which the production is carried out. Irrigation is one of the major inputs in the agricultural production process. Owing to this, the ownership of electricity connection by a farmer in the presence of subsidised electricity has a significant bearing on her/his cost of production. The availability of either free or partially priced electricity has contributed towards increasing income inequalities within the agricultural sector by making the irrigation cost almost nil for the *haves*. But this is not the case for the *have-nots* or the *haves* who have access to inadequate, unreliable and poor quality electricity because, in the absence of access to reliable electricity, these farmers have to irrigate their crops through the use of diesel pump-sets. Such irrigation practices in the presence of very high and continuously rising diesel prices impose a huge cost burden on farmers for producing the same quantity of output. It is due to this reason that the average cost of production has remained quite low for the *haves* whereas it is relatively high for the farmers in the other category. Given the same output price, this has implications for net economic returns to both categories of farmers.

The *haves* continue to have higher net economic returns whereas these returns from the sale of same output have been quite low for the *have-nots*. All this leads to increasing income inequalities in the society.

Left backward areas as subsidy losers: The state's policy of providing non-discriminatory electricity subsidy to the agricultural sector has weakened the financial soundness of the Punjab state electricity board. This affected the pace of irrigation pump-set energisation that has shown a declining trend since the 1980s.[14] A huge capital cost is involved in the expansion of new electric wires, which are required for an effective electricity connection on the farm. Under the conditions of the deteriorating financial position of the board, an already existing network of electric wires assumes significance. The availability of electric lines in the vicinity of the farm is the minimum condition that can ensure speedy electrification of irrigation pump-sets (IPS) on that farm. The pump-sets in farms having passage of electric line through their vicinity have a good chance of getting electrified.

We have seen that in the backward area, a larger percentage (i e, 65 per cent compared to 14 per cent in the progressive area) of the farms are not having an electricity connection. Compared with the progressive area, a majority (80 per cent) of the farms in the backward area do not have any chance of getting electrified irrigation pumpsets in near future. The main reason for such a low incidence of connection in the backward area is the relatively poor network of electric lines. Here, no electric wire, not even in the distance of 300-400 metres, have been observed to be passing through the vicinity of most of the farms whereas the situation is quite different in the other case due to the existence of a better network of electric wires. This lack of access to the basic infrastructure, essential to ensure the flow of electricity supply to the fields of a large set of farmers in the backward areas, leaves these farmers excluded in the sense that they cannot dream of getting any benefit from the electricity subsidy even in near future. The disparities between the two areas on account of the flow of electricity subsidy in future will persist even if we assume that all those who are having connection possibilities will get an electricity connection on their farm. In such a case, only 48 per cent of farmers in the backward area will be having electrified irrigation pumpsets – much lower in comparison to the 91 per cent in the progressive area. This implies that the progressive area will remain a major beneficiary[15] of the electricity subsidy in the near future, even if both areas experience similar situation of electricity supply, which is not so.

Troubled sustainability of agriculture: The provision of non-discriminatory electricity subsidy has had a negative impact on the sustainability of agriculture as it has had implications for depletion of underground water.[16] The cheap availability of electricity and credit have increased steeply the use of tube wells for irrigation in Punjab. The number of electrically-operated tube wells has increased from six lakh in 1990-91 to 7.5 lakh in 1999-2000 [CMIE 2003]. The subsidised electricity sale has reduced the marginal cost of irrigation to almost zero. It persuaded farmers to over-irrigate their lands. It has been found that only 54.70 per cent of the farmers applied 25 to 30 irrigations as per the water requirements of the rice crop [Singh Amarjit 1998: 191]. This reveals the non-optimal use of electricity and of the scarce underground water resources by the farmers. The reckless use of water through tube wells has caused the problems of underground water depletion in some areas. The water table in the central districts of Punjab has been going down at an average rate of 0.23 metres per year. This rapid pace of underground water depletion may trouble sustainability of Punjab's agriculture. There can be a temporary escape from this problem. But it will cost more than Rs 2,000 crore or an additional expenditure of Rs 5,000 per hectare along with a two-fold rise in energy consumption due to replacement of present pump-sets by submersible pumps in next 15 years [GoI 2003: 121].

The availability of this cheap mode of irrigation also persuaded farmers in the backward area to shift to cultivation of water-intensive crops like rice, from their old practices of growing cotton. In this area 94.2 per cent of the farmers are growing rice mainly due to subsidised electricity supply. This crop diversification has been a major factor for the depletion of groundwater at a fast pace in this area because rice is a water-intensive crop. Due to this, more extraction of water takes place than the recharge through rain.[17] The average level by which groundwater depleted during the last five years in the backward area has been estimated to be about 42 feet from the survey data[18] whereas in the progressive area, it has not depleted as much (i e, by 22.5 feet). Given the same rate of water extraction, such differing water depletion rates in the two areas have been due to differences in recharging the aquifer through adequate rainfall, etc.

VI
Scope for Policy Action

Possibilities on Demand-Side

Till now, we have noticed that the provision of electricity subsidy rather than serving the expected purpose has had adverse impacts. This calls for the need, from the policy perspective, to explore alternatives to this policy. The demand-side provides one possibility to explore such alternatives. The demand-side consists of farmers – the largest interest group in Punjab's politics [Mukherji 1998] and given the literary evidence on the state's submission to the interest groups in the intermediate regimes (see Section I), the exploration of possibilities on the demand side assumes significance. We hypothesise that the farmers in Punjab did not think seriously about the long-term impact of such subsidy policy and were lured by political parties. But they may understand well if they are made aware of the economics of supplying electricity at their farms. On the basis of this notion, we asked farmers their willingness to pay (WTP) user charges in two different situations. In the first case, the electricity utility operates under the full scope of state intervention and influence and in the second case, it is made independent of any state influence. The following sub-sections highlight farmers' response towards the payment of user charges in these two hypothetical situations.

WTP under the veil of state influence: In the first situation, the WTP user charges has been almost nil on the part of farmers.

Table 4: Willingness to Pay User Charges by Farmer Class in the Progressive and Backward Areas

WTP	Progressive Area				Backward Area			
	Small	Medium	Large	Total	Small	Medium	Large	Total
At Metered rate	65 (95.6)	23 (79.3)	43 (81.1)	131	52 (96.3)	40 (78.4)	35 (77.8)	127
At Flat rate	3 (4.4)	6 (20.7)	10 (18.9)	19	2 (3.7)	11 (21.6)	10 (22.2)	23
Total	68 (100)	29 (100)	53 (100)	150	54 (100)	51 (100)	45 (100)	150

Note: The figures in parentheses are percentages of farmers within their farmer class.

Source: Primary survey.

Most of them have simply refused to pay any user charges as they know that the power utility in Punjab is under state ownership and control and in the politics of numbers, they can influence the state to get their demands fulfilled. A classification of our sample size into two categories (viz, non-OYT and OYT) as per the status of the IPS makes this finding quite interesting. The non-OYT is the set of the farmers other than the farmers having connections under the OYT scheme. We found that a majority of the farmers in the non-OYT category and all the farmers in the OYT category in the progressive area refused to pay any user charges. Similar results have been found in the backward area also. Along with changes in attitude towards payment of electricity charges due to their access to free electricity for the long time, the farmers of both the areas have different reasons for their reluctance to pay any user charge. In the progressive area where the electricity availability is relatively better in both quantity as well as quality, the farmers are not willing to pay merely because they are getting electricity during odd hours (e g, at night). It is very inconvenient to them and they want electricity during the day time. The power utility supplies electricity to the agricultural sector during the night (off-peak hours) because the supply of electricity to the subsidised consumers during this time imposes a smaller financial burden on the utility. The response of farmers regarding the payment of user charges is nothing but a reflection of their lobbying power. Such an attitude of using the lobbying power has also been found, to some extent, in the backward area but for most of the electrified IPS owners, the availability of inadequate and poor quality electricity has been the main reason for their reluctance to pay the electricity charges.

Another factor has been farmers' belief that they can influence the state through their vote bank and lobbying power. This belief is obvious to get strengthened due to increasing political dominance in electricity board's affairs. This belief of farmers also gets reflected in their disappointment with the removal of free electricity supply and privatisation of the electricity board [Jain 2003]. But the question of seeking any diversion from the state's electricity subsidy policy needs an examination of farmers' original WTP user charges. So it becomes necessary to interview farmers in a hypothetical situation where the power utility is kept independent of political influence. Here, we told farmers that there are no price concessions on the sale of electricity in this situation but they will definitely be provided adequate, reliable and quality electricity.

WTP under promise of adequate, reliable electricity availability: Our survey results point out that a majority of the farmers, who are unsatisfied with inadequate, unreliable electricity supply under the subsidy regime, are willing to pay reasonable user charges. Though some farmers are favouring flat rates, a majority agreed to accept metered rate in both areas, provided the availability of quality electricity is ensured. The two areas differ on account of IPS electrification. This makes one curious to know whether these differences shaped farmers' WTP user charges at the metered rate. In the backward area, the non-electrified IPS holders are more willing to pay user charges at metered rate than their counterparts with electrified IPS holders. In the progressive area, there is not much difference among both categories of farmers (Table 4).

Focusing on the cases favouring metered electricity supply, it can be seen that a majority of the farmers with non-electrified pumpsets, in both the areas, made higher bids than those who are already having electrified pumpsets. The farmers having electrified pumpsets in the progressive area made the lowest bid of Rs 0.50 per unit but the same has been Rs 1.50 for both categories of farmers in the backward area (Table 5). However, the minimum bid level of non-electrified pump-set owners in the progressive area has been higher than their counterparts in the backward area. This set of farmers also showed relatively more

Table 7: Resource Inputs and Cost Estimates for a Single Irrigation of One Acre of Land

Period	Resources Needed			Irrigation Cost (Rs)				
	Time (Hours)	Diesel (Litres)	Electricity (kWh)*	Incurred			Saved	
				Diesel	Electricity @PSEB's Ac	Electricity @AWTP	@PSEB's Ac	@AWTP
First month	5	7	18.39	138.88	44.87	40.46	94.01	98.42
Next 2.5 months	3.5	5	12.87	99.20	31.40	28.31	67.80	70.89
Total	8.5	12	31.26	238.08	76.27	68.77	161.81	169.31

@ = at the rate of; AC = Average Cost; AWTP = Average Willingness to Pay.
Source: Primary survey.

Table 5: Summary Statistics for Payment of User Charges by IPS Electrification Status and Farmer Class Differences in Progressive and Backward Areas

Summary Statistics	Progressive Area					Backward Area				
	Electrified IPS		Farmer Class			Electrified IPS		Farmer Class		
	Yes	No	Small	Medium	Large	Yes	No	Small	Medium	Large
Mean (Rs)	1.5	3.01	2.03	1.59	1.13	2.38	3.1	3.1	2.59	2.4
Standard deviation	0.54	0.45	0.61	0.52	0.56	0.5	0.51	0.48	0.62	0.53
CoV (per cent)	36	14.95	30.05	32.7	49.6	21.01	16.45	15.5	23.94	22.1
Minimum (Rs)	0.5	2.25	1.25	0.5	0.5	1.5	1.5	1.5	1.5	1.5
Maximum (Rs)	2.75	3.5	3.5	2.5	2.5	4	4	4	4	4

Note: CoV = Coefficient of variation.
Source: Primary survey.

Table 6: Distribution of Farmers (in Percentage) as Per Their WTP User Charges (Per kWh)

WTP(Rs)	Progressive Area					Backward Area				
	Electrified IPS		Farmer Class			Electrified IPS		Farmer Class		
	Yes	No	Small	Medium	Large	Yes	No	Small	Medium	Large
< = 0.50	15.4	-	-	8.7	37.2	-	-	-	-	-
0.50-2.50	83.7	21.4	81.5	91.3	62.8	79.4	14.1	11.5	65	77.1
2.50-3.50	0.9	78.6	18.5	-	-	19	78.1	80.8	32.5	20
> 3.50	-	-	-	-	-	1.6	7.8	7.7	2.5	2.9
Total	100	100	100	100	100	100	100	100	100	100

Source: Primary survey.

consistency in their bid levels. But, farmers in the backward area made the highest bids of Rs 4 per unit. These relatively high bid levels are due to the fact that farmers perceive other electric motor substitutes (like diesel engines) as dearer and of poor quality.

A large proportion of farmers who made high bids are small farmers of the backward area. On the contrary, a majority of the medium and large farmers in the backward area made relatively low bids. But, it has been better than the response of medium and large farmers in the progressive area. A large group of these farmers made bids not more than Rs 0.50 whereas their counterparts kept the same at Rs 1.50 in the backward area. In some cases, it has been even at Rs 4 per unit. This difference in bids by the same class of farmers between the two areas may be due to the difference in their experience of electricity supply at this juncture. This along with the wish to enjoy the better conditions of electricity supply at the farm might have persuaded farmers of the backward area to make relatively higher bids (Table 6).

It can be observed that the rich farmers of the progressive area who have a high capacity to pay have low WTP and the relatively poor farmers of the backward area who have a low capacity to pay have high WTP user charges if the electricity utility ensures the availability of reliable and quality electricity. There are more than one-third of large farmers in the progressive area who kept their bid levels up to Rs 0.50 only. Therefore, there is a need to evolve some sort of balancing strategy under these circumstances. However, the farmers' unanimity regarding the payment of user charges under conditions of reliable and quality electricity supply is a healthy sign for the financially strapped electricity utility in an agriculturally advanced state. But, even then, there arise, in one's mind, various queries like what are the economic benefits on the farmers' side. Will they be better off with willingness-based payment of user charges? Will there be any increase in their consumer surplus after this policy change? And so on. These queries are the subject matter of the next section.

VII
Merits of Policy Change for the Farmers

The scenario of providing adequate, reliable and quality electricity supply ensures economic benefits on the demand side. Farmers made an average bid at Rs 2.20 per unit. This bid level is too high in comparison to the free availability of electricity. But even then, we argue that this new scenario has its merit for benefiting the farmers in terms of irrigation cost reduction. The farmers will be able to reduce this cost even after paying electricity charges as per the average bid level. In order to arrive at some meaningful estimates about the magnitude of avoidable additional cost burden that the farmer has to incur due to her/his dependence on the diesel pumpset, we focus on some water-intensive crops like rice that is cultivated in both the areas. This may facilitate the applicability of same results of avoidable cost burden for both the areas. Since most of the small farmers in the backward area (65 per cent) do not have electrified irrigation pumpsets, the cost analysis can be made with respect to the irrigation practices in this area. Also, it is better to confine the analysis to the unit of per acre in order to get a good estimate of the additional cost burden that a farmer has to bear following his dependence on diesel pump-set.

It is better to know, before delving into the cost analysis, the water needs of the rice crop along with the diesel or electricity requirements for irrigating a single acre of land (Table 7). The gestation period for the hybrid variety of the rice crop is 3.5 months.

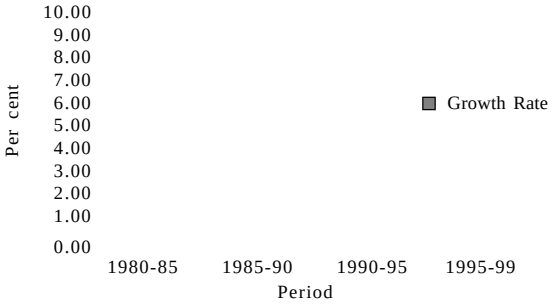
Appendix 2

Table 2: Electricity Status and Average Expenditure (Rs) on Crops (Per Acre)

Electricity Status	Wheat	Rice	Cotton	Sugar Cane
Availability of connection				
the *haves* (progressive area)	3018.60	4279.48	-	4472.22
the *have-nots* (backward area)	3358.82	5621.87	6200	-
Non-availability of connection				
the *haves* (progressive area)	3219.64	7800.25	-	6166.66
the *have-nots* (backward area)	3388.46	8017.85	6382.75	-

Source: Primary survey.

Figure A: Growth Rate of Pump-set Energisation in Punjab



Appendix 1

Table 1: Selected Socio-Economic Indicators of the Selected Districts

Variable	Unit	Mansa		Ludhiana		Punjab
		2001	Rank	2001	Rank	2001
Agriculture						
Cropping intensity	-	[176]	15	[195]	4	[187]
Net Irrigated area	Per cent of net cropped area	[88.0]	14	[100]	1	[94.5]
Number of tractors	Per '000 hectares	[43]	14	[90]	4	[63]
Agricultural workers	Per cent of total workers	59.1	1	19.8	17	39.4
Industry						
Number of units	Per cent of total industrial units	1.38	16	21.23	1	100
Employment	Per cent of total industrial employment	0.78	17	30.22	1	100
Investment	Per cent of total industrial investment	0.22	17	21.46	1	100
Production	Per cent of total industrial production	0.73	16	28.61	1	100
Human development, population and urbanisation						
HDI	-	0.633	17	0.761	1	-
Population density	Per square kilometre	317	16	804	1	482
Urban population	Per cent of total population	20.68	14	55.8	1	33.9
Urban population	Per cent of total urban population	1.73	16	20.51	1	100

Note: Figures in the square brackets refer to year 1999; Ranks of all variables are calculated for corresponding years.
Source: Census of India: Punjab (2001); Government of Punjab (2002; 2004).

The water needs of this variety of rice are more than those of wheat or cotton crop. Also, these do not remain uniform throughout its gestation period, rather there takes place some variation. The crop of rice requires irrigation on every alternate day and with a gap of three days during the first and the next 2.5 months, respectively, i e, the rice crop needs irrigation for 15 times in the first month and for 25 times in the subsequent 2.5 months. This variation in irrigation needs affects the diesel and electricity requirement for irrigating a single acre of land. The diesel pump-set consumes about seven litres of diesel for irrigating a single acre of land once during its five-hour long operation in the first month and during next 2.5 months, it consumes about five litres of diesel for irrigating the same plot of land. It takes 3.5 hours during this time. The diesel requirements during the former period are more than the latter period because usually in the initial period, the summer season is at its peak and the water evaporation takes place rapidly. Suppose if the same acre of land is irrigated with an electric motor of five horse power (HP) capacity and it takes the same time as the diesel pump-set to irrigate one acre of land once during both periods, the continuous operation of this electric motor for five hours and 3.5 hours during the first month and the next 2.5 months will consume 18.39 kWh and 12.87 kWh of electricity, respectively.

This diesel pump-set based irrigation during both periods involves a total cost of Rs 238, if the then current diesel price of Rs 19.84 is considered. In case of electricity, we've estimated the irrigation cost as per the electricity utility's average cost, i e, Rs 2.44 per kWh in 1999-2000 and the farmers' average bid level of Rs 2.20 per kWh. In the former case, the total cost of irrigating a single acre of rice once is equal to Rs 76.27. It is Rs 68.77 during the later period. From these estimates, it can be inferred that the electricity-based irrigation is enabling a farmer to save more than Rs 160 in the single irrigation of the crop. When this cost-saving estimate is made for the entire gestation period of the rice crop, it turns out to be within the range of Rs 3,100-3,250 – an amount close to his average cost of producing wheat (see Appendix 2).

VIII
Summing-up

This paper highlights the electricity subsidy distribution pattern in an agrarian state. Punjab being one of the agriculturally advanced states provides a good example for examining disparities in the distribution of electricity subsidy. This paper devises a new approach for examining the beneficiaries of electricity subsidy. Earlier studies considered the magnitude of electricity subsidy and based their findings on the (reported) agricultural electricity consumption figures, whose authenticity can be doubted, as agricultural electricity consumption is unmetered. Our study devises a new approach and considers the direction of subsidy benefits (rather than its magnitude) in assessing the electricity subsidy flow disparities across different farmer classes within the progressive and the backward areas of Punjab.

Our findings, revealing the comparative picture of the flows of electricity subsidy benefits, are based on first-hand information collected through a primary survey of 200 farm households in the selected progressive and backward districts of Punjab. We also surveyed another 100 households in both the districts to capture the OYT connection holders to delve into the nature of state's electricity subsidy policy. Our results indicate the presence of regional disparities regarding the flow of the electricity subsidy. These differences are significant at 5 per cent level of significance for almost all the indicators used to reflect the flow of the electricity subsidy. The OYT scheme provided another shock to the already existing disparities among different classes of farmers. We found such a scheme to be a conscious move of the state towards limiting the benefits of the subsidy regime and the scarce undergroundwater to certain farmer classes. All this contributed towards the division of Punjab's agricultural sector into the classes of *haves* and *have-nots*. It also affected the sustainability of Punjab's agriculture and left backward areas as the subsidy losers. We also discussed farmers' experience of electricity availability under the subsidy regime and their willingness to pay user charges both under the existing system and the situation when the power utility, being independent of the state influence, ensures the availability of adequate, reliable and quality electricity to the agricultural sector. We found that the farmers are willing to pay reasonable user charges irrespective of the regional differences if the power utility fulfils its promise in the later hypothetical scenario. Based on their average bid levels, we estimated further the economic benefits that will accrue to farmers in terms of reduction in the irrigation cost. This exercise was done to see the economic incentive for the farmers to make a choice between diesel-based irrigation and electricity-based irrigation. The results have been positive as electricity-based irrigation ensures savings, almost equal to the cost of cultivating one acre of wheat! On the basis of this evidence, we put forward the case for user charges-based open access to electricity to speed up the pace of economic development of an agro-based economy as this policy, apart from bringing hope for the sustainability of the electricity utility, will ensure enough economic returns to the farmers dependent on non-electrical means of irrigation. EPW

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Notes

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1 Sreenivasamurthy and Bisaliah (1988) find that the adoption of mechanical and bio-chemical innovations increased agricultural productivity by 52 per cent and 37 per cent, respectively whereas the remaining 11 per cent increase in agricultural productivity took place through the interaction between these two types of innovations.

2 Irrigation has played a significant role in raising the levels of agricultural productivity by permitting the use of better seed-fertiliser combinations, enabling productivity schedules to shift upwards along with increasing employment elasticity of output by encouraging multiple cropping [Sen 1975].

3 Smith (1776) considers the provision of infrastructure along with defence and justice as the important duties of the state. There exist differences among economists regarding their approaches to fulfil this role of the state. Nurkse (1961: 640-643) considers infrastructure as a "non-specific initiatory pioneering type of investment" and argues for its creation ahead of demand. But, others like Hirschman (1958) consider "ahead of demand" creation of infrastructure as the wastage of scarce resources and argue for its creation only in response to demand for it.

4 The market failure occurs due to the inability to define private ownership rights for water as a resource. This inability results in (i) the non-formation of a market price for water; (ii) the existence of externalities which are caused due to the behavioural impact of individual user on collective access to water, and (iii) a divergence between the private marginal costs and social marginal costs of water provision for irrigation [Ellis 1992: 254].

5 Serious doubts have been raised in literature about the magnitude of agricultural electricity consumption. It has been pointed out that the state electricity boards dump a part of their losses into the unmetered electricity supply to the agricultural sector [see Sant and Dixit 1996].

6 The political parties in Punjab did their best to win elections through

populist measures. Since the late 1970s, the sale of electricity to the agricultural sector was based on flat rate. But the political parties, in the 1990s, moved a step forward to attract the rural vote banks. The Congress government under the leadership of Rajinder Kaur Bhattal in its populist 51-point programme announced to provide electricity free of any charge to the farmers having either equal or less than seven acres of land. Congress' rival regional party, viz, Shiromani Akali Dal (Badal) also "promised free power for tube wells, free canal water for irrigation" [Singh 1998: 235]. This regional political party kept its word on assuming the office after having electoral victory in Punjab.

7 These two selected districts differ in terms of their socio-economic development levels. Ludhiana – the land of green, white and blue revolutions is more advanced on agricultural fronts than Mansa district. This is reflected in terms of various agricultural performance indicators like cropping intensity, net area irrigated, agricultural mechanisation and the dependency of labour force on agriculture for livelihood (Appendix Table 1). Ludhiana is much ahead of Mansa district on industrial fronts also. The existence of the highest number of industries, industrial employment, investment and production is a clear indication of Ludhiana's industrial achievements. Similarly, Ludhiana has performed well for developing its infrastructure. This impact of the economic achievements of the two districts is clearly revealed by their respective Human Development Index. As expected, Mansa did the worst even in this respect whereas Ludhiana continues to hold the top position throughout Punjab. The economic achievement of a region also affects the density of population and urbanisation due to their relation with rising per capita income levels. Ludhiana, by the Census 2001, ranks first for having the highest population density whereas Mansa district comes at the 16th rank. The level of urbanisation too is at the highest level in Ludhiana.

8 The existing literature relates positively the benefits arising from electricity subsidy to the land ownership [Reddy 1992; Karnik and Lalvani 1996; Howes and Murgai 2003]. It points out that a large part of this subsidy goes to large and medium farmers whereas small farmers remain at large the non-beneficiaries.

9 Sangha, Ahlupur, Kahnewala and Jhanda Kalan were the four villages selected in the Mansa district. These villages fall within the jurisdiction of the Sardulgarh subdivision. In the Ludhiana district, we took Sudhar and Mullanpur as the representative study areas. Both of these towns were situated in the neighbourhood of the Ludhiana district. In Mansa district, we had surveyed households having electricity connections under the OYT scheme in villages of Bhunder, Jhanduka, Sangha and Sardulewala after collecting information from the Sardulgarh and Jhunir substation. The surveyed villages were Bharowal Kalan, Bhundri, Birmi, Dakha, Fadla, Gorahoor, Majri, Mandeaani, Nurpur Veit, Pdain, Ranke, Sidhvan Veit, Svadi Kalan and Talwandi Khurd in the Ludhiana district. These villages were concentrated around the substations of Hambdhan and Mullanpur.

10 The ownership of landholding can be taken as a proxy to capture varying levels of interest group strength but, as the landownership data may be defective due to under-reporting, we relied upon Punjab's operational landholding statistics.

11 An official assigned with the job of keeping all land records of a village.

12 During the primary survey, farmers have disclosed that they have to pay bribes to the electricity board officials to get permission for the use of stabilisers.

13 See e g, Bathla (1997).

14 For more discussion on problems involved in mobilising loans from the institutional sources in Punjab, see Gill (2004).

15 The growth rate of pump-set energisation has fallen drastically from the 9.26 per cent during 1980-85 to 1.56 per cent during the 1995-99 (see Figure A in Appendix 2).

16 Recently, the state has withdrawn its free electricity supply policy but electricity sale to agriculture is still subsidised. It is supplied at a certain fixed price. Given non-economic factors, this policy is likely to continue.

17 The depletion of underground water as a threat to Punjab's agriculture has been recognised long back, see e g, Joshi and Tyagi (1991); Surender Singh (1991); Baldev Singh (1992); B D Dhawan (1993).

18 The degree of rainfall in this backward area is relatively low as this area falls into the dry zone of Punjab.

19 These estimates are based on approximate levels of groundwater as told by the farmers during the survey. No scientific technique has been applied to measure the actual level of groundwater.

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