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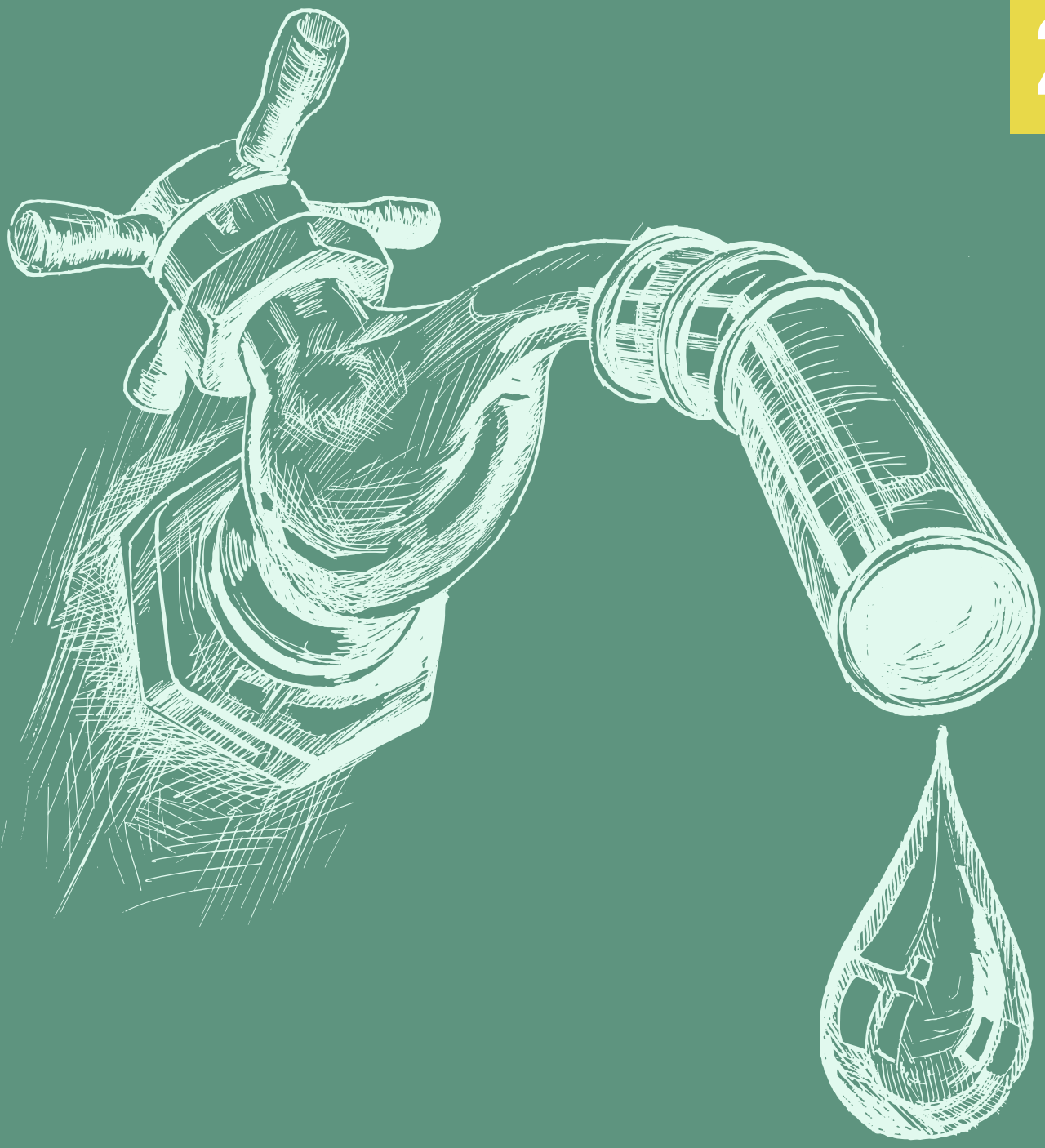

PHED vs Ward Members:
How Implementing Agency Affects Households' Access to Piped Water in Bihar

I. INTRODUCTION

As part of the Chief Minister's Saat Nischay Yojana, the Har Ghar Nal ka Jal project aims to provide every household in Bihar with piped water. In 2016, project implementation was decentralised to ward members through the Ward Implementation and Management Committees. Only in wards where water quality issues were identified and water treatment was required, the implementation was centralised under the state's Public Health Engineering Department (PHED). However, from May 2023, responsibility for all wards was handed over to the PHED, based on the claim that the experience of the previous years showed that ward members lacked expertise in running and maintaining Nal Jal projects. But is this claim justified?

In this policy brief, we quantitatively assess the impacts of these two modes of implementation - PHED and ward members - on the availability of piped water in rural households in 2019/20. Using village-level data on piped water availability from the 2020 Mission Antyodaya Survey and econometric techniques, we find that neighbouring wards in **villages with PHED implementation have 7.9% - 21.8% fewer water connections.** This suggests that **had ward members been given the responsibility of implementing the program in place of PHED, an additional 1,77,000 - 4,36,000 households would have had access to piped water** in 2019/20. However, due to data limitations, we cannot account for the quality, cost, and durability of these projects. In the following sections, we explain the data and methods used, present the results, and discuss policy implications.

II. DATA AND METHODS

We use data from multiple sources to analyse how household access to piped water differs with the mode of Nal Jal implementation. The **Mission Antyodaya survey**, conducted by the Ministry of Rural Development in 2020, provides information on the proportion of households with access to piped water at the village level. Since the mode of Nal Jal implementation was at the ward level, we matched each ward to the unique village boundary within which it is located using the ward-to-village mapping conducted by Bihar's State Election Commission (SEC). The details of this process are provided in Appendix 1.

Overall, we were able to match 88,817 out of the 109,689 wards in the SEC dataset, covering 81.0% of the wards in SEC and 52.7% of Census villages in Antyodaya. Figure 1 shows that piped water access at the village-level was highest in central and west Bihar and lowest in the northeast. Figure 2 shows that particularly in the southwest, neighbouring wards see Nal Jal implementation by both PHED and ward members.

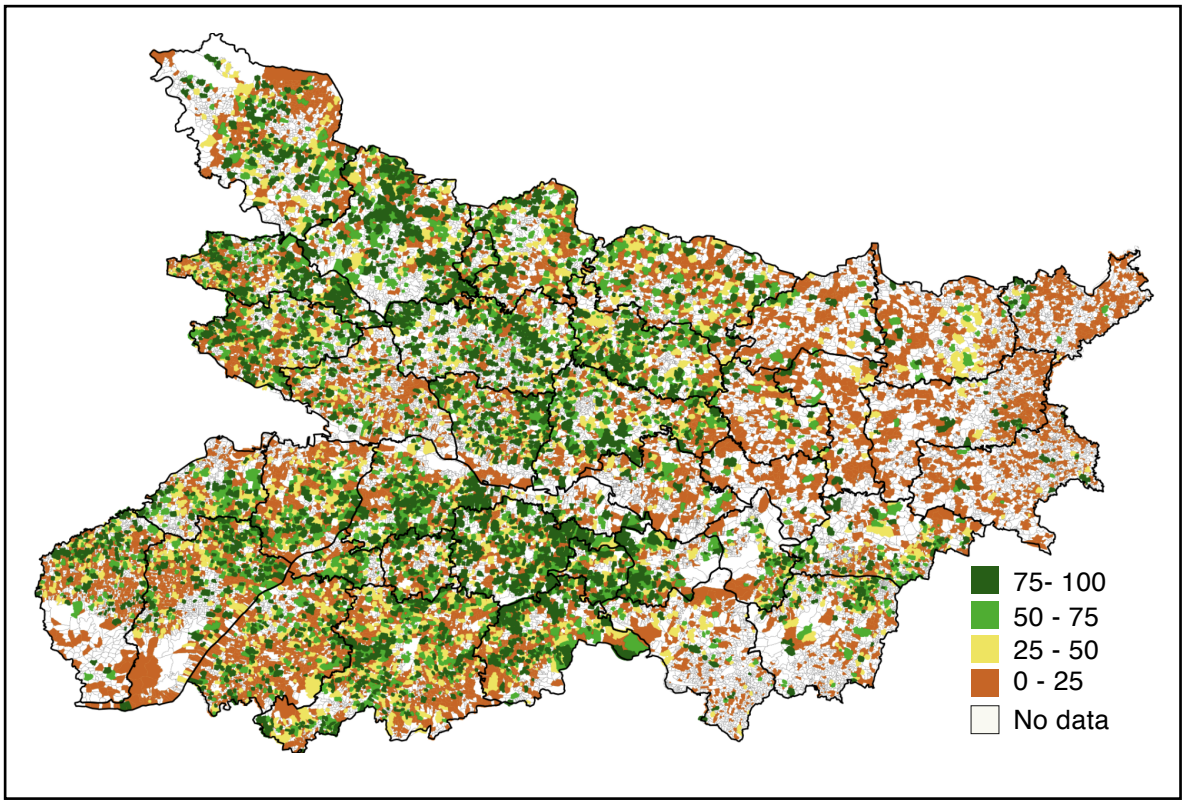

Figure 1. Percentage of households with access to pipeed water in each village

To estimate the difference in piped water access between the two implementation modes, we compare piped water access in:

1. Villages with a high proportion of PHED implementation versus low within the same Gram Panchayat (GP).

2. Gram Panchayats with a high proportion of PHED implementation versus low within the same block.

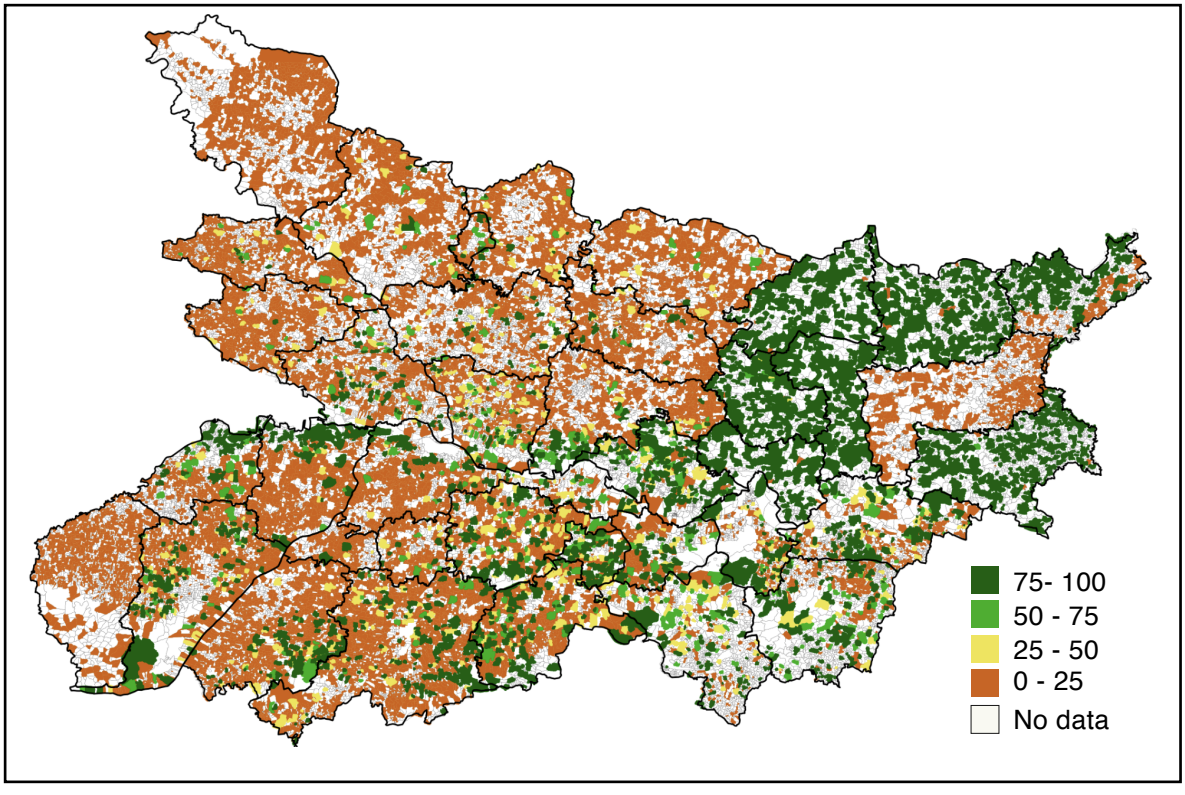

Figure 2. Percentage of wards where Nal Jal implemented by PHED

III. RESULTS

Using regression analysis, we find that within the same GP, mean household access to piped water is significantly lower by 7.9% in villages where Nal Jal was implemented by PHED. In this analysis, **we account for factors such as availability of tap water prior to 2016**, distance from the district headquarters and the nearest town, geographical area and population, education, health and road infrastructure using Census 2011 data.

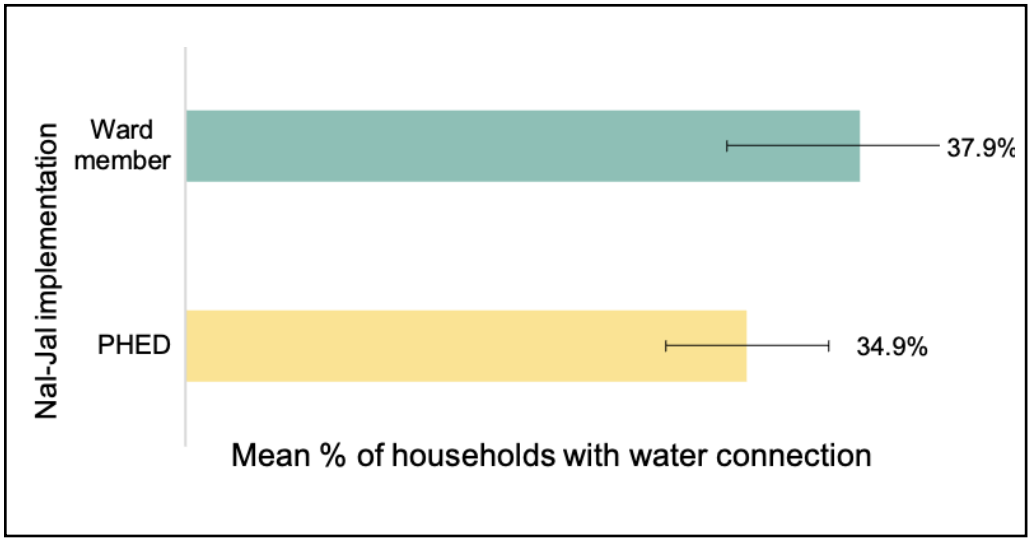

Figure 3. Percentage of households with access to piped water in village, 2020

Given that not all Mission Antyodaya villages are mapped in our analysis, we perform another analysis that compares outcomes across GPs within the same block. This has the advantage that we are able to cover 94.5% of the GPs and 94.7% of the wards of Bihar. We aggregate the data to the GP level to compare mean household access to piped water in the panchayat with the proportion of wards assigned to PHED in the panchayat. On average, we find that **GPs with full PHED implementation show a 21.8% reduction in household access to piped water** compared to panchayats with no PHED implementation in the same block. The regression tables for these results are provided in the Appendix.

IV. POLICY RECOMMENDATIONS

Decentralised implementation by ward members resulted in improved access to piped water for lakhs of households. While PHED projects may have better water quality due to separate treatment facilities, they are also more expensive. **Our analysis suggests that PHED should continue to provide technical expertise to ensure water safety, but placing implementation in the hands of ward members leads to greater access.**

Transferring financial and implementation powers to ward members was a significant achievement of decentralisation in Bihar. This was particularly empowering for ward members from SC/ST communities, as their wards are given priority in allocating Nal Jal projects. **Decentralising to elected representatives also has the added benefits of deepening democracy and improving local accountability.**

V. APPENDIX

A I. Steps involved in the matching of Antyodaya and SEC datasets

The purpose of this exercise was to match villages (linked to wards) from the SEC to the Antyodaya dataset. We followed a nested matching process wherein we first matched districts followed by sub-districts and GPs. Within matched GPs, village and tolas were matched on names, producing a ward-to-village matching between Antyodaya and SEC datasets.

At the sub-district level, 533 out of the 534 sub-districts were matched. The two data-sets differed in the number of unique GPs and villages. A total of 7697 GPs were matched with a match rate of 94.5% for SEC and 97% for Antyodaya.

A total of 17,620 Antyodaya villages (out of 36,919) were matched with a match rate of 75.6% for SEC and 47.7% for Antyodaya. The unmatched villages in the Antyodaya data-set were then matched with the village tola names in SEC improving this to 19,674 or 52.7% matches. This produced a mapping of 88,817 wards out of 109,689 (81%) with their corresponding Antyodaya villages.
The difference in the match rate for GPs and villages is largely due to the non-standardisation of village and tola names in the SEC data.

A II. Balance Tables

In Table 4, we compare pre-treatment characteristics of matched and unmatched villages in the Antyodaya and SEC datasets using Census 2011. We find no statistically significant differences between matched and unmatched villages from Antyodaya on household access to piped water, distance from district headquarters and nearest town, geographical area and population, education, health and road infrastructure and status of treatment of tap water.

1 The SEC dataset did not contain data on one sub-district - Bettiah in Paschim Champaran district

Figure 4. Balance test on Antyodaya villages		
Variable	**Unmatched**	**Matched**
	Standard errors in paranthesis	
No. of households	433.272 (1,008.958)	657.532 (1,090.753)
No. of households with piped water	111.957 (246.183)	188.615 (377.080)
Proportion of households with piped water	0.288 (0.350)	0.330 (0.355)
Distance from district HQ (in km)	33.708 (19.642)	32.672 (18.455)
Distance from nearest town (in km)	21.946 (13.964)	20.717 (13.197)
Area (in hac)	177.015 (270.080)	250.917 (307.182)
Population	1,752.621 (2,159.569)	2,776.539 (2,865.547)
SC Population	282.863 (407.562)	477.796 (532.789)
Proportion of SC in population	0.175 (0.206)	0.197 (0.168)
No. of gvt. primary schools	1.026 (0.934)	1.358 (1.148)
No. of PHCs/SCs	0.166 (0.372)	0.259 (0.438)
If 100% households have water access	0.082 (0.275)	0.103 (0.304)
Has all-weather road	0.678 (0.467)	0.721 (0.448)
Observations	**17,640**	**19,674**

In Table 5, we compare matched and unmatched wards in the SEC dataset on demographic and administrative characteristics. We find no statistically significant difference in the total population, proportion of SC population, literacy status and reservation status between matched and unmatched wards.

Figure 5. Balance test on SEC wards		
Variable	**Unmatched**	**Matched**
	Standard errors in paranthesis	
Ward SC reserved (2016)	0.164 (0.371)	0.176 (0.380)
Ward ST reserved (2016)	0.014 (0.118)	0.010 (0.101)
Ward OBC reserved (2016)	0.185 (0.388)	0.184 (0.387)
Ward female reserved (2016)	0.469 (0.499)	0.461 (0.499)
Margin of victory proportion	0.199 (0.153)	0.197 (0.152)
Education status: Illiterate	0.115 (0.320)	0.111 (0.315)
Education status: Literate	0.574 (0.494)	0.544 (0.498)
SC ward member	0.159 (0.366)	0.166 (0.372)
Observations	**15,052**	**88,814**

A III. Regression Results table

a. Village level comparison

	Mean HHs with piped water
Proportion of wards with PHED	-0.030***
	(0.011)
Distance from district HQ (in km)	0.000
	(0.001)
Distance from nearest town (in km)	-0.001*
	(0.001)
Area (in hac)	-0.000
	(0.000)
Population (in units of 100)	-0.001***
	(0.000)
SC Population	0.000
	(0.000)
No. of gvt. primary schools	0.002
	(0.004)
No. of PHCs/SCs	-0.000
	(0.006)
If all HHs have water access	0.016
	(0.012)
Has all-weather road	-0.005
	(0.006)
Constant	0.379***
	(0.018)
Observations	15887
Fixed Effects	UGP
Controls	Population,Land Area,Connectivity,Infra,Untreated Water

Figure 6. Regression table on effect of proportion of wards where Nal Jal implementation by PHED on proportion of households with acceess to piped water in village. Fixed effects at GP - level. Village - level controls on population, land area, connectivity, social infrastructure and pre-treatment access to untreated water added.

b. GP level comparison

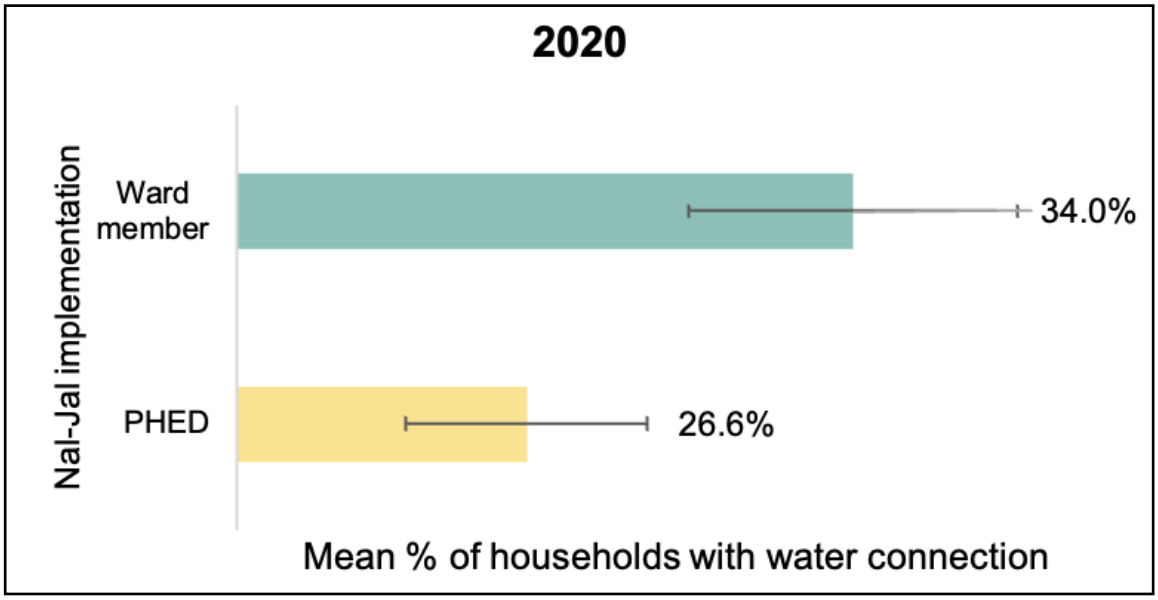

Figure 7. Percentage of households with access to piped water in gram panchayat, 2020

	Mean HHs with piped water
Proportion of wards with PHED	-0.030***
	(0.011)
Distance from district HQ (in km)	0.000
	(0.001)
Distance from nearest town (in km)	-0.001*
	(0.001)
Area (in hac)	-0.000
	(0.000)
Population (in units of 100)	-0.001***
	(0.000)
SC Population	0.000
	(0.000)
No. of gvt. primary schools	0.002
	(0.004)
No. of PHCs/SCs	-0.000
	(0.006)
If all HHs have water access	0.016
	(0.012)
Has all-weather road	-0.005
	(0.006)
Constant	0.379***
	(0.018)
Observations	15887
Fixed Effects	UGP
Controls	Population,Land Area,Connectivity,Infra,Untreated Water

Figure 8. Regression table on effect of proportion of wards where Nal Jal implementation by PHED on proportion of households with access to piped water in village. Fixed effects at the subdistrict level. GP - level controls on population, land area and number of villages added.