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Conditional Cash Transfers in Resource-poor Environments: Evidence from the Philippine 4Ps

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Abstract

We provide new evidence of the heterogeneous impact of the Philippines' conditional cash transfer (CCT) program designed to improve human capital investments among children from poor households. Using a regression discontinuity design, our moderation analysis shows that the distance to and quality of education and health facilities matter in child schooling and vaccination behaviors. Conditional cash transfers provide some but incomplete protective effects against the adverse influence of suboptimal facility conditions on these child outcomes. We also document no crowding out effects from some elective affirmative actions directed towards CCT beneficiaries.

Keywords: conditional cash transfer, 4Ps, education, health, impact evaluation

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Conditional Cash Transfers in Resource-poor Environments: Evidence from the Philippine 4Ps

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1. Introduction

Previous evaluations of the Philippine conditional cash transfer (CCT) program for the poor have noted the need to understand how supply-side conditions alter household human capital investment decisions and, ultimately, child education and health outcomes. While supply-side factors have been included in earlier impact evaluations (e.g. Orbeta, et al., 2021), these were largely used to control for potential confounding effects and rarely to understand how they modify behaviors or mediate program impacts.

We supplement these earlier studies by assessing the potential moderating effects of conditional cash transfers on the influence of school and health facility characteristics on education- and health-seeking behaviors of poor households. Earlier studies on the Philippine *Pantawid Pamilyang Pilipino Program* (4Ps), the government flagship CCT program, have focused on uncovering potential heterogeneous program impacts by household residence location, child's sex, and child monitoring status. We complement these by looking at other potential sources of impact heterogeneity. We employ a similar regression discontinuity design that have been used in these earlier 4Ps evaluations, but expanded to account for potential 4Ps moderating effects and to include more sample observations in the estimation.

We uncovered several observations that may have important implications for policy in general and in the design of conditional cash transfer programs in particular.

First, we confirm longstanding lessons that education- and health-facility quality matters in human capital investments. For example, we find evidence that increasing school distance have adverse effects on school attendance across education levels. Shortages in health human resources (HHR) and in vaccine supply decrease the attainment of basic and age-appropriate vaccination among children.

Second, we find some protective moderating effects of 4Ps against the adverse influence of suboptimal education and health facility conditions. In some cases, the 4Ps is able to cancel out and even reverse the negative influence of poor supply-side conditions. However, the protective 4Ps effects may not be universal in the sense that it does not fully compensate for adverse influences of all supply-side limitations.

Finally, we did not find evidence that affirmative actions targeted towards 4Ps beneficiaries crowd-out access among non-beneficiaries, at least on child immunization. In contrast, we find

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that children from 4Ps beneficiaries are even slightly disadvantaged compared to non-beneficiaries with the overall expanded services provided by facilities.
The rest of the study is organized as follows. In the next section, we provide an overview of the Philippine's 4Ps. The program has been an important feature of the Philippine social protection system, being one of its single largest programs over the last decade. This is followed by a discussion on the accessibility and service quality of education and health facilities available to 4Ps beneficiaries. We show that 4Ps beneficiaries, i.e., poor households, usually live farther away from education and health facilities that may be of poorer quality compared with other facilities. In Sections 4 and 5, we then discuss the data and estimation strategy that we employed in our analysis. We present the results in Section 6. Finally, we conclude with a summary of our findings and some policy implications.

2. Pantawid Pamilyang Pilipino Program

The Pantawid Pamilyang Pilipino Program (4Ps) is the Philippines's flagship poverty reduction strategy that provides conditional cash transfers (CCT) to improve health, nutrition and education outcomes among poor households. The program is largely patterned after CCT programs in Latin American countries, particularly Brazil and Mexico, that introduced similar interventions in the 1990s. In 2019, the government enacted Republic Act No. 11310, also known as the 4Ps Law, which institutionalizes the implementation of the CCT program with the Department of Social Welfare and Development (DSWD) as its lead implementing agency.

In its initial year in 2008, the 4Ps covered about 300 thousand household-beneficiaries in the 20 poorest provinces in the Philippines. The program has since expanded considerably both in the number of households and in the geographic areas covered. By 2020, the 4Ps has been providing regular cash grants to about 4.3 million households in practically all provinces of the country, representing 16.3 percent of all Philippine households (Philippine Statistics Authority [PSA], 2022a). This household share is about 3- to 4-percentage points higher than the recorded household poverty incidence of 12.1 percent in 2018 and 13.2 percent in 2021 (PSA, 2022b). In 2022, the government allocated PhP107.7 billion for 4Ps, of which PhP99.1 billion has been earmarked as cash grants, making it one of the government's largest social protection programs.

Potential 4Ps household-beneficiaries are identified through a standardized national targeting system called *Listahanan*, formerly called the National Household Targeting System for Poverty Reduction, which identifies poor households using a proxy means test methodology based on household responses in an assessment tool. Only households with a pregnant member or with at least one child below 18 years old, and willing to comply with program conditionalities are included in the program.

Household beneficiaries receive monthly cash grants for complying with program conditionalities: (i) up to PhP700 per month for each child aged 3- to 18-years with 85 percent school attendance rate for up to three children, (ii) PhP750 per month for complying all health conditionalities[2] and attending Family Development Sessions, and (iii) PhP600 per month rice subsidy for complying with at least one education or health conditionality. A fully compliant household with three eligible children may receive anywhere between PhP27,000 and

[2] These include (a) pre-natal, delivery and post-natal care by skilled attendant for pregnant women; (b) newborn care or post-natal follow up visits for newborn infants; (c) monthly checkups and scheduled vaccination for children below 2 years old; (d) bimonthly growth and development monitoring for children aged 2- to 5-years; and (d) biannual availing of deworming pills or medicines.

PhP41,400 per year, depending on the children's school levels, or about 18.7- to 28.7-percent of the 2021 official poverty threshold for a five-member household. In addition, 4Ps beneficiaries may receive unconditional top-up cash grants, such as in the aftermath of natural disasters or during pandemics (DSWD, 2021).[3]

Several 4Ps evaluations (e.g. Chaudhury, et al., 2013; Orbeta, et al., 2014; Orbeta, et al., 2021) have documented the program's positive impacts on school attendance and access to health care services, among others. They also showed that the program does not deter labor force participation or encourage consumption of adult goods such as alcoholic beverages and gambling. However, later evaluations have found either no significant or even perverse impacts on most child nutrition outcomes[4] (Orbeta, et al., 2014; Orbeta, et al., 2021), which others have traced to program caps on the number of eligible children (Raitzer, et al., 2021) and other moderating factors (e.g., Bustos, 2022). These results, including the mixed impacts on nutrition outcomes, are largely in line with the empirical evidences on the effects of CCT programs on education and health outcomes among poor households around the world.[5]

Similar with other CCT interventions, the 4Ps presumes that education and health facilities are available, accessible and acceptable to households (Orbeta, et al., 2021). While this critical assumption has been well recognized, empirical assessments of the potential contributions of qualitative differences in supply-side conditions remains scant. A few exceptions include Bustos (2022), who found moderating effects of geography on some child nutrition outcomes, and Araos, et al. (2022), who concludes in their qualitative research that the documented negative impact on nutrition outcomes may not be directly attributed to differences in supply-side factors between 4Ps and non-4Ps beneficiaries.

3. Education and health facilities in the Philippines

Supply-side conditions affect household decisions on human capital investments. Limitations in accessibility, proxied by distance or commuting times, for example, have been associated with poorer outcomes in education (e.g. Card, 1993; Tigre, et al., 2017) and in health (Karra, et al., 2017; Quattrochi, et al., 2020). Indeed, meta-analytic studies (e.g., Bastagli, et al., 2016; Garcia and Saavedra, 2017; Ranganathan and Lagarde, 2012) have shown that CCT programs are more effective when delivered in conjunction with supply-side interventions.

In the Philippines' 4Ps, the DSWD conducts annual supply-side assessments to determine the availability, accessibility and adequacy of health and education facilities in 4Ps communities. These assessments are then used to rally the commitment of other stakeholders, including local governments, other national government agencies, and civil society organizations, among others, to address supply-side gaps.

[3] The 4Ps has undergone several modifications since its introduction in 2008. See Orbeta, et al. (2021) for a summary of these modifications, and DSWD (2021) for the latest description of the program.

[4] An earlier evaluation by Kandpal, et al. (2016) using cluster-randomized control trial documented the following intent-to-treat effects: a 10.2 percentage point reduction in severe stunting and a marginally significant 0.284 increase in average height-for-age z-scores among children aged 6- to 36-months. Estimated impacts on other nutrition outcomes, e.g. weight-for-age z-scores, stunting, underweight and severely underweight status, were not statistically different from zero.

[5] See Manley, et al. (2020) and Cooper, et al. (2020) for reviews and meta-analyses of impacts on health; see Garcia and Saavedra (2017) on education.

In this section, we document the spatial distribution of health and education facilities to provide indications of its availability and accessibility to 4Ps households. We also present several proxies for adequacy of services provided by these facilities, based on data from the 2015 Census of Population [CP] (PSA, 2017), Department of Education (DepEd) administrative data, and the 4Ps third-wave evaluation (Orbeta, et al., 2021).

3.1. Spatial distribution

Table 1 shows the spatial distribution of education and health facilities using data from the 2015 CP (PSA, 2017). We specifically look at the location of the nearest primary and secondary education facilities, and health centers and hospitals relative to each barangay based on responses of local government representatives in the 2015 Census of Population module for barangay governments. The distribution in Panel A is weighted by the total barangay household population, while that in Panel B is weighted by the barangay distribution of 4Ps household obtained from DSWD.

By and large, Table 1 shows that 4Ps household beneficiaries reside in barangays that are farther away from education and health facilities relative to the general population. This disparity in availability and accessibility is less pronounced for elementary schools and health clinics, which are available within two kilometers in about nine of every ten barangays nationwide, but are quite apparent in the other facilities that we have considered. For instance, 40.3 percent of 4Ps households live in barangays that are at least two kilometers away from the nearest high school compared with only 28.1 percent of the general population. Similarly, 80.3 percent of 4Ps households live in a barangay that is at least two kilometers away from the nearest hospital, which contrasts with 65.3 percent of the general population

When disaggregated by characteristics of residence barangay, the disparity in distance to education and health facilities between 4Ps households and the general population are more distinct among those living in rural areas and outside of municipality centers (i.e., *población*), as well as those living in barangays outside of the National Capital Region (NCR).

3.2. Service quality

3.2.1. Education

Table 2 shows proximate measures of school quality disaggregated by education level, broad region, and share of 4Ps beneficiaries in school population calculated from DepEd's Basic Education Information System for school year 2017-2018. We only include public schools, where 4Ps beneficiaries are more likely to be attending.

Gaps between ideal[6] and actual student-classroom and student-teacher ratios remain as important issues among Philippine public schools, especially in the secondary education levels and in urban centers, as shown in Table 2. This is despite the massive expansion in public school teacher hiring and in capital outlays for school building construction over this decade. Between 2010 and 2018, DepEd created more than 360,000 new teaching positions to reach almost 840,000 authorized teaching posts by 2018, although only 92 percent of these positions had been filled (DepEd, 2019). Over the same period, appropriations for the construction, replacement and completion of basic education facilities peaked at PhP109 billion in 2017, however implementation has been hampered by several intervening factors (Navarro, 2022).

[6] Ideal ratios are based on DepEd Department Order (DO) No. 77, s. 2010, and DepEd DO No. 10, s. 2008.

Table 1. Location of nearest education and health facility, 2015

	Elementary school			High school			Health Centers			Hospitals		
	Within barangay	Nearest barangay		Within barangay	Nearest barangay		Within barangay	Nearest barangay		Within barangay	Nearest barangay	
		<2km	≥2km		<2km	≥2km		<2km	≥2km		<2km	≥2km
A. Distribution of population												
Philippines	89.3	8.5	2.1	50.2	21.3	28.5	87.7	5.8	6.4	15.2	19.4	65.3
By urbanicity												
Urban	91.0	8.0	1.0	69.5	18.9	11.6	93.0	5.6	1.3	26.7	27.8	45.4
Rural	87.5	9.1	3.3	29.9	23.8	46.2	82.1	6.0	11.8	3.1	10.6	86.2
By poblacion status												
Current	81.3	16.5	2.2	62.5	26.3	11.2	84.5	12.5	3.0	29.8	28.6	41.6
Former	90.5	8.0	1.3	68.4	19.4	12.2	93.3	3.6	3.1	16.6	30.3	53.0
Never	92.0	5.8	2.2	45.3	19.6	35.0	88.7	3.5	7.7	10.0	15.9	74.0
By broad region												
NCR	79.1	19.4	1.6	67.2	27.4	5.4	82.2	15.7	2.1	30.3	46.2	23.5
Balance Luzon	90.3	7.7	2.0	46.4	23.6	29.9	90.1	4.4	5.5	13.3	19.5	67.2
Visayas	88.2	9.7	2.1	43.6	22.5	33.9	84.4	6.7	8.9	7.7	12.5	79.7
Mindanao	93.7	3.4	2.7	53.2	12.8	33.8	88.9	2.4	8.5	16.6	10.6	72.6
B. Distribution of 4Ps households												
Philippines	90.7	6.4	2.9	40.7	18.8	40.3	84.8	4.7	10.5	7.7	11.8	80.3
By urbanicity												
Urban	92.4	6.7	0.9	67.6	18.1	14.2	93.6	4.7	1.6	21.3	23.3	55.4
Rural	89.9	6.3	3.7	29.4	19.1	51.3	81.1	4.6	14.2	2.1	7.0	90.8
By poblacion status												
Current	82.2	15.4	2.2	57.0	26.5	16.3	84.6	11.1	4.2	23.0	23.0	53.0
Former	89.9	6.9	2.5	58.4	20.4	21.0	87.4	5.1	7.6	14.3	21.0	64.6
Never	92.5	4.5	3.0	36.9	17.2	45.8	84.8	3.3	7.6	4.3	9.2	86.4
By broad region												
NCR	77.1	21.7	1.2	62.3	32.6	5.1	81.6	17.0	1.5	26.0	54.6	19.4
Balance Luzon	91.2	6.6	2.1	38.5	22.4	39.1	87.7	4.1	8.2	6.8	12.9	80.3
Visayas	89.9	7.8	2.3	36.2	20.2	43.6	80.7	6.4	12.9	4.2	8.0	87.7
Mindanao	92.4	3.3	4.1	42.5	12.7	44.4	84.6	2.6	12.6	8.2	7.0	84.5

Source: Authors' calculation based on census data from PSA (2017) and 4Ps data from DSWD.

Table 2. Selected public school input indicators by school level, school year 2017-2018

	All schools	By broad region				By 4Ps student share			
		NCR	Balance Luzon	Visayas	Minda-nao	No 4Ps	>0% to ≤10%	>10% to ≤20%	>20%
A. Elementary School									
% with ≤40:1 student-teacher ratio	94.3	86.7	96.0	97.7	89.2	94.3	92.9	96.5	95.5
% with ≤45:1 student-classroom ratio	92.8	32.9	95.2	97.0	88.2	92.9	89.8	96.5	94.9
% with at least one Master Teacher	39.7	94.0	47.4	31.5	33.2	30.6	54.6	43.3	29.3
B. Junior High School									
% with ≤25:1 student-teacher ratio	58.2	61.9	61.0	59.1	52.5	60.8	54.3	54.1	60.6
% with ≤45:1 student-classroom ratio	70.6	35.6	75.2	71.0	66.6	74.2	61.9	68.4	74.9
% with at least one Master Teacher	31.0	73.2	29.4	31.1	29.0	19.6	45.1	39.1	27.0
C. Senior High School									
% with ≤25:1 student-teacher ratio	48.2	29.3	51.7	41.4	50.8	53.2	32.9	40.4	50.2
% with ≤45:1 student-classroom ratio	74.9	47.3	70.2	61.1	59.6	67.6	53.9	62.5	65.9
% with at least one Master Teacher	27.4	67.9	35.5	20.6	16.8	25.3	38.9	32.4	18.8

Source: Authors' calculation based on DepEd administrative data.

In addition to declining but still prominent input gaps in education, teacher quality has also been cited as a significant concern. While public school teachers generally have passed quality testing through the teacher licensure examination, additional administrative or support roles assigned to teachers may erode teaching quality (David, et al., 2019).

In Table 2, we show the proportion of schools with Master Teachers (MTs) as proxy for teacher quality. Promotion to MT level requires several quality indicators, including tenure or experience, additional trainings, and ratings in subjective performance measures, among others. In 2018, only 6.7 percent of authorized teaching posts in the public basic education sector was allotted for MT positions. Presence of MTs in schools vary significantly across school levels, with higher proportion with MTs in elementary schools, and across regions, wherein schools with MTs are largely concentrated in NCR.

Table 2 also shows that our selected school quality measures differ considerably across shares of 4Ps beneficiaries in the student population. Controlling for other school characteristics[7] in regression analyses, it is apparent from Figure 1 that public schools with higher proportion of students from 4Ps beneficiary households have higher student-teacher and student-classroom ratios, and lower propensity of having at least one master teacher in its faculty roster. Overall, these suggest that poor students from 4Ps beneficiary households living in poorer communities are likely attending poorer quality schools.

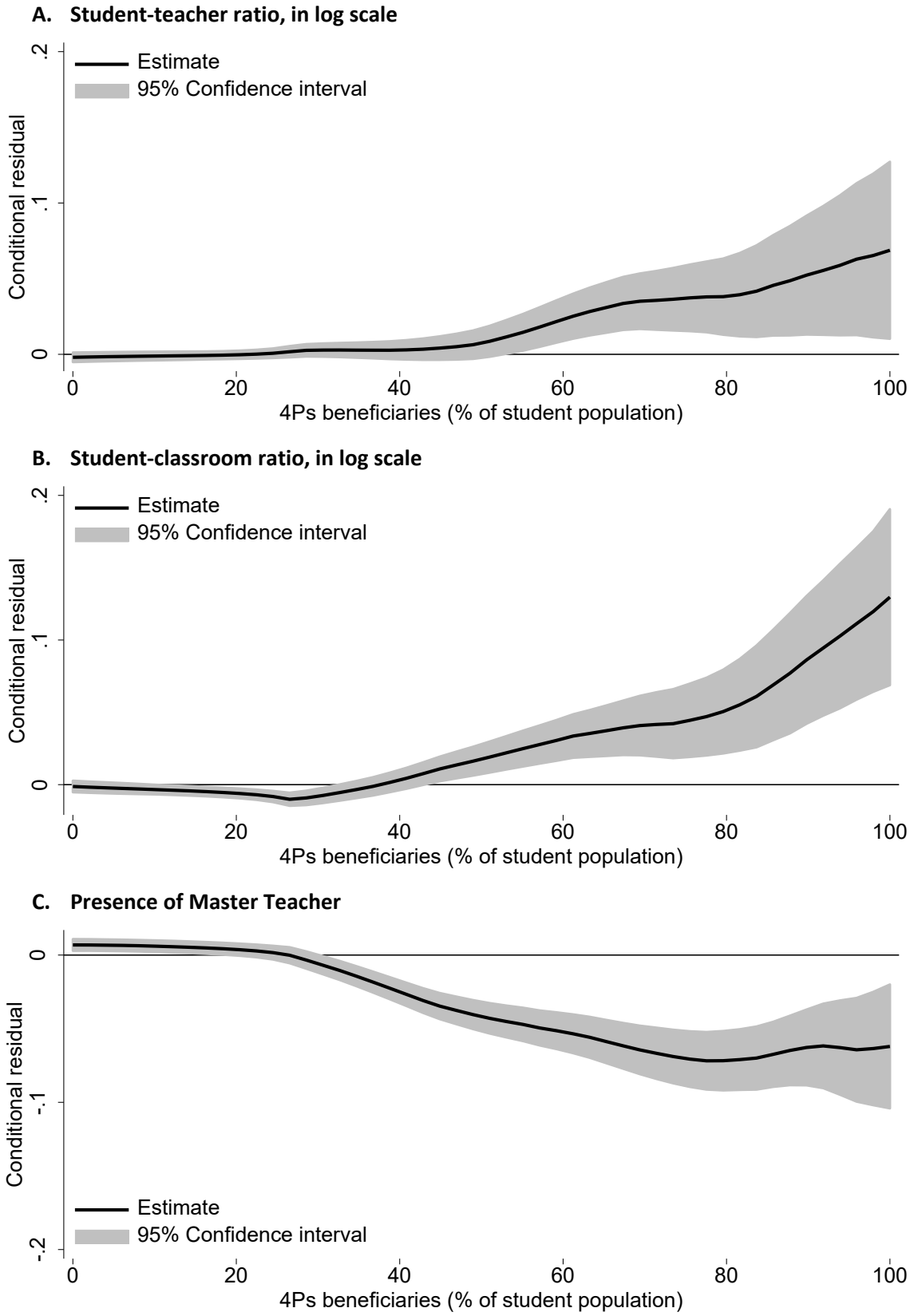
3.2.1. Health

Table 3 provides a summary of resources and services available in 161 public health facilities that had been visited by the sample of poor and near-poor respondents in the 4Ps third-wave evaluation study (Orbeta, et al., 2022). It highlights resource gaps in public health facilities, as well as variations in the availability of services provided by them across the country. For example, only three-quarters of the 161 public health facilities reported having all water-sealed toilet, piped water, and finished floors, roofing and outer walls, and this ranges between 63.1 percent in the Visayas and 93.3 percent in the National Capital Region. While majority of facilities reported having sufficient or very sufficient medical supplies (59.8%) and vaccines (77.7%), this is not the case for medical equipment (45.8%) and medicines (42.5%).

In terms of healthcare services provided, Table 3 shows near-universal provision of the following: immunization (97.8%), weigh measurement (98.3%), height measurement (98.3%), deworming (98.9%), vitamin supplementation (98.3%), antenatal care services (94.4%), weight monitoring of pregnant women (97.8%), blood pressure measurement of pregnant women (99.4%), breastfeeding counseling (98.3%), family planning counselling (98.9%), and post-natal care (97.2%). Less common services include feeding program (67.0%) and basic emergency obstetric care (51.4%).

[7] These include student population, region, school levels offered, and school management type. Regression model estimates are available from the authors' upon request.

Figure 1. Share of 4Ps students and proxies for school quality



Source: Authors' calculation based on DepEd administrative data. Note: The figure plots smoothed regression model residuals conditional on school characteristics against the share of 4Ps beneficiaries in the school's student population.

Table 3 also underscores gaps in health human resources. While majority cited having sufficient or very sufficient number of midwives (60.3%) and of barangay health workers or nutrition scholars (71.0%), this cannot be said of nurses (46.9%) and of physicians (27.9%). Indeed, in Table 4, summing the average health human resource (HHR) density for physicians, nurses and midwives leads to an HHR-to-population density of only 59.8 HHR per 100,000 population, which is significantly below the indicative threshold of 445 physicians, nurses and midwives per 100,000 population suggested by the World Health Organization (2016).[8]

Time allocation of health professionals in these facilities appear to vary by type of profession and by location. For example, among those reported having the following health personnel, Table 4 shows that the average combined days per month spent in the health facility and in the community are markedly less for physicians (18.5 days) and nurses (19.6 days) compared with dentists (22.4 days), midwives (23.6 days), other medical/allied medical staff (25 days), and non-medical staff (26.7 days). Physicians spend about 4.4 days per month on field duty in communities, which is less frequent compared with other personnel employed by health facilities. These time allocations by health professionals also vary by region and urbanicity, with those in rural areas generally spending less days in the health facility and in the community in total, except for dentists.

Focusing on child health services, Table 5 shows the share of health facilities that provide different immunization and supplementation services. It is apparent that not all facilities that 4Ps beneficiaries regularly visit provide services that children require, particularly some vaccines that are included in the government's Expanded Program on Immunization: BCG (93.9%), Hepatitis B (74.3%), DPT-HepB-HiB (96.1%), oral polio vaccine (98.3%) or inactivated polio vaccine (93.3%), and MMR (98.9%). On the other hand, Vitamin A and Iron supplementation is near-universally provided in these facilities.

Health facilities may elect to provide additional services to 4Ps beneficiaries, such as those indicated in Table 6. Almost all of the facilities (97.8%) in the survey reported that they monitor 4Ps compliance to program conditionalities, with about a third of them having separate records for this activity. About three-quarters of health facilities provide at least one additional service to 4Ps beneficiaries on top of the standard compliance monitoring. The most frequent additional services include conducting house visits (76.5%), prolonging office hours (46.0%), assigning dedicated schedules for 4Ps beneficiaries (29.3%), and increasing health supplies (27.6%). Some facilities opened special desks for 4Ps beneficiaries (23.0%) and increased their personnel (16.7%), but these are less common compared with other affirmative activities geared towards 4Ps beneficiaries.

[8] It may be argued that this does not include the totality of HHR in the areas covered. However, recent estimates by Abrigo and Ortiz (2019) using census data show that less than a quarter of cities and municipalities in the country have HHR densities above the WHO threshold in 2015.

Table 3. Selected input indicators in public primary health facilities, 2017

	All sample	By broad region				By urbanicity	
		NCR	Bal. Luzon	Visayas	Minda-nao	Urban	Rural
Service hours per week open for patients	41.0	45.3	41.3	38.8	42.0	42.6	39.2
% with usable amenities							
Water sealed toilet	95.5	93.3	93.3	98.5	94.2	96.7	94.3
Piped water	80.5	93.3	83.3	70.8	85.5	85.9	74.7
Finished floors	95.5	100.0	96.7	95.4	94.2	96.7	94.3
Finished roofing	92.7	100.0	93.3	90.8	92.8	96.7	88.5
Finished outer walls	95.5	100.0	100.0	90.8	97.1	96.7	94.3
Finished floors, roofing and outer walls	88.8	100.0	90.0	84.6	89.9	95.7	81.6
All specified amenities	73.7	93.3	80.0	63.1	76.8	82.6	64.4
% with sufficient or very sufficient health resources							
Medical equipment	45.8	86.7	40.0	44.6	40.6	56.5	34.5
Medical supplies	59.8	60.0	50.0	64.6	59.4	63.0	56.3
Medicines	42.5	60.0	30.0	44.6	42.0	47.8	36.8
Vaccines	77.7	80.0	93.3	70.8	76.8	80.4	74.7
Doctors	27.9	40.0	33.3	26.2	24.6	27.2	28.7
Nurses	46.9	13.3	53.3	44.6	53.6	43.5	50.6
Midwives	60.3	33.3	56.7	60.0	68.1	53.3	67.8
BHW/BNS	71.0	40.0	66.7	86.2	65.2	64.1	78.2
% with services provided							
Immunization	97.8	100.0	100.0	98.5	95.7	97.8	97.7
Weight measurement	98.3	100.0	100.0	100.0	95.7	98.9	97.7
Height measurement	98.3	100.0	100.0	100.0	95.7	98.9	97.7
Deworming	98.9	100.0	100.0	100.0	97.1	98.9	98.9
Feeding program	67.0	93.3	50.0	63.1	72.5	67.4	66.7
Vitamin Supplementation	98.3	100.0	93.3	100.0	98.6	96.7	100.0
Basic Emergency Obstetric Care	51.4	66.7	56.7	44.6	52.2	57.6	44.8
Antenatal Care Services	94.4	100.0	100.0	93.9	91.3	95.7	93.1
Weight monitoring of pregnant women	97.8	100.0	100.0	96.9	97.1	98.9	96.6
Take blood pressure of pregnant women	99.4	100.0	100.0	100.0	98.6	98.9	100.0
Breastfeeding counseling	98.3	100.0	100.0	100.0	95.7	96.7	100.0
Family Planning counseling	98.9	100.0	100.0	100.0	97.1	98.9	98.9
Post-natal care	97.2	100.0	100.0	95.4	97.1	96.7	97.7
At least one of specified services	67.0	33.3	70.0	70.8	69.6	62.0	72.4
All specified services	33.0	66.7	30.0	29.2	30.4	38.0	27.6
With PhilHealth accreditation (%)	43.6	93.3	43.3	44.6	31.9	50.0	36.8

Source: Authors' calculations based on the third-wave 4Ps impact evaluation study survey data (Orbeta, et al., 2021).

Table 4. Health personnel in public primary health facilities, 2017

	All sample	By broad region				By urbanicity	
		NCR	Balance Luzon	Visayas	Minda-nao	Urban	Rural
Personnel per 100,000 catchment population							
Physician	5.5	2.9	15.1	3.2	4.1	3.7	7.4
Dentist	4.0	2.6	10.2	2.2	3.3	3.3	4.7
Nurse	22.1	4.1	24.8	22.2	24.8	14.4	30.3
Midwife	32.2	4.5	33.9	31.0	38.6	16.7	48.6
Med Tech/Lab Tech/Aide	2.8	2.3	5.4	1.5	3.0	1.8	3.9
Non-medical staff	95.3	15.3	81.3	149.8	67.4	62.7	129.6
% with at least one personnel							
Physician	46.4	100.0	56.7	32.3	43.5	55.4	36.8
Dentist	36.9	100.0	50.0	26.2	27.5	46.7	26.4
Nurse	81.6	100.0	93.3	75.4	78.3	88.0	74.7
Midwife	96.1	100.0	100.0	90.8	98.6	94.6	97.7
Med Tech/Lab Tech/Aide	32.4	73.3	36.7	24.6	29.0	39.1	25.3
Non-medical staff	63.7	93.3	73.3	64.6	52.2	69.6	57.5
Days per month with available personnel in facility							
Physician	14.1	16.3	12.8	15.7	12.6	15.8	11.4
Dentist	15.9	18.3	16.6	14.8	14.5	15.1	17.4
Nurse	13.3	20.1	12.0	10.8	14.3	16.0	10.0
Midwife	15.4	18.8	14.0	15.1	15.5	18.5	12.2
Med Tech/Lab Tech/Aide	16.3	10.5	13.6	20.6	17.5	17.2	14.8
Non-medical staff	17.3	14.6	17.3	18.2	17.2	18.2	16.1
Days per month on field duty in catchment area							
Physician	4.4	4.4	5.0	1.6	6.1	5.4	2.8
Dentist	6.5	3.1	9.3	4.7	8.5	5.5	8.3
Nurse	6.3	5.3	7.4	6.6	5.6	6.9	5.5
Midwife	8.2	6.1	9.3	8.3	8.0	8.8	7.5
Med Tech/Lab Tech/Aide	9.4	20.5	4.7	2.6	11.2	12.6	4.1
Non-medical staff	9.5	11.9	11.4	7.8	9.3	11.7	6.6

Source: Authors' calculations based on the third-wave 4Ps impact evaluation study survey data (Orbeta, et al., 2021).

Table 5. Child immunization and supplementation in public primary care facilities, 2017

	All sample	By broad region				By urbanicity	
		NCR	Balance Luzon	Visayas	Minda-nao	Urban	Rural
% with services provided							
BCG	93.9	100.0	83.3	93.9	97.1	94.6	93.1
Hep B	74.3	66.7	70.0	72.3	79.7	76.1	72.4
Pentavalent vaccine (DPT-Hep B-HiB)	96.1	100.0	96.7	95.4	95.7	97.8	94.3
Oral polio vaccine	98.3	100.0	100.0	96.9	98.6	98.9	97.7
Inactivated polio vaccine	93.3	100.0	93.3	92.3	92.8	96.7	89.7
MMR	98.9	100.0	100.0	98.5	98.6	98.9	98.9
Vitamin A	99.4	100.0	100.0	100.0	98.6	98.9	100.0
Rotavirus vaccine	42.5	13.3	23.3	32.3	66.7	44.6	40.2
Tetanus toxoid	67.0	66.7	60.0	78.5	59.4	64.1	70.1
Iron tablets	97.2	86.7	100.0	96.9	98.6	95.7	98.9
At least one of specified services	76.0	86.7	93.3	83.1	59.4	72.8	79.3
All specified services	23.5	13.3	6.7	16.9	39.1	26.1	20.7
% with enough supply in past three months							
BCG	95.2	93.3	96.0	98.4	92.5	95.4	95.1
Hep B	93.2	90.0	95.2	95.7	90.9	97.1	88.9
Pentavalent vaccine (DPT-Hep B-HiB)	90.1	66.7	93.1	91.9	92.4	88.9	91.5
Oral polio vaccine	95.5	100.0	93.3	93.7	97.1	97.8	92.9
Inactivated polio vaccine	87.4	93.3	85.7	95.0	79.7	87.6	87.2
MMR	98.9	100.0	100.0	98.4	98.5	98.9	98.8
Vitamin A	96.6	93.3	93.3	96.9	98.5	96.7	96.6
Rotavirus vaccine	39.5	0.0	57.1	42.9	37.0	34.2	45.7
Tetanus toxoid	…	…	…	…	…	…	…
Iron tablets	…	…	…	…	…	…	…
At least one of specified services	89.9	100.0	93.3	92.3	84.1	88.0	92.0
All specified services	9.5	0.0	6.7	7.7	14.5	10.9	8.1

Source: Authors' calculations based on the third-wave 4Ps impact evaluation study survey data (Orbeta, et al., 2021).

Table 6. 4Ps-focused affirmative services in public primary care facilities, 2017

	All sample	By broad region				By urbanicity	
		NCR	Balance Luzon	Visayas	Mindanao	Urban	Rural
Facilities with 4Ps compliance monitoring (%)	97.8	100.0	100.0	96.9	97.1	97.8	97.7
With separate record for 4Ps compliance monitoring (%)	32.2	33.3	23.3	28.6	39.4	39.3	24.7
With additional services provided as part of 4Ps monitoring (%)							
Open a special desk/window for 4Ps beneficiaries	23.0	33.3	20.0	20.6	24.2	21.4	24.7
Assign separate schedule for 4Ps beneficiaries	29.3	20.0	30.0	22.2	37.9	29.2	29.4
Have longer office hours for 4Ps activities	46.0	40.0	40.0	41.3	54.6	47.2	44.7
Increased personnel staff	16.7	33.3	23.3	12.7	13.6	15.7	17.7
Increased supply of medicines, vaccine or equipment	27.6	26.7	16.7	25.4	34.9	30.3	24.7
Visit households to check on beneficiaries	73.0	66.7	70.0	71.4	77.3	75.3	70.6
At least one of specified services	76.5	80.0	73.3	72.3	81.2	79.4	73.6
All specified services	5.6	0.0	6.7	6.2	5.8	4.4	6.9

Source: Authors' calculations based on the third-wave 4Ps impact evaluation study survey data (Orbeta, et al., 2021).

4. Methodology

We investigate the potential moderating effects of the 4Ps on the association between facility characteristics and household education- and health-seeking behaviors using a regression discontinuity design (RDD), similar to the strategy employed in earlier 4Ps impact evaluations (e.g. Orbeta, et al., 2014; Orbeta, et al., 2021). We utilize the same household survey and looked at similar outcomes used in the third-wave 4Ps evaluation (Orbeta, et al., 2021). However, our analyses depart from those in Orbeta, et al. (2021) along a number of dimensions.

First, we rely on a stronger local randomization assumption instead of the more common continuity assumption employed in Orbeta, et al. (2021). In any RDD, a forcing variable is used to assign treatment based on some set threshold. In the 4Ps, the *Listahanan* is used to generate an estimate of the per capita household income, which is then compared with the provincial poverty threshold to identify poor households that may be eligible for the 4Ps, conditional on other program inclusion and exclusion criteria.

Using a local randomization-based RDD, we assume that observations near enough to the assignment threshold are exchangeable. That is, treatment is good as randomly assigned in some small neighborhood around the assignment threshold. Contrast this with continuity-based RDD wherein outcomes are assumed to be sufficiently smooth at the threshold without the treatment. Using a local randomization-based RDD potentially allows us to use more sample from the survey as long as local randomization holds, unlike in continuity-based RDD where only samples closest to the threshold are typically employed.

Second, while we assess 4Ps impact on the same outcomes, namely school enrollment, school attendance and child immunization, the sample covered in both studies are different. In Orbeta, et al. (2021), impact estimates for education outcomes are disaggregated by narrow and broad age groups irrespective of the child's schooling level eligibility. Given the nature of our analyses where we want to link school endowments with child education outcomes, we use the sample of school-age children who were eligible to attend a particular school level regardless of age group. On the analyses on immunization, we employ the sample of children aged two to five years instead of the age group one to five years in Orbeta, et al. (2021) to allow possible delays in immunization among children.

Third, our analyses focus on the potential heterogeneous impact of the 4Ps conditional on the supply-side conditions faced by households. While Orbeta, et al. (2021) considered several sub-group analyses, these focused on households' residence location, child's sex, and 4Ps children monitoring status. We thereby complement their earlier analyses by looking at the possible moderating effect of 4Ps in various resource-poor settings.

4.1. Data

We employ the household and facilities survey in the third-wave 4Ps impact evaluation study (Orbeta, et al., 2021). The face-to-face surveys were conducted between November 2017 to January 2018, covering 6,775 poor and near-poor households in 180 villages across 25 provinces using the 2008-based *Listahanan*. Ten municipalities from Luzon, Visayas and Mindanao were randomly selected from the pool of municipalities with at least 20 barangays having at least 30 households in each island group. Household samples from these municipalities were then selected based on how near the households' estimated per capita incomes were from the relevant provincial poverty threshold, with households with estimated

per capita incomes closer to the poverty threshold being sampled with greater certainty consistent with the regression discontinuity design.[9]

Table 7 reproduces information in Tables 4 and 5 in Orbeta, et al. (2021), showing the average household composition, estimated per capita income, and 4Ps recipient status among samples on either side of the poverty threshold. It shows that household compositions are about the same on average for households near but on opposite sides of the poverty threshold. As may be expected, those tagged as poor in the *Listahanan* had lower average per capita incomes and higher propensity of having received any benefits from the 4Ps.

Table 7. Household composition and per capita income

	Estimated per capita income relative to poverty threshold	
	Below	Above
Total households count	3,450	3,325
Average number of household members	5.2	5.1
0 to 5 years old	0.6	0.6
6 to 14 years old	1.3	1.2
15 to 18 years old	0.5	0.5
19 to 60 years old	2.5	2.5
Average estimated income per capita (in 2008 PMT score)	PhP14,466	PhP15,596
Share ever received any 4Ps benefits (%)	85.2	2.5

Source: Orbeta, et al. (2021). Notes: PMT – Proxy means test.

We specifically utilized responses in Module C that captured school enrollment and attendance for children aged six to 20 years old, and in Module D that captured immunization information among children aged zero to five years. In our analyses, we exclude responses for school-aged children who have already graduated from (senior) high school, and those aged below two years at the time of the survey. This results in a total available sample of 11,435 school-aged children and 2,826 pre-school-aged children for our analyses.

For each of these children, we linked them to the nearest health and education facility based on their household's geolocations collected during the survey. Locations and characteristics of health facilities were based on responses of health facility administrators to Module G of the third-wave 4Ps survey. Locations of schools, on the other hand, were based on information provided by the DepEd, which we supplemented with data from OpenStreetMap Philippines indexed in the United Nations Office for the Coordination of Humanitarian Affairs data enclave and from manual geographic tagging by project research assistants. School characteristics were provided by the DepEd from its Basic Education Information System.

We excluded households and facilities with no specified locations, as well as those with provided locations but were outside the boundaries of their reported provinces. In total, we were able to match 9,607 school-aged children and 2,638 pre-school-aged children, representing 84.0 percent and 93.3 percent of the potential samples, respectively.

[9] Further details are available in Orbeta, et al. (2021).

4.2. Estimation strategy

We employ a regression discontinuity design to assess the potential modifying effects of 4Ps on the influence of supply-side conditions on education- and health-seeking behaviors among the poor. As previously discussed, we use a stronger local randomization assumption that allows us to estimate effect modification in linear probability models of the form:

$$y_{ihf} = \tau \cdot Z_{ihf} + Z_{ihf} \cdot \boldsymbol{W_f\gamma} + \boldsymbol{W_f\phi} + \boldsymbol{V_h\kappa} + \boldsymbol{X_{ihf}\beta} + \varepsilon_i, \quad (1)$$

where y_{ihf} is the outcome for child $i = \{1,2,\dots,N_h\}$ from household $h = \{1,2,\dots,H\}$ that lives within the catchment area of facility $f = \{1,2,\dots,F\}$. The vectors $\boldsymbol{X_{ihf}}$, $\boldsymbol{V_h}$ and $\boldsymbol{W_f}$ are respectively child-, household-, and facility-specific characteristics with the conformable vectors $\boldsymbol{\beta}$, $\boldsymbol{\kappa}$ and $\boldsymbol{\phi}$ being their respective related regression coefficients. The indicator variable $Z_{ihf} = \{0,1\}$ captures household 4Ps eligibility with value equal to unity when the household's estimated per capita income is below the provincial poverty threshold.

The parameter τ captures the program's main effect, which has been the primary interest in previous 4Ps evaluations (e.g. Orbeta, et al., 2021). In this study, we are more interested in the values in the vector $\boldsymbol{\gamma}$, which captures the modifying effects of 4Ps on the influence of facility characteristics on household decisions. Under local randomization, the variables $\boldsymbol{X_{ihf}}$, $\boldsymbol{V_h}$, $\boldsymbol{W_f}$ and ε_i are all independent of treatment eligibility Z_{ihf} for some close neighborhood around the eligibility threshold. This allows unbiased estimation of τ and $\boldsymbol{\gamma}$ that provide the true magnitude of the main and modifying 4Ps effects, respectively. Note that we use program eligibility instead of actual program receipt to simplify the analyses and to focus on the impact of the program on its intended beneficiaries regardless of actual 4Ps status. As such, our estimated intent-to-treat effects estimates are expected to be attenuated compared with the effects of the program on those who actually received 4Ps benefits because of their eligibility.

There are a couple of reasons why we think local randomization is likely to hold for some close neighborhood around the poverty threshold. First, the proxy means model employed in *Listahanan* is not publicly available, which makes precise targeting of predicted per capita income levels at some specific level highly unlikely. Second, being based on statistical models and limited information from available data, the predicted poverty status based on proxy means are subject to inclusion and exclusion errors, especially among those with predicted per capita incomes close to the poverty threshold.

Following Cattaneo, et al. (2016), we empirically identify a bandwidth around the assignment threshold wherein local randomization is highly probable. We do this by nonparametrically testing the equality of distribution of a battery of selected household and facility variables among eligible and non-eligible households in our study sample. We perform this test for different bandwidths of estimated per capita income up to PhP5,000 in increments of PhP100 relative to the provincial poverty threshold. The expectation is that under local randomization these variables should have the same distribution regardless of 4Ps eligibility. We only include variables related to facility endowments and their accessibility among households, and exclude characteristics that were in proxy means models used to estimate household per capita income.

We also performed binomial probability tests to assess whether the shares of households on either side of the assignment threshold for a given bandwidth are balanced. We expect under

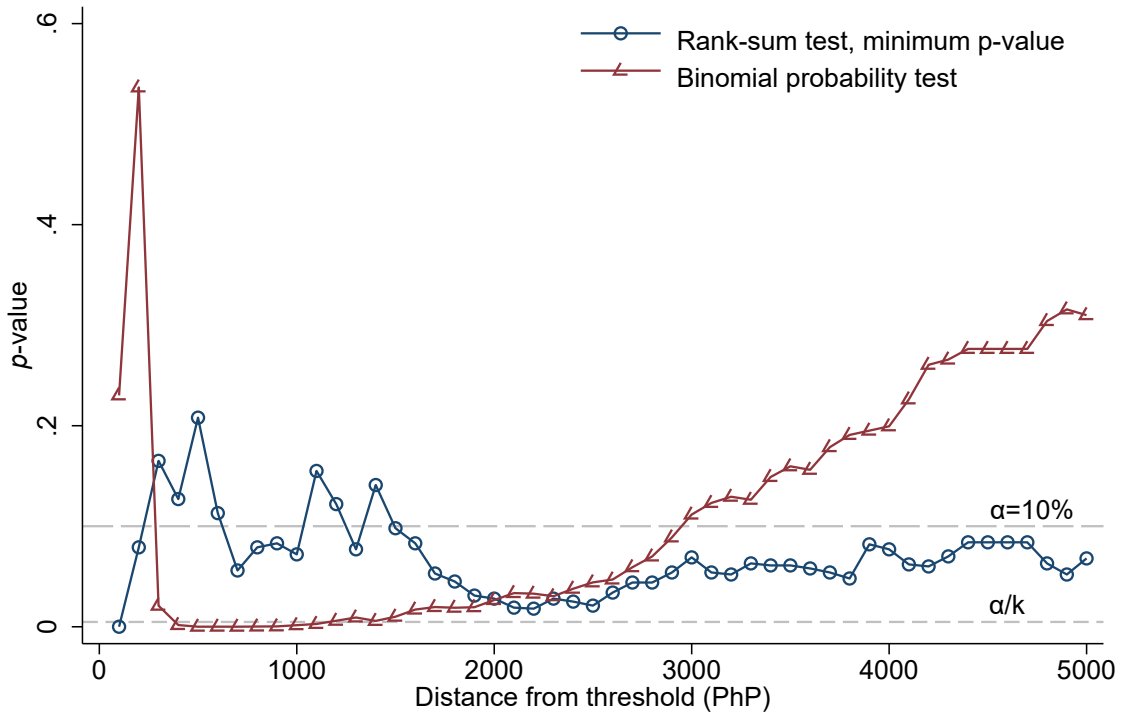
local randomization that households are equally likely to be on either side of the threshold, and thus should have about the same number of households for a given bandwidth.

Results of the above balance tests are summarized in Figure 2. We only show the minimum *p*-value for the rank-sum equality of distribution tests and the p-value of the binomial probability test performed for each bandwidth. For the rank-sum tests, a Bonferroni-adjusted α-level, i.e. α divided by the number of variables being tested k, is provided to account for multiple testing. The list of variables included in the rank-sum tests is provided in Appendix Table A.1.

The results of the equality of distribution tests presented in Figure 2 show significant difference in the distribution of household and facility characteristics between 4Ps-eligible and non-eligible households for some small enough bandwidths around the poverty threshold, which may suggest potential manipulation of the assignment variable.[10] This imbalance in distribution appears to become alleviated as the bandwidth increases.

The binomial distribution tests also detect an imbalance in the distribution of households around the poverty threshold, particularly for the smallest bandwidth that we considered. The distribution of households relative to the assignment threshold becomes more balanced as the bandwidth is enlarged, then worsens before improving as the sample size targets for each survey site are reached with household incomes further away from the poverty threshold.

Figure 2. Balance test by estimation window



Source: Authors' calculations.

[10] Orbeta, et al. (2021) noted a "very small lumping of observations near the cutoff" in the density plot of household distribution along the forcing variable. However, their density test indicates no manipulation of observations near the assignment threshold. Further, the proxy means model is not publicly available to allow precise manipulation of predicted per capita income.

Based on these results, we use a bandwidth of PhP3,000 in our main analyses. Appendix Table A.1 summarizes the results of several balance assessments separately for each of our selected variables for this bandwidth. The rank-sum tests show that we cannot reject the hypothesis that each of the variables are drawn from the same distribution for the poor and near-poor households included in this estimation window. We also performed several equality of joint distribution tests and find that the joint distribution of the selected variables are statistically indistinguishable for poor and near-poor households with predicted per capita incomes within the PhP3,000 bandwidth.[11] These results provide us some confidence that local randomization may be likely for this particular bandwidth.

An important limitation of our strategy is that we can only infer the impact of 4Ps eligibility on households whose per capita incomes are within the small bandwidth that we have identified. It may be argued that cash transfers may have greater value to the poorest households and thereby we can expect them to be more responsive to such cash incentives, but these are outside the scope of this study.

5. Results

5.1. School attendance

Table 8 summarizes the results of our main regression models for school enrollment and for school attendance conditional on enrollment by child's schooling level eligibility. We provide three sets of estimates for each outcome. The most basic specifications include only the 4Ps eligibility indicator as explanatory variable to allow us to directly compare the unconditional average outcomes between poor (4Ps-eligible) and near-poor (non-eligible) children. Related facility characteristics are then added in the more elaborate models to account for their potential confounding effects and to provide estimates of the potential moderating effects of the 4Ps.

Estimates of the main 4Ps effects suggest that the program on average had limited impact on improving school enrollment rates and school attendance across education levels, which are largely in line with results in Orbeta, et al. (2021). Inspection of baseline outcomes among children in non-eligible households in the basic specifications (Column 1) show that enrollment rates were already close to universal at 97.9 percent for elementary school (Panel A), 96.3 percent for junior high school (Panel B), and 93.2 percent for senior high school (Panel C), which may have limited the program's effectiveness. It is worth noting that among those enrolled, only 60.1 percent of elementary pupils had attended at least 85 percent of school days, although this rate increases with school level: 65.3 percent among junior high school students, and 71.9 percent among senior high school students (Column 4).

Limiting our analysis to the main effects may miss important nuances in how the 4Ps may affect child investment decisions. One may reasonably expect, for instance, that cash transfers may have greater impacts under poorer baseline circumstances as has been documented in the literature (Bastagli, et al., 2016).

[11] We performed the following joint distribution tests: Hyodo and Nishiyama's (2018) test of equality of means and covariances, Baringhaus and Franz' (2004) test of multivariate distribution equality, and Biswas and Ghosh's (2014) test of multivariate distribution equality. Results are available from the authors' upon request.

Table 8. School attendance and school endowments

	Enrolled in school (=1)			Attended at least 85% of school days (=1)		
	(1)	(2)	(3)	(4)	(5)	(6)
A. Elementary school						
Z (=1)	-0.002	-0.003	0.067	0.020	0.022	0.056
	(0.004)	(0.004)	(0.041)	(0.015)	(0.015)	(0.141)
log(distance to school, km)		0.001	0.001		-0.034***	-0.036***
		(0.002)	(0.003)		(0.008)	(0.011)
log(Student-classroom ratio)		0.002	0.014**		-0.041**	-0.014
		(0.005)	(0.006)		(0.020)	(0.030)
log(Student-teacher ratio)		-0.001	-0.002		0.048	0.028
		(0.008)	(0.011)		(0.030)	(0.043)
log(MT per 100 students)		0.019**	0.026**		0.014	0.009
		(0.009)	(0.011)		(0.040)	(0.058)
Z (=1) x log(distance to school, km)			0.000			0.003
			(0.004)			(0.016)
Z (=1) x log(Student-classroom ratio)			-0.022**			-0.050
			(0.011)			(0.040)
Z (=1) x log(Student-teacher ratio)			0.000			0.038
			(0.016)			(0.060)
Z (=1) x log(MT per 100 students)			-0.015			0.008
			(0.017)			(0.079)
Constant	0.979***	0.973***	0.938***	0.601***	0.602***	0.582***
	(0.003)	(0.021)	(0.030)	(0.011)	(0.071)	(0.099)
Number of observations	6,338	5,751	5,751	6,196	5,621	5,621
Number of clusters	4,131	3,745	3,745	4,082	3,699	3,699
BIC	-6,215	-5,557	-5,532	8,691	7,863	7,895

Source: Authors' calculations. Note: *, **, and *** shows statistical significance at the 10-, 5- and 1-% alpha-levels, respectively. The sample includes children eligible for the stated education level. School attendance is conditional on school enrollment. Values in parentheses are heteroskedasticity-robust standard errors clustered at the household level. BIC – Bayesian information criteria.

Table 8. School attendance and school endowments *(continued)*

	Enrolled in school (=1)			Attended at least 85% of school days (=1)		
	(1)	(2)	(3)	(4)	(5)	(6)
B. Junior high school						
Z (=1)	0.005	0.014**	0.001	0.015	0.019	-0.214
	(0.006)	(0.007)	(0.069)	(0.017)	(0.020)	(0.177)
log(distance to school, km)		0.004	0.000		-0.052***	-0.057***
		(0.004)	(0.005)		(0.011)	(0.016)
log(Student-classroom ratio)		-0.010	-0.018		0.002	-0.029
		(0.009)	(0.016)		(0.022)	(0.033)
log(Student-teacher ratio)		0.019***	0.027**		-0.009	-0.015
		(0.006)	(0.011)		(0.022)	(0.032)
log(MT per 100 students)		0.001	-0.014		0.180***	0.200**
		(0.026)	(0.039)		(0.066)	(0.086)
Z (=1) x log(distance to school, km)			0.007			0.008
			(0.008)			(0.022)
Z (=1) x log(Student-classroom ratio)			0.015			0.054
			(0.019)			(0.045)
Z (=1) x log(Student-teacher ratio)			-0.016			0.010
			(0.013)			(0.045)
Z (=1) x log(MT per 100 students)			0.038			-0.047
			(0.051)			(0.134)
Constant	0.963***	0.926***	0.935***	0.653***	0.716***	0.850***
	(0.005)	(0.033)	(0.059)	(0.013)	(0.088)	(0.134)
Number of observations	3,821	2,932	2,932	3,690	2,833	2,833
Number of clusters	2,980	2,291	2,291	2,896	2,224	2,224
BIC	-2,162	-1,679	-1,651	4,967	3,832	3,861

Source: Authors' calculations. Note: *, **, and *** shows statistical significance at the 10-, 5- and 1-% alpha-levels, respectively. The sample includes children eligible for the stated education level. School attendance is conditional on school enrollment. Values in parentheses are heteroskedasticity-robust standard errors clustered at the household level. BIC – Bayesian information criteria.

Table 8. School attendance and school endowments *(continued)*

	Enrolled in school (=1)			Attended at least 85% of school days (=1)		
	(1)	(2)	(3)	(4)	(5)	(6)
C. Senior high school						
Z (=1)	0.014	0.013	-0.038	-0.004	0.023	-0.068
	(0.014)	(0.016)	(0.119)	(0.027)	(0.031)	(0.258)
log(distance to school, km)		-0.002	-0.015		-0.068***	-0.041
		(0.009)	(0.014)		(0.018)	(0.031)
log(Student-classroom ratio)		-0.019	0.008		-0.089**	-0.144***
		(0.018)	(0.027)		(0.038)	(0.055)
log(Student-teacher ratio)		-0.015	-0.050**		0.064*	0.105*
		(0.015)	(0.024)		(0.037)	(0.055)
log(MT per 100 students)		-0.024	-0.024		0.090*	0.083
		(0.029)	(0.044)		(0.046)	(0.075)
Z (=1) x log(distance to school, km)			0.022			-0.045
			(0.018)			(0.037)
Z (=1) x log(Student-classroom ratio)			-0.050			0.104
			(0.036)			(0.076)
Z (=1) x log(Student-teacher ratio)			0.066**			-0.075
			(0.030)			(0.075)
Z (=1) x log(MT per 100 students)			0.002			0.014
			(0.059)			(0.095)
Constant	0.932***	1.059***	1.087***	0.719***	0.897***	0.937***
	(0.010)	(0.059)	(0.095)	(0.020)	(0.129)	(0.189)
Number of observations	1,276	924	924	1,199	870	870
Number of clusters	1,198	864	864	1,130	817	817
BIC	-28	-21	1	1,506	1,097	1,120

Source: Authors' calculations. Note: *, **, and *** shows statistical significance at the 10-, 5- and 1-% alpha-levels, respectively. The sample includes children eligible for the stated education level. School attendance is conditional on school enrollment. Values in parentheses are heteroskedasticity-robust standard errors clustered at the household level. BIC – Bayesian information criteria.

Distance to school appears to be an important factor in children's school attendance decision, but not their school enrollment. Conditional on being enrolled, the probability of attending at least 85 percent of school days in the past month decreases by about 3 to 6 percentage points for every percent increase in school distance depending on school level. Other school characteristics, particularly student-classroom and student-teacher ratios, appear to also affect household education investment decisions, but the estimates are either inconsistent across model specifications or are measured imprecisely.

Interestingly, Master Teachers (MT)-to-student ratio is positively associated with school enrollment but not school attendance in the elementary level (Panel A), and with school attendance but not school enrollment in the junior secondary (Panel B) and senior secondary levels (Panel C), respectively. The coefficients on MT-student ratio for school enrollment across school levels are rather small, but those for school attendance in the secondary levels are quite considerable. In particular, a one percent increase in MT-student ratio is associated with about 20 percentage points increase in the propensity of at least 85 percent-school days attendance in junior high school and about 10 percentage points increase in senior high school.

Columns 3 and 6 in Table 8 show that the modifying effects of the 4Ps on the influence of these school characteristics on schooling decisions are quite sizeable and potentially economically important, however they are largely imprecisely measured, except for a few exceptions. Specifically, we find that 4Ps is able to attenuate but not fully negate the adverse influence of increasing student-teacher ratio on enrollment propensity among senior high school-level children (Panel C). However, we also find some indication that elementary school-level children from 4Ps-eligible households are less likely to enroll relative to children from non-eligible households when the nearest elementary school has higher student-to-classroom ratio (Panel A), which needs further investigation.

5.2. Immunization

Table 9 presents our main results on child immunization. Similar to Table 8, we start with a basic model, which we expand in subsequent models to include facility characteristics. We look at two outcomes, namely, having basic immunization and having age-appropriate immunization. In our analysis, we tag a child as having basic immunization if (s)he has received one dose of BCG vaccine (for tuberculosis), three doses of DPT (diphtheria-tetanus-pertussis) vaccine, three doses of polio vaccine and one dose of measles vaccine. For age-appropriate immunization, a child should have received four doses of hepatitis B vaccine and three doses of Hib vaccine in addition to basic vaccination. We only include children aged two to five years old in our analyses.

Similar to Orbeta, et al. (2021), we find no support that 4Ps eligibility increased basic and age-appropriate immunization among children based on our estimated main 4Ps effects. However, we find empirical support that supply-side limitations, like insufficiency in human resource or in vaccine supply, as well as distance to the nearest health facility, negatively influence child vaccination-seeking behaviors. Having insufficient health human resource (HHR) supply, for instance, is associated with a 7.7 percentage point decline in a child having basic immunization, while having insufficient vaccine supply is associated with a 4.2 percentage point decline in the propensity of having all age-appropriate vaccinations. These estimates are particularly substantial if we compare it with the baseline basic and age-appropriate vaccination rates of 42.4 percent and 4.3 percent, respectively, among our sample of children.

Table 9. Child immunization and health facility endowments

	With basic immunization (=1)			With age-appropriate immunization (=1)		
	(1)	(2)	(3)	(4)	(5)	(6)
Z (=1)	0.014	0.010	-0.039	-0.012	-0.013	-0.032
	(0.021)	(0.021)	(0.081)	(0.007)	(0.008)	(0.026)
log(distance to health facility, km)		-0.015	-0.032*		0.003	0.006
		(0.014)	(0.018)		(0.005)	(0.007)
with insufficient HHR supply (=1)		-0.037	-0.077**		0.008	-0.003
		(0.027)	(0.038)		(0.009)	(0.016)
with insufficient vaccine supply (=1)		-0.078	-0.018		0.015	-0.042***
		(0.108)	(0.173)		(0.044)	(0.015)
with additional 4Ps services (=1)		0.071**	0.113***		0.018**	0.013
		(0.030)	(0.041)		(0.008)	(0.014)
Z (=1) x log(distance to health facility, km)			0.032			-0.004
			(0.027)			(0.010)
Z (=1) x with insufficient HHR supply (=1)			0.082			0.020
			(0.053)			(0.018)
Z (=1) x with insufficient vaccine supply (=1)			-0.110			0.101
			(0.219)			(0.076)
Z (=1) x with additional 4Ps services (=1)			-0.082			0.011
			(0.060)			(0.017)
Constant	0.424***	0.424***	0.450***	0.043***	0.016	0.026
	(0.015)	(0.042)	(0.055)	(0.006)	(0.014)	(0.019)
Number of observations	2,826	2,638	2,638	2,826	2,638	2,638
Number of clusters	2,304	2,152	2,152	2,304	2,152	2,152
BIC	4,063	3,818	3,842	-1,431	-1,261	-1,232

Source: Authors' calculations. Note: *, **, and *** shows statistical significance at the 10-, 5- and 1-% alpha-levels, respectively. The sample includes children aged two to five years old. Values in parentheses are heteroskedasticity-robust standard errors clustered at the household level. BIC – Bayesian information criteria.

The estimated modifying effects of 4Ps are also relatively substantial although imprecisely measured. However, comparing the association between facility characteristics and child immunization by 4Ps eligibility presented in Figure 3 shows that the 4Ps is able to mitigate and even negate the adverse influence of some supply-side limitations, particularly HHR supply and distance to health facility, on child immunization.

While the positive effect of 4Ps eligibility on immunization rates in resource-poor settings suggests that the cash incentive has somehow bridged supply issues with behavior change, it may be a concern when health facility-initiated affirmative actions for 4Ps beneficiaries, such as providing preferential treatment in access to health services and medical supplies, crowds-out other households who are not afforded the same benefits. We examine this potential crowding-out effect by including a dummy variable that indicates whether the nearest health facility provides any of the 4Ps-targeted affirmative actions listed in Table 6.

The estimation results in Table 9 show that having 4Ps-focused additional service(s) in the nearest health facility increases the likelihood of having basic immunization among near-poor children by about 11 percentage points, but only by 3.2 percentage points among poor children. The added effects of such affirmative actions are much more muted in the case of having age-appropriate vaccinations. We take these results as indicative of no crowding out effect of 4Ps-focused affirmative actions adopted by health facilities.

5.3. Sensitivity analysis

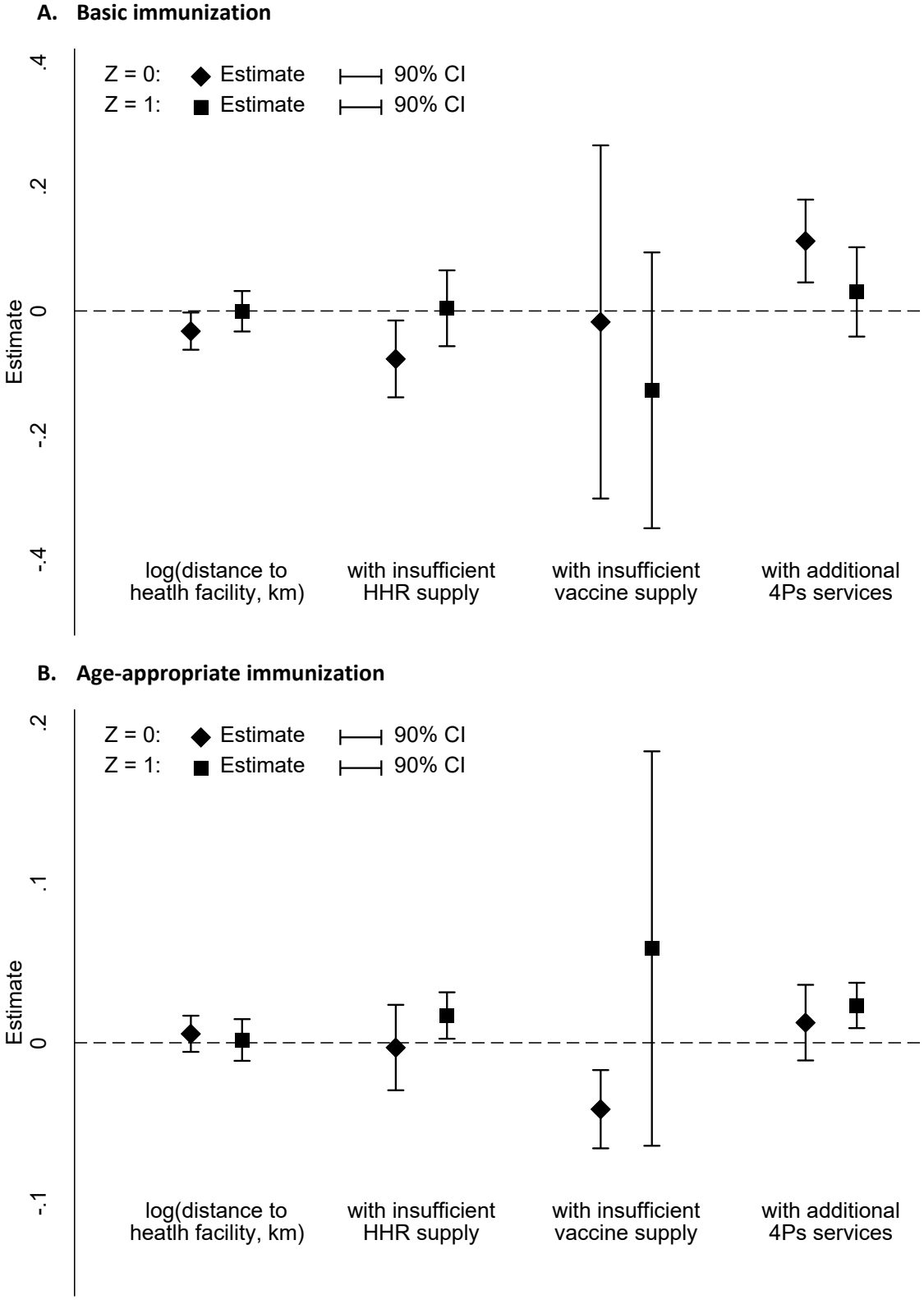
We employed several strategies to assess the robustness of our estimates to alternative model specifications. More specifically, we vary our estimation bandwidth, and added control variables into our baseline model.

First, we tighten the estimation bandwidth to include sample observations within PhP1,500 from the poverty threshold instead of the PhP3,000 used in our main regression models. Using a smaller bandwidth may result in local randomization being more likely, but at the cost of reducing sample size, which directly affects precision.

Second, we include additional explanatory variables in our baseline model to assess the possible confounding effects from unobserved attributes. In particular, we include region fixed-effects to account for common area-specific education and health interventions implemented by regional government education and health offices. We also control for child's age, which may be important in time-sensitive interventions like education and health. Lastly, we also add a restricted cubic spline of household per capita income centered around the poverty threshold to account for non-linear effects in the forcing variable akin to a continuity-based RDD.

The results of the above alternative specifications presented as Appendix Tables B.1 to B.4 are qualitatively similar to the main regressions that we have presented.

Figure 3. Association between child immunization and health facility endowments.



Source: Authors' calculations. Note: The figure plots the association between health facility characteristics and immunization rates conditional on 4Ps eligibility implied by the model estimates in Table 9. The confidence bands are based on heteroskedasticity-robust standard errors clustered at the household level

6. Conclusions

The study highlights three important issues in the design of conditional cash transfers aimed at improving human capital investments on children. First, we find that supply-side conditions have important bearing on education- and health-seeking behaviors among households. Second, conditional cash transfers may alleviate the negative influence of some of these supply-side limitations, but whether it can provide universal protective coverage against all potential adverse effects of suboptimal supply-side investments remains unclear. Finally, general equilibrium effects, especially from large-scale interventions like the 4Ps, merit particular attention. At least in the case of child immunization, we find no evidence of crowding out effects from elective affirmative actions adopted by health facilities for 4Ps beneficiaries.

While we find limited evidence that the 4Ps improve school enrollment, school attendance and child immunization rates under more general conditions in the narrow per capita income bandwidth that we explored, similar to findings in earlier 4Ps evaluations (e.g. Orbeta, et al., 2014; Orbeta, et al., 2021), we document specific settings where 4Ps may have greater impact. It must be underscored, however, that demand-side interventions can only push the envelope so far. Inexistent or poor-quality supply of education and health services have sizeable influence on human capital investments on children as we have documented in this study. Addressing these supply availability and quality gaps are paramount.

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Appendix A. Balance test

Table A.1. Covariate balance using ±PhP3,000 estimation window

	Standardized difference	Variance ratio	Rank-sum test p-value
log(distance to public primary health facility, km)	-0.011	1.007	0.750
log(distance to nearest public elementary school, km)	0.025	1.006	0.321
log(distance to nearest public junior high school, km)	0.029	0.966	0.286
log(distance to nearest public senior high school, km)	0.027	0.972	0.323
Student-classroom ratio in nearest public elementary school	-0.029	0.828	0.098
Student-classroom ratio in nearest public junior high school	-0.017	0.897	0.881
Student-classroom ratio in nearest public senior high school	-0.039	0.921	0.330
Student-teacher ratio in nearest public elementary school	-0.019	0.790	0.401
Student-teacher ratio in nearest public junior high school	0.011	1.217	0.547
Student-teacher ratio in nearest public senior high school	-0.005	0.970	0.492
Master teacher per 100 students in nearest public elementary school	-0.033	0.816	0.324
Master teacher per 100 students in nearest public junior high school	0.046	1.122	0.066
Master teacher per 100 students in nearest public senior high school	-0.026	0.889	0.681
With insufficient HHR supply in nearest public primary health facility (=1)	0.026	0.965	0.292
With insufficient vaccine supply in nearest public primary health facility (=1)	-0.026	0.838	0.279
With additional 4Ps services in nearest public primary health facility (=1)	0.024	0.959	0.331
Distance to nearest phone service (minutes)	0.007	1.075	0.819
Distance to nearest post office (minutes)	0.012	1.220	0.911
Located in National Capital Region (=1)	0.006	1.020	0.807
Located in poblacion (=1)	-0.023	0.960	0.348
With access to paved road (=1)	0.017	1.000	0.474

Source: Authors' calculations.

Appendix B. Alternative model specifications

Appendix Table B.1. School attendance and school endowments: Alternative ±PhP1,500 estimation window

	Enrolled in school (=1)			Attended at least 85% of school days (=1)		
	(1)	(2)	(3)	(4)	(5)	(6)
A. Elementary school						
Z (=1)	-0.002	-0.002	0.079*	0.017	0.019	0.121
	(0.004)	(0.004)	(0.044)	(0.015)	(0.016)	(0.147)
log(distance to school, km)		0.001	0.000		-0.034***	-0.035***
		(0.002)	(0.003)		(0.008)	(0.011)
log(Student-classroom ratio)		0.000	0.013**		-0.044**	-0.007
		(0.005)	(0.007)		(0.020)	(0.030)
log(Student-teacher ratio)		0.000	0.001		0.046	0.028
		(0.008)	(0.012)		(0.031)	(0.045)
log(MT per 100 students)		0.015	0.024*		0.033	0.016
		(0.009)	(0.012)		(0.041)	(0.061)
Z (=1) x log(distance to school, km)			0.002			0.000
			(0.004)			(0.016)
Z (=1) x log(Student-classroom ratio)			-0.023**			-0.067
			(0.011)			(0.041)
Z (=1) x log(Student-teacher ratio)			-0.003			0.033
			(0.017)			(0.062)
Z (=1) x log(MT per 100 students)			-0.017			0.030
			(0.019)			(0.082)
Constant	0.978***	0.973***	0.931***	0.600***	0.614***	0.559***
	(0.003)	(0.022)	(0.034)	(0.011)	(0.074)	(0.105)
Number of observations	5,895	5,342	5,342	5,762	5,220	5,220
Number of clusters	3,826	3,465	3,465	3,781	3,422	3,422
BIC	-5,739	-5,104	-5,081	8,099	7,318	7,347

Source: Authors' calculations. Note: *, **, and *** shows statistical significance at the 10-, 5- and 1-% alpha-levels, respectively. The sample includes children eligible for the stated education level. School attendance is conditional on school enrollment. Values in parentheses are heteroskedasticity-robust standard errors clustered at the household level. BIC – Bayesian information criteria.

Appendix Table B.1. School attendance and school endowments: Alternative ±PhP1,500 estimation window *(continued)*

	Enrolled in school (=1)			Attended at least 85% of school days (=1)		
	(1)	(2)	(3)	(4)	(5)	(6)
B. Junior high school						
Z (=1)	0.004	0.013*	-0.003	0.016	0.020	-0.197
	(0.006)	(0.007)	(0.073)	(0.018)	(0.021)	(0.185)
log(distance to school, km)		0.004	0.001		-0.054***	-0.054***
		(0.004)	(0.006)		(0.011)	(0.017)
log(Student-classroom ratio)		-0.010	-0.018		0.000	-0.023
		(0.010)	(0.016)		(0.023)	(0.035)
log(Student-teacher ratio)		0.019***	0.027**		-0.014	-0.027
		(0.006)	(0.012)		(0.023)	(0.034)
log(MT per 100 students)		-0.005	-0.028		0.152**	0.155*
		(0.027)	(0.041)		(0.069)	(0.090)
Z (=1) x log(distance to school, km)			0.006			0.001
			(0.008)			(0.023)
Z (=1) x log(Student-classroom ratio)			0.015			0.040
			(0.020)			(0.047)
Z (=1) x log(Student-teacher ratio)			-0.015			0.023
			(0.013)			(0.046)
Z (=1) x log(MT per 100 students)			0.054			-0.012
			(0.054)			(0.139)
Constant	0.963***	0.927***	0.938***	0.646***	0.733***	0.858***
	(0.005)	(0.035)	(0.062)	(0.013)	(0.092)	(0.143)
Number of observations	3,577	2,719	2,719	3,453	2,626	2,626
Number of clusters	2,782	2,118	2,118	2,703	2,056	2,056
BIC	-1,985	-1,521	-1,493	4,681	3,586	3,616

Source: Authors' calculations. Note: *, **, and *** shows statistical significance at the 10-, 5- and 1-% alpha-levels, respectively. The sample includes children eligible for the stated education level. School attendance is conditional on school enrollment. Values in parentheses are heteroskedasticity-robust standard errors clustered at the household level. BIC – Bayesian information criteria.

Appendix Table B.1. School attendance and school endowments: Alternative ±PhP1,500 estimation window *(continued)*

	Enrolled in school (=1)			Attended at least 85% of school days (=1)		
	(1)	(2)	(3)	(4)	(5)	(6)
C. Senior high school						
Z (=1)	0.016	0.011	-0.075	-0.004	0.022	-0.141
	(0.014)	(0.017)	(0.129)	(0.028)	(0.033)	(0.275)
log(distance to school, km)		0.002	-0.005		-0.069***	-0.053
		(0.009)	(0.015)		(0.019)	(0.034)
log(Student-classroom ratio)		-0.024	0.003		-0.097**	-0.150***
		(0.019)	(0.028)		(0.039)	(0.058)
log(Student-teacher ratio)		-0.019	-0.062**		0.057	0.085
		(0.016)	(0.025)		(0.038)	(0.058)
log(MT per 100 students)		-0.023	-0.018		0.093*	0.107
		(0.031)	(0.049)		(0.049)	(0.086)
Z (=1) x log(distance to school, km)			0.011			-0.026
			(0.019)			(0.040)
Z (=1) x log(Student-classroom ratio)			-0.047			0.097
			(0.038)			(0.079)
Z (=1) x log(Student-teacher ratio)			0.078**			-0.050
			(0.032)			(0.078)
Z (=1) x log(MT per 100 students)			-0.005			-0.016
			(0.063)			(0.105)
Constant	0.930***	1.083***	1.130***	0.722***	0.951***	1.037***
	(0.011)	(0.063)	(0.105)	(0.021)	(0.136)	(0.207)
Number of observations	1,178	841	841	1,106	790	790
Number of clusters	1,106	786	786	1,042	742	742
BIC	-11	12	34	1,382	994	1,019

Source: Authors' calculations. Note: *, **, and *** shows statistical significance at the 10-, 5- and 1-% alpha-levels, respectively. The sample includes children eligible for the stated education level. School attendance is conditional on school enrollment. Values in parentheses are heteroskedasticity-robust standard errors clustered at the household level. BIC – Bayesian information criteria.

Appendix Table B.2. Child immunization and health facility endowments: Alternative ±PhP1,500 estimation window

	With basic immunization (=1)			With age-appropriate immunization (=1)		
	(1)	(2)	(3)	(4)	(5)	(6)
Z (=1)	0.023	0.017	-0.043	-0.01	-0.01	-0.044
	(0.022)	(0.022)	(0.087)	(0.008)	(0.008)	(0.029)
log(distance to health facility, km)		-0.012	-0.024		0.002	0.003
		(0.014)	(0.019)		(0.006)	(0.007)
with insufficient HHR supply (=1)		-0.037	-0.085**		0.009	-0.003
		(0.028)	(0.040)		(0.010)	(0.017)
with insufficient vaccine supply (=1)		-0.081	-0.015		0.014	-0.044***
		(0.108)	(0.174)		(0.044)	(0.016)
with additional 4Ps services (=1)		0.056*	0.086*		0.015*	0.005
		(0.032)	(0.044)		(0.009)	(0.016)
Z (=1) x log(distance to health facility, km)			0.023			-0.001
			(0.028)			(0.011)
Z (=1) x with insufficient HHR supply (=1)			0.093*			0.022
			(0.055)			(0.019)
Z (=1) x with insufficient vaccine supply (=1)			-0.121			0.102
			(0.220)			(0.077)
Z (=1) x with additional 4Ps services (=1)			-0.060			0.020
			(0.064)			(0.018)
Constant	0.424***	0.433***	0.466***	0.042***	0.019	0.037*
	(0.015)	(0.045)	(0.060)	(0.006)	(0.015)	(0.022)
Number of observations	2,621	2,443	2,443	2,621	2,443	2,443
Number of clusters	2,135	1,989	1,989	2,135	1,989	1,989
BIC	3,776	3,548	3,573	-1,261	-1,105	-1,077

Source: Authors' calculations. Note: *, **, and *** shows statistical significance at the 10-, 5- and 1-% alpha-levels, respectively. The sample includes children aged two to five years old. Values in parentheses are heteroskedasticity-robust standard errors clustered at the household level. BIC – Bayesian information criteria.

Appendix Table B.3. School attendance and school endowments: With additional controls

	Enrolled in school (=1)			Attended at least 85% of school days (=1)		
	(1)	(2)	(3)	(4)	(5)	(6)
A. Elementary school						
Z (=1)	0.040	0.040	0.079*	0.053	0.053	0.034
	(0.037)	(0.037)	(0.041)	(0.140)	(0.140)	(0.148)
log(distance to school, km)	0.000	0.000	0.000	-0.022**	-0.022**	-0.023**
	(0.003)	(0.003)	(0.003)	(0.011)	(0.011)	(0.011)
log(Student-classroom ratio)	0.013**	0.013**	0.014**	-0.002	-0.002	-0.002
	(0.006)	(0.006)	(0.006)	(0.030)	(0.030)	(0.030)
log(Student-teacher ratio)	-0.003	-0.003	-0.002	0.008	0.008	0.008
	(0.010)	(0.010)	(0.010)	(0.044)	(0.044)	(0.044)
log(MT per 100 students)	0.024**	0.024**	0.024**	0.012	0.012	0.011
	(0.010)	(0.010)	(0.011)	(0.057)	(0.057)	(0.058)
Z (=1) x log(distance to school, km)	0.000	0.000	0.000	0.002	0.002	0.002
	(0.004)	(0.004)	(0.004)	(0.015)	(0.015)	(0.015)
Z (=1) x log(Student-classroom ratio)	-0.017*	-0.017*	-0.018**	-0.049	-0.049	-0.049
	(0.009)	(0.009)	(0.009)	(0.040)	(0.040)	(0.039)
Z (=1) x log(Student-teacher ratio)	0.005	0.005	0.002	0.040	0.040	0.041
	(0.014)	(0.014)	(0.014)	(0.061)	(0.061)	(0.061)
Z (=1) x log(MT per 100 students)	-0.023	-0.023	-0.023	-0.019	-0.019	-0.015
	(0.017)	(0.017)	(0.017)	(0.078)	(0.078)	(0.078)
Constant	0.939***	0.939***	0.924***	0.596***	0.596***	0.567***
	(0.029)	(0.029)	(0.032)	(0.104)	(0.104)	(0.108)
Number of observations	5,751	5,751	5,751	5,621	5,621	5,621
Number of clusters	3,745	3,745	3,745	3,699	3,699	3,699
BIC	-6,075	-6,075	-6,054	7,948	7,948	7,977

Source: Authors' calculations. Note: *, **, and *** shows statistical significance at the 10-, 5- and 1-% alpha-levels, respectively. The sample includes children eligible for the stated education level. School attendance is conditional on school enrollment. Columns 1 and 4 include region fixed effects. Columns 2 and 5 include child's age and its interaction with 4Ps eligibility. Columns 3 and 6 include restricted cubic spline of per capita income centered on the poverty threshold, and its interaction with 4Ps eligibility. BIC – Bayesian information criteria.

Appendix Table B.3. School attendance and school endowments: With additional controls *(continued)*

	Enrolled in school (=1)			Attended at least 85% of school days (=1)		
	(1)	(2)	(3)	(4)	(5)	(6)
B. Junior high school						
Z (=1)	0.012	0.012	0.033	-0.202	-0.202	-0.120
	(0.066)	(0.066)	(0.070)	(0.176)	(0.176)	(0.184)
log(distance to school, km)	0.001	0.001	0.001	-0.035**	-0.035**	-0.037**
	(0.006)	(0.006)	(0.006)	(0.017)	(0.017)	(0.016)
log(Student-classroom ratio)	-0.016	-0.016	-0.015	-0.009	-0.009	-0.002
	(0.014)	(0.014)	(0.014)	(0.034)	(0.034)	(0.034)
log(Student-teacher ratio)	0.024**	0.024**	0.024**	-0.018	-0.018	-0.020
	(0.011)	(0.011)	(0.011)	(0.032)	(0.032)	(0.032)
log(MT per 100 students)	-0.011	-0.011	-0.013	0.162*	0.162*	0.151*
	(0.039)	(0.039)	(0.039)	(0.089)	(0.089)	(0.089)
Z (=1) x log(distance to school, km)	0.006	0.006	0.006	0.005	0.005	0.005
	(0.008)	(0.008)	(0.008)	(0.021)	(0.021)	(0.021)
Z (=1) x log(Student-classroom ratio)	0.015	0.015	0.014	0.053	0.053	0.047
	(0.018)	(0.018)	(0.018)	(0.044)	(0.044)	(0.044)
Z (=1) x log(Student-teacher ratio)	-0.020	-0.020	-0.020	0.006	0.006	0.007
	(0.013)	(0.013)	(0.013)	(0.044)	(0.044)	(0.044)
Z (=1) x log(MT per 100 students)	0.045	0.045	0.047	0.043	0.043	0.050
	(0.050)	(0.050)	(0.051)	(0.131)	(0.131)	(0.132)
Constant	0.966***	0.966***	0.947***	0.913***	0.913***	0.785***
	(0.055)	(0.055)	(0.059)	(0.163)	(0.163)	(0.168)
Number of observations	2,932	2,932	2,932	2,833	2,833	2,833
Number of clusters	2,291	2,291	2,291	2,224	2,224	2,224
BIC	-1,630	-1,630	-1,600	3,935	3,935	3,953

Source: Authors' calculations. Note: *, **, and *** shows statistical significance at the 10-, 5- and 1-% alpha-levels, respectively. The sample includes children eligible for the stated education level. School attendance is conditional on school enrollment. Columns 1 and 4 include region fixed effects. Columns 2 and 5 include child's age and its interaction with 4Ps eligibility. Columns 3 and 6 include restricted cubic spline of per capita income centered on the poverty threshold, and its interaction with 4Ps eligibility. BIC – Bayesian information criteria.

Appendix Table B.3. School attendance and school endowments: With additional controls *(continued)*

	Enrolled in school (=1)			Attended at least 85% of school days (=1)		
	(1)	(2)	(3)	(4)	(5)	(6)
C. Senior high school						
Z (=1)	-0.087	-0.087	-0.060	-0.049	-0.049	-0.168
	(0.116)	(0.116)	(0.124)	(0.257)	(0.257)	(0.272)
log(distance to school, km)	-0.015	-0.015	-0.015	-0.044	-0.044	-0.043
	(0.014)	(0.014)	(0.014)	(0.030)	(0.030)	(0.030)
log(Student-classroom ratio)	0.008	0.008	0.006	-0.108*	-0.108*	-0.113**
	(0.026)	(0.026)	(0.026)	(0.057)	(0.057)	(0.057)
log(Student-teacher ratio)	-0.063***	-0.063***	-0.066***	0.109**	0.109**	0.103*
	(0.024)	(0.024)	(0.024)	(0.056)	(0.056)	(0.056)
log(MT per 100 students)	-0.038	-0.038	-0.039	0.078	0.078	0.071
	(0.048)	(0.048)	(0.048)	(0.078)	(0.078)	(0.079)
Z (=1) x log(distance to school, km)	0.028	0.028	0.028	-0.035	-0.035	-0.031
	(0.018)	(0.018)	(0.018)	(0.037)	(0.037)	(0.037)
Z (=1) x log(Student-classroom ratio)	-0.049	-0.049	-0.048	0.083	0.083	0.094
	(0.036)	(0.036)	(0.037)	(0.076)	(0.076)	(0.076)
Z (=1) x log(Student-teacher ratio)	0.076**	0.076**	0.077**	-0.059	-0.059	-0.053
	(0.031)	(0.031)	(0.030)	(0.074)	(0.074)	(0.074)
Z (=1) x log(MT per 100 students)	0.015	0.015	0.014	0.003	0.003	0.008
	(0.059)	(0.059)	(0.059)	(0.096)	(0.096)	(0.097)
Constant	1.067***	1.067***	1.028***	1.080***	1.080***	1.075***
	(0.147)	(0.147)	(0.150)	(0.205)	(0.205)	(0.213)
Number of observations	924	924	924	870	870	870
Number of clusters	864	864	864	817	817	817
BIC	70	70	92	1,196	1,196	1,217

Source: Authors' calculations. Note: *, **, and *** shows statistical significance at the 10-, 5- and 1-% alpha-levels, respectively. The sample includes children eligible for the stated education level. School attendance is conditional on school enrollment. Columns 1 and 4 include region fixed effects. Columns 2 and 5 include child's age and its interaction with 4Ps eligibility. Columns 3 and 6 include restricted cubic spline of per capita income centered on the poverty threshold, and its interaction with 4Ps eligibility. BIC – Bayesian information criteria.

Appendix Table B.4. Child immunization and health facility endowments: With additional controls

	With basic immunization (=1)			With age-appropriate immunization (=1)		
	(1)	(2)	(3)	(4)	(5)	(6)
Z (=1)	-0.001	-0.001	-0.028	-0.023	-0.023	-0.028
	(0.076)	(0.076)	(0.084)	(0.026)	(0.026)	(0.030)
log(distance to health facility, km)	-0.004	-0.004	-0.003	0.005	0.005	0.005
	(0.019)	(0.019)	(0.019)	(0.007)	(0.007)	(0.007)
with insufficient HHR supply (=1)	-0.074*	-0.074*	-0.074*	-0.008	-0.008	-0.008
	(0.040)	(0.040)	(0.040)	(0.016)	(0.016)	(0.016)
with insufficient vaccine supply (=1)	-0.161	-0.161	-0.160	-0.041**	-0.041**	-0.040***
	(0.178)	(0.178)	(0.178)	(0.017)	(0.017)	(0.017)
with additional 4Ps services (=1)	0.072*	0.072*	0.073*	0.010	0.010	0.011
	(0.039)	(0.039)	(0.039)	(0.015)	(0.015)	(0.015)
Z (=1) x log(distance to health facility, km)	0.015	0.015	0.012	-0.006	-0.006	-0.007
	(0.025)	(0.025)	(0.025)	(0.011)	(0.011)	(0.011)
Z (=1) x with insufficient HHR supply (=1)	0.081	0.081	0.079	0.021	0.021	0.020
	(0.051)	(0.051)	(0.051)	(0.018)	(0.018)	(0.018)
Z (=1) x with insufficient vaccine supply (=1)	-0.14	-0.14	-0.155	0.088	0.088	0.084
	(0.220)	(0.220)	(0.220)	(0.076)	(0.076)	(0.077)
Z (=1) x with additional 4Ps services (=1)	-0.081	-0.081	-0.083	0.006	0.006	0.006
	(0.055)	(0.055)	(0.056)	(0.017)	(0.017)	(0.018)
Constant	0.276***	0.276***	0.279***	0.028	0.028	0.023
	(0.068)	(0.068)	(0.075)	(0.023)	(0.023)	(0.028)
Number of observations	2,638	2,638	2,638	2,638	2,638	2,638
Number of clusters	2,152	2,152	2,152	2,152	2,152	2,152
BIC	3,771	3,771	3,801	-1,164	-1,164	-1,133

Source: Authors' calculations. Note: *, **, and *** shows statistical significance at the 10-, 5- and 1-% alpha-levels, respectively. The sample includes children aged two to five years old. Values in parentheses are heteroskedasticity-robust standard errors clustered at the household level. Columns 1 and 4 include region fixed effects. Columns 2 and 5 include child's age and its interaction with 4Ps eligibility. Columns 3 and 6 include restricted cubic spline of per capita income centered on the poverty threshold, and its interaction with 4Ps eligibility. BIC – Bayesian information criteria.