Incorporating public transfers into the measurement of poverty

Anders Kjelsrud* and Rohini Somanathan†

Abstract

Official poverty measures in India do not explicitly account for access to government services and in-kind transfers even though these vary substantially across Indian states. This paper presents some approaches to incorporate benefits from public schooling and subsidized consumption into private expenditure estimates to arrive at more accurate measures of poverty. The implicit government transfers lead to more dispersion in the state-wise poverty: the relatively rich states become richer while the poor become relatively poorer. This finding suggests that many centrally funded schemes in India are mis-targeted as they are allocated to states in accordance with the official poverty counts.

*Statistics Norway and University of Oslo, email: gkj@ssb.no
†Delhi School of Economics, email: rohini@econdse.org

1 Introduction

Levels of public provision vary substantially both across and within many countries. This is challenging when measuring real consumption levels since access to publicly provided goods and in-kind transfers tends to influence people's consumption decisions and levels, which means that consumption estimates based solely on private expenses are biased. If access to key services varies systematically with wealth we may have a serious measurement problem. In this paper we present some approaches to correct for this bias and to incorporate benefits from unpaid public services into private consumption estimates.

We apply our methods to the measurement of poverty in India. The official poverty estimates for Indian states are important figures in the public debate—both at the national and the global scene—and they are decisive for the allocation of various funds from the center government to the states. Because the estimates play such a crucial role they have been heavily debated and evaluated during the past decades. Despite these debates, and despite three independent evaluation commissions since the early 1990s, the official procedures have never really attempt to factor in regional differences in public provision. Some of the justification for this is that the Indian Constitution states that every citizen is entitled to basic government services like schooling and health care for free. However, available evidence shows that a large fraction of the population lives in regions without these facilities. Less than half of the Indian villages have a public school with grade levels above five, according to the 2011 Census, and only 7% have a government health care facility with a trained doctor. Access to other basic amenities, such as piped water, electricity and public transportation is also scant.

The first thing we do is to document a strong positive relation between income levels and access to government facilities across states, and an equally strong but negative relation between income and poverty rates. We find the same pattern when we replace physical access to facilities with different types of development expenditure by the state governments. The fact that public provision is much higher in the richer states suggests that the official poverty rates exhibit a systematic bias; since they ignore public services they are likely underestimate the real consumption levels of people living in the richer states relative to people in the poorer states, and hence, overestimate poverty in the former and underestimate poverty in the latter states. If this is right, it also means that the relatively rich Indian states currently are being over-funded by

the central government at the expenses of the poorer states, since the poverty rates are used as an allocation device.

To correct for the bias in the poverty rates we would ideally like to add the value of public services to the aggregate consumption of households receiving benefits, and then calculate levels of poverty based on this extended expenditure distribution. This requires a procedure to value government services. The standard approach for this is to equate values with provision costs.[1] The approach is transparent and easily implementable, but it is likely to grossly overstate the value of government services and transfers in India, due to high salaries in the public sector, corruption, absenteeism and other types of inefficiencies. We illustrate this for government education and show that if we value public schools by provision cost their implicit value greatly exceeds the typical prices paid for private schooling. Our approach is therefore to identify values based on the demand rather than the supply of public goods.

We limit our analysis to two government programs: public elementary education and subsidized consumption goods through the Public Distribution System (PDS). The PDS is the largest subsidy program in India, and its main aim is to assure food security through provision of cheap food grains (rice and wheat) to those estimated to be poor. The program also provides fuels (kerosene) at subsidized prices. Our overall strategy to value the two government programs is to use market prices of privately provided goods and services, and then impute implicit transfers to households as these values subtracted the costs of using the programs. The main challenge is to identify a set of comparable market goods.

For the PDS this is relatively straightforward, as the food grains and fuels provided through the program are relatively standard market goods (Dreze and Khera, 2013; Himanshu and Sen, 2013). To reduce potential quality differences we calculate market prices by using the reported prices of those that also consume the same goods through the PDS. The identification of school values is much more difficult, since the quality of schools is likely to differ significantly across public and private providers and since schooling is a non-separable good, meaning that we do not observe consumption of private schools for those enrolled in government schools. We propose to evaluate schooling quality based on learning outcomes and then calculate the value of government schools based on the prices paid for enrolment in private schools that have comparable outcomes

[1] See Van de Walle and Nead (1995) for an overview. This is also the way national accounts value government expenditure.

as the typical government schools. This strategy would give conservative values of government schooling if the more able students attend private schools and if outcomes reflect both ability and school quality.

We implement the above methods using data from rural India taken from the Indian Human Development Survey (IHDS) of 2004-05 and 2011-12 (Desai *et al.*, 2009, 2015).[2] We supplement this data set with school test scores from the Annual Status of Education Report (ASER). All children in the ASER are given the same tests, irrespective of the type of school they attend. We can therefore investigate differences in performance in government and private schools by comparing the two distributions of test scores. For each Indian state, we identify the part of the private school test distribution that contains the median government school score and use this location as a measure of relative school quality. For most states the median government school falls into the second to fourth decile of the private school distribution. We next look at the distribution of private school expenses in the IHDS and compute the average expenses within the part of this distribution that corresponds to the relative quality measures. Provided that the prices of private education increase with the quality of schools, this strategy should provide a subsample of students that attend private schools of comparable quality as the median government schools. We could therefore use the costs incurred by this set of students to impute values to public schools, and assign implicit transfers as these values subtracted the within-state median costs of government schooling.

Our results show that the PDS and government schooling provide relatively large implicit transfers—for those below the poverty line the average per capita transfer from the PDS amounted to about 3% of their total expenditure in 2004-05 and almost 8% in 2011-12. The average transfer from government elementary education was 3% of expenditure in 2004-05 and 4% in 2011-12. The state-wise variation is however substantial, and systematic. Poor people from the rich states receive much higher transfers than poor people elsewhere. As an example, the average transfer amounts to more than 40% of the poor's expenditure in Tamil Nadu in 2011-12, but just 7-10% of expenditure in states like Haryana, Maharashtra, Rajasthan, Uttar Pradesh and West Bengal

[2]The survey data includes a comprehensive expenditure questionnaire along side information on usage and expenses on different types of government programs. Based on this expenditure data we are able to calculate state-wise poverty rates that are comparable to the official estimates based on data from the National Sample Survey (NSS). We use the IHDS rather than the NSS because the latter does not provide any information on usage of government services. The expenditure surveys which are used to calculate the official poverty rates do not even report which type of school children are enrolled in.

in the same year.

To arrive at a distribution of extended expenditure, which could be used to calculate new poverty rates we simply add these transfers to households' private expenditure. When calculating poverty we make sure that the overall level of poverty remains similar before and after we add the transfers by lifting the poverty line in each state by a similar amount. Doing this we find that poverty decreases in states with already low levels of poverty, such as Tamil Nadu, and increases in the states with higher levels of poverty. The state-wise variation in poverty rates therefore rises significantly—the coefficient of variation increases by more than 10% in both survey years. The magnitudes of these findings could be illustrated by the degree of mis-targeting in a imagined scheme that is allocated to states in accordance with the official poverty rates. Many centrally funded development schemes in India are distributed to states in this fashion. Tamil Nadu is the most extreme case, and in per capita terms this state is getting about 40% too much funding in 2004-05 and almost 90% too much in 2011-12, using our update poverty rates as a benchmark. States like Andhra Pradesh, Kerala and Punjab are also relatively over-funded. Much of this mis-targeting comes at the expense of large and poor states, such as Bihar and Uttar Pradesh.

The main finding of this paper—that the variance in state-wise poverty increases once we factor in the implicit transfers from public provision—is robust to a variety of ways of valuing the expenditure benefits from public schooling and the PDS. Our analysis is however limited in the sense that it only considers two government programs.[3] Still, based on the strong negative correlation between local availability of a broad set of government facilities and poverty rates, we have reasons to believe that our estimates are lower bounds of the true impact of government services and transfers when measuring poverty.

The rest of the paper proceeds as follows. In Section 2 we discuss regional differences in public provision and how the official poverty estimates in India are calculated. We present our methods in Section 3, and our findings on implicit government transfers and their impact on poverty in Section 4. Section 5 contains some robustness test. We extent the analysis to urban households in Section 6 and provide some concluding remarks in Section 7.

[3]The main analysis is also somewhat limited in that it only covers rural India. We ignore urban areas because we do not have a set of nationwide school test scores, but also because the whole idea of factoring in government services when measuring poverty is likely to be less significant for the cities since people there would have access to all the most basic public amenities and since poverty is concentrated in rural areas. As an extension to the analysis we still show that, under some assumptions, our main findings go through also for urban India.

2 Background: Government programs and poverty in India

2.1 Public provision and access to amenities

A large fraction of the rural population in India lacks access to basic public amenities, such as reasonably functioning schools and health centers. The 1961 Census provides the first systematic evidence of village-level access to public goods and shows that about 44% of the villages had primary schools and less than 2% had health centers. The provision of government schools expanded relatively fast in the decades that followed, and by 2011 more than 80% of the villages had a primary school. Access to government schools of higher grade levels have also improved, but the levels are still quite low. Middle schools (grade 6-8) were present in about 45% of Indian villages in 2011, whereas 20% had a government high school (grade 9-10). In contrast, only 7% of the villages had a Primary Health Centre, the smallest public facility with a trained doctor. Village-access to Primary Health Sub-centres has increased over time, but these facilities do not have the personnel or equipment to treat major ailments. Access to other basic amenities are scant, about 40% of Indian villages had a bus stop in 2011, 38% had piped water, 64% had paved roads going to the village and about 56% had electricity. The variation across states is however huge. Villages in states such as Tamil Nadu and Kerala usually have all of the aforementioned amenities, while access in states such as Bihar, Jharkhand and West Bengal is many times lower.

States also differ in the provision of other types of government programs, like the Public Distribution System (PDS). The PDS was the first nationwide transfer program after Indian Independence and its original objective was to assure food security through provision of cheap food grains. Later, the program also introduced subsidized fuels (kerosene). In 1997 the PDS became a targeted program, with prices and allocations determined by the poverty category in which a household was classified. The categories were initially simply APL and BPL (above and below the poverty line), but in 2004 the Antyodaya (AAY) was launched to provide the ultra poor higher allocations at lower prices. The central government provides most of the funding for the PDS through its grain procurement and storage networks, and allocations to states are based on the official poverty rates. The state governments' main responsibilities are therefore to provide transportation and distribution.

2.2 The official poverty rates

The official poverty estimates in India are based on household consumption data collected by the National Sample Survey Organisation (NSS). These surveys sample a large number of households all over the country, usually every fifth year, and capture expenditure on a variety of privately purchased consumption goods ranging from different foods, fuels and cloths to durables and services like education and health care. They also impute values for home-produced goods using market prices. The same procedure is used to impute values for a limited set of goods received as gifts or charity. Goods consumed through the PDS are in contrasted valued at the subsidized prices, not by the market prices of similar goods. Moreover, durables and services received in-kind are not recorded, meaning that the surveys ignore consumption of free government services.

Provided that access to government amenities and transfers vary across time and space, and given that public provision affects peoples' real consumption levels and decisions, the survey data have an inherent measurement problem. Yet, the methods of construction poverty lines in India have completely ignored this bias in the NSS. The background for this is that services such as schooling and health care are, as stated by the 1962 expert group of poverty measurement, *expected to be provided by the state according to the Constitution* (Government of India, 1993, p.8). Given adequate provision, everyone should have access and hence there is little need for adjusting the private expenditure figures. Over the years it has however been acknowledged that access varies widely and that many states are very far from subscribing to the Constitution. Starting from the early 2010s, and as part of a larger revision in the methods of estimating poverty, some attempts were therefore made to incorporate regional variation in education and health care services. Other key government amenities, including the PDS, were still ignored.

Ideally, one would like to add the value of the free services to the aggregate expenditures of households receiving them, and then compute poverty based on this extended distribution of consumption expenditure. The official methodology in India follows an alternative route and adjusts for schooling and health care by incorporating variations in costs into the price indices used to set the state-wise poverty lines. In principle one would think that people living in states with poor access to government services will face higher prices since they would have to rely on private alternatives and that this could be captured by a price index. However, the approach used is problematic, partly because it ignores which households that are benefitting from the

public services, and partly because of the particular procedure used to capture state-wise prices. The prices of education and health care are measured as the median out-of-pocket expenses on each of the services, and these are—not very surprisingly—highest in the rich states. We cannot infer from this that schooling and health care are more expensive in the richest states; the observed relation might equally well reflect the fact that richer households tend to spend a larger absolute amount on schooling and health care, regardless of the level of public provision.

In fact, based on the levels of public provision in different states it seems more likely that the relationship is going the other way around. Table 1 presents the state-wise correlations between different measures of public provision versus per capita net domestic product and poverty rates. Village-access to public facilities are strongly correlated with income levels, and negatively correlated with poverty rates. We find the same pattern for different type of development expenditure by the state governments. Because provision seems to be better in the rich states, the adjustment applied by the official methods might actually worsen the initial bias in the NSS. Ironically, the impact of this is likely to be limited due to another flaw in the procedure. Since government services are free or highly subsidized, and because the NSS therefore underestimates the consumption value of these services, the price index weights of schooling and health care become very small. The whole adjustment therefore barely impacts the final price index used to deflate poverty lines.

To sum up, official poverty numbers in India do not properly account for access to public amenities, and provided that poor households utilize and value government services, the official numbers are likely to underestimate poverty in states with poor access as compared to states with better access. As can be seen from Table 1, states with good access to publicly provided goods tend to have relatively low levels of poverty, and as a consequence of this, the official methodology is likely to underestimate regional variation in poverty.

We now turn to our methods for correcting this bias.

TABLE 1: Correlations: Public provision vs. income and poverty, by states 2011-12

	Per capita net state domestic product	**Poverty rate**
	(1)	(2)
Village-access to government amenities (shares)		
Primary schools	0.57	-0.26
Primary health centre (PHC)	0.34	-0.48
Government bus stop	0.86	-0.72
Electricity	0.79	-0.74
Tap water	0.73	-0.77
Paved roads	0.61	-0.40
PDS shop	0.59	-0.59
Revenue expenditure per capita (rupees)		
Total development expenditure	0.87	-0.61
Elementary and secondary education	0.86	-0.68
Medical and Public Health	0.69	-0.78
Transport	0.72	-0.41
Electricity	0.60	-0.51
Water supply	0.44	-0.23

Note: The table shows correlation coefficients. Information on village access to government amenities is extracted from the 2011 Census, whereas the per capita expenditure figures by the states are from the data bank of the Reserve Bank of India. The expenses on education are taken from Government of India (2015), while the state-wise poverty rates are from Government of India (2013).

3 Data and methods

3.1 Methods

A standard approach for valuing government spendings, often labelled benefit incidence analysis (Van de Walle and Nead, 1995), is to equate values with provision costs and then assign implicit transfers to people using the government programs (see for example Ruggeri *et al.*, 1994; Aaberge *et al.*, 2010). The procedure does not seem particularly suited for a country like India however, where the public sector is characterized by various sources of inefficiencies. Provision costs would in these cases grossly overstate the true value of public services. In Appendix B we illustrate this for government schooling. Based on the state governments' budgets we show that the cost per student is more than twice the median price of private schooling (and often much higher) in almost all Indian states. Given that about a quarter of children in India attends private schools, despite their modest means and availability of public schools, it seems brave to assume that these costs reflect the true value of government education.

Our approach is therefore to use demand rather than supply to value government programs. In-

stead of using provision cost we impute values to programs based on market prices of comparable privately provided goods. This approach is similar to the one used in most household surveys when valuing home-produced goods and other goods received in-kind. Usually we cannot use the average price of private goods directly since families choose these goods actively, presumably due to their higher quality.[4] To identify the prices of goods and services that are comparable to those provided through government programs we therefore need to carefully pick the group of households for which we calculate the market prices over.

Several studies have evaluated the implicit value of the PDS using market price directly (Dreze and Khera, 2013; Himanshu and Sen, 2013). We use a similar approach, but in contrast to these earlier studies we calculate market prices based exclusively on the subset of households that also consume the same goods through the PDS. Our hope is that this would provide a more accurate price comparison, as many rich families that are likely to consume grains of relatively high quality are excluded from the computation of market prices.

Schooling, in contrast, is a non-separable good, meaning that people cannot use more than one school at once. Hence, we do not observe consumption of private schools for those enrolled in government schools. This is problematic since quality is likely to differ significantly across government and private providers. To identify the prices of private schools that are similar to the government schools we therefore need some way of comparing quality. We propose to do this based on learning outcomes. More particularly, we calculate the value of government schooling based on the prices paid for enrolment in private schools that have comparable outcomes as the typical government schools. This approach, which attributes differences in learning to school quality, would give conservative values of government schooling if the more able students attend private schools and if outcomes reflect both ability and school quality. We discuss this possible selection of students more thoroughly in the robustness section.

Having identified the values of the PDS items and government schooling, we next assign values to households and individuals that use the particular programs, and define the per capita implicit transfer as:

$$t^i = q^i(v^i - c^i), \tag{1}$$

where q^i is the per capita amount consumed through government program i, v^i is the value of

[4] One approach would be to compute prices conditional on product quality. This is however hard using standard household surveys, since they most often do not report a rich enough set of product attributes.

the program, while c^i is the cost associated with using the program. Before we describe how we implement the above methods we briefly describe our data.

3.2 Data

Our main data source is the Indian Human Development Survey (IHDS). The IHDS is a nation-wide representative household survey, conducted in 2004-05 and again in 2011-12. The surveys include a NSS-like consumption questionnaire with information on both expenditure and quantities on different consumption goods. In addition they provide information on usage of a wide range of government programs, in particular school enrolment and expenditure per student in both government and private schools.[5] Note that the IHDS provides poverty measures that are comparable to the official estimates, which are based on the NSS (see Table A1).

We supplement this household data with school test scores from the Annual Status of Education Report (ASER).[6] In each year since 2005, the ASER has administered test to about seven hundred thousand children from rural areas. Since all children in the surveyed households are given the same test, irrespective of the type of school they attend, this data allow us to compare performance across public and private schools. To match the IHDS in time, we use the ASER data from 2005 and 2012. Both of these ASER surveys include basic tests in reading and math, roughly at the level of grade 2, and children are given a score on each task based on the highest level they are able to complete. The reading task has five scores (no knowledge, letters, words, paragraphs and stories), while the math task has four scores (no knowledge, number recognition 1-99, subtraction and division). The survey from 2012, in addition, includes tests in English language with seven scores (no knowledge, capital letters, smaller letters, simple word, easy sentences, word meaning in local language, sentence meaning in local language).

[5] The NSS consumer expenditure surveys do not have this information. The NSS employment-unemployment surveys do have information on school enrolment, but not on costs per students. The NSS conducted special education surveys in 2008 and 2014, which contain this but these surveys do not include a full expenditure questionnaire, and they do not provide information on usage of other government programs.

[6] The IHDS conducts tests of children aged 8-11, but the number of kids that took part in these exercises is too small to compare performance across different types of schools.

3.3 Implementation

The IHDS asks households about the amount consumed of rice, wheat and kerosene. It also asks about the prices paid. Both of these questions are posted separately for market purchases and purchases through the PDS. We use this information to calculate values and costs. To minimize measurement errors and because we are mainly interested in the state-wise comparison, we use the median market prices within states to value the three PDS items (among households with PDS consumption of the same goods). Costs are calculated in the same manner, except for rice and wheat, for which we compute costs separately by BPL and AAY households. We do this since the PDS prices for these goods vary by the poverty categories.

We implement our method of valuing government schooling by comparing performance in the standardized ASER tests across public and private schools. To assure some variation in the test scores we focus solely on students in grade level 3.[7] We show in the robustness analysis that all of our findings are invariant to this choice. Table 2 shows the average performance in reading and math of students in government and private schools. As can be seen, students in private schools tend to perform somewhat better than students in government schools.[8] As a way of combining the reading and math scores we first compute an overall test score for each student in the ASER survey. We do this by performing a standard principal component analysis, separately for each survey year, and by using the first component as an overall index.

In the next step we calculate the average value of this index for each village, separately for students enrolled in government and private schools. Having obtained these village averages, which would correspond to school averages if villages do not have multiple private and public schools, we then identify the median government school within each state. To arrive at a relative quality measure, we finally investigate which decile of the distribution of private schools this median public school falls into. For most states, it falls into the third or the fourth decile, which indicates that the private schools on average are of relatively higher quality. In the robustness section we predict test scores controlling for background characteristics like parents' education and household amenities. The quality comparison between the two types of schools is quite

[7] Since the tests are roughly of grade level 2 difficulty, most students in higher grade levels obtain the maximum score. Table A2 displays the number of surveyed students in grade level 3.

[8] Note also that the average school performance in both types of schools seems to have deteriorated over time. Whether this is true or caused by inconsistencies across the two surveys is not a concern here, as we do not use the variation in test scores over time.

TABLE 2: Test scores fractions, third grade students

	2005		2012	
	Gov	Pvt	Gov	Pvt
	(1)	(2)	(3)	(4)
Read				
Nothing	0.10	0.04	0.15	0.04
Letters	0.19	0.11	0.31	0.18
Words	0.25	0.19	0.24	0.22
Paragraphs	0.23	0.25	0.15	0.21
Stories	0.24	0.41	0.15	0.34
Observations	32.820	5.910	26.681	10.115
Math				
Nothing	0.19	0.12	0.49	0.21
Numbers	0.38	0.28	0.33	0.36
Subtract	0.31	0.34	0.14	0.29
Division	0.12	0.27	0.04	0.14
Observations	32.523	5.876	26.648	10.103

Note: The table show test scores from the ASER. The numbers are presented as fractions of children with the different scores, using only children enrolled in grade level 3.

robust to this alternative specification.

We next use the relative quality measure to calculate the implicit values of the government schools. We do this by evaluating the distribution of private school prices in the IHDS and by identifying the part of this distribution that corresponds to the relative test score measure. Provided that the prices of private education increase with the quality of schools, this sub-group of students should attend private schools that are of comparable quality as the median government schools, and we could therefore use the prices paid by these students to impute values to the public schools. More concretely, we first compute village-level average expenditure on schooling for those enrolled in private schools at grade level 1 through 10. The expenditure on schooling include expenses on tuition, books, uniforms and transportation. We then construct state-specific deciles based on the village averages, and calculate the value of government schooling as the average amount paid by the students in the particular decile identified through the test score comparison.[9] The cost of government schools is derived by first calculating the average amount spent on schooling for those enrolled in public schools within each village, and then by using the median of these values within states. We do this separately for pure government schools and government aided schools.[10]

[9]Thus, we assume that the relative quality measure based on third grade students captures quality differences also for other grade levels.

[10]Some states, such as Kerala, use most of their government funds for education on assistance to government-aided schools. It therefore makes sense to impute transfers to students enrolled in these private institutions, and not only to those in pure government school.

Having obtained values and costs of government schooling and the PDS, we next calculate implicit transfers based on the expression in Equation (1). To arrive at a distribution of extended expenditure, which could be used to calculate new poverty rates we simply add these transfers to households' private expenditure. When calculating poverty rates we adjust the poverty lines to assure that the overall level of poverty remains similar before and after we add the transfers. We do this by lifting the poverty line in each state by a similar amount.

4 Results

In this section we present the results on implicit transfers and poverty based on our estimates of values and costs of the PDS and government schooling (see Table A3 and A4). We focus on rural households from the 17 so-called major states. The combined population in these states cover most of the rural population in India.[11] In Appendix C we extend the analysis to urban households.

4.1 Implicit transfers

The overall transfers from the PDS are larger than those from government schooling in both survey years. For those below the poverty line, the average per capita transfer from the three PDS items combined rose from 3.3% of their private expenditure in 2004-05 to 7.9% in 2011-12. Most of this increase could be attributed to increased consumption of PDS rice and higher market prices.[12] The importance of the government school transfers, as measured by these fractions, also increased albeit somewhat less, from 2.9% to 4.3%.

The state-wise variation is substantial. As an example, the average transfer from government schooling and the PDS amount to more than 40% of the poor's expenditure in Tamil Nadu in 2011-12, but just 7-10% of expenditure in states like Haryana, Maharashtra, Rajasthan, Uttar Pradesh and West Bengal in the same year. Table A5 and A6 show the full set of state figures. Figure 1 and 2 plot average overall transfers among those below the poverty line versus poverty

[11] According to the population figures in the Indian Census they constituted 96 per cent of the rural population in 2001 and 97 per cent in 2011.

[12] For evidence of increased PDS transfers based on the NSS expenditure surveys, see Dreze and Khera (2013) and Himanshu and Sen (2013).

rates based on private expenditure. The differences across states are systematic, especially for government schooling where the implicit transfers are much larger for states with relatively low levels of poverty. For the PDS the pattern is somewhat weaker, but also for this program there is a tendency of larger average transfers in the relatively less poor states.

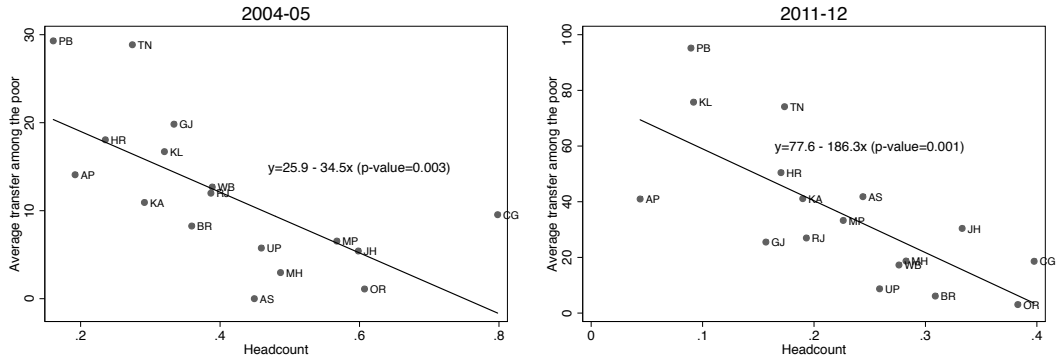
4.2 Implications for measured poverty

The fact that poor people in states with relatively high levels of poverty receive less government transfers than poor people elsewhere suggests that the official estimates underestimate the variance in poverty across states, since they do not factor in the implicit transfers.

Table 3 shows the coefficient of variation for the state-wise poverty rates, based on expenditure and extended expenditure. Not surprisingly given the relationship documented above, we find that the government transfers lead to greater variation in regional poverty—the coefficient of variation rises by more than 11% in 2004-05 and by 12% in 2011-12. The bottom part of the table shows similar estimates based on the Poverty Gap Index. In contrast to the poverty rates, this index also captures the depth of poverty in each state. The percentage increase in the coefficient of variation using this measure is about 7% in 2004-05 and 12% in 2011-12.

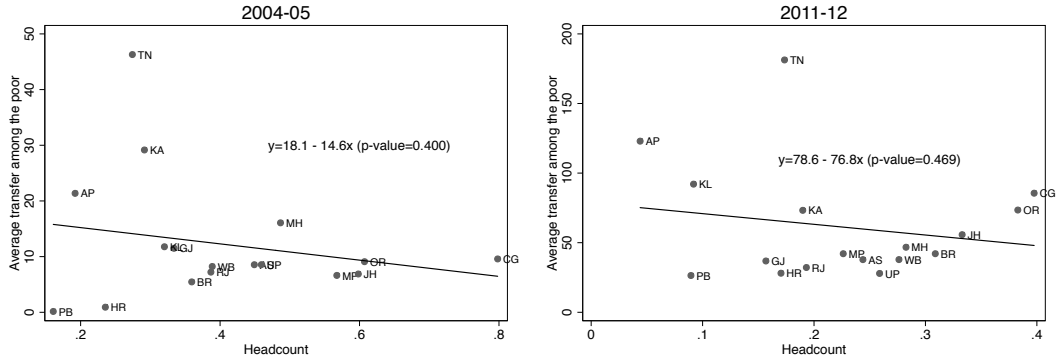
Table 4 displays the bias in the state-wise poverty rates, using our updated measures as a benchmark. Note that the population weighted bias equals zero, since the total number of poor is the same for both sets of poverty numbers. The numbers in the table could also be seen as measures of the degree of mis-targeting in programs that are funded by the central government and allocated to states in accordance with the official poverty numbers. Tamil Nadu is the most extreme case. Based on the sketched allocation of funds this state is getting 39% too much funding in 2004-05 and almost 90% too much in 2011-12. States like Andhra Pradesh, Kerala and Punjab also receive significantly more than they should, at the expenses of large and poor states, such as Bihar and Uttar Pradesh.

FIGURE 1: Government school transfers of the poor vs. poverty rates



Note: The figures plot average per capita transfers from government schooling among those below the poverty line versus the poverty rate in each state. The poverty rates are computed from the IHDS and are calculated without adding the implicit transfers from government programs.

FIGURE 2: PDS transfers of the poor vs. poverty rates



Note: The figures plot average per capita transfers from the PDS among those below the poverty line versus the poverty rate in each state. The poverty rates are computed from the IHDS and are calculated without adding the implicit transfers from government programs.

TABLE 3: Coefficient of variation, state-wise poverty

	2004-05	**2011-12**
	(1)	(2)
Headcount		
Expenditure	0.321	0.359
Extended expenditure	0.357	0.401
Poverty Gap		
Expenditure	0.524	0.401
Extended expenditure	0.559	0.450

Note: The tables shows the coefficient of variation for state-wise poverty. "Expenditure" is reported private expenditure, and "Extended expenditure" is this plus the implicit government transfers.

TABLE 4: Bias in state-wise poverty, in per cent

	2004-05	**2011-12**
	(1)	(2)
Andhra Pradesh	11.3	32.1
Assam	-5.7	-2.8
Bihar	-3.3	-5.8
Chhattisgarh	0.0	9.1
Gujarat	7.0	1.5
Haryana	-0.1	2.9
Jharkhand	-2.1	7.6
Karnataka	9.3	13.8
Kerala	6.8	33.8
Madhya Pradesh	-2.8	3.9
Maharashtra	-1.6	-3.1
Orissa	-4.4	4.5
Punjab	2.4	23.6
Rajasthan	-1.4	-4.2
Tamil Nadu	38.5	86.1
Uttar Pradesh	-3.0	-9.1
West Bengal	0.6	-3.6

Note: The table presents the percentage bias in the state-wise poverty rates, using our updated poverty rates based on extended expenditure as a benchmark. Note that the population weighted bias equals zero, since we normalize the overall level of poverty.

5 Robustness

In this section we explore how robust our finding of increased state-wise poverty is to alternative ways of estimating the implicit transfers. For each of the alternatives setups we normalize the poverty lines such that the overall level of poverty remains constant.

Our baseline estimates of the PDS transfers are based on within-state median market prices, calculated exclusively from households with PDS consumption of the same goods. The differences in quality of rice, wheat and kerosene bought through the PDS and through the market are likely to be much less significant than the differences between, say, government and private schools. Still, we cannot be sure that they are entirely the same goods.[13] One strategy for evaluating the robustness of our implicit PDS transfers is to use different parts of the distribution of market prices. Table 5 reports average transfers (including those from government schooling) for household below the poverty line and the coefficient of variation in state-wise poverty, when we value the PDS items as the 5th, 10th and 25th percentile of the market distribution within states. As before, we only use the market prices of households with PDS purchases of the same goods. The average transfers decline somewhat when we use lower parts of the market price

[13]Khera (2011) discusses some of these issues.

distribution, but our finding of increased variance in state-wise poverty is not affected.

However, the finding that poor families in the rich states receive higher transfers than poor families elsewhere might it selves be driven by variation in goods quality. Suppose that rich households systematically purchase rice, wheat and kerosene of higher quality than poor households. If this is the case, then any part of the market price distribution in the rich states will tend to give spuriously high price estimates—simply because the reported prices are likely to belong to relatively affluent households that consume goods of higher quality. This would subsequently lead to inflated PDS transfers in the rich states as compared to the poorer states. To correct for this possible bias in our estimates we apply the regression based method suggested by Deaton *et al.* (2004). The idea behind this method is that the variation in the consumption prices people report stem from a mixture of quality variation and real price differences. Assuming that goods quality rises log-linear with people's total consumption we could remove the bias in the state-wise prices by running the following regression:

$$log\ price_h = \sum_j d_j D_j + \beta(log\ y_h), \tag{2}$$

where $price_h$ is the reported item price by household h, y_h is total expenditure and D_j is a set of state dummy variables. We run this regression separately for rice, wheat and kerosene and for each of the two survey rounds.[14] The adjusted prices are identified from the state dummy coefficients and the expenditure term evaluated at the overall median expenditure within each survey round. Having obtained the adjusted market prices of the three goods we next impute implicit transfers and compute new poverty rates as before. The outcomes are shown in Table 5, and as can be seen, all estimates are robust to this alternative valuation.

As a final robustness check of our PDS findings we use regionally disaggregated market prices as valuation. A potential concern with our estimates is that prices might vary also within states, and that the market prices in locations where many people utilize the PDS could be different than elsewhere in the same state. To check for this we compute median market and PDS prices at the district and village level and use those prices to calculate implicit transfers. As can be seen from Table 5, the level of aggregation has no impact on our findings.

We conduct several sensitivity test also for our schooling results. In our baseline specification

[14]The β-coefficient is positive and significant for all six regressions.

we impute implicit prices to public schools based on the performance of students in grade level 3. As a first robustness test we compute relative quality measures of government using the test scores of students in grade level 2 and 4, and calculate implicit transfers and the subsequent poverty rates based on this. Table 6 shows the relative quality measures, whereas the other outcomes are presented in Table 5. The estimates show that the choice of grade level has little impact on our findings.

As a second sensitivity test we incorporate the test scores for English language. These tests are only available in the ASER survey from 2012. Column (7) of Table 6 shows the relative quality measure when the English test is included in the principal component analysis. The comparison between government and private schools remains the same as in our baseline specification for 10 out of 17 states, while it changes in favor of the private schools in the remaining states, except for in Uttar Pradesh where government school students perform somewhat better when English is included. The overall findings on state-wise poverty is little affected.

In the final robustness specification we correct—at least partially—for selection of students into private schools. We do this through a simple regression analysis where we control for a set of background characteristics. The approach is similar in spirit to the method of quality adjustment presented above. Note that since the ASER survey from 2005 does not contain any information on the households, we are only able to implement the analysis for 2012. We capture village-level school quality for both types of schools by running the following regression:

$$score_{ij} = X_i\beta + \sum_{i=1}^{I}\sum_{t=1}^{2} d_{ij}D_{ij} + \epsilon_{ij}, \tag{3}$$

where $score_{ij}$ is the test scores of students in village i and school type j, D_{tj} is a set of school type-village dummies, and X is a vector of observable characteristics, consisting of the age and gender of the students, the education level of both parents and other household characteristics.[15] We run this regression separately for each state to allow for heterogenous relations between the background characteristics and school performance. By assuming that the quality of a given type of school is the same within villages we next capture village-level school quality through the dummy coefficients, d_{tj}. Having obtained these predicted values we then locate the median

[15]More particularly, we include binary variables that capture whether there are more than one school-going child in the household, whether the household gets a newspaper every day, whether it has other reading material in house, whether it has a constructed toilet and whether anyone in the household know how to handle a computer.

government school value in the private school distribution and compute the subsequent school values, implicit transfers and updated poverty rates as before. The outcomes are presented in the final column of Table 6 and show that for 12 out of 17 states the government schools are estimated to be of relatively higher quality, as compared to in our main specification. The levels of implicit transfers are thus somewhat higher. The impact on state-wise poverty is however very limited.

TABLE 5: Average transfers and state-wise poverty under alternative specifications

	2004-05			2011-12		
	Mean transfer poor HHs	**CV of state HC**	**CV of state PG**	**Mean transfer poor HHs**	**CV of state HC**	**CV of state PG**
	(1)	(2)	(3)	(4)	(5)	(6)
Main specification	24.1	0.357	0.559	97.1	0.404	0.453
Alternative specifications for PDS values						
25th percentile	23.4	0.357	0.560	88.2	0.400	0.452
10th percentile	21.1	0.355	0.552	79.1	0.396	0.451
5th percentile	19.4	0.356	0.556	75.3	0.394	0.448
Quality adjustment	23.9	0.357	0.557	95.2	0.399	0.448
Median within districts	24.2	0.358	0.561	97.2	0.400	0.452
Median within villages	24.1	0.359	0.559	96.9	0.403	0.452
Alternative specifications, schooling						
Grade level 2	23.5	0.356	0.561	99.8	0.403	0.453
Grade level 4	22.9	0.356	0.559	106.1	0.403	0.447
Tests in English	–	–	–	93.8	0.397	0.446
Predicted test scores	–	–	–	110.7	0.402	0.451

Note: The table shows average transfers among the poor and the coefficient of variation in state-wise poverty using different procedures to value the government programs.

6 Conclusion

The official poverty estimates in India do not properly account for local levels of public provision. This is problematic as access to government services and transfers varies systematically with income. The state-wise poverty counts are therefore likely to overestimate poverty in the relatively rich states and underestimate poverty in the poorer ones. Since several centrally sponsored development schemes are allocated to states in accordance with the official poverty estimates, this also means that funds systematically are being mis-allocated and skewed towards the rich states.

We have proposed some approaches to correct for the bias in poverty measures based on private

TABLE 6: Relative quality measures, test scores

	2005			2012				
	Main	Robustness		Main	Robustness			
	Class 3 *Reading Math*	Class 2 *Reading Math*	Class 4 *Reading Math*	Class 3 *Reading Math*	Class 2 *Reading Math*	Class 4 *Reading Math*	Class 3 *Reading Math English*	Class 3 *Reading Math Predicted*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Andhra Pradesh	4	4	4	4	4	5	3	4
Assam	4	3	3	3	3	2	3	3
Bihar	3	2	3	1	2	4	1	2
Chhattisgarh	5	3	3	3	1	2	2	4
Gujarat	3	3	3	3	4	3	3	5
Haryana	2	2	2	1	1	2	1	2
Jharkhand	3	3	3	2	2	3	2	3
Karnataka	3	3	3	4	4	4	3	5
Kerala	5	5	3	5	3	3	4	4
Madhya Pradesh	2	2	3	2	1	2	2	3
Maharashtra	5	4	6	4	4	5	4	5
Orissa	3	3	2	1	1	2	1	2
Punjab	4	4	3	2	3	4	2	4
Rajasthan	3	3	2	2	2	2	1	2
Tamil Nadu	4	4	4	4	4	5	3	5
Uttar Pradesh	2	3	2	1	1	1	2	3
West Bengal	5	4	4	3	3	2	3	3

Note: The table shows different estimates of relative government school quality based on the comparison of test scores from the ASER.

expenditure. Our analysis is limited in the sense that it only covers two government programs. We still find sufficiently large implicit transfers to raise the variance in state-wise poverty rates quite substantially. Simple correlation coefficients between the availability of other government facilities and poverty rates suggest that our estimates should be interpreted as lower bounds.

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Appendix A Extra tables and figures

TABLE A1: State-wise poverty measures (rural sector)

	Headcount				**Poverty Gap**			
	2004-05		**2011-12**		**2004-05**		**2011-12**	
	NSS	IHDS	NSS	IHDS	NSS	IHDS	NSS	IHDS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Andhra Pradesh	0.32	0.19	0.11	0.04	0.07	0.04	0.02	0.01
Assam	0.36	0.45	0.34	0.24	0.07	0.11	0.06	0.05
Bihar	0.56	0.36	0.34	0.31	0.13	0.07	0.06	0.07
Chhattisgarh	0.55	0.80	0.45	0.40	0.14	0.33	0.09	0.11
Gujarat	0.39	0.33	0.22	0.16	0.09	0.09	0.03	0.04
Haryana	0.25	0.24	0.12	0.17	0.05	0.06	0.02	0.03
Jharkhand	0.52	0.60	0.41	0.33	0.11	0.18	0.07	0.08
Karnataka	0.37	0.29	0.25	0.19	0.07	0.07	0.03	0.04
Kerala	0.20	0.32	0.09	0.09	0.04	0.10	0.02	0.02
Madhya Pradesh	0.54	0.57	0.36	0.23	0.13	0.22	0.08	0.05
Maharashtra	0.48	0.49	0.24	0.28	0.12	0.13	0.05	0.06
Orissa	0.61	0.61	0.36	0.38	0.17	0.19	0.07	0.09
Punjab	0.22	0.16	0.08	0.09	0.04	0.03	0.01	0.01
Rajasthan	0.36	0.39	0.16	0.19	0.07	0.11	0.03	0.04
Tamil Nadu	0.38	0.27	0.16	0.17	0.07	0.06	0.02	0.05
Uttar Pradesh	0.43	0.46	0.30	0.26	0.09	0.12	0.06	0.06
West Bengal	0.38	0.39	0.23	0.28	0.08	0.09	0.04	0.06
All	0.42	0.41	0.26	0.22	0.09	0.12	0.05	0.05
CV	0.23	0.32	0.36	0.36	0.32	0.52	0.42	0.40
No of HHs	63.492	23.928	47.502	24.840	63.492	23.928	47.502	24.840

Note: The table shows poverty measures derived from the IHDS and the NSS based on the most recent official poverty lines. CV shows the coefficient of variation in the state-wise poverty rates.

TABLE A2: Number of observations in the ASER, students in grade 3

	2005		**2012**	
	Gov	Pvt	Gov	Pvt
	(1)	(2)	(3)	(4)
Andhra Pradesh	1072	285	826	539
Assam	526	53	1095	267
Bihar	3607	452	4241	284
Chhattisgarh	1068	49	925	160
Gujarat	1290	86	1679	158
Haryana	1200	626	738	797
Jharkhand	1742	192	1680	264
Karnataka	1822	185	1303	358
Kerala	853	100	301	499
Madhya Pradesh	2736	268	2927	730
Maharashtra	2570	151	1816	265
Orissa	2527	52	1558	93
Punjab	974	338	579	480
Rajasthan	2438	808	1648	1165
Tamil Nadu	1223	315	1124	656
Uttar Pradesh	5499	1866	3489	3272
West Bengal	1180	26	664	93

Note: The table shows the number of observed students in grade level 3 in the ASER.

TABLE A3: Values and costs of government programs, 2004-05

	PDS rice			**PDS wheat**			**PDS kerosene**		**Schooling**		
	Value	Cost		Value	Cost		Value	Cost	Value	Cost	
		BPL	*AAY*		*BPL*	*AAY*				*Gov*	*Aided*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Andhra Pradesh	10	5	3	12	7	6	18	10	114	36	175
Assam	12	6	4	–	–	–	22	11	11	19	19
Bihar	10	5	4	8	3	3	25	12	74	28	58
Chhattisgarh	8	6	3	8	5	5	18	10	78	24	58
Gujarat	11	3	–	8	2	–	14	9	154	45	167
Haryana	–	–	–	8	3	–	10	10	168	78	121
Jharkhand	10	4	3	10	4	3	17	11	62	18	78
Karnataka	11	3	3	10	4	3	11	10	107	44	178
Kerala	13	9	–	13	8	–	15	10	210	83	112
Madhya Pradesh	10	6	3	7	5	2	15	10	58	24	18
Maharashtra	12	7	3	9	5	2	16	11	44	25	46
Orissa	8	5	3	–	–	–	20	10	32	25	40
Punjab	16	11	–	9	3	–	13	11	282	118	214
Rajasthan	–	–	–	8	5	2	15	10	111	41	27
Tamil Nadu	12	4	–	12	8	–	20	9	175	36	47
Uttar Pradesh	9	4	3	7	3	2	20	11	61	26	85
West Bengal	10	6	3	10	5	2	22	10	110	45	64

Note: "Gov" are pure government schools, while "Aided" are government aided private schools. "BPL" and "AAY" denote the different poverty categories in the PDS. The PDS values and costs are per kg for rice and wheat, and per liter for kerosene. The schooling estimates are monthly values and cost of school enrolment.

TABLE A4: Values and costs of government programs, 2011-12

	PDS rice			**PDS wheat**			**PDS kerosene**		**Schooling**		
	Value	Cost		Value	Cost		Value	Cost	Value	Cost	
		BPL	*AAY*		*BPL*	*AAY*				*Gov*	*Aided*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Andhra Pradesh	25	1	1	30	18	18	30	15	430	53	132
Assam	20	7	4	20	10	10	35	18	213	39	8
Bihar	18	7	4	11	6	3	40	17	60	35	168
Chhattisgarh	16	2	1	12	2	1	25	16	131	49	188
Gujarat	20	3	3	15	2	2	30	15	253	79	136
Haryana	27	14	–	15	5	5	30	15	305	71	341
Jharkhand	20	1	1	–	–	–	25	17	192	49	66
Karnataka	20	3	3	18	4	3	30	16	334	78	197
Kerala	26	2	2	21	2	11	30	15	733	147	299
Madhya Pradesh	17	4	3	12	3	2	28	16	185	52	133
Maharashtra	20	8	3	15	6	2	30	16	196	72	147
Orissa	15	2	2	20	8	10	30	16	47	30	30
Punjab	30	–	20	14	4	4	30	17	458	67	485
Rajasthan	30	8	–	12	2	2	30	15	222	73	67
Tamil Nadu	26	0	0	20	8	8	40	14	686	82	153
Uttar Pradesh	15	6	3	11	6	2	30	16	103	54	182
West Bengal	20	2	2	16	7	2	30	16	144	62	102

Note: "Gov" are pure government schools, while "Aided" are government aided private schools. "BPL" and "AAY" denote the different poverty categories in the PDS. The PDS values and costs are per kg for rice and wheat, and per liter for kerosene. The schooling estimates are monthly values and cost of school enrolment.

TABLE A5: Per capita transfers of households below the poverty line, 2004-05

	PDS			**Schooling**	**Combined**
	Rice	Wheat	Kerosene		% of exp.
	(1)	(2)	(3)	(4)	(5)
Andhra Pradesh	16	0	3	15	0.11
Assam	1	0	4	0	0.01
Bihar	0	0	5	7	0.04
Chhattisgarh	5	0	3	10	0.09
Gujarat	2	3	4	19	0.08
Haryana	0	1	0	17	0.05
Jharkhand	2	2	2	7	0.05
Karnataka	21	3	0	12	0.12
Kerala	8	1	2	17	0.09
Madhya Pradesh	2	2	2	7	0.06
Maharashtra	5	6	3	3	0.05
Orissa	4	0	4	1	0.03
Punjab	0	0	0	29	0.07
Rajasthan	0	3	2	13	0.06
Tamil Nadu	34	1	7	29	0.22
Uttar Pradesh	2	2	4	7	0.05
West Bengal	1	1	6	13	0.06
All	5	2	3	9	0.06

Note: The table shows average transfers to households below the poverty line. All numbers are presented as per capita monthly values in current rupees. Column (5) shows the combined transfer as a fraction of private expenditure.

TABLE A6: Per capita transfers of households below the poverty line, 2011-12

	PDS			Schooling	Combined
	Rice	Wheat	Kerosene		% of exp.
	(1)	(2)	(3)	(4)	(5)
Andhra Pradesh	96	1	5	42	0.23
Assam	32	1	5	38	0.12
Bihar	21	7	9	6	0.08
Chhattisgarh	62	6	4	20	0.19
Gujarat	10	13	11	24	0.08
Haryana	0	19	4	47	0.09
Jharkhand	51	0	2	30	0.15
Karnataka	47	6	6	44	0.16
Kerala	55	7	3	63	0.15
Madhya Pradesh	9	22	6	35	0.13
Maharashtra	17	19	7	19	0.09
Orissa	54	1	6	3	0.13
Punjab	0	21	2	108	0.15
Rajasthan	0	20	6	28	0.08
Tamil Nadu	132	5	15	105	0.42
Uttar Pradesh	13	7	5	9	0.07
West Bengal	23	7	8	18	0.09
All	30	9	6	23	0.11

Note: The table shows average transfers to households below the poverty line. All numbers are presented as per capita monthly values in current rupees. Column (5) shows the combined transfer as a fraction of private expenditure.

Appendix B Values of government schooling based on provision costs

In this section we compute implicit transfers for government elementary and secondary schooling based on provision costs.

We extract data on cost from the state governments' budgets (Government of India, 2007, 2015). The first step is to calculate the cost per student in government schooling. We do this by dividing the total provision cost in each state by the number of students in government schools. The total number of students is calculated by using the multipliers provided by the IHDS. The provision costs cover all expenses related to public schooling (administration costs, teacher training, text books etc.), including assistance to non-government schools. The exact definition of what constitutes a non-government school seems to vary by states, and in some states the sub-heading for assistance comprises more than 90% of total expenses on education. Because of this we pool students in pure government and government-aided schools. We also pool students from rural and urban areas, since the budget data do not distinguish between these two sectors.

Table B1 displays the annual cost per student for the two survey years. It also shows the median expenses on private schooling within each state. As can be seen, the cost per student is usually much higher than the median cost of private schooling.

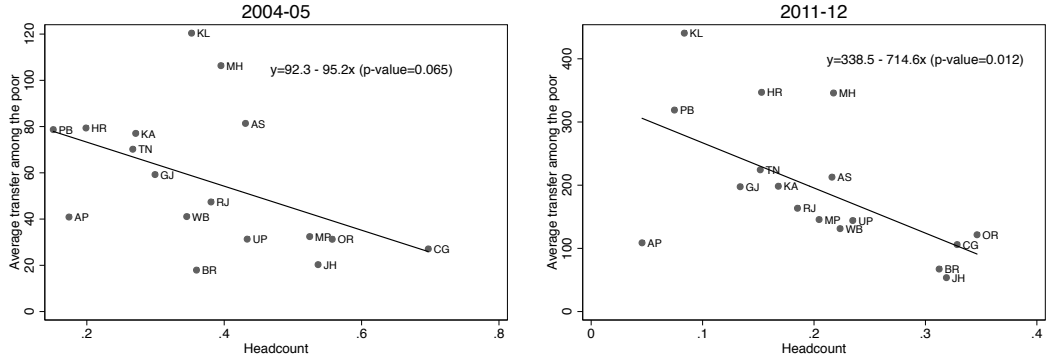
In the next step we equate the value of attending a government school with the cost per student. We then assign these values to students enrolled in government schools, subtract the median out-of-pocket expenses on schooling and calculate per capita transfers just as in our main analysis. Figure 3 plots the average monthly transfer among those below the poverty line in rural and urban areas versus the poverty rate in each state. The average transfers are naturally much higher than those presented earlier in this paper, but interestingly, the relationship between transfers and poverty rates is very similar. We still find that poor households in relatively rich states receive much higher transfers than poor households elsewhere.

TABLE B1: Provision cost per student i government schooling (grade level 1 to 10)

	2004-05		2011-12	
	Cost per student (1)	Median pvt school (2)	Cost per student (3)	Median pvt school (4)
Andhra Pradesh	3449	1750	14366	9325
Assam	4949	150	12100	7616
Bihar	1694	1000	3964	4016
Chhattisgarh	2177	800	6560	3398
Gujarat	4883	1985	16793	6220
Haryana	6103	2600	21264	10748
Jharkhand	2493	1350	4310	4850
Karnataka	6159	1735	16249	7072
Kerala	13462	2450	40782	9565
Madhya Pradesh	2489	1100	8057	5567
Maharashtra	7313	508	24838	5437
Orissa	2714	400	8213	4106
Punjab	7325	3400	18434	10777
Rajasthan	4392	1670	13166	5407
Tamil Nadu	5198	1900	22883	11398
Uttar Pradesh	3117	950	11197	2795
West Bengal	3534	1290	8627	3209

Note: The table shows average provision cost per student in government schools in current rupees and median prices of private schooling.

FIGURE 3: Government school transfers of the poor vs. poverty rates, rural and urban areas combined



Note: The figures plot average per capita transfers from government schooling among those below the poverty line versus the poverty rate in each state. The poverty rates are computed from the IHDS and are computed without adding the implicit transfers from government programs.

Appendix C Urban households

Our analysis so far has focused solely on rural parts of India. This is mainly due to lack of data for the urban sector, but also because the implications of incorporating government services are likely to be less significant for this sector as all cities would have basic amenities like government schools and health clinics. In this section we still make an effort to extend our analysis to include urban households. This is possible, at least partly, since the IHDS samples about 1000 urban neighborhoods.

The adjustment for subsidized PDS items is straightforward to implement since all households in the IHDS are asked the same questions on prices and consumption of these goods. Government schooling is more tricky, as the ASER only surveys rural households. Our strategy is to use the relative school quality measures from the rural sector. This implicitly assumes that the comparison between government and private schools within states is similar for urban and rural areas. This we clearly cannot know. Yet, as a way of evaluating how plausible the assumption is we conduct some rough tests based on the reading and math scores reported in the IHDS. Students living in the cities usually perform better on these tests as compared to students from rural areas, and this also holds when we limit the sample to either government or private school-going children. The difference in test performance between government and private schools is however very similar in both sectors—we are not able to reject that it is the same for more than one state in 2004-05 and two states in 2011-12.[16] This suggests that the strategy of using the relative quality measures based on rural students in the ASER data is reasonable.

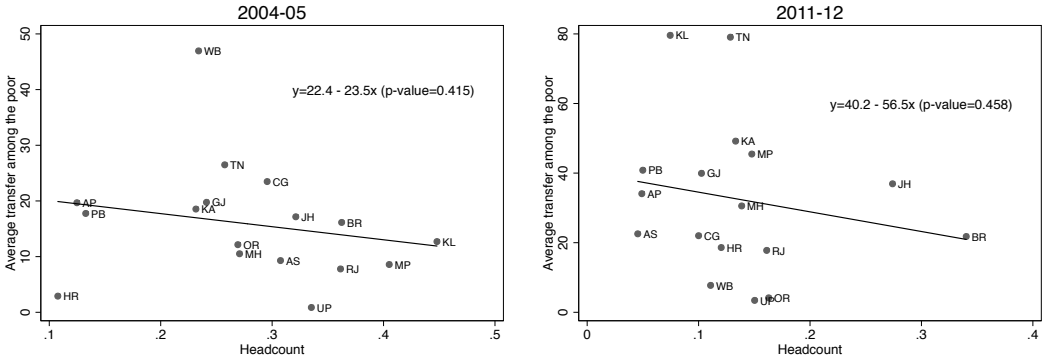
Figure C1 and C2 show the subsequent transfers to households below the urban poverty lines, plotted versus the state-wise poverty rates. The relationship between average per capita transfers and levels of poverty is weaker than for the rural sector, but again we find that the poor in the rich states tend to get more than poor people elsewhere. The correlation versus the state-wise average transfers in rural areas is also strong and about 0.8 in 2004-05 and more than 0.9 in 2011-12.

[16] We conduct the tests as follows. For each state we compute an overall test score index using a principal component analysis. We then run the following regression, separately for each state and only including students enrolled in grade level 3:

$$\text{Test score} = \alpha_1 \text{Rural} + \alpha_2 \text{Rural private school} + \beta_1 \text{Urban} + \beta_2 \text{Urban private school},$$

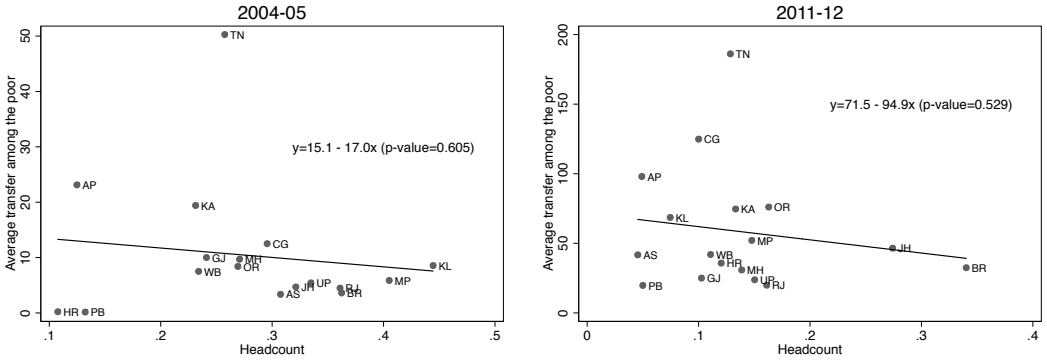
where all the controls are binary variables. We then test whether α_2 is equal to β_2. We are only able to reject this for Haryana in 2004-05 and Jharkhand and Rajasthan in 2011-12 (based on a 5% significance level).

FIGURE C1: Government school transfers of the poor vs. poverty rates, urban areas



Note: The figures plot average per capita transfers from government schooling among those below the poverty line versus the poverty rate in each state. The poverty rates are computed from the IHDS and are computed without adding the implicit transfers from government programs.

FIGURE C2: PDS transfers of the poor vs. poverty rates, urban areas



Note: The figures plot average per capita transfers from the PDS among those below the poverty line versus the poverty rate in each state. The poverty rates are compute from the IHDS and are computed without adding the implicit transfers from government programs.

Having obtained the implicit transfers we next add these amounts to households' private expenditure and calculate update poverty rates. As for the rural sector, we normalize the urban poverty lines to assure an unchanged level of poverty. The two first columns of Table C1 show the coefficient of variation in state-wise poverty, calculated on expenditure and extended expenditure. The difference between these sets of estimates is about 10% in 2004-05 and a little more than 17% in 2011-12. Column (3) and (4) show the coefficient of variation for the overall state poverty rates. We obtain these by combining the rural and urban poverty rates, using the population in each sector as weights. Also for these measures we find that the variance in state-wise poverty rises once we factor in government transfers, the coefficient of variation increases with about 12% in 2004-05 and with more than 13% in 2011-12.

TABLE C1: Coefficient of variation, state-wise poverty

	Urban		**Rural + Urban**	
	2004-05	**2011-12**	**2004-05**	**2011-12**
	(1)	(2)	(3)	(4)
Headcount				
Expenditure	0.296	0.431	0.309	0.380
Extended expenditure	0.324	0.504	0.345	0.431
Poverty Gap				
Expenditure	0.367	0.540	0.484	0.427
Extended expenditure	0.457	0.619	0.526	0.489

Note: The tables shows the coefficient of variation for state-wise poverty. "Expenditure" is reported private expenditure, and "Extended expenditure" is this plus the value of government transfers.