Social Spending, Distribution, and Equality of Opportunities: The Opportunity Incidence Analysis

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Abstract: Existing evidence forms a body of "conventional wisdom" on the redistributive impact of fiscal policies that has been recently questioned by more disaggregated analyses. This paper proposes an additional extension to the traditional benefit incidence analysis (BIA) to further explore the extent to which the conventional wisdom holds, as well as to provide effective guidance in fiscal decision making. The BIA extension includes linking fiscal policies with the concept of equality of opportunities. The paper describes this approach and showcases the application of the proposed "opportunity incidence analysis" (OIA) to six pilot countries: Liberia, Côte d'Ivoire, Zambia, Tajikistan, Thailand, and Paraguay. Three main contributions stand out: first, the OIA complements the traditional BIA by applying its mechanics to a more forward looking concept of equal opportunity. Second, opportunities can be used to target public spending with higher precision. Third, microsimulations can be used to understand the cost-effectiveness of alternative spending interventions that seek to improve equality of opportunities. All of these results complement the diagnosis produced by the traditional incidence analysis and provide useful information to guide specific policy decisions.

Keywords: Equality of opportunities, distribution, incidence, public spending, targeting, microsimulations

JEL classification: I38, H50, D63

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1. Introduction

Poverty and inequality have very complex roots, so their eradication cannot rely on simple measures. Fiscal policies can help, however. It is well known that the composition and distribution of public spending and tax burdens affect poverty and inequality. This is true from minimalist welfare states (Breceda, Rigolini, and Saavedra 2008) to societies that use fiscal policies to redress breached social contracts in conflict-affected and polarized societies (Addison, Chowdhury, and Murshed 2004). There is a well-developed body of literature that, for decades, has examined the links between fiscal policy and distribution, focusing on two questions: what are the distributive impacts of tax and expenditure policies and what are the capacities of tax and expenditure policies to affect the current distribution of income and to reduce the incidence of poverty? This literature is recently reviewed, for example, in Martinez-Vazquez (2008), Essama-Nssah (2009), Lustig et al. (2011), and Bastagli, Coady, and Gupta (2012).[1]

A key result that emerges from the prolific literature is what Lustig et al. (2011) call the "conventional wisdom." First, the higher use of direct taxes tends to make the final distribution of income more equal—that is, direct taxes generally tend to be progressive. The reverse is true for indirect taxes. The higher relative importance of indirect taxes tends to make tax systems more regressive.[2] Although indirect taxes are paid mostly by higher quintiles of the distribution (that is, they are pro-poor), they are also regressive because the poor pay a higher share of their incomes (with variations across countries). Many tax systems therefore tend to show a proportional to a mildly progressive incidence impact and, in general, they have not been a very effective means of redistributing income. In contrast, direct cash transfers and in-kind transfers tend to be more progressive if they are adequately targeted and implemented. So the expenditure side of the budget (including transfers) can have a more significant impact on income distribution. Expenditure programs in the social sectors (education and health) are generally more progressive because more is spent in relative and absolute terms on those services that are more frequently used by the poor (especially basic education and primary health care).

There are, however, multiple reasons why these general results may vary from country to country. These reasons include other economic and institutional factors, such as the degree of decentralization of public finance;[3] the extent of the underground or informal sector; the distributive effects of other public policies—such as price controls on goods and services; minimum wages; prohibition on export and import quotas; and interest rate controls on deposits, among others (Martinez-Vasquez 2008).[4] In

[1] An important string of contributions in this field has come from the World Bank, including works by Chenery et al. (1974); Selowsky (1979); Dervis, de Melo, and Robinson (1982); Van de Walle and Nead (1995); Bourguignon and Pereira da Silva (2003); Lofgren (2004) ; and Moreno-Dobson and Wodon (2008).

[2] As a net result, it is likely that in a typical country, overall tax incidence may be proportional or mildly regressive for very-low-income groups, proportional over a large range of middle-income groups, and progressive for higher-income groups (Cuesta and Martinez-Vazquez 2012).

[3] Typically, omitting subnational taxes and transfers from incidence analysis is likely to present a picture of incidence that is more progressive (or less regressive) than is actually the case because regional and local taxes tend to be more regressive than central taxes (Martinez-Vazquez 2008).

[4] For example, price controls for farm products tend to hurt the rural poor and benefit the urban poor and the rich. Financial repression of interest paid on bank deposits tends to hurt the poor more than the rich because of poor people's inability to seek alternative savings vehicles. Foreign exchange rationing and import quotas tend to be quite regressive, and export controls can hurt small traditional crop farmers. These factors may have a significant impact on the overall distribution of tax burdens and public spending, and they may even reverse the final fiscal incidence that would have been reached in the absence of those aspects.

addition, long-term factors and short-term crises may both affect the traditional impacts of fiscal policies. Individuals may have low current income simply because they are in a low-income period of their lives (of school age or in retirement), or because they are disproportionately vulnerable to—and/or affected by—a crisis. In general, patterns of lifetime incidence are often quite similar to, but less pronounced than, those based on an annual income perspective (Fullerton and Rogers 1991). Also, vulnerable groups may well vary country to country even in the face of a similar crisis (Habib et al. 2010). In fact, an important consideration from the dynamic nature of distribution in the context of crises is the emergence of a cadre of "new" poor or crisis-specific vulnerable groups, that is, groups that were not poor in off-crisis periods.[5] The obvious implication is that the design of compensatory fiscal policies needs to take these temporality issues into account because such interventions may contribute differently to short- and long-run vulnerabilities.

Box 1: Not So "Conventional Wisdom" After All

Bastagli, Coady, and Gupta (2012) indicate that fiscal policy has typically had a bigger role in the reduction of income inequality in advanced economies than in developing economies. In general, expenditures are the most redistributive tool in advanced countries (especially non-means-tested benefits such as public pensions, universal child benefits, and in-kind transfers), but taxes play different roles, from having strong redistributive effects in the United States, Belgium and Germany, to having relatively little influence in the United Kingdom and France, where means-tested benefits play a substantive redistributive role. Instead, in developing economies, the low magnitude of transfer programs (especially in Asia-Pacific and sub-Saharan Africa areas), as well as poor targeting, limits the redistributive capacity of social spending, which is aggravated by the presence of a large informal sector. Conversely, in advanced economies, in-kind transfers are regressive in many developing economies, driven by a regressive incidence of higher education and health care.

But differences are also important *within* developing countries, even within the same region. Lustig et al. (2011) focus on six Latin American countries and show that "conventional wisdom"—that is, a little redistributive capacity of fiscal policies in that region because of smaller government size and less progressive fiscal policies (shown earlier by Goñi, Lopez and Serven [2008], and Breceda, Rigolini, and Saavedra [2008])—applies only partially. Their results show that each country represents a different reality. Argentina, for example, has a big government, as do Brazil and Bolivia. However, while Argentina has high redistribution levels , Bolivia's redistributive achievements are low, and Brazil's are lower than Mexico, a country with a smaller government. The only country following the conventional wisdom is Peru, with a small government, very low redistribution in absolute levels, and a moderate relative redistribution (in terms of the effectiveness by the amount spent). Specific decisions on the size and composition of spending are therefore critical.

Source: Bastagli, Coady, and Gupta (2012); Lustig et al. (2011).

Decades of distributive analysis of fiscal policies show that these analyses still overlook important distributional effects of other public policies, long-term and transitory crisis-related effects, and require "more resolution" in the identification of vulnerable groups (typically mashed in quintile and decile

[5] The analysis of Habib et al. (2010) in the context of the recent financial crisis reveals differences between the "crisis-vulnerable" or "newly poor" households and the permanently or structurally poor households. The newly poor households are smaller, have lower dependency, have higher skills, are more urban, and are employed in something other than agriculture. In terms of the distribution of income losses, those in the 70th percentile and above are expected to be less adversely affected in urban areas; the impact is more evenly distributed among rural households.

classifications). Unfortunately, economists have not yet devised adequate methodologies to take all these dimensions into account. In that context, this study provides a framework to fill in some of these gaps, in concrete, the identification of vulnerable groups and the incorporation on longer-term effects—those related with equality of opportunities—at the center of the incidence analysis.

2. Toward an Opportunity Incidence Analysis

2.1 Equality of opportunities

Relatively recent literature on equality of opportunities provides a promising extension to the traditional focus on equality of outcomes—related to incomes, consumption, health, and education—that has dominated the distributive incidence analysis (Roemer [1998] and Roemer et al. [2003] are the seminal references). The framework of equality of opportunities is based on several key concepts: *objective* is the goal that equal opportunities are expected to achieve (say, universal access to education), while *circumstances* are the attributes of an individual's environment (either social, genetic, or biological) that affect the achievement of the objective, but that are beyond the control of the individual and for which society does not regard him or her responsible. *Effort* refers to individual behaviors and decisions that, together with circumstances, determine the level of objective accomplished.[6] Equality of opportunities prevails when an objective or opportunity is achieved with the same level of effort across different circumstances. Analytically, Roemer spells out the cost of the interventions that equalize the value of the objective across types at any given degree of effort (Roemer et al. 2003, 542).[7]

Van der Gaer (1993), Ooghe, Schokkaert, and Van de Gaer (2007), Hild and Voorhoeve (2004), and Cogneau and Mesplé-Somps (2008) developed a second empirical approach. In their approach, the concept of equality of opportunities is restricted to the situation when the distribution of expected earnings is independent of social origins (typically proxied by parental education and/or parental labor occupation) and, in some cases, geographical location.[8] A third analytical approach develops nonparametric statistical tests—in particular, stochastic dominance tests—to conclude whether or not a distribution of incomes or consumption is compatible with equal opportunities. Leblanc, Pistolesi, and Trannoy (2008) define equality of opportunity as the situation where income distribution conditional on social origin cannot be ranked according to stochastic dominance criteria (again, social origin is defined by parental education and/or occupation).

A final approach estimates the Human Opportunity Index (HOI) developed by Paes de Barros et al. (2008) and Molinas et al. (2010). The HOI measures the extent to which a society progresses toward universal access of basic opportunities (box 2). The index synthesizes in a single indicator how close a society is to universal coverage of a given opportunity *and* how equitably coverage of that opportunity is distributed. Opportunities are goods and services that constitute investments in children, thus increasing their human capital, such as primary education and adequate housing infrastructure. An equitable policy ensures that a child's chance of accessing these key goods and services is not correlated with circumstances that are beyond his or her control, such as gender, parental background, or ethnicity. The HOI "penalizes" the extent to which different circumstance groups (*types* in Roemer's terminology) have

[6] The other two critical concepts in this framework are *instruments*, that is, the policies and resources used to equalize opportunities and *type*, a set of individuals who all have the same circumstances.
[7] Empirical applications of this approach are found in Roemer et al. (2003), and Bourguignon, Ferreira, and Menendez (2007).
[8] Some versions of this approach, as in Cogneau and Mesplé-Somps (2008) or Cogneau and Gignoux (2008), use "intermediary" variables to analyze the link between social origin and income/consumption, such as social position and education. They conclude that a significant part of difference in inequality of opportunity for income/consumption can be attributed to differences in intergenerational mobility linking parental education and occupation with sons' education and occupation.

different coverage rates: the penalty is zero if coverage rates among multiple circumstance groups are equal, and positive and increasing as differences in coverage among circumstance groups increase.

The extended incidence analysis that this paper develops builds upon the HOI work. In fact, the HOI combines a few appealing properties in terms of intuitive appeal, simplicity, practicality (especially in relatively data-scarce environments), and simple microeconomic foundations (to ensure that it has a simple interpretation).[9] A key feature of the HOI is that it not only takes into account the overall coverage rates of these services, but also the extent to which those *without* coverage are concentrated in groups with particular circumstances, for example, economic status, gender, parental education, ethnicity, and so on. More specifically, the *HOI is an inequality-sensitive coverage rate* that incorporates both the average coverage of a good or service, which society accepts should be universal (which implies that the *individual* is not held responsible for lack of access), and if it is allocated according to an equality of opportunity principle.

Box 2. Computing the Human Opportunity Index from Household Survey Data

To construct the HOI, the conditional probabilities of access to opportunities for each child based on his or her circumstances must be obtained. To do so, one can estimate a logistic model, linear in the parameters β, where event *I* corresponds to accessing the opportunity (for example, access to clean water), and *x* the set of circumstances (for example, gender of the child, education, gender of the head of the household, and the like). One can fit the logistic regression using survey data:

$$Ln\left(\frac{P\left[I=1\middle|X=(x_1,...,x_m)\right]}{1-P\left[I=1\middle|X=(x_1,...,x_m)\right]}\right)=\sum_{k=1}^{m}x_k\beta_k$$

where x_k denotes the row vector of variables representing the k dimension of circumstances, hence, $x=(x_1,...,x_m)$ and $\beta'=(\beta_1,...,\beta_m)$, a corresponding column vector of parameters. From the estimation of this logistic regression, one obtains estimates of the parameters $\{\beta_k\}$ to be denoted by $\{\hat{\beta}_{k,n}\}$, where n denotes the sample size.

Given the estimated coefficients, one can obtain for each individual in the sample his or her predicted probability of access to the opportunity in consideration:

$$\hat{p}_{i,n}=\frac{Exp\left(x_i\hat{\beta}_n\right)}{1+Exp\left(x_i\hat{\beta}_n\right)}.$$

Finally, compute the overall coverage rate, *C*; the D-index; the penalty, *P*; and the HOI using the predicted probability $\hat{p}$ and sampling weights, *w*: $C=\sum_{i=1}^{n}w_i\hat{p}_{i,n}$ $D=\frac{1}{2C}\sum_{i=1}^{n}w_i\left|\hat{p}_{i,n}-C\right|$

$P=C*D$; and $HOI=C-P$.

Source: Adapted from Molinas et al. (2010); Paes de Barros et al. (2008).

[9] The HOI is equality sensitive and Pareto consistent. When access to an opportunity increases equally for all circumstance groups, the index increases proportionally. Changes in the HOI over time can be decomposed into changes in the distribution of circumstances in the population (composition effect), changes in coverage rates for all groups (scale effect), and changes in the degree of inequality of opportunity (equalization effect).

Notwithstanding these desirable features of the HOI in particular, and the equality of opportunity concept in general, there are a number of limitations associated with the analysis of equality of opportunities. Primarily, the conceptual distinction between circumstance and effort has not been operationalized in practice with similar clarity. Effort has either been assumed to be a residual of circumstance or has been surpassed by restricting the focus of analysis to individuals who cannot be accountable for effort differences, that is, children. A result of this is the uncomfortable solution of luck being considered part of effort, as explicitly admitted by Roemer et al. (2003).[10] A second limitation is that distinction between circumstance and opportunity is not always sharp either. Family income is typically considered a circumstance, but it also constitutes an opportunity—inasmuch as it contributes to the access of basic services—for the success in life for a child. Disability is clearly considered as a circumstance for a child, but having an able, healthy status is considered to be an opportunity for future success (or current success in school).[11] Third, what is ethically acceptable or desirable is conveniently made dependent on any society's judgment. This, ultimately, creates a sort of "quicksand" baseline since few circumstances may be universally agreed upon.[12] As a result, comparability across countries may be troublesome. A fourth limitation refers to the empirical application of measurements, specifically for the HOI. Equality of opportunities in a given context is sensitive to the selection of peoples and objectives, as with any other social indicator (say, access coverage). However, the HOI is also sensitive to the set of circumstances selected as well as the set of opportunities considered. Fifth, quality issues are hardly included in the analysis, both because quality is an open-ended conceptual issue (whether an opportunity is simply access to a service or, rather, access to a *quality* service), and also because data sets typically lack the information to systematically include quality considerations.

2.2 Equality of opportunities and fiscal issues: opportunity incidence analysis

Methodologically, this analysis expands the "traditional" benefit incidence analysis (BIA) into an "opportunity incidence analysis" (OIA), that is, an incidence analysis of public spending along a distribution of opportunities. The BIA estimates how much of a given expenditure category (taxation) is received (imposed) by (to) a particular socioeconomic group or geographical area. This defines the extent to which spending (or revenue collection) is pro-poor.[13] Also, it captures the (absolute) progressivity of spending—that is, how the benefit decreases or increases along with a welfare measure, such as income, consumption, or wealth. Similarly, OIA estimates how much spending is received by a particular circumstance group, that is, a group of the population defined by a set of common circumstances. And so OIA informs on how such spending increases or decreases along a set of circumstances that make individuals more likely to enjoy a given opportunity. In doing so, OIA generates a distribution of opportunities by estimating the probability of each individual, given his or her set of circumstances, to access a particular opportunity. In presentational terms, in the same way that the distribution of incomes

[10] Interpretations are even more troublesome when, for example, sex or race become effort variables, as they are deemed residuals of socioeconomic background captured solely by parental education or occupation.
[11] Being exposed to or the victim of insecurity may be considered equally as a circumstance (in the same way as urban or rural residence), but also as a lack of opportunity for children when considering the potential effects on the physical and emotional development of the child.
[12] Thus, if a society considers that females should not be educated equally as males, then sex will not be incorporated as a circumstance in the analysis. And different judgments may appear frequently across different contexts, be it for religious reasons or in contexts of conflict and historical grievances among groups.
[13] This analysis does not focus on shares captured by different groups, although appendix 1 reports those for education spending and section 4 devises how it could be used for policy purposes.

can be defined by quintiles (deciles or percentiles), the distribution of opportunities is proxied by the probability to access and can be defined also in terms of quintiles of probability.

So, similarly to the mechanics of BIA, OIA is constructed using the following steps:

Step 1: Approximate the value to consumers/beneficiaries of a public service—typically by equating it to the cost of providing the service.

Step 2: Identify all beneficiaries of the service provision.

Step 3: Obtain gross unitary benefits, by dividing total benefits (from step 1) among total beneficiaries (from step 2).

Step 4: Rank the identified beneficiaries in the household data set according to their distribution of probability of access to a particular opportunity—or by different circumstance groups. The ranking is carried out using a "logit" technique, which estimates the probabilities that different groups of individuals who share a same set of circumstances (*types*) will access a specific opportunity.

Step 5: Assign the gross unitary benefit (as obtained in step 3) across the distribution of beneficiaries identified in the household data set and compute the shares of the services that are allocated to different portions of the population. Typically, the unit of analysis is the representative household by quintile of probability quintiles (or by circumstance group).

To calculate net benefits, two more steps are needed:

Step 6: Calculate the out-of-pocket household per capita spending from the household data set.

Step 7: Subtract from the expenditure assigned the benefit, the out-of-pocket household per capita spending . The resulting figure is the net unitary benefit per individual or household after receiving a public service and subtracting their own contributions. The resulting benefit is the measure of transfer truly disposable to the household.

2.3 OIA and BIA: a comparison

An important advantage of incidence methodology—for both OIA and BIA—is the simple and powerful policy message it produces. Results often identify which circumstance group—or socioeconomic group in the case of BIA—benefits the most or how different the estimated distribution fares with respect to the expected distribution based on the statutory conditions of the program. However, conceptually, BIA and OIA rest on strong operational assumptions. The BIA approach assumes that publicly provided services are homogeneous across all consumers/beneficiaries. Yet, quality may vary enormously, which may imply higher benefits to certain households and lower benefits to others. Both BIA and OIA also assume that: benefits received by individuals are equal to the costs of service provision; individuals identically value each dollar received in the form of a transfer and each dollar taxed away; a perfect translation of taxes to consumers; and, typically, that there is no evasion or illegal behavior. Additionally, since data are most often available at the household level rather than at the individual level, assumptions must be made about the distribution of resources within the household. A common practice is to assume equitable intrahousehold allocations and to rely on per capita measures as the household representative welfare measure. In practical terms, one of the main caveats of both BIA and OIA is that the precision of the estimates produced is constrained by data quality and the disaggregation level across available data.

Yet OIA methodology has three main advantages over traditional BIA. First, it allows a sharper picture of the distribution of resources and opportunities directly associated to such resources. For example, it allows focusing on the allocation of public resources spent on education against a concept of vulnerability *directly related* to education (probability of accessing education given a set of circumstances). This is preferred to working around an indirect concept of per head household income or consumption, as in BIA. Second, OIA provides insights on how multiple factors (all those considered relevant circumstances) affect the distribution of educational resources. This is not to say that the analysis determines *causality* between circumstances and educational benefits (in the same way that a traditional BIA does not establish causality between household incomes and education spending), but it certainly complements the insights provided by traditional BIA based on per head household income. Third, by focusing on opportunities that will have impacts on individuals' future capacities to lead a decent life, the analysis is able to expand a very short-run perspective over a longer-term horizon.

Before showing the results of the OIA, three points must be made. First, the focus of the HOI is on opportunities for children. This is so because, intuitively, there can be little disagreement about the set of circumstances that are beyond a child's control, and the issue of effort in achieving access to the opportunities can be considered irrelevant in the case of children. Second, results are sensitive to the choices on opportunity, age group, and the set of circumstances chosen. These are country-specific decisions, which call for a great deal of caution when engaging in cross-country comparisons. Nonetheless, the results of Narayan and Hoyos (2012) for almost 20 sub-Saharan African countries substantiate that results tend to be robust to relatively small changes in definitions and age groups. Third, the mainstream HOI analysis is a diagnostic tool whose *normative* implications need to be very carefully considered. The HOI diagnosis is primarily conceived as a "constraint" model that assesses the relevance of a number of constraints (the set of circumstances considered) in determining the probability of enjoying an opportunity. Similarly, the simulation exercise developed in section 4 does not distinguish among different policy alternatives that are compatible to a given public expenditure; instead, it focuses on the total fiscal cost. Furthermore, OIA (as well as BIA) says little about the extent to which a certain program or policy influences the behavior of beneficiaries (or nonbeneficiaries). Nonetheless, the exercise can be useful from a policy point of view to the extent that it relates to both demand and supply factors, such as individual characteristics and public spending, respectively.

3. Opportunity Incidence Analysis in Practice

3.1 Relevant opportunities and circumstances

From a conceptual viewpoint, HOI analysis typically focuses on a number of basic services that are critical early in life to provide the opportunities to allow a child to grow up in a reasonably healthy environment, receive education, and access affordable health services to function productively in any given society. In practice, in selecting the final set of indicators among the list of basic opportunities that can be analyzed as "opportunities" for a given country, two issues are of paramount importance. First, indicators must be available from existing data sources. For example, in one of the case studies analyzed in this paper, Côte d'Ivoire, a series of household surveys have been administered since 1985. The surveys are nationally representative and fairly comparable over time. In addition to the long time period covered, analysts can take advantage of the information on household income and spending, which are usually not available in other surveys used for the HOI study of African countries. In contrast, in the case of Liberia, there is only a Core Welfare Indicator Questionnaire (CWIQ), which provides information aggregated at the national level from which to build the analysis. Second, the indicators chosen must be relevant for the specific country and provide useful information. In terms of relevance, the broad

categories of basic opportunities identified in earlier work (education and access to housing services) correlate to capabilities that are almost universally accepted as necessary for a productive life. However, in defining the precise indicators within each broad category, country-specific factors need to be taken into account. In particular, it is important to note that an HOI is useful, in terms of adding value to what is already known, if the coverage or incidence of a particular opportunity is reasonable in a country. If, for example, only a small share of the population has access to a given opportunity, the HOI analysis will not provide much new information because almost everyone remains equally excluded from the basic service. Conversely, if the coverage of a given public service is almost universal, the HOI analysis will not provide much value added because everyone is almost equally included in the service.

Table 1 lists the set of opportunities and circumstances constructed with the data used for this study and for the six sample countries: Côte d'Ivoire, Liberia, Paraguay, Tajikistan, Thailand, and Zambia.[14] The opportunities reported in table 1 cover two aspects of well-being: education and health care.[15]

An important consideration in the selection of opportunities is the extent to which quality of service is considered. Basic goods and services are not usually homogeneous: their quality varies tremendously. This is particularly true for education and health care analyzed in the HOI framework. A relatively simple approach to measuring education quality is to focus on timely progression through school. While going to school provides a sense of inclusion, timely progression may reflect children's adequate progress. This is, of course, no substitute for a more direct measures of learning, such as standardized test scores. Unfortunately, information on test scores—even when available—cannot be readily matched to household survey data. For health care opportunities, quality is partly accounted for in the definition of the opportunity itself, by differentiating public compared to private provision or—when information allows—defining access more specifically as timely and affordable access to medical attention when demanded, as in the case of Paraguay or Tajikistan (table 1).[16]

Circumstances are related to inherent characteristics of the child and his or her household for which the child has no control over. Circumstances may include those that are specific to every child—gender, age, birth order, orphan condition—and the household—such as number of children, household per capita incomes, presence of both parents (or household head and his/her spouse/partner), and geographical location. Furthermore, religion, language, and ethnicity (of the household head) are sometimes included in the analysis. The characteristics of the household head constitute a proxy for the features of the child's parents that, sometimes, are not easily identifiable for each specific child within a household from the household survey.

[14] The selection of these countries responds to an analytical demand from a country and should not be taken to indicate either a favorable or unfavorable status of their equality of opportunities.

[15] In addition to housing/habitational opportunities, this constitutes a typical set of opportunities used in HOI literature. However, some studies have also experimented with other sets of opportunities, such as normal anthropometric indicators (normal body mass index, normal weight for height, and normal height for age) as a health outcome opportunity; adequate toys and adequate psychomotor development as early childhood development opportunities; and playing sports and maintaining safe sexual practices as youth development opportunities.

[16] In the case of housing opportunities, for example, most household surveys allow discriminating across different types of safety of water and sanitation services. This is not the case, however, for electricity provision; household surveys do not capture quality issues such as frequency and severity of blackouts or disruptions in service.

Table 1: Opportunities and Circumstances

Country	Opportunities	Age Range	Coverage	HOI	Definition	Circumstances
Côte d'Ivoire (2008)	Attend school Attend school Start primary school on time Finish 6th grade	6–12 1–15 6–7 13– 5	60.9 55.3 46.2 29.2	52.5 47.1 37.3 21.4	Attending school, ages 6–12 Attending school, ages 13–15 Entered first grade at age 6 or 7 Report 6 years of completed education	Child's gender; gender, education, and age of the household head; number of children in the household; per capita household income; area of residence (urban/rural); region/province of residence
Liberia (2007)	Attend school	6–15	62.9	56.7	Attending school, ages 6–15	Child's gender; gender, education, and age of the household head; number of children in the household; household's asset index; presence of parents and elders in the household; area of residence; region/province of residence; exposure to conflict
Paraguay (2010)	Attend school Attend preschool Start primary school on time Finish 6th grade on time Finish 9th grade Timely and affordable access to health care	5–17 5 6–7 13 16–17 0–17	87.9 75.0 69.3 59.9 61.2 78.5	85.2 75.0 69.3 59.9 61.2 73.6	Attending school, ages 5–17 Attending preschool, age 5 Attended 1st grade, age 6 or 7 Finished 6th grade by age 13 Finished 9th grade by age 16 or 17 Suffered illness or accident in past 90 days, demanded medical attention, and received care from a health professional	Child's gender; gender and education of household head; household head lives with couple/spouse; main language spoken at home; number of children; per capita household income; area of residence; region/province of residence
Tajikistan (2009)	Attend school Attend preschool Attend preschool (preference based) Can read Can write Can read and write Primary completed Basic education completed Afford health care when needed Timely health care when needed	7–17 3–5 3–5 6–18 6–18 6–18 11–18 17–18 0–18 0–18	90 8 38 88 87 87 96 92 36 87	88 5 31 86 86 85 95 88 32 82	Attending school, ages 7–17 Attending preschool, ages 3–5 …if parents prefer to send him Child can write Child can read Child can read and write Completed primary by ages 11–18 Completed basic education by ages 17–18 Household needed health care and… …did not find difficult to pay for it. …did not delay health care due to cost	Child's gender; gender and education of the household head; household consumption; region/province of residence; ethnicity
Thailand (2008)	Attend school Attend school Attend school Timely entrance to school Primary completion	7–18 7–15 16–18 7–8 13–14	90.4 96.5 68.9 95.0 94.2	88.5 95.8 63.2 95.0 93.1	Attending school, ages 7–18 Attending school, ages 7–15 Attending school, ages 16–18 Attending school by age 7 or 8 Completed 6th grade by age 13 or 14	Child's gender, age, relationship with household head and language spoken; age and education of household head; household consumption; area of residence; region/province of residence; composition and size of the household.
Zambia (2009)	Attend school Attend school Attend school Attend high school Attend guaranteed free years of school Timely entrance to school	7–18 7–15 16–18 16–18 7–13 7–8	79.1 82.5 66.7 19.6 81.7 85.7	74.4 78.2 59.2 12.5 76.9 82.4	Attending school, ages 7–18 Attending school, ages 7–15 Attending school, ages 16–18 Attending high school, ages 16–18 Attending school, ages 7–13 Attending school by age 7 or 8	Child's gender, age, and relationship with household head; age and education of household head; household consumption; area of residence; region/province of residence; composition and size of household.

Source: Author's estimates from national sources reported in table 2.
Note: Composition refers to the number of household members within certain age brackets.

It is important to note that the list of circumstances does not include all the circumstances that may be relevant in determining a child's access to opportunities. This is because the selection of circumstances, which defines the groups between which the equality of opportunities is examined, is necessarily limited

by the information that is available from surveys. To consider just a few examples, as indicated above, access to opportunities for a child may be influenced to some extent by the child's ethnic group or tribe at birth. However, because ethnic and tribal affiliation is not included in the household surveys (for sensitivity reasons), this characteristic cannot be incorporated as a circumstance in the analysis. Information on the region where the child is located, wherever available, has been used as an extremely rough proxy to compensate for the absence of information on ethnicity. Another example: even when a timely record of vaccinations is critical for the health of children, this information is not provided by respondents in the household surveys. Given that the list of circumstances cannot be completely comprehensive, the HOI that is computed using just the available circumstances would serve as a theoretical "upper bound" (Paes de Barros et al. 2008).[17] This means that adding the important circumstances currently missing would very likely *add* to the penalty for inequality and drive the HOI downward. In simple terms, the "true" HOI, if one could obtain that, would not show a picture that is better than what the HOI, based on limited information, suggests.

Only children under the age of 18 years are considered for all the opportunities studied. As discussed earlier in this paper, focusing on the children and young individuals obviates the need to make the distinction between access and utilization related to effort, attitudes, or preferences of the child or the child's parents. Assuming that children do not take any part in decisions associated with his or her health care or education is not free of caveats, however. Personal maturity and family dynamics may make this generalization troublesome, more so as an individual approaches the age of majority. Furthermore, education in many countries is mandatory only until the age of 14, increasing the probability of teenagers engaging in labor activities, and, therefore, having perhaps more say in household decision making. These considerations are typically assumed away for simplicity. Similarly, household preferences (not only children's) may play a significant role in decision making, but they are typically simplified in the HOI analysis. For example, a child may have access to a school at a reasonably close location, but may not attend school because the parents do not value education or because the school is of a low quality. In such instances, that child will be treated as having no access to school. If this is a basic service, society must ensure that the child uses the service, which might entail not only having a school nearby, but also maintaining schools at a satisfactory level of quality or requiring obligatory attendance. In such cases, the HOI measure will overestimate the extent of inequality of opportunities, counting such households as failing to access the public service when, in fact, they do not want to access the existing services.

3.2 OIA and BIA of Public Spending on Education

An OIA and BIA of public spending on education were conducted in all six sample countries: Côte d'Ivoire, Liberia, Zambia, Paraguay, Tajikistan, and Thailand. As indicated in section 2, the analysis requires: (i) unitary public benefits per beneficiary from data on total public spending and number of enrolled students; (ii) beneficiaries' contributions toward education, based on the reported costs incurred in education from household surveys; and (iii) allocation of those unitary benefits and contributions across a distribution of welfare (proxied by income, consumption, or wealth), in the case of traditional BIA, and a distribution of opportunity—specifically, access probability to public education—in the case of OIA. To the extent possible, which varies from country to country, the information on spending is disaggregated by type of education (preschool, primary, or secondary) and region (by the relevant subnational administration: region, department, or province). Table 2 provides a summary description of the sources of information and level of disaggregation for each country.

[17] While this theoretical property may not always hold when the HOI is estimated from a logistic regression as it is done in most cases, it would be rare to find cases where adding a circumstance would actually increase HOI.

Table 2: Information Sources and Level of Disaggregation of Public Spending

Country	Survey	Years	Fiscal sources	Year(s) of fiscal data	Level of disaggregation of fiscal data
Côte d'Ivoire	Household Living Standards Survey	2008	World Bank (2008)	2007	Primary and secondary level
Liberia	Core Welfare Indicators Questionnaire	2007	World Bank (2010)	2007/2008	Primary and secondary level
Paraguay	Permanent Household Survey	2003 to 2010	Ministry of Education Ministry of Health Ministry of Finance Preliminary results of BOOST in Paraguay	2004 2009	Education: Regions Preschool/primary/ secondary Health: Regions Type of center
Tajikistan	Tajikistan Living Standards Survey	2003 2007 2009	Preliminary results of BOOST in Tajikistan	2009	Regions
Thailand	Household Socio-Economic Survey	2008	Local Administrative Organization Survey Ministry of Education Comptroller General's Department ONESQA (2010)	2008	Regions Primary/secondary
Zambia	Living Conditions Monitoring Survey	2010	Ministry of Finance and National Planning Ministry of Education Statistical Bulletins	2009	Primary/secondary Provinces

Source: Author's compilation.
Note: Data for enrollment come from the household surveys in the case of Côte d'Ivoire and Tajikistan.

The average public unitary benefits to children enrolled in public school vary in this country sample from US$6.9 in Liberia (for primary education) to US$531 in Paraguay (for secondary education). As expected, differences are also large in terms of the unitary benefits per student across levels of education. For example, in Liberia the ratio of the unitary benefits on secondary education over the unitary benefit on primary education exceeds 12. In contrast, it is only 2.3 for Paraguay. For countries with original information available at the regional level to construct region-specific averages, Tajikistan is the country where the variation was the largest, with the highest unitary benefit on education being sevenfold that of the region with the lowest unitary benefit. Similarly, there are large differences in terms of the private contribution toward education that households incur by having their children in public schools. In Paraguay, that proportion is 260 percent (for primary education), while in Côte d'Ivoire, it is 67 percent—that is, on average, contributions exceed benefits, for a joint distribution of primary and secondary education. However, these averages conceal significant differences across types of households classified by either their incomes or opportunities realized. Figures 1–6 show those differences.[18]

There are several outstanding results arising from the joint BIA and OIA. First, the BIA reveals that aggregate gross public spending on education (across all education levels and age groups considered) tends to be either regressive or neutral (figures 1a to 6a). In particular, the *average* public education benefit per child does increase as welfare levels increase in Côte d'Ivoire, Liberia and Thailand, while remains (close to) uniform in Paraguay, Tajikistan, and Zambia.[19]

[18] Note that the *average* unitary benefits and *average* unitary household contributions reported in those figures capture the benefit and household contributions for children of the appropriate age and quintile resulting from averaging the benefits and contributions of both those children who go to public schools and those who do not go to public schools. That is, they represent the average benefit and cost of each child in the quintile.

[19] Part of the unambiguous regressivity in average gross unitary spending in **Côte d'Ivoire** and **Liberia** can be explained by having the lower enrollment levels, which means that as poor children attend less school, they tend to lower more the average benefit for their respective quintiles. Instead, in **Tajikistan**, enrollment is high; there are no large differentials across quintiles; virtually no private enrollment; and information does not allow for level-specific benefits. All these factors lead to little variation in the distributive profile of public spending. In **Thailand**, instead, variation is much larger, both for levels and large regions. It also has a high enrollment rate, but public spending on education disproportionately goes to Bangkok, the less populated and less poor "region" of the country. Larger benefits (and also larger private contributions) concentrate in the richest quintile and

Private contributions by households with children of school age tend, instead, to be progressive (Liberia is the only exception, with a decreasing but nonlinear pattern)[20]: that is, households' contributions toward their children's schooling rise as the welfare of the household increases. In other words, richer households contribute more toward the (also public) education of their children than poorer households do.

The resulting distribution of *net* spending on education—after putting together gross public benefits and households' contributions—reflects a progressive picture. This indicates that the progressivity of household contributions is often very influential in determining the final distributive profile of education spending. This is not the case in Liberia, where contributions are nonlinear, and in Thailand, where the progressivity of contributions is less marked and does not counteract the regressivity of the public spending.

Second, OIA reveals a somewhat different story (figures1b to 6b). Now, *average* households' private contributions toward educational services continue to be progressive (except again for Liberia) as they increase along with sets of circumstances that make children groups more likely to access a public school. *Average* public benefits per children of school age are again typically regressive or neutral, as they were in the BIA. However, the OIA now reveals that the Thai distribution becomes more neutral than in the BIA case, while the Zambia distribution becomes slightly more regressive than the BIA indicated.[21]

So, children pertaining to households with circumstances that make them more likely to attend school receive on average more unitary benefits than children with sets of circumstances that make them less likely to attend school. For example, in Côte d'Ivoire, girls in rural households with uneducated heads (no primary education completed) have a 39 percent probability of accessing education. Boys in urban households whose heads have completed primary education or more have a 85 percent chance of attending school. In Tajikistan and Paraguay, the probabilities of attending school between groups with the least and most likely range only between 73 and 92 percent and between 77 and 96 percent, respectively.

Third, again, the extent of households' private contributions among circumstance groups influences by and large the overall progressivity of the *net* educational spending when using OIA. As it was in the previous analysis, Côte d'Ivoire, Tajikistan, Zambia, and Paraguay reveal a progressive distribution of *average* net unitary benefits, while Liberia does not follow any clear pattern. Thailand's results, however,

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relatively little variation takes place in the rest. In **Paraguay**, there is a combination of factors compensating each other and leading to a neutral distribution of gross unitary public spending. As indicated later, profiles are different for elemental and secondary public spending, thus contributing to a uniform distribution. Also, poorer households concentrate in low-populated, rural and geographically isolated provinces, which tend to receive disproportionately large public education transfers per student from the central administration, partially reflecting higher salaries for their teachers. Instead, the most populous and richer regions in the country receive lower than average unitary transfers. This is especially true for primary education. While this is also true for secondary education, higher enrollment in those regions compensates for the fact that they receive lower unitary transfers. In **Zambia**, as in Paraguay, the neutral profile of the average unitary spending on education masks a progressive primary and regressive secondary public spending, with the richest quintiles in secondary capturing 40 percent of benefits in that level. For primary spending, the poorer quintiles capture more benefits, but there are also those with the largest nonattendance rates, which compensate for their larger benefits. Again, these factors counteract each other when aggregated.

[20] Liberia is a special case for a number of reasons, including, among others, a civil war that devastated school infrastructure, used children and teenagers of school age as combatants, and killed thousands of parents. Its educational sector disproportionately depends on foreign aid (and its variations) and it is tiny, both in relative terms (as percent of gross domestic product [GDP]) and absolute terms, both compared with the region and even among conflict countries. Finally, Liberia has a disproportionally high share of students in the private education system (not considered here), which includes community schools, mission schools, and schools established by private sector organizations and large corporations (World Bank 2010).

[21] A possible reason to explain the change in Thailand is that the inclusion of circumstances other than incomes and geographical department reduces the influence that the concentration of richer populations in Bangkok has on the distributive profile of educational spending.

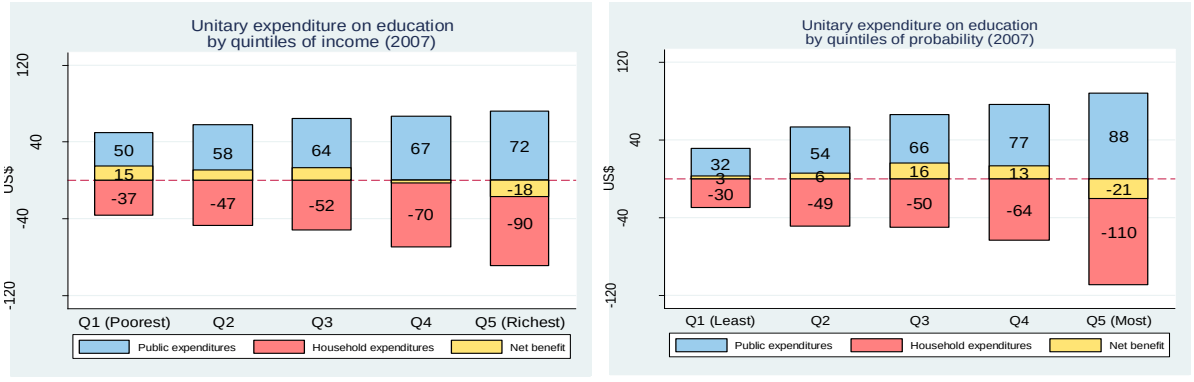
diverge between the BIA and OIA: average net unitary benefits pass from a regressive pattern (increase with welfare level) to a more neutral pattern (close to uniform regardless of the favorable set of circumstances). This divergence results again from the neutrality of gross unitary benefits, a weak progressivity of households' contributions, and high rates of enrollment in the country.

However, the comparison and generalization of results across these countries require a great deal of caution. There are discrepancies in the rates of enrollment in primary and secondary education within each country (table 1) and also across countries. Countries differ in the reference age group for which the analysis is conducted, which in part reflects differences in mandatory education policies (for both starting age and duration of mandatory public education). Furthermore, some countries provide public subsidies to private schools while others do not, which likely affects the average unitary benefits considered. Some countries have been exposed to events such as civil war and insecurity that affect, among others, the supply of and demand for education services. Other countries have a complex decentralization system that affects the delivery of public education. In other words, there is quite a degree of heterogeneity among the public education sectors across these countries.

There are also a number of issues that need to be considered when interpreting these results. It is worth noting that in the context of this static incidence analysis, larger transfers mean larger costs of education because provision costs are equated one-on-one with education benefits.[22] So, to the extent that beneficiaries from poor households attend public schools in areas with higher provision costs—for example, higher salaries for teachers in rural or isolated schools, or rather, large cities with higher costs of living—will affect the progressivity profile. Also, the extent to which administrative and investment spending tends to disproportionally benefit scarcely populated regions may affect the progressivity of public spending because these resources are allocated to fewer students. Furthermore, results might also reflect that richer families opt out of the public system in favor of enrolling their children in private schools. Finally, richer families spend more on fees, texts, school materials, and other costs than poorer families. The disaggregation of the incidence analysis for Paraguay's education spending illustrates some of these issues.

Fig 1 Côte d'Ivoire, 2007 (attending school, ages 6-15)

Fig 1a **Fig 1b**



Source: Author's estimates from INS (2008); Abras et al (2011),World Bank (2008)

[22] Because the analysis is static, it does not include future rates of return to education, that is, their true investment side.

Fig 2 Zambia, 2009 (attending school, ages 7-18)

Fig 2a

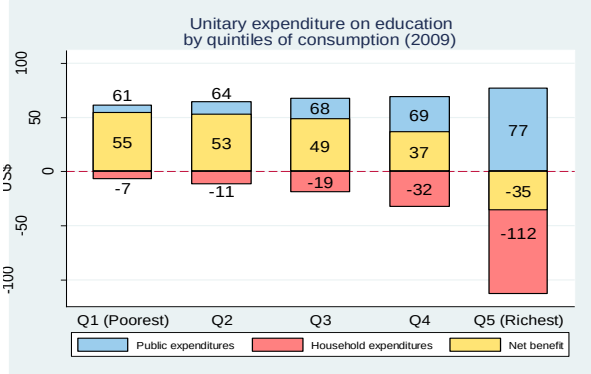
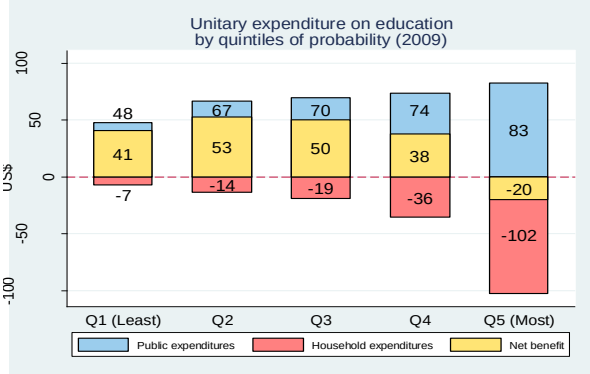


Fig 2b



Source: Author's estimates from Zambia's Ministry of Education (2010), Zambia's Ministry of Finance and National Planning (2010), Cuesta, Kabaso, Suarez-Becerra (2012), CSO's Living Conditions Monitoring Survey (LCMS, VI).

Fig 3 Liberia, 2007 (attending school, ages 6-15)

Fig 3a

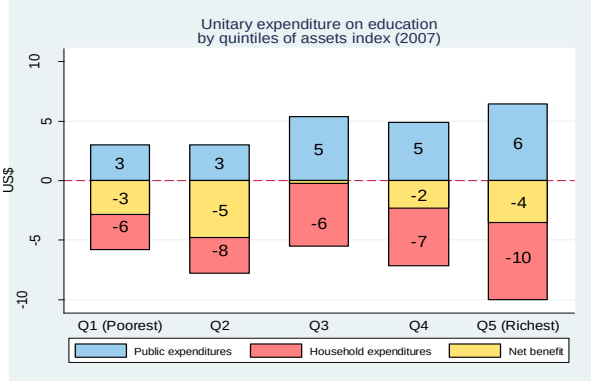
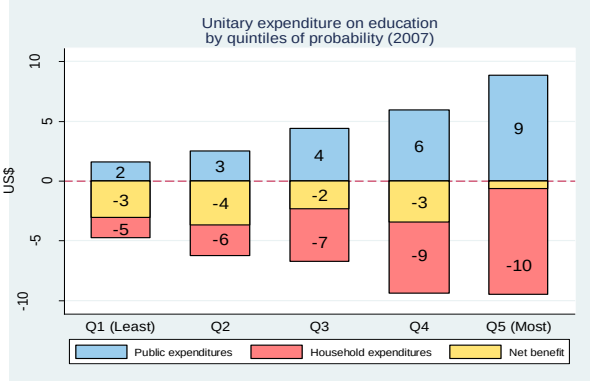


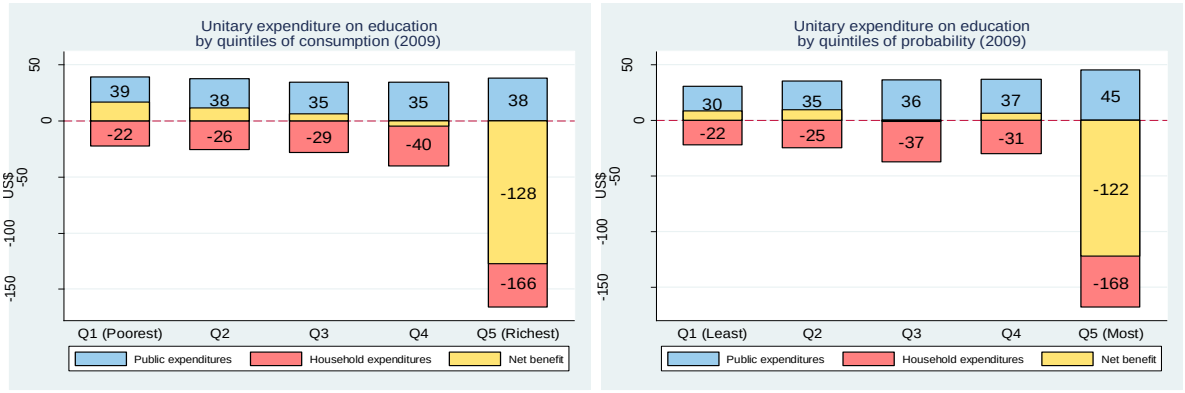
Fig 3b



Source: Authors' estimates from LISGIS (2008) and Abras and Cuesta (2011), World Bank (2010)

Fig 4 Tajikistan, 2009 (attending school, ages 7-17)

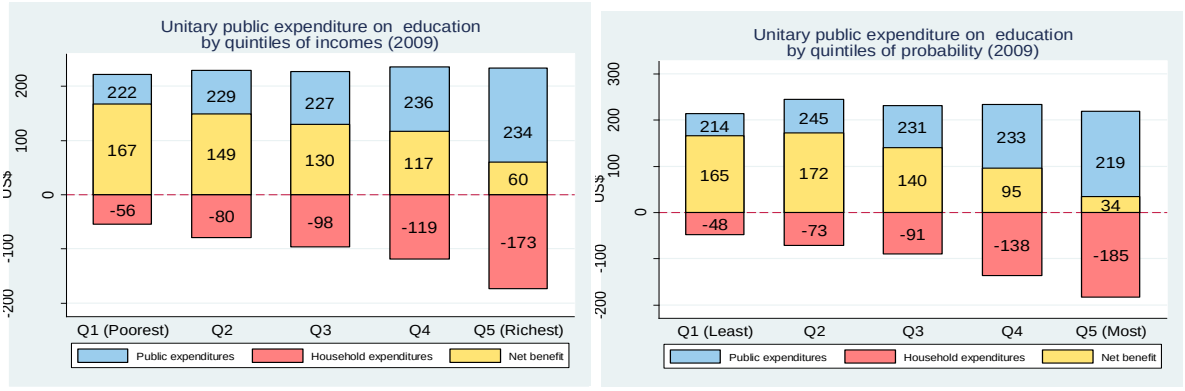
Fig 4a **Fig 4b**



Source: Author's estimates from Tajikistan Living Standards Survey (2007), World Bank (2012), Abras, Cuesta and Tiwari (2012)

Fig 5 Paraguay, 2009 (attending public school, ages 5-17)

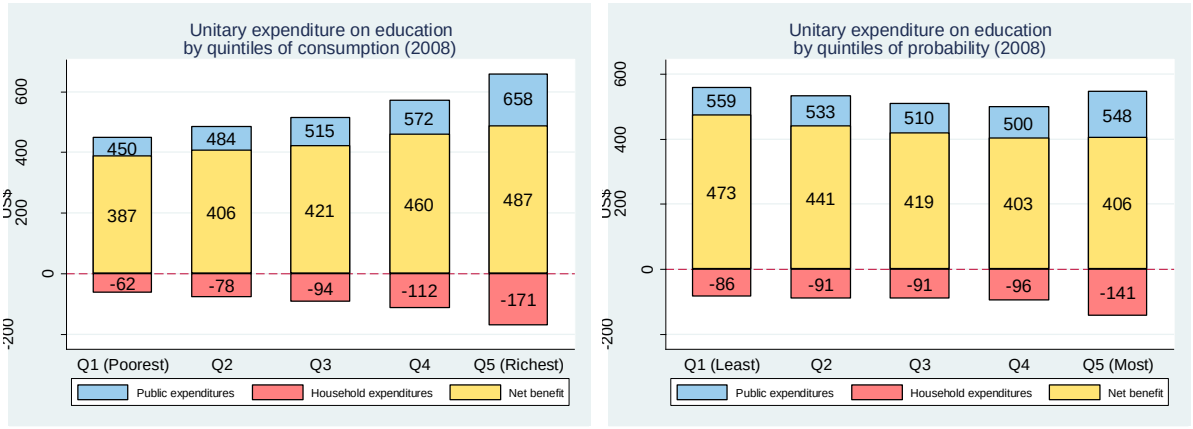
Fig 5a **Fig 5b**



Source: Authors' estimates from INEC's EPH 2009, Ministerio de Educación de Paraguay (2009, 2010), Ministerio de Finanzas de Paraguay (2013), Cuesta and Suarez-Becerra (2013)

Fig 6 Thailand, 2008 (attending public school, ages 7-18)

Fig 6a **Fig 6b**



Source: Author's estimates from Thailand MOE LAO Survey, CGD data, SES (2008) and Madrigal and Cuesta (forthcoming)

For all countries except Paraguay and Thailand, public spending on education was not disaggregated at the regional level—Tajikistan had regional-specific information, but not level specific. Thai data allowed an analysis of primary and secondary education across the main regions of the country, but not at a provincial level (the second subnational level in the country).[23] So, it was only for Paraguay that public spending was specific to both levels of education and each of the departments of the country. Taking advantage of this disaggregation, the following analysis disaggregates the BIA and OIA for each level of education for Paraguay, with benefits specific to each department.

Disaggregated results for Paraguay, reported in figures 7 and 8, show different distributive patterns for elemental (preschool and primary) and secondary education. Both the BIA and OIA portrayed a progressive distribution of net public spending on elemental education, which results from both progressive gross public benefits and private contributions patterns. That is, as welfare levels increase and sets of circumstances become more favorable to attend school in Paraguay, average unitary transfers decrease and private contributions increase (figures 7a and 8a). In contrast, net unitary benefits for secondary education do not follow a clear nonlinear pattern—although the poorest and those with the set of circumstances least favorable have higher net benefits than the richest and those with most favorable circumstances. This is the result of a combination of a regressive pattern of average gross unitary benefits and a progressive pattern of average household contributions toward secondary education.

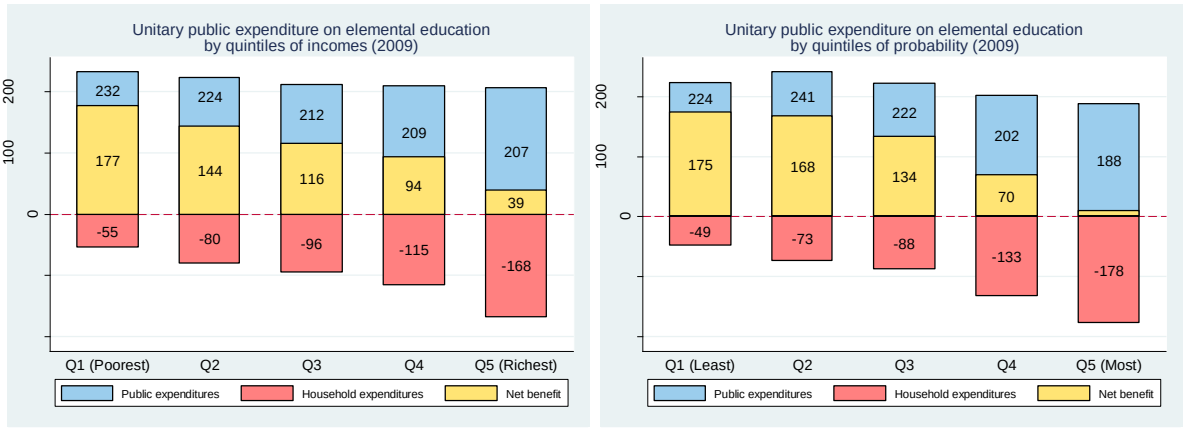
This pattern is in part explained by poorer households or households with less favorable circumstances participating less in secondary education than children from richer households and with more favorable circumstances. Results also reflect that beneficiaries from poor households or least favorable circumstance group attend public schools in departments with higher provision costs. These higher costs typically reflect higher salaries of teachers in rural and isolated schools and the allocation of centralized expenses of the educational system (*alcance nacional*) across fewer students in smaller departments. In contrast, the most populous and richer regions in the country receive lower than average unitary transfers.

[23] Furthermore, some parts of the decentralized budget were not clearly traceable in Thailand (Cuesta and Madrigal forthcoming).

This is especially true for primary education. Finally, richer families spend more on fees, texts, school materials, and other costs than poorer families.[24]

Figure 7: Distribution of Unitary Public Expenditures on *Elemental* Education Net of Private Household Contributions, Paraguay, (ages 5-15), 2009

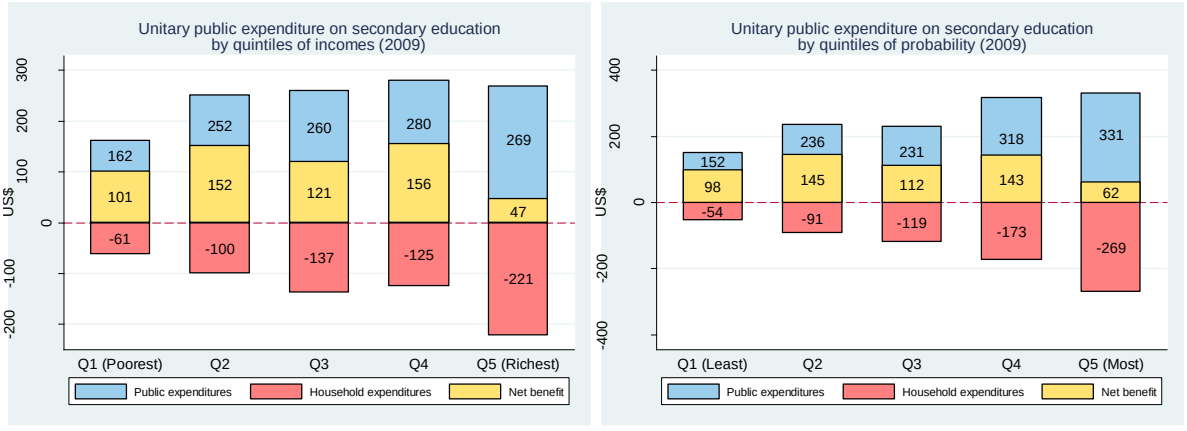
a. **b.**



Source: Authors' estimates from INEC's EPH 2009, Ministerio de Educación de Paraguay (2009, 2010), Ministerio de Finanzas de Paraguay (2013), Cuesta and Suarez-Becerra (2013)

Figure 8: Distribution of Unitary Public Expenditures on *Secondary* Education Net of Private Household Contributions, Paraguay, (ages 16-17), 2009

a. **b.**



Source: Authors' estimates from INEC's EPH 2009, Ministerio de Educación de Paraguay (2009, 2010), Ministerio de Finanzas de Paraguay (2013), Cuesta and Suarez-Becerra (2013)

[24] Some 39 percent of children in the top quintile of the distribution of beneficiaries attend private schools, only 3 percent of children in each of the two bottom quintiles do. Those children from the top quintile who go to public or publically subsidized schools spend on average three times more than children from the bottom two quintiles.

3.3 OIA and BIA on Public Health Care

For the countries in this study, the BIA and OIA for public health care spending is only applied to Paraguay, for which there is sufficient information on the demand for health care, access to health care facilities, and household private spending by types of health services.[25] In particular, Paraguay's Permanent Household Survey allows identification of households in which a child suffered an illness or accident (within the last 90 days) that was considered serious enough to seek medical attention. Among those cases, the analysis further identifies those who responded that although they were willing to receive attention, they did not seek it because medical services were not close by, were too expensive, or were not considered by individuals sufficiently good to effectively demand them . This group is categorized as being excluded from public and private health services. Those who visited a healer[26] or a relative are not considered to enjoy the public health care opportunity.[27] Consequently, those who suffered an illness or accident in the last 90 days, considered it sufficiently important to seek attention and were not subject to supply, costs, and quality restrictions are categorized as enjoying the opportunity of timely and affordable access to health care services. Public provision of health care refers to services provided by the Ministry of Health and Social Welfare (*Ministerio de Salud Publica y Bienestar Social*) and the Institute of Social Security (*Instituto de Prevision Social*). Public care services are further divided into those provided in a health center (*centro* or *posta de salud*) and those provided in hospitals.[28] No further disaggregation is possible given the available administrative and household survey data. Private health care corresponds to services provided by pharmacies and private professionals and medical institutions. All of this information is available at the departmental level.

The distribution of net unitary benefits from health care is neither progressive nor regressive in Paraguay. The average *aggregate* benefit from health care neither systematically increases nor decreases along with income levels (figure 9a). Household out-of-pocket contributions do not seem to follow a monotone trend either, although beneficiaries in the bottom 40 percent incur less out-of-pocket contributions in absolute terms on a systematic basis. The result is a net benefit for those in the top income quintile that exceeds the benefit of the poorest quintile, although the largest net benefit is enjoyed by the middle-income group . This regressivity conceals distinct patterns for health centers and hospital-related net benefit profiles. Figures 10a and 11a depict nonlinear patterns along income levels. Again, they are neither progressive nor regressive. In the case of the distributive incidences depicted by the quintiles of probability, net benefits from public spending on health centers first decrease and then increase (figure 10b), while they remain mostly uniform across quintiles of access probability for hospital care, except, again, for the middle-income group, which captures the largest share of benefits (figure 11b).

There are several possible explanations for these nonlinear patterns. One option is that richer households, and/or those with circumstances making them more likely to access public health, do not opt out of the

[25] Other studies talk of health opportunities in the form of health and nutrition outcomes (see footnote 15). However, as health and nutrition outcomes are a function of many different factors interacting complexly, it is believed that access to public health services is a more accurate representation of the opportunity, in the same way that access to public education captures educational opportunities. This does not deny, of course, that health and nutrition status—like education status—constitute important intermediate inputs for current and future well-being and welfare.

[26] It is possible that the family preferred the attention of a healer instead of that of standard health services, even if the latter were available and affordable. In this case, the analysis would be overestimating exclusion to health care. However, the percentage of the ill who visited a healer or a relative was 1.49 percent in 2010.

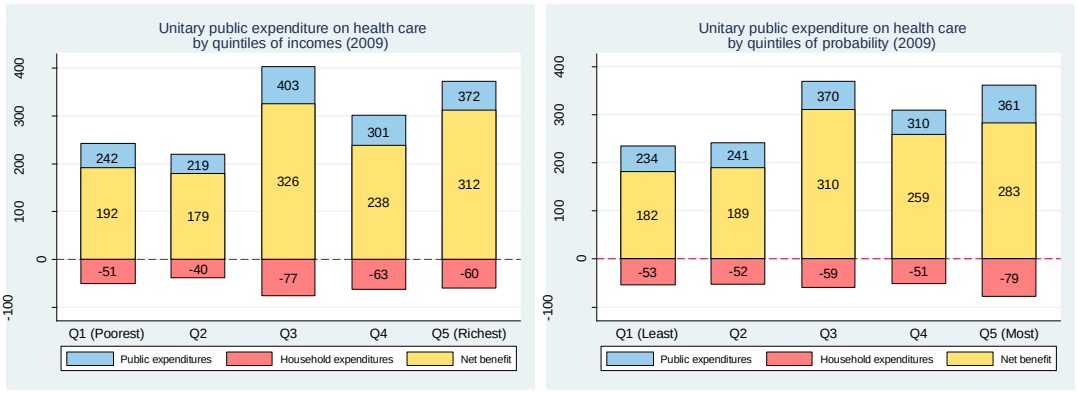
[27] Self-medicated are also considered as excluded from health services. However, the analysis was conducted assuming that self-medication is considered as not seeking health services. Results—available upon request—did not change substantially.

[28] Under health centers, primary and secondary health services are provided by *postas de salud* and *clinicas de salud*. Secondary and tertiary health services provided by regional and central hospitals and by MSPyBS and IPS hospitals are grouped under hospital services.

public system (at least for a number of medical services). In addition, and contrary to education, different medical conditions and accidents require different types of health care. The complexity and severity of required attention should not be expected to follow unambiguous socioeconomic nor geographical lines. Outliers do not drive these results either. In fact, results do not change when two scarcely populated departments—Canindeyú and Ñeembucú—with extremely high average public transfers on public health are removed.[29] Another potential source of bias in these estimates, self-medication, does not fabricate these results either. Results do not change after including self-medicated individuals as having access to public health care services.[30] Finally, it is also worth noting that these distributive incidences are not the result of the poor demanding—or reporting—less health services, because this analysis considers only those who demanded attention to a condition considered serious enough to require medical attention in the first place.

Figure 9: Distribution of Unitary Public Expenditures on Health Care Net of Private Household Contributions, Paraguay, 2009 (Ages 0–17)

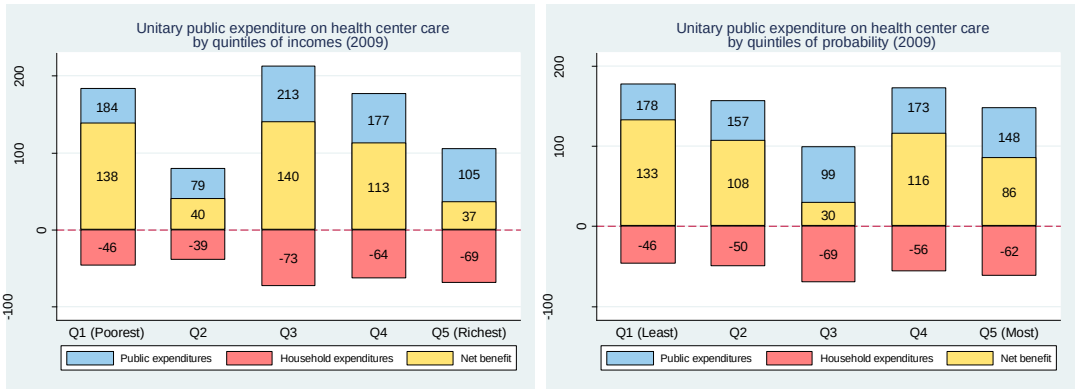
a. **b.**



Source: Author's estimates from INEC's EPH 2009; MSPyBS (2010); IPS (2011); Cuesta and Suarez-Becerra (2013).

Figure 10: Distribution of Unitary Public Expenditures on *Health Center Care* Net of Private Household Contributions, Paraguay, 2009 (Ages 0–17)

a. **b.**

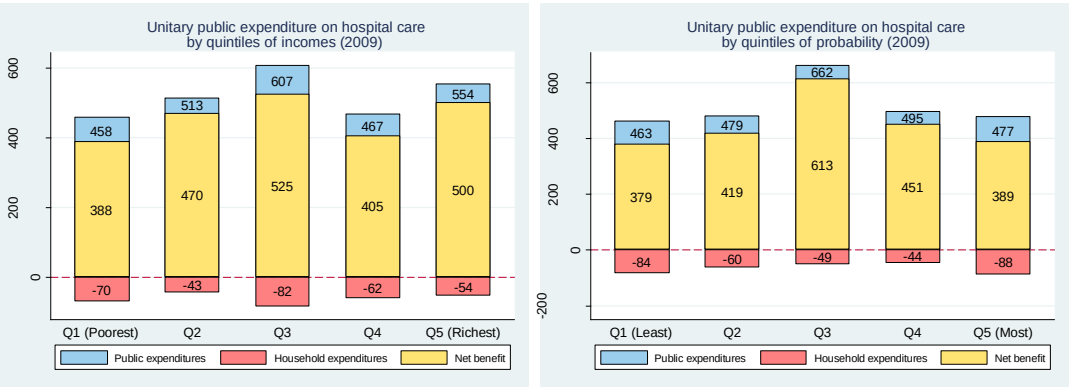


Source: Author's estimates from INEC's EPH 2009; MSPyBS (2010); IPS (2011); Cuesta and Suarez-Becerra (2013).

[29] Data available upon request.
[30] Results available upon request.

Figure 11: Distribution of Unitary Public Spending on *Hospital Care* Net of Private Household Contributions, Paraguay, 2009 (Ages 0–17)

a. **b.**



Source: Author's estimates from INEC's EPH 2009; MSPyBS (2010); IPS (2011); Cuesta and Suarez-Becerra (2013).

4. Two Policy Applications of OIA

The BIAs and OIAs presented so far have a diagnostic nature, that is, they describe the extent to which the distribution of public spending is progressive. In appendix 1, the BIA and OIA describe instead the share of public benefits captured by each quintile of beneficiaries. The obvious question is how this information can provide value added in terms of effectively guiding policy decisions. The following sections provide two concrete illustrations of applications of OIA to guide policy making in the intersection of social spending, distribution, and equality of opportunities. The first relates to the use of the distribution of opportunities as an additional targeting criterion to complement conventional means-tested instruments. The second application continues the tradition of ex ante microsimulations to inform how certain policy interventions could improve equal access to opportunities more cost-effectively.

4.1. Targeting

This application provides an extended analysis of the targeting of public spending that complements the traditional focus on those with the lowest access. This strategy consists of integrating both outcomes and opportunities into targeting decisions. This can be achieved by targeting additional spending to population groups with larger gaps between their share of public benefits and their share of population *and* with sets of circumstances that make them less likely to gain access to an opportunity by themselves.

The number of groups that result from considering the set of circumstances used so far in this analysis would exceed 1,300 combinations. This large number is difficult to manage for this illustration. Instead, it is better to focus on the most influential circumstances for a given opportunity in each country to run this analysis. Focusing again on Paraguay, the analysis considers simply the education level of the household head (less than sixth grade, sixth grade completed, seventh to ninth grade completed, or higher than ninth grade); language of household head (only Guarani, only Spanish/mixed); and residence (urban, rural). The combination of these three categories—found to be most critical in explaining educational and health HOIs in the country—defines 16 circumstance groups, as reported in table 3. This example focuses on two opportunities, attending secondary school and accessing public hospital health care (when sick), which are found to be particularly notorious in terms of their distributive profile in Paraguay. Table 3 reports the probabilities of accessing both opportunities across the 16 circumstance groups.

Table 3: Circumstance Groups and Their Probabilities of Attending School and Accessing Health Care Services When Sick

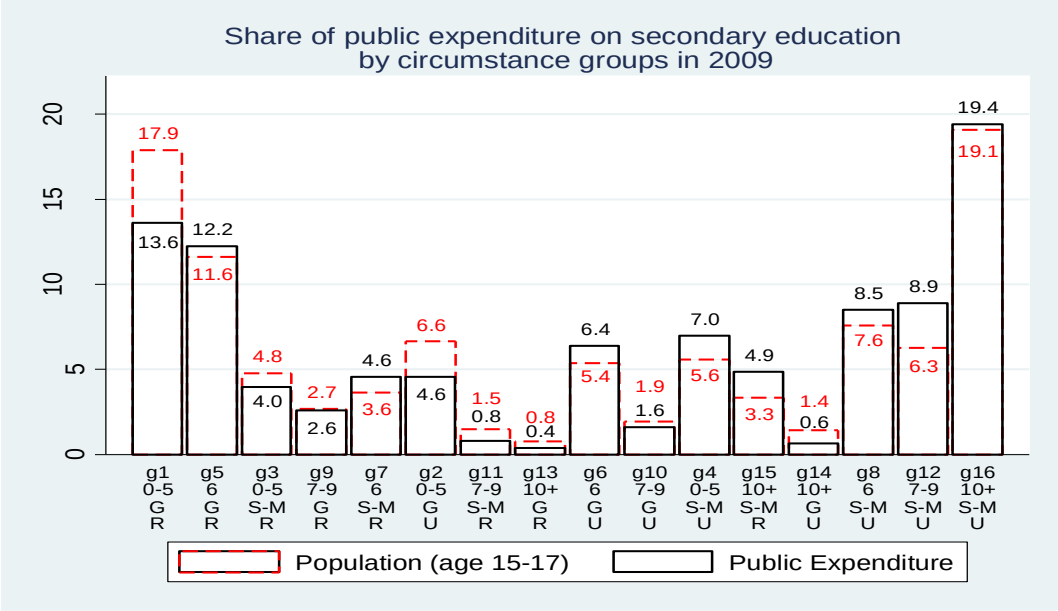
Code	Household head: education (grade completed)	Household head: main language spoken at home	Region of residence	Average probability of attending school: ages 5–17 (%)	Average probability of accessing health services when required: ages 0–17 (%)
1	5th or less	Guarani only	Rural	77	64
2	6th			88	75
3	7th to 9th			85	76
4	10th or more			91	84
5	5th or less	Spanish only or mixed		82	71
6	6th			90	81
7	7th to 9th			88	78
8	10th or more			93	86
9	5th or less	Guarani only	Urban	84	77
10	6th			91	85
11	7th to 9th			89	80
12	10th or more			94	88
13	5th or less	Spanish only or mixed		89	83
14	6th			94	87
15	7th to 9th			91	85
16	10th or more			96	90

Source: Author's estimates from INEC's EPH (2009).

After sorting these 16 circumstance groups by their probability of access to education (from least to most likely) and their probability of access to public health care, respectively, figure12 and figure 13 report the gap between each group's share of population and share of benefits. For access to secondary education, groups that have a lower than average probability to access and receive a share of public resources lower than their population shares are children in households whose heads speak only Guarani or, if speaking Spanish or both, live in rural areas. These groups are coded as 13, 11, 3, 2, and 1 in figure 12. Interestingly, groups with household heads that speak only Guarani and reside in urban areas (and are well educated)—that is, groups 10 and 14—opt out of the public education system to a considerable extent: between 20 and 36 percent of children in those circumstance groups are enrolled in private education, compared to between 1 and 5 percent of children in the other mentioned groups. This procedure would then only select five very specific circumstance groups to target with additional resources following the integrated outcome and opportunity criteria.

Similarly, children with the least probability of accessing public health care (when sick) and having the largest gap—in relative terms—between their population and benefit shares live in rural households whose heads speak only Guarani and have low levels of education (sixth grade or less), as seen in groups 1 and 5. Also in this category—of groups receiving proportionally less benefits than their population shares—are children in households whose heads speak Spanish or both languages, reside in rural areas, and typically have household heads with low education. Those groups are coded 14, 13, 10, 11, 7, and 3 in figure 13. These groups represent a small fraction of the population—20 percent of the population for the eight groups identified—but their gaps in terms of population-benefit shares are very large in proportional terms. These groups—most of which do not appear to opt out of the public health system in favor of private attention[31]—would constitute obvious candidates for targeted interventions. It is also worth noting that these groups are not exactly the same ones by opportunity (although rural households with less educated heads speaking Guarani only are the least advantaged in both cases), which underscores the potential need for different target groups across equalizing interventions.

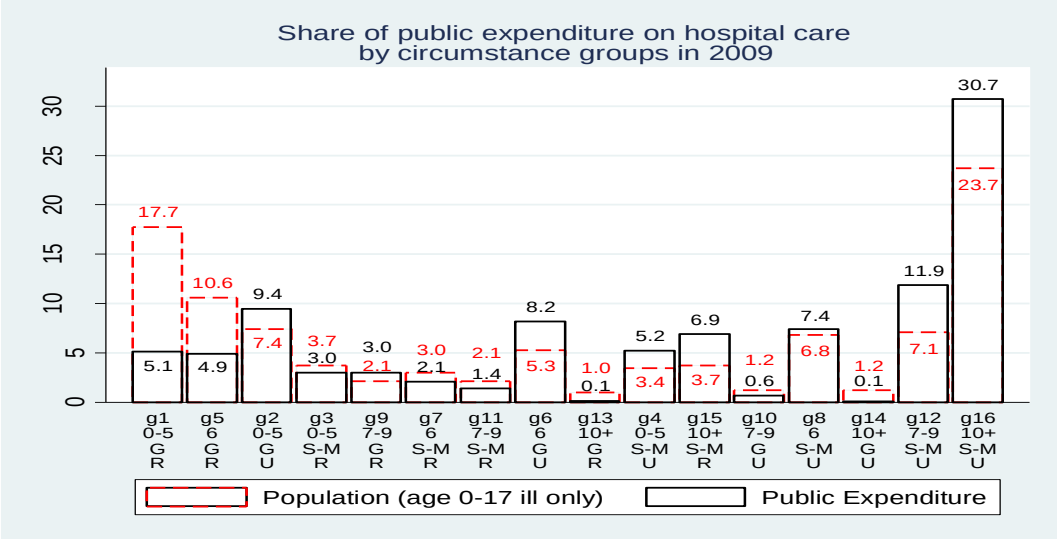
Figure 12: Share of Public Spending on *Secondary* Education by Circumstance Group (Ages 15–17), 2009



Source: Author's estimates from INEC's EPH (2009); Ministerio de Educación (2009).
Notes: Groups sorted by average probability of attending public school. Household head's education (highest level attended): "0–5" less than 6th grade; "6" completed primary (2nd cycle); "7–9" (attended 3rd cycle of elemental); "10+" attended high school or higher. Main language spoken by household head: "G" Guarani; "S-M" Spanish or both. Area of residence: "R" rural; "U" urban.

[31] Only groups 10 and 14 appear to substantially seek private health providers when demanding medical attention. In effect, these groups use private providers in one out of three cases of sickness and/or accidents, according to EPH (2009).

Figure 13: Share of Public Expenditure on Hospital Health Care by Circumstance Group



Source: Author's estimates from INEC's EPH (2009); MSPyBS (2010); IPS (2011).
Notes: Groups sorted by average probability of accessing public health services. Household head's education (highest level attended): "0–5" less than 6th grade; "6" completed primary (2nd cycle); "7–9" (attended 3rd cycle of elemental); "10+" attended high school or higher. Main language spoken by household head: "G" Guarani; "S-M" Spanish or both. Area of residence: "R" rural; "U" urban.

4.2. Ex ante microsimulations of reforms

The HOI can be also adapted to conduct ex ante simulation analyses of fiscal implications of redistributive interventions aimed at improving the opportunities' profile in a country. In particular, the exercise simulates the distributional consequences of reassigning public expenditures across different circumstance groups. Box 3 provides an explanation of the mechanics of the ex ante exercise.

Critical for this exercise is the inclusion of public spending on education as an ad hoc circumstance for children. Thus fiscal policy acts as both an instrument for improving equality of opportunities as well as an exogenous circumstance to households. This is not free of caveats, but it is compatible with the HOI framework. Nevertheless, endogeneity between public spending and education enrollment rates is a potential issue. While this is certainly possible (and even desirable from a policy point of view) at a macro or aggregate level, it is not obviously relevant at the household level. Endogeneity at this level would imply that public policy decisions would be affected by a specific household's condition. This is at best hard to defend. Furthermore, public spending levels and composition are exogenous to a particular household condition. To be clear, households are assumed not to vote with their feet, so to speak, choosing different levels of spending on education across regions. This would not be a realistic proposition in many countries, at least based on education considerations exclusively. In addition, one would argue that the level and composition of spending that an administration decides should not compromise the right of children to receive education. Finally, this case is no different from other less

clear-cut candidates for circumstance, where the distinction between circumstance and opportunity is not so clear (say, household level of income or consumption). Moreover**,** Molinas et al. (2010) acknowledge that in specific contexts, policies and circumstances may become the same; even modifying the distribution of circumstances can itself become a policy.

Box 3: Constructing the Ex Ante Simulation Distributive Analysis of Fiscal Interventions

Step 1: Baseline. Estimate a logit model whose dependent variable is the opportunity of attending school for children of a relevant age and the independent variables include potentially relevant circumstances for which information is available, such as (for illustration purposes): child's gender; household head's gender, education, and age; region of the household; urban or rural nature of the community where the household is located; number of children in the household; single parent, mother alive, and father alive.

$$\ln\left[\frac{P(I_i=1)}{1-P(I_i=1)}\right]=\alpha+\sum_{ij}(\beta_j X_j)_i+u_i$$

where $I_i = 1$ indicates whether or not the group *i* of children attends school or not and X_j are the *j*-circumstances believed to affect school attendance.

Step 2: Computing opportunities incorporating spending. A new HOI for attending school for children of a relevant age is estimated using the same previous circumstances *and* the gross unitary public spending on education, *S*. The unitary transfer is allocated to eligible children of school age, who should be attending school. Depending on available information, the gross unitary benefit will take into account the budgetary allocation by level of education and region, thus allowing for sufficient variation in the imputation of such benefits across households.

$$\ln\left[\frac{P(I_i=1)}{1-P(I_i=1)}\right]=\alpha+\sum_{ij}(\beta_j X_j)_i+\delta S_i+u_i$$

A new distribution of probabilities of attending school is estimated across children with different sets of circumstances and public spending benefits:

$$\hat{P}(I_i=1)$$

Step 3: Policy shock. Once the parameters of each circumstance determining the opportunity of attending school are estimated, changes or "shocks" to the distribution of public spending on education are introduced: S^{sim}. These changes may consist of increasing or decreasing the gross unitary public transfer implicit in public education provision and/or changes in the distribution of benefits based on different qualifying conditions, such as age, gender, or location. The critical—and strong—assumption is that increasing public spending will not lead to increases in the private contribution necessary to attend public schools—neither for those children already enrolled nor for new children not previously attending school

who will now attend as a result of the new policy—at least in the short run. A second critical assumption is that there are no economywide or intersectoral effects. Increasing spending on education may, for example, mean building more schools in rural areas, and hence the parameter associated with location may change as a result. Such interactions are ruled out in the exercise, which merely implies a monetized transfer to beneficiaries. Two types of simple policy shocks can be considered: from a purely "redistributive" scenario in which public resources are taken away from certain groups and transferred to other more vulnerable groups (at an assumed zero cost), to scenarios involving a net fiscal cost from removing de facto school fees, reducing nonfee costs, or increasing teacher salaries.

$$\ln\left[\frac{\hat{P}(I_i = 1)}{1 - \hat{P}(I_i = 1)}\right]^{sim} = \hat{\alpha} + \sum_{ij}(\hat{\beta}_j X_j)_i + \hat{\delta} S_i^{sim}$$

The resulting new estimated probabilities from this step are:

$$\hat{P}(I_i = 1)^{sim}$$

Step 4: Attribution. The difference in the estimated HOIs in step 3 and in step 2 is the impact attributed to the policy shock. The critical assumption in this case is that no household behavioral changes result from the policy change. In other words, the simulation is a pure demand shock that allows no behavioral change. This follows the tradition of static BIA as described in van de Walle and Nead (1995).

$$\hat{P}(I_i = 1)^{sim} - \hat{P}(I_i = 1)$$

Source: author

Table 4 presents the results of these micro simulations for four alternative scenarios in Zambia (see Appendix 2 for the estimated "logit"). **Simulation 1** has an *increase in government transfers of 20 percent –with respect to the baseline transfer—across the board, that is, to all children that attend public school.* The simulation increases by 20 percent the current public transfer accruing to each child who would attend public school once the measure is announced. **Simulation 2** represents an *increase in transfers for all children who would attend public schools in the form of fee recovery*. Officially, mandatory education in Zambia is free yet households report paying fees as part of their expenses for their children's education. In policy terms, the intervention conceived in this scenario is a voucher for each child attending a public school equivalent to the average monetary cost of households' contributions in the form of implicit fees to the public school (the average fees among those reporting to incur in that cost is about US$ 20). This does not necessarily imply that each specific household would be compensated exactly by the amount of fees paid as reported but by the *average* fees paid by children attending public school for ages 7 to 13. **Simulation 3** is *a truly redistributive scenario, in which public resources channeled into beneficiaries of rural public schools are increased by 30% (with respect to the*

baseline) at the cost of children in urban schools, who would see their benefits cut by 10%. This is not to say that this is a realistic or desirable policy; rather, the scenario provides a sense of the redistributive potential of such an intervention.

Table 4: Simulation Results for Reforms in Public Spending on Education among Children Age 7—13, Zambia

Coverage (%)			**Baseline (%)**	**Sim 1:** increase of 20% of gross unitary benefit across the board	**Sim 2:** Average fees returned across the board	**Sim 3:** 30% increase in benefits to rural students and 10% decrease among urban students
All			82.0	83.1	82.1	83.3
Area of Residence						
Rural			78.0	79.3	79.9	78.0
Urban			90.8	91.3	90.6	90.8
Groups of circumstances (defined by household head's education, area of residence, sex of child)						
6th grade or less	Rural	Male	70.1	72.5	72.5	70.0
		Female	71.5	73.9	73.9	71.5
	Urban	Male	81.4	80.9	80.9	81.4
		Female	82.9	82.5	82.5	82.8
7th to 9th grade	Rural	Male	79.8	81.7	81.7	79.8
		Female	81.0	82.8	82.8	81.0
	Urban	Male	88.3	88.0	88.0	88.3
		Female	88.9	88.6	88.6	89.0
9th grade or more	Rural	Male	89.4	90.5	90.5	89.3
		Female	90.2	91.2	91.2	90.2
	Urban	Male	94.2	94.0	94.0	94.2
		Female	94.4	94.3	94.3	94.4
HOI			77.6	78.9	79.2	79.3
Total fiscal cost (US$ millions)			156.7	188.0	196.6	188.8

Source: Author's estimates

A first finding is that the overall impact in terms of improved probability of attending school across all simulations is very similar and quite limited in magnitude, even when it involves large swings in resources (simulation 2) or large relative increases in transfers (simulations 1 and 3). This implies that even when changes simulated in Zambia produce improvements in coverage and equal opportunities (HOI increases) in primary education, these are not substantial in a country with a relatively low public spending on education (4% of GDP – of which about 50% goes to primary education). At the current level of enrolment of Zambia, simulations show that the most cost effective way of increasing a 1 percent

enrolment while at the same time increasing equal opportunities would cost approximately US$ 25 million (simulation 3).

Secondly, behind the modest estimated average effects on the distribution of opportunities, there are different patterns of winners and losers for each scenario. However, these patterns do not seem to cause large compositional effects among the different types of children. Interestingly, rural groups tend to do better than urban children in all three simulations. Given the nature of the first two simulations, all groups benefit in net terms, but some benefit more than others. The smallest win in simulations 1 and 2 are found among rural male and female children with non-educated household heads. The groups with the largest wins are rural female and male children with most educated household heads. Only simulation 3 has net winners and net losers: rural female and male children with non-educated household heads are the largest winners, with urban female and male children with non-educated household heads, reporting the largest loses. Once again, this evidence shows that "template" interventions are bound to be less effective because diverse circumstance groups benefit differently from alternative interventions.

5. Conclusions

For decades now, the distributive analysis of public social spending and taxes has underscored a few features considered to be commonly shared, such as progressive primary education and basic health care; more neutral or regressive spending on secondary education and curative medical attention; progressivity of direct taxes; and regressivity of indirect taxes. Increasingly, however, this conventional wisdom is questioned based on new evidence that provides more "resolution" to categories of spending and taxes, such as Lustig et al. [2011]) and increasing evidence on the distributive impact of fiscal decisions between developed and developing countries, as recently shown by IMF work.

Despite this challenging of the conventional wisdom, the capacity of traditional distributive incidence analysis of fiscal policies remains limited. In effect, distributive analyses of incidence—the focus of this paper [32]—still fail to provide a comprehensive picture of the effects of public interventions other than social spending, incorporating both long-term and transitory crisis-related effects, or provide "more resolution" in the identification of vulnerable groups, regional differences, and subcategories of spending. Unfortunately, economists have not yet devised adequate methodologies to take into account all these dimensions simultaneously. In this line, the proposed OIA provides a simple framework that expands traditional BIA and advances the identification of vulnerable groups based on longer-term considerations related with equality of opportunities.

In particular, this analysis adds to the existing work on equality of opportunities and fiscal policies, linking the recently developed HOI to fiscal issues. It does so by including the equality of opportunity angle to traditional BIA and illustrating the potential of this analysis to effectively guide public policy decisions. The empirical analysis was conducted for a few piloting countries and compared the distributive incidence analysis of public spending on education for each country. The OIA was also conducted for a health care opportunity in the case of Paraguay, with an example of how it can be used for guiding policy in the areas of improving targeting decisions and prioritizing fiscal interventions based on a cost benefit of their redistributive impact.

This paper first compared side-by-side BIA and OIA, the latter replicating the mechanics of BIA along a distribution of opportunities, proxied by the estimated probability of accessing a basic service. This

[32] Yet, this statement is also valid for computational general equilibrium and other techniques not analyzed here. See Cuesta and Martinez-Vazquez (2012) for a discussion on the capacity of other techniques to capture distributive effects of policies, especially in a context of crisis.

exercise confirms that BIA and OIA provide similar results in terms of diagnosis. In other words, the OIA does not deviate substantially from the BIA in terms of the conventional wisdom but their messages do not always coincide. Interestingly, both approaches confirm the influential role of households' private contributions toward education. Depending on the extent to which household contributions increase along the set of most favorable circumstances, the final distributive outcome can turn progressive, neutral, or regressive. More complex is the distribution of access to health care services analyzed in Paraguay—for which information was available to distinguish attention types and regional spending—in part reflecting the fact that different medical conditions may not follow clear socioeconomic lines.

This evidence should hopefully be useful in complementing policy debates in several directions. Equality of opportunities clearly underscores the need to think carefully on *how* to spend current resources more effectively with a longer-run perspective. How can we be effective in improving access to opportunities that, in some cases, are very far from universal provision, while in others, there are very unequally distributed across population groups? While not exclusive in theory, budgetary constraints in practice may call for a policy decision regarding which side to prioritize (universal access or equality across groups), that is, interventions that either expand coverage or reduce access inequalities. OIA can be a tool to provide relevant empirical evidence on the consequences of using each type of intervention. Also, it identifies which groups are lagging behind in terms of opportunities and, therefore, which objectives need be targeted more urgently, regardless of the instrument, whether conditional cash transfers, school programs, or any other interventions conceived.

This particular application of the OIA framework provides a simple mechanism to channel public resources more equitably. Additional public spending may be better targeted to those population groups that (i) average large gaps between their share of total population and their share of public benefits associated with that opportunity *and* (ii) experience a large degree of vulnerability in their access to a given opportunity, that is, have a set of circumstances that make them unlikely to access the opportunity. In Paraguay, this prioritization exercise identified a set of four or five types of children as the groups that would benefit the most in terms of reducing inequitable differentials in access to secondary education and access to public hospital care, respectively.

A second application of the OIA develops an ex ante microsimulation focusing on opportunities rather than on outcomes, with the hope that the traditional short-term analysis of welfare outputs may be complemented with a discussion of longer-term effects addressing how to remove critical obstacles to an egalitarian society. For example, the illustrative ex ante microsimulation exercise conducted for Zambia identifies the winners and losers of alternative interventions in the size and composition of public education spending.

These results should contribute to the design of more effective policy decisions regarding fiscal resources to help policy makers better understand how circumstances act as serious constraints to equal opportunities. Ultimately, OIA provides more complementary information on opportunities, circumstances, and longer-term issues that complement information on outcomes, behavior, and short-term immediate effects than existing incidence analyses provide.

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Appendix 1 Share of Public Spending Captured by Quintiles of Welfare and Circumstance Sets

Fig 1 Cote d'Ivoire, 2007 (attending school, ages 6-15)

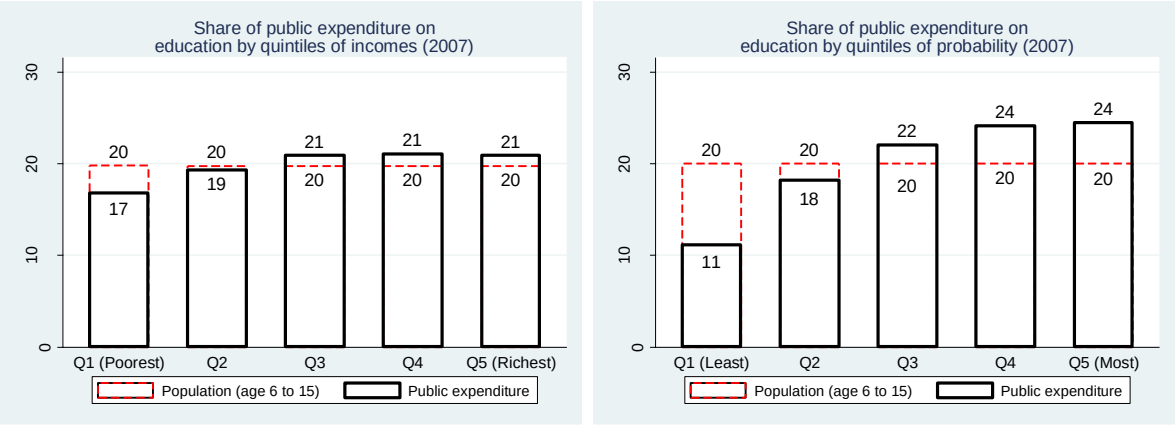


Fig 2 Zambia, 2009 (attending school, ages 7-18)

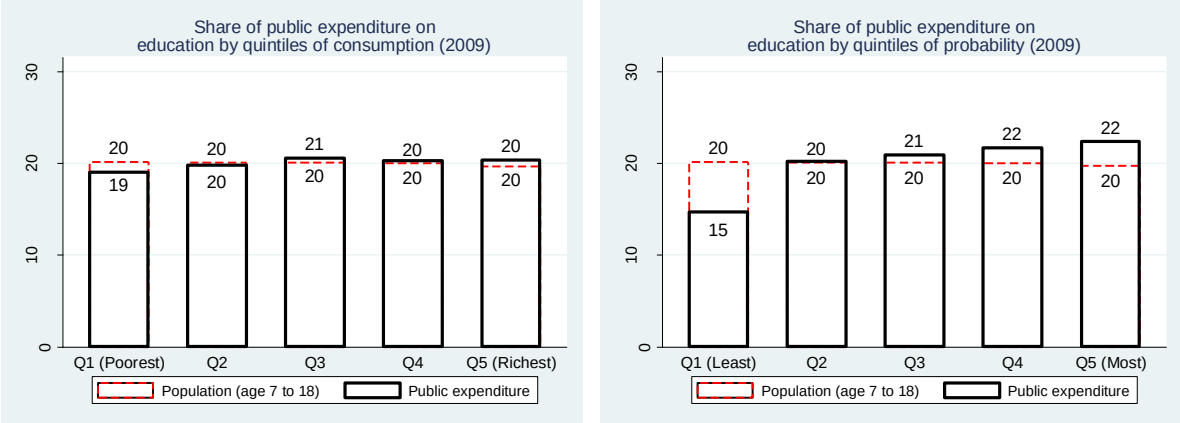


Fig 3 Liberia, 2007 (attending school, ages 6-15)

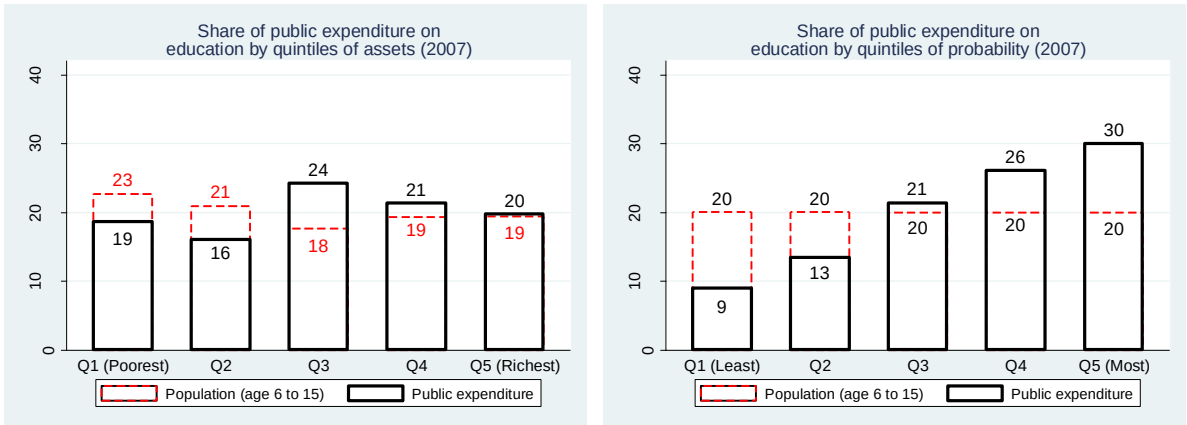


Fig 4 Tajikistan, 2007 (attending school, ages 7-17)

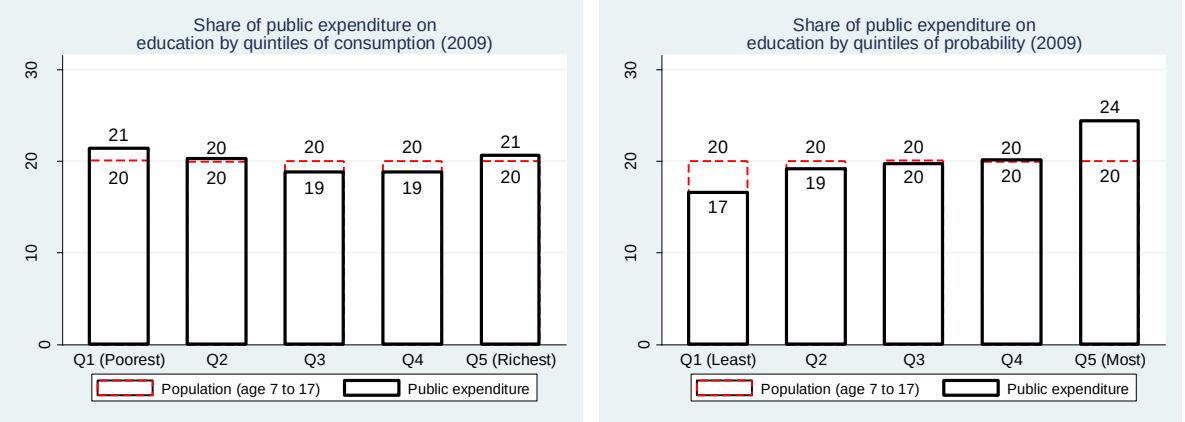


Fig 5 Paraguay, 2009 (attending public school, ages 5-17)

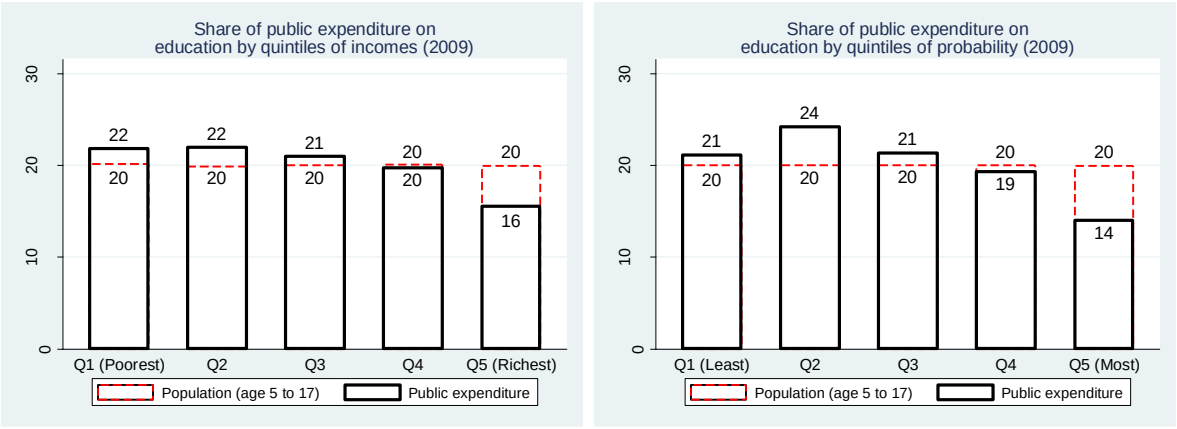
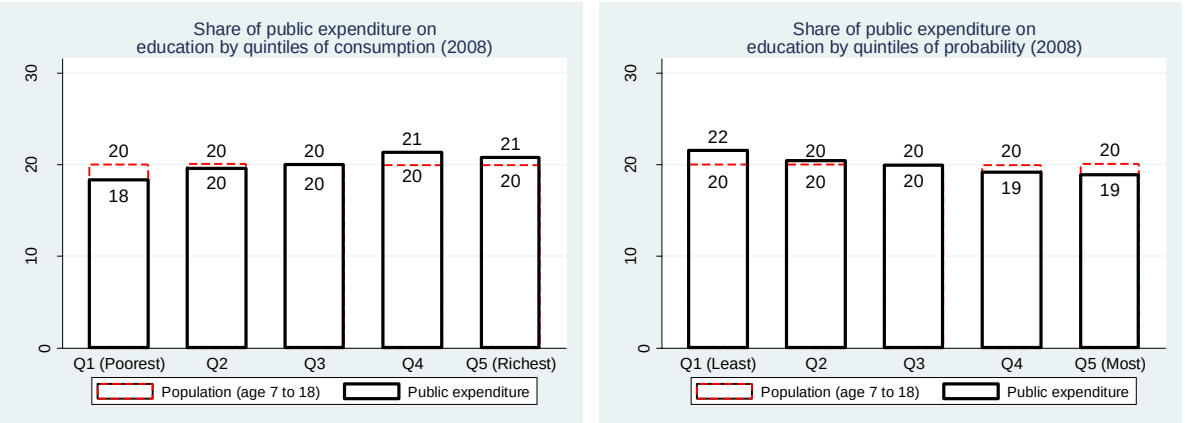


Fig 6 Thailand, 2008 (attending public school, ages 7-18)



Source: same as Figs 1-6

Appendix 2: Estimating Educational Opportunities for Zambia, 2009 (Age 7-13)

	Odds ratio
Child:	
Female	1.05
	(0.059)
Household head:	
Female	1.24*
	(0.108)
Age	1.02**
	(0.003)
Education level of household head	
Basic: 1st to 6th grade	1.24*
	(0.131)
Basic: 7th grade	1.71**
	(0.198)
Basic: 8th to 9th	2.5**
	(0.324)
High School	2.89**
	(0.421)
Tertiary	5.37**
	(1.106)
Lives with couple (household head)	1.02
	(0.37)
Household:	
Log per capita expenditure	1.67**
	(0.094)
Number of other children between 7 and 18 years	0.83
	(0.09)
Rural area of residence	0.69**
	(0.066)
Province	
Per student public expenditure in basic education	1.01**
	(0.002)
Constant	0.003*
	(0.002)
No. Observations	19,724
P(13,1601)	38.10
Prob > F	0.0000

Source: author's estimates
Notes: std errors in parentheses.* significant at 5%; ** significant at 1%