Socioeconomic background and healthcare use: the role of health and educational systems.

Yves Arrighi

LEM (UMR-CNRS 9221) – Université Lille 3 Charles de Gaulle, Lille, France

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Abstract : This study provides an analysis of social inequalities in access to healthcare of children in 43 low-and-middle-income countries. More specifically, it assesses whether policies aimed at increasing access to education (including tuition-free education policies) and several health system characteristics (e.g. means of financing healthcare, supply-side factors) contribute to increased access to care, and mitigate social inequalities in health.

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Introduction

A strong correlation between socioeconomic status (SES) and health has been documented for decades. Part of the research on health inequalities attempted to investigate whether socioeconomic disparities in health status emerge early in life. Evidence for a socioeconomic gradient in health was first provided by the literature focusing on inequalities in infant mortality rates (e.g. Mare 1982, Hobcraft et al. 1984, Ostberg 1992, Brockerhoff et al. 2000, Wagstaff 2000). Public health research works on health inequalities among "living" children appeared more recently (e.g. Aber et al. 1997, West et al. 1997, Starfield et al. 2002, Newacheck et al. 2003, Larson and Halfon 2010). This provides insight that, in addition to an epidemiological inheritance effect, children from poor households may either be subject to more health shocks and/or respond less efficiently to health shocks (e.g. less effective investments in health capital).

In economics, research on a socioeconomic gradient in child health appeared in the early 2000s. It can merely be categorised into two main questions. On the one hand, Case et al. (2002) used a cross-sectional American sample and found that the social gradient in health widens as children age. This seminal paper generated considerable attention from researchers such that a large number of papers on this topic have been published since then. Empirical evidence have been produced mainly using data from developed countries (Chen et al. (2006), Condliffe and Link (2008), Dowd (2007) and Murasko (2008) use US data; Currie and Stabile (2003) Canadian data; Currie et al. (2007), Propper et al. (2007), and Apouey and Geoffard (2013) UK data; Khanam et al. (2009, 2013) Australian data; Reinhold and Jurges (2012) German data), but hardly with data from developing countries (e.g. Cameron and Wiliams 2009; and Park 2010 for Indonesia)

On the other hand, several studies compared the importance of socio-economic inequalities in child health cross-nationally (e.g. Houweling & Kunst, 2010, McKinnon et al. 2014). The role of SES is found to be more important in developing countries than in high-income countries where universal access to health care has been achieved. Indeed, poor households may be less able than their counterparts from developed countries to respond to health shocks (e.g. inability to purchase nutrition goods or medical care). These studies highlight important variations in the level of inequalities across low and middle income countries (LMICs), part of which could be explained by structural differences in terms of health, social, or educational policies and resources. Yet, the examination of country-level determinants of child health outcomes and of social inequalities in child health is only recent and scarce. For example, recent studies making use of the Demographic and Health Surveys found that more generous paid maternity leave policies (Nandi et al. 2016) and tuition-free education policies (Quamruzzaman et al. 2014) significantly reduce infant mortality in LMICs, whereas McKinnon et al. (2016) found that countries with higher out-of-pocket health expenditures had higher levels of neonatal mortality rates. However, knowledge on children access to care remains limited.

The contributions of this paper to the latter literature are twofold. First, it makes use of the World Health Surveys (WHS) which provides insights of a social gradient in children access to care (horizontal equity) in 45 LMICs, whereas previous literature analysed inequalities in infant mortality (e.g. Hajizadeh et al. 2014), standardized height for age (e.g. Welander et al. 2015) and childhood vaccination uptake (Hajizadeh et al. 2015) by making use of the Demographic and Health Surveys. Second, it analyses and compares the combined influence of countries' health and educational systems simultaneously, as opposed to previous research that looked at sole country characteristics or policies (e.g. Quamruzzaman et al. 2014).

Data

Individual data

The WHS contain multi-country micro-level data at the children, parental and household levels. They were conducted by the World Health Organization (WHO) between 2002 and 2004 in 70 countries among 287,732 respondents aged 18 and over. The samples were nationally representative except in China, Comoros, Congo, Côte d'Ivoire, India and Russia (Üstün et al., 2003). WHS contains for LMICs a module with detailed health information on household's youngest child. Respondents were first asked which symptom(s) their youngest child experienced during his/her last episode of illness. The respondent was then asked whether or not the child received any care or treatment during his/her last episode of illness. The outcome variable in this study is the dichotomy unmet need (1) vs. care received (0). Respondents who were not the biological father or mother of the child surveyed were excluded from the analyses. The study's sample consists of 41,159 children (aged 0-6) - parent pairs from 43 LMICs countries described in Table 1.

The relative socioeconomic status of the child is proxied by household's wealth and educational level. Country-specific principal component analyses (PCAs), based on whether or not a household owns selected assets and has access to certain services were used to construct a wealth index (methodological details are provided in Appendix). Comparisons based on their SES can thus only be done between children-parent pairs within a single country; not between observations from different countries. The correlation between material conditions and children access to care is captured through a binary variable (POOR) that equals one if the child's household belongs to the bottom quintile of the country's distribution, and zero otherwise. In sensitivity analysis, polynomial transformations of the centiles of the distribution are considered [IN PROGRESS]. For education, information on the respondent's educational level and the highest educational level achieved by any household member were combined. The educational variable equals zero if nobody in the household completed primary school, one if another household member than the child's parent did, and two if the respondent achieved primary school.

Parental health status has been found in the literature to weaken the strength of the income gradient: it may drive part of the relationship between SES and child health (Propper et al. (2007), Khanam et al. (2009, 2013), Apouey and Geoffard (2013)). Indeed, poor parents reporting their health as bad may over-rate poor health status for their children. Besides, genetic transmissions of disabilities and sickness might also play a role. Sick parents can also be thought to be less able than their healthier counterparts to seek for healthcare when their child falls sick. Parent's health status is captured by two variables. The 5 grades self-assessed health variable (very bad, bad, fair, good and very good) was transformed into a binary one (poor health vs. good health). The respondent's experience of difficulties with activities of daily living (ADL), ranging from none to extreme, were also dichotomized (any difficulty vs. none).

Other covariates include the age and gender of the respondent and of his/her children, as well as the respondent's employment and marital statuses. Household characteristics comprise a variable indicating whether none, some or all household members are covered by a health insurance scheme, the household size and the number of children aged 6 or less in the household, and whether the household is located in rural or urban settings. These variables proxy several constraints for the respondent and his household. For instance, employed and/or single respondents may have less time to devote to their child (Ruhm, 2000; Heck and Parker, 2002), children from large families might suffer from the quantity/quality trade-off introduced by Becker and Lewis (1973). Health insurance coverage is expected mitigate the correlation between SES and access to health care. Indeed, health insurance schemes have been found to mitigate at the household level the financial burden of health expenditures (e.g. Jütting 2003, Jowett et al. 2004, Liu et al. 2002, Palmer et al. 2004, Trujillo et al. 2005). However, this information is subject to important non-response rates (7% for the overall sample, but 93% in Nepal, 33% in Ukraine and 27% in Pakistan).

Country-level data

Three sources of country-level data are combined to obtain a set of covariates covering means of financing healthcare and education, supply-side factors and existence of social/health/education policies : World Bank (WB); World Health Organization (WHO) and WORLD Policy Analysis. For quantitative covariates, I gathered estimates over the 2000-04 period for all the surveyed countries and computed average figures, in order to reduce the potential threats of missing values and heterogeneity. These covariates were then discretized into three categories using the quartiles of their distribution (25%; 50%; 25%). For categorical variables, I used information for year 2002 (i.e. when surveying started). Table 1 contains the data used and the dependent variable's mean.

Data from the WB includes income classification of the country (low income (LI), lower-middle income (LMI), upper-middle income (UMI)), total government expenditures on education as a percentage of GDP, government expenditures on education as a percentage of total government expenditure and pupil-teacher ratio in primary education.

WHO provides information on healthcare provision (density of physicians, nurses and hospital beds per 10,000 inhabitants) and health financing. The latter includes total expenditure on health as a percentage of GDP, government expenditure on health as a percentage of total expenditure on health, government health expenditures as a share of total government expenditure, the share of out-of-pocket payments in private health expenditures, and social security expenditure on health as a percentage of government expenditures on health.

Data on legislations and social policies that have been released recently by the WORLD Policy Analysis Center is also used. It includes access to education, minimum legal age of work and availability of parental leave for children health needs. Access to education encompasses two variables: whether or not primary / secondary education is tuition-free and compulsory.

Empirical Specification

The outcome variable is the dichotomy unmet_{ij} that equals one if children i from country j did not receive care or treatment following his last episode of illness. The probability that $\mathbb{P}(\text{unmet}_{ij} = 1)$ is modelled by logit regressions. In M1, the model is solely adjusted on covariates measured at the child, parental and household levels :

$$\text{logit}\big(\text{P}(\text{unmet}_i = 1)\big) = \beta_0 + \beta_1 poor_i + \sum_k \beta_k X_i^k + \varepsilon_i \, ;$$

where ε_i is distributed according to a logistic distribution. The introduction of the rich set of covariates X^k reduces the risk to obtain biased estimates for the effect of SES due to omitted third factors. Reverse causality issues have a lesser extent here than when assessing the causal effect of income on health among school-aged children, adolescents or adults. Indeed, the sample is restricted to children aged six or less, which their labour enrolment is rather low according to the International Labour Organization (2002). The sickness episodes experienced by these children are thus are unlikely to have any impact on household wealth. The model is then enriched by an interaction term between insurance coverage and SES to account for the potential mitigating impact of health insurance (M2).

To appraise the extent to which variations in the individual propensity to experience unmet can be attributed to differences between countries, I estimate the following random intercept OLS model (M3):

$$\text{logit}\left(\text{P}\big(\text{unmet}_{ij} = 1\big)\right) = \beta_{0j} + \beta_1 poor_{ij} + \sum_k \beta_k X_{ij}^k + \varepsilon_{ij};\ \beta_{0j} = \gamma_{00} + u_{0j} \, ;$$

where γ_{00} is the grand-mean of unmet across countries, u_{0j} the country-level residuals (i.e. country-specific deviations from γ_{00}) and ε_{ij} the individual-level residual. Estimates of the variance of u_{0j}, together with the intra-class correlation coefficient and the median odd-ratio provide a measurement of the variation in unmet need rates across countries. After specifying and testing a random-slope for SES

(M4 : $\beta_{1j} = \gamma_{10} + u_{1j}$), I introduce country-level covariates Z^l in the random intercept equation $\left(M5 : \beta_{0j} = \gamma_{00} + \sum_l \gamma_{0l} Z_j^l + u_{0j}\right)$ and in the equation representing the varying effect of SES by country :

$$M6 : \beta_{0j} = \gamma_{00} + \sum_l \gamma_{0l} Z_j^l + u_{0j} \; ; \; \beta_{1j} = \gamma_{10} + \sum_l \gamma_{1l} Z_j^l + u_{1j}$$

where γ_{10} is the average effect of $poor$ across countries, γ_{1l} the change in the value of γ_{10} which is imputable to country-level characteristic C^l , and u_{1j} the random component, i.e. the changes in γ_{10} that are not captured through the fixed effects.

All country-fixed effects are introduced simultaneously in the nested models (random parameters only). As a sensitivity analysis, the selection of contextual effects is carried out following a stepwise selection strategy based on Akaike Information Criterion (AIC) and LR tests [IN PROGRESS]. Analyses have been carried out using Stata 13 MP.

[Preliminary] Results

Table 1 describes the sample according to the dependent variable. 17.5% of the respondents reported that their children did not receive care during their last episode of illness. Parents reporting unmet need for their child are more likely to live in rural settings, to belong to the bottom SES households, to be uneducated and to experience health problems. Turning to institutional factors (Table 3), people living in countries guarantying (on the paper) a right to medical services, to free primary education and to work leaves for children care are more likely to fail accessing care. The share of out-of-pocket expenditures in private health expenditures is negatively correlated with healthcare use. However, health expenditures and its share made through the public channel do not seem to have the anticipated relationship with unmet need rates, so as social security expenditures on health expressed as a share of public health spending. Health (hospitals) and educational supply side factors counterbalance the latter observation.

Table 4 summarizes the results from M1-M3. The ordinary logit model (M1) provides interesting results. The odds of facing unmet need are 1.48 times higher (P-value <0.1%) for children belonging to the bottom quintiles of countries' wealth distributions than their wealthier counterparts. Parents tend to report lower access to care for new-born children aged 0-12 months. Children living in households with six or more members are less likely to receive care, as well as those living in households with more than one child. Educational background is found to facilitate access to healthcare. The bad health condition of the parent affects positively the probability of the child to fail obtaining treatments, but solely self-assessed health was found to be significant.

In the interaction model estimated on a reduced sample of 38,144 observations (M2), children from households covered by an insurance scheme are not found to report significantly different unmet need

rates. However, the effect of SES appears to be mitigated by insurance coverage: the odds-ratios associated with the interaction terms are lower than one (only that attached to partial insurance coverage is significant at the 10% level). The magnitudes of the odds-ratios attached to the other parameters remain unchanged, suggesting that the loss of data does not induce a strong selection bias on the other covariates.

In M3 (Table 4), $\mathbb{V}\mathrm{ar}(u_{0j})$ is estimated value at 0.482, and the ICC suggests that 12.8% of the residual variation in the propensity of a child to face unmet need is attributable to country characteristics. The Hausmann likelihood ratio test and the decrease in both AIC and BIC statistics confirm that including a random intercept term captured some heterogeneity that was unrelated to individual characteristics. The five countries with the lowest country-level residuals u_0 are Vietnam, Sri Lanka, Pakistan, Kazakhstan and Mauritius, whereas Mauritania, Paraguay, Guatemala, Ethiopia and Brazil exhibit the five highest unmet need rates (Figure 1). Compared to M1, the dummy variable representing limitations in ADL becomes significant, while that corresponding to poor health status fails to stay significant. According to the Hausmann test, introducing a random slope for SES enables to gain further information (LR = 50.8, M4 in Table 4). The varance of u_{1j} is indeed significantly not null: the wealth gradient differs across countries (0.11 CI [0.05-0.22]). On the one hand, the correlation between SES and access to care is found to be significantly lower than average in Viet Nam, Dominican Republic, Zambia, India and the Philippines (Figure 2). On the other hand, Morocco, Chad, Mali, Malawi, Ethiopia and Nepal have an above average gradient (Figure 2). Besides, the sign of the covariance between the two country-level random components is undetermined: countries with higher than average unmet need rates do not necessarily exhibit stronger correlations between SES and healthcare use.

Table 5 summarizes the odds-ratios associated with the country-level fixed effects, the SES dummy (M5) and theirs interaction terms (M6). The variance of the residual component has substantially decreased, as highlighted by the ICC (5.26%). Among the information on legislations and social policies, the (theoretical) compulsory & free education dummy as well as the availability of work leaves for children caring are the sole significant variables at the 10% level. However, the signs attached to these parameters are of the wrong sign, confirming the previous descriptive statistics: the probability of a child to face unmet healthcare need is higher in countries offering such guaranties that are a priori positive from a welfare perspective. Quite surprisingly, increased levels of out-of-pocket payments at the national level turns out to have a protective effect on being denied access to care, contradicting descriptive analyses. [For reviewer: This effect needs to be clarified at this stage]. Residents from countries with good hospital facilities tend to report easier access, so as people having on average less dense classrooms. Model M6 also provides mixed results. The wealth gradient is flatter than average for middle income countries than low-income countries. However, increased levels of total health expenditures are found to steepen the SES gradient.

[IN POGRESS]

Discussion [IN POGRESS]

This paper aimed at investigating potential contextual effects associated with social gradients in children access to care, whereas previous literature focused mainly on the adult population or on children health outcomes. The studies makes use of WHO' World health Surveys, a multi-country cross-sectional dataset covering a large panel of countries differing notably by their income level and health systems.

Pooled analyses suggest that the wealth gradient in access to healthcare is important in most countries. Children living in countries with better health infrastructures (proxied by hospital density) tend to have increased access to care; a result that has already been documented for the adult population (Starfield and Shi 2002, Wagner et al. 2011). Wealth-related health inequalities in childhood were found to be more pronounced for low income countries than LMI countries. Similar conclusions were drawn for the adult population by Hosseinpoor et al. (2012) who compared, using the WHS, socioeconomic inequality in the prevalence of non-communicable diseases between GNI groups. I also found that health insurance coverage positively affect access to health care

Nevertheless, several limitations are worth mentioning. First, the way I characterize health and educational systems is rather imprecise: the contextual effects involved do not capture their actual variations. Second, no causal relationship between health systems characteristics and health outcomes can be formulated from my results. Only studies measuring outcomes before and after the implementation of a health insurance scheme (e.g. Liu et al. 2002, and Witter and Garshong 2009) or comparing participants/non participants using matching techniques (e.g. Trujillo et al. 2005) could permit to do so. However, such findings are limited to a single context. Third, few high income countries were included in the analysis, as the child health module was absent for most surveyed countries. This prevents us from obtaining robust estimates of income group specific slopes for wealth.

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Table 1 : Country-Level Data

Country	Country Code	Unmet need rate (WHS)	Sample Size	Income Group	Pupil / Teacher Ratio	Gov. Exp. on Educ. (% of GDP)
Bangladesh	BGD	0.102	1758	LI	47.0	2.06
Bosnia & Herzegovina	BIH	0.092	76	UMI		
Brazil	BRA	0.228	807	UMI	23.2	3.87
Burkina-Faso	BFA	0.131	1665	LI	47.2	4.43
Chad	TCD	0.303	735	LI	68.9	2.22
China	CHN	0.126	294	UMI	22.8	1.90
Comoros	COM	0.162	253	LI	36.3	3.88
Congo, Republic	COG	0.098	407	LI	65.3	2.78
Cote d'Ivoire	CIV	0.168	495	LMI	43.6	3.91
Dominican Republic	DOM	0.249	862	UMI	30.1	1.95
Ecuador	ECU	0.220	699	UMI	23.9	1.15
Ethiopia	ETH	0.334	899	LI	52.4	3.77
Georgia	GEO	0.051	98	LMI	16.3	2.31
Ghana	GHA	0.072	1012	LMI	32.1	6.45
Guatemala	GTM	0.383	1510	LMI	33.1	2.98
India	IND	0.091	1797	LMI	40.4	3.70
Kazakhstan	KAZ	0.034	266	UMI	19.8	2.85
Kenya	KEN	0.128	1281	LI	34.5	5.97
Laos	LAO	0.113	744	LMI	30.5	2.18
Malawi	MWI	0.130	1996	LI	63.2	4.66
Malaysia	MYS	0.124	1141	UMI	19.3	6.91
Mali	MLI	0.247	688	LI	64.6	3.67
Mauritania	MRT	0.448	554	LI	44.0	2.88
Mauritius	MUS	0.049	667	UMI	24.7	3.81
Mexico	MEX	0.201	4916	UMI	27.4	4.64
Morocco	MAR	0.210	1084	LMI	28.1	5.39
Myanmar	MMR	0.094	660	LI	32.2	
Namibia	NAM	0.135	549	UMI	31.2	6.70
Nepal	NPL	0.186	1960	LI	37.6	3.22
Pakistan	PAK	0.056	1593	LMI	35.0	1.89
Paraguay	PRY	0.371	1220	LMI	25.8	4.02
Philippines	PHL	0.186	2527	LMI	34.9	2.98
Russia	RUS	0.168	149	UMI	17.3	3.42
Senegal	SEN	0.263	578	LMI	50.3	3.44
South Africa	ZAF	0.109	248	UMI	37.2	5.12
Sri Lanka	LKA	0.039	747	LMI	24.3	3.05
Swaziland	SWZ	0.100	241	LMI	32.4	5.86
Tunisia	TUN	0.144	856	UMI	22.8	6.35
Ukraine	UKR	0.146	144	LMI	19.9	5.04
Uruguay	URY	0.131	251	UMI	20.8	2.42
VietNam	VNM	0.037	535	LMI	28.5	4.90
Zambia	ZMB	0.142	1204	LMI	49.1	2.13
Zimbabwe	ZWE	0.246	993	LI	38.7	

Table 1 (continued)

Country Code	Total Exp. On Health (% of GDP)	Gov. Health Exp. (% Total Health Exp.)	Social Security Exp. (% Gov. Health Exp.)	Out of Pocket Exp (% Private exp. On health)	Physicians /10,000 inhabitants	Hospital beds /10,000 inhabitants	Nurses /10,000 inhabitants
BGD	3.12	27.42	0.00	87.78	2.5	3.2	2.8
BIH	7.66	59.24	97.06	100.00	13.4	31.9	21.3
BRA	7.54	41.40	0.00	57.18	13.8	26.0	38.4
BFA	5.24	45.00	0.78	94.04	0.5	9.0	45.7
TCD	5.40	39.66	0.00	96.20	0.4	4.3	2.8
CHN	4.70	36.78	55.14	90.56	12.4	25.4	9.6
COM	2.82	53.86	0.00	100.00	1.5	22.0	7.4
COG	2.36	52.62	0.00	100.00	2.0	16.0	5.3
CIV	4.24	25.24	2.76	88.60	1.2	4.0	9.3
DOM	5.66	32.90	21.52	77.82	18.8	21.0	56.2
ECU	4.74	36.72	32.42	85.50	15.5	16.0	16.6
ETH	5.24	56.32	0.40	80.80	0.3	2.0	2.2
GEO	8.18	16.28	52.02	89.78	39.0	44.2	40.3
GHA	6.68	39.42	0.00	78.98	1.5	9.0	9.2
GTM	5.42	39.06	50.88	90.64	9.0	5.0	40.5
IND	4.68	19.60	5.64	93.04	5.8	8.0	12.7
KAZ	3.70	55.56	0.00	100.00	35.5	73.2	76.4
KEN	4.44	45.06	9.46	80.12	0.9	16.5	11.8
LAO	3.62	29.96	6.18	90.98	3.2	9.0	57.9
MWI	9.90	65.56	0.00	40.74	0.2	11.0	5.9
MYS	3.90	54.00	0.78	74.00	7.1	18.0	18.1
MLI	6.32	42.26	0.83	99.34	0.8	3.0	6.2
MRT	2.72	68.22	0.00	100.00	1.1	4.0	6.4
MUS	4.02	52.74		76.76	10.6	30.0	37.3
MEX	6.12	45.18	66.90	94.84	24.4	10.6	24.4
MAR	4.98	32.84	0.00	76.28	5.1	8.5	7.8
MMR	2.18	12.74	2.40	99.30	3.6	6.7	9.8
NAM	7.10	70.40	1.68	17.36	3.0	33.0	30.6
NPL	5.66	26.38	0.00	89.72	2.1	1.8	4.6
PAK	2.30	19.80	0.00	98.08	6.8	7.0	4.5
PRY	8.56	34.78	42.82	80.52	11.1	12.0	17.9
PHL	3.26	41.60	21.28	78.16	9.6	7.5	60.6
RUS	5.58	59.20	39.86	77.10	0.5	105.3	41.9
SEN	5.18	36.40	10.76	90.68	0.6	1.0	3.2
ZAF	8.34	40.98	3.78	17.66	2.2	28.4	1.1
LKA	3.88	44.74	0.30	84.30	6.8	30.3	75.8
SWZ	6.14	60.38	0.00	42.10	1.2	21.0	32.0
TUN	5.62	47.12	25.28	81.76	9.2	17.5	28.7
UKR	6.40	52.86	0.20	90.22	30.0	87.9	8.5
URY	9.92	33.84	47.30	26.38	37.0	19.0	8.5
VNM	5.46	29.88	21.46	87.80	1.6	22.0	11.3
ZMB	6.34	58.26	0.00	75.74	1.2	20.0	20.1
ZWE	7.22	38.20	0.00	50.88	2.0	30.0	14.9

Table 1 (continued)

Country Code	Constitution guaranties right to medical services?	Constitution guaranties free and compulsory primary education?	Legal working age is 16 y.o.	Work leave to meet children's health needs?
BGD	0	0	1	0
BIH	0	0	0	1
BRA	0	1	1	0
BFA	0	0	1	1
TCD	0	1	0	1
CHN	0	0	1	0
COM	0	0	0	1
COG	0	1	1	1
CIV	0	0	0	1
DOM	1	1	1	0
ECU	1	1	1	1
ETH	0	0	0	1
GEO	1	1	1	1
GHA	0	1	0	0
GTM	1	1	0	0
IND	0	1	0	0
KAZ	1	1	1	1
KEN	1	1	1	1
LAO	0	0	0	0
MWI	0	0	0	0
MYS	0	0	0	0
MLI	0	1	0	1
MRT	0	0	0	1
MUS	0	0	1	0
MEX	0	1	0	0
MAR	0	0	0	1
MMR	1	0	0	1
NAM	0	1	1	1
NPL	1	0	0	0
PAK	0	1	0	0
PRY	1	1	1	0
PHL	0	1	0	0
RUS	1	1	1	1
SEN	0	0	0	1
ZAF	1	0	0	1
LKA	0	0	0	0
SWZ	0	0	1	0
TUN	1	1	1	0
UKR	1	1	1	1
URY	0	0	0	0
VNM	1	1	0	0
ZMB	0	0	0	0
ZWE	1	0	0	0

Table 2: Descriptive Statistics – Individual Level

	Unmet = 0	Unmet = 1	Total
Child is male	0.516	0.509	0.514
Child Age	2.28 (1.4)	2.18 (1.4)	2.26 (1.4)
Respondent is male	0.399	0.385	0.397
Respondent's age	31.64 (8.4)	32.24 (9.2)	31.75 (8.6)
Couple	0.913	0.912	0.913
Urban settings	0.425	0.351	0.412
More than one child in household	0.392	0.452	0.402
More than 5 household members	0.408	0.461	0.418
Bottom quintile of Wealth distrib.	0.220	0.322	0.238
Another HH member achieved primary	0.158	0.187	0.163
Respondent achieved primary	0.612	0.493	0.591
Respondent is employed	0.617	0.578	0.610
Respondent reports poor SAH	0.324	0.364	0.331
Respondent has Difficulties w/ADL	0.417	0.441	0.421
Sample Sizes	33,849	7,210 (17.5%)	41,159

Table 3 : Descriptive statistics – Country level

		Sample Size	Average unmet need rate
Income Group	LI	13849	0.181
	LMI	15529	0.170
	UMI	11781	0.174
Right to medical services	No	29678	0.160
	Yes	11481	0.215
free and compulsory primary education	No	18508	0.160
	Yes	22651	0.187
Legal working age is 16	No	29196	0.180
	Yes	11963	0.164
Work leave	No	29631	0.167
	Yes	11528	0.195
Total Exp. On Health (% of GDP)	Bottom 25%	10650	0.131
	Middle	23259	0.192
	Upper 25%	7250	0.187
Gov. Health Exp. (% Total Health Exp.)	Bottom 25%	11586	0.129
	Middle	22498	0.198
	Upper 25%	7075	0.178
Social Security Exp. (% Gov. Health Exp.)	Bottom 25%	14863	0.160
	Middle	16227	0.150
	Upper 25%	10069	0.239
Out of Pocket Exp (% Private exp. On health)	Bottom 25%	9181	0.154
	Middle	21830	0.179
	Upper 25%	10148	0.185
Physicians /10,000 inhabitants	Bottom 25%	10244	0.197
	Middle	22502	0.157
	Upper 25%	8413	0.197
Hospital beds /10,000 inhabitants	Bottom 25%	11430	0.214
	Middle	25792	0.166
	Upper 25%	3937	0.120
Nurses /10,000 inhabitants	Bottom 25%	11416	0.180
	Middle	20368	0.164
	Upper 25%	9375	0.194
Pupil / Teacher Ratio	Bottom 25%	5452	0.140
	Middle	25223	0.178
	Upper 25%	10484	0.187
Gov. Exp. on Educ. (% of GDP)	Bottom 25%	8238	0.145
	Middle	25830	0.198
	Upper 25%	7091	0.126

Table 4: Models M1 – M4

$\mathrm{P}(\mathrm{unmet}_{ij} = 1)$	**M1**	**M2**	**M3**	**M4**
Poor	1.484 ***	1.492 ***	1.421 ***	1.4 ***
Some members insured		1.043		
All members insured		1.063		
Poor*Some insured		0.709 *		
Poor*All insured		0.917		
Respondent is male	0.978	0.983	0.975	0.975
Child aged [1-3[	0.806 ***	0.804 ***	0.826 ***	0.829 ***
Child aged 3+	0.862 ***	0.881 ***	0.912 **	0.914 **
Another HH member primary	0.899 ***	0.894 ***	0.854 ***	0.866 ***
Respondent primary	0.66 ***	0.647 ***	0.601 ***	0.605 ***
Respondent is employed	0.859 ***	0.835 ***	0.905 ***	0.902 ***
Respondent reports poor SAH	1.15 ***	1.149 ***	1.049	1.048
Respondent has limitations	0.995	0.996	1.064 **	1.061 *
Urban	0.915 ***	0.906 ***	0.782 ***	0.779 ***
Respondent is male	1.048	1.069 *	1.027	1.036
Respondent aged 30+	1.085 ***	1.081 **	1.1 ***	1.096 ***
Couple	0.965	0.977	1.047	1.047
2+ Children in HH	1.135 ***	1.15 ***	1.102 ***	1.106 ***
6+ HH members	1.086 ***	1.088 ***	1.117 ***	1.125 ***
Intercept	0.267 ***	0.269 ***	0.225 ***	0.223 ***
N	41027	38144	41027	41027
M	43	43	43	43
$\mathbb{V}\mathrm{ar}(u_{0j})$			0.48 [0.31; 0.75]	0.46 [0.29; 0.73]
$\mathbb{V}\mathrm{ar}(u_{1j})$				0.11 [0.05; 0.22]
$\mathrm{Cov}(u_{0j}; u_{1j})$				0.02 [-0.07; 0.11]
LR Test vs M1			2057.98	2108.77
LR Test vs M3				50.79
AIC	37295.22	34848.44	35239.24	35192.45
BIC	37484.9	35070.72	35437.55	35408
ICC			0.12788	0.14779
MOR			1.93964	2.05546

Table 5: Models M5 – M6

$P(\text{unmet}_{ij} = 1)$	**M5**	**M6**
Poor	1.422 (10.97) *	2.65 (2.44) *
Lower Middle Income	0.832 (-0.67)	0.895 (-0.42)
Upper middle income	1.096 (0.24)	1.261 (0.62)
LMI*Poor		0.727 (-2.14) *
UMI*Poor		0.595 (-1.81) *
right to medical services	1.33 (1.3)	1.486 (1.85) *
right to medical services*Poor		0.636 (-3.37) *
free & compulsory prim. Educ	1.518 (1.8) *	1.618 (2.13) *
free & compulsory prim. Educ*Poor		0.815 (-1.5)
working age 16	0.709 (-1.57)	0.729 (-1.48)
working age 16*Poor		0.834 (-1.33)
Parental leave	1.719 (2.44) *	1.513 (1.91) *
Parental leave*Poor		1.548 (3.57) *
Medium Health Expenditures	0.631 (-1.27)	0.585 (-1.52)
High Health expenditures	0.513 (-1.47)	0.442 (-1.85) *
Medium Health Expenditures * Poor		1.388 (1.88) *
High Health expenditures*Poor		2.02 (3.18) *
Medium public % of health exp.	1.905 (2.62) *	1.934 (2.74) *
High public % of health exp.	1.766 (1.55)	1.816 (1.66) *
Med. Pub. % of health exp. * Poor		0.9 (-0.67)
High pub. % of health exp. * Poor		0.867 (-0.66)
Medium social security expenditures	0.742 (-1.28)	0.777 (-1.11)
High social security expenditures	1.555 (1.26)	1.408 (1)
Medium social security exp.*Poor		0.866 (-0.98)
High social security exp.*Poor		1.58 (2.28) *
Medium % of OOP payments	0.569 (-1.84) *	0.552 (-1.99) *
High % of OOP payments	0.187 (-3.4) *	0.18 (-3.57) *
Medium OOP*Poor		1.176 (0.89)
High OOP*Poor		1.302 (0.98)
Medium physician density	0.832 (-0.5)	0.793 (-0.65)
High physician density	1.752 (1.47)	1.784 (1.55)
Medium physician * Poor		1.19 (0.81)
High physician density * Poor		0.803 (-0.71)
Medium hosp. beds density	0.552 (-2.23) *	0.525 (-2.49) *
High hosp. beds density	0.331 (-3.18) *	0.353 (-3.07) *
Medium hosp. beds * Poor		1.184 (1.25)
High hosp. beds * Poor		0.719 (-1.39)
Medium nurse density	1.097 (0.29)	1.234 (0.67)
High nurse density	1.087 (0.24)	1.132 (0.36)
Medium nurse * Poor		0.674 (-2.17) *
High nurse density * Poor		0.931 (-0.4)
Medium pupil / teacher ratio	2.017 (2.39) *	2.182 (2.73) *
High pupil / teacher ratio	1.923 (1.35)	2.338 (1.8) *
Medium pupil / teacher * Poor		0.688 (-2.31) *
High pupil / teacher ratio * Poor		0.478 (-2.8) *

Medium public exp. On education	1.302 (1.11)	1.376 (1.38)
High public exp. On education	0.929 (-0.2)	0.956 (-0.13)
Medium exp. on education * Poor		0.809 (-1.63)
High exp. on education * Poor		0.935 (-0.34)
Level 1 covariates	x	x
$\mathbb{V}\mathrm{ar}(u_{1j})$		0.002 [0 ; 0.05]
$\mathbb{V}\mathrm{ar}(u_{0j})$	0.182 [0.11 ; 0.29]	0.168 [0.1 ; 0.27]
$\mathrm{Cov}(u_{0j}; u_{1j})$		0.019 [-0.01 ; 0.05]
AIC	35248.27	
BIC	35653.51	
ICC	0.05255	
MOR	1.50302	

Figure 1: Deviations from the grand-intercept (M3)

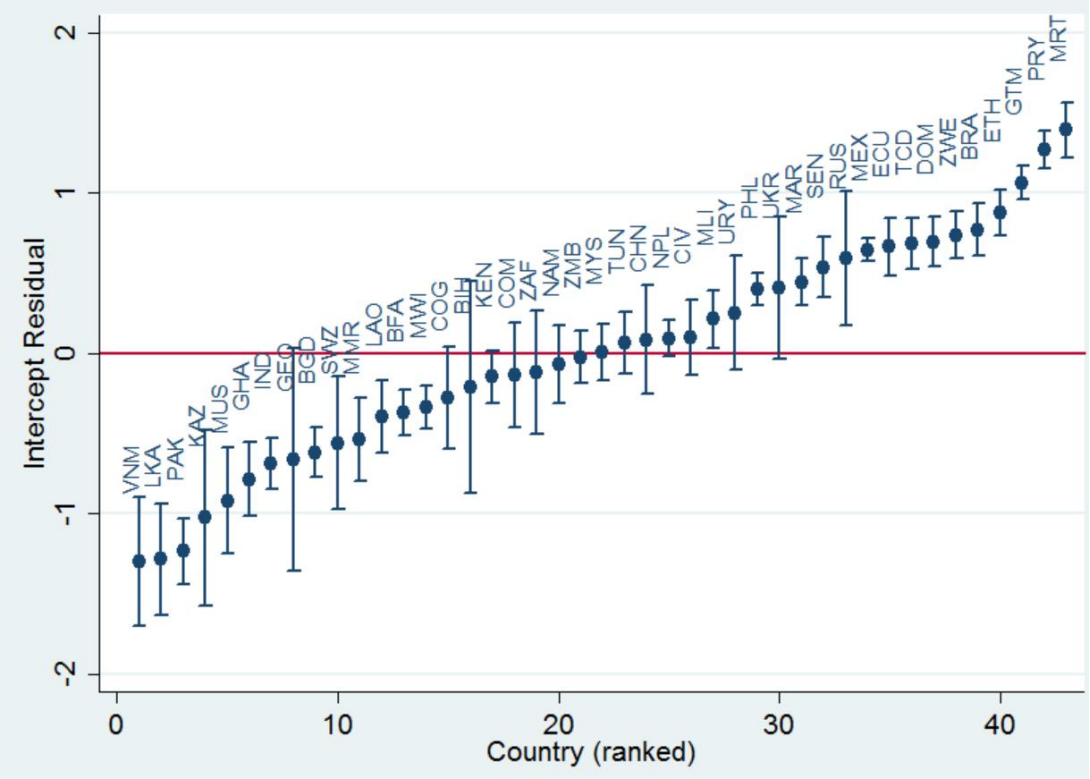
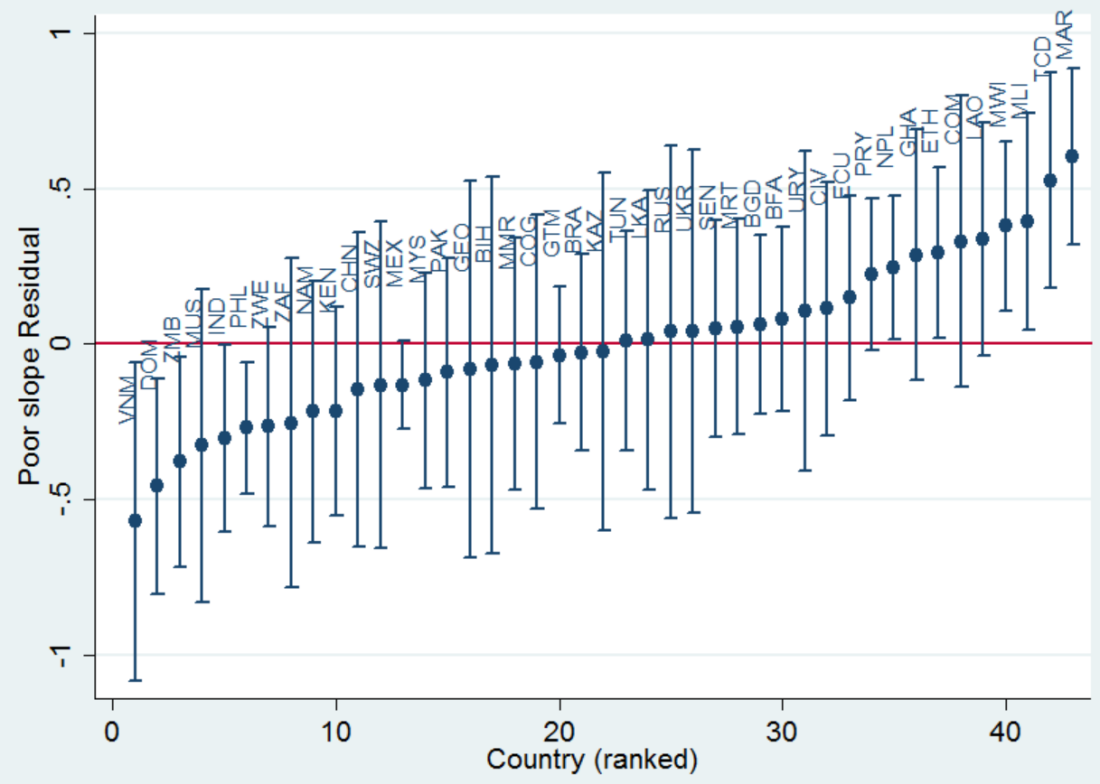


Figure 2 : Deviations from the grand effect of SES (M4)



Appendix : Construction of country-specific wealth indexes

WHS' household questionnaire includes a module on permanent income indicators. Households informants were asked whether their household own items within a list of certain assets/equipment. The list of assets, provided in the table below, depends on the income group of the country: respondents from UMI countries (e.g. Georgia, Malaysia, Mauritius, Russia) were submitted a different list than interviewees from e.g. Bangladesh and China. The last five items in the list provided in low-income and lower-middle income countries are country-specific.

Asset	Group 1 (UMI & High Income)	Group 2 (Low Income & LMI)
1	Has One / More than one room(s)	Has One / More than one room(s)
2	Has Zero / One / More than one car(s)	Has chairs
3	Has Zero / One / More than one television(s)	Has tables
4	Has a bicycle	Zero / One / More than one car(s)
5	Has a video cassette recorder	Has electricity
6	Has a stereo system	Has a bicycle
7	Has a DVD player	Has a clock
8	Has a video camera	Has a bucket
9	Has a washing machine for clothes	Has a washing machine for clothes
10	Has a washing machine for dishes	Has a washing machine for dishes
11	Has a vacuum cleaner	Has a refrigerator
12	Has a refrigerator	Has a fixed line telephone
13	Has a fixed line telephone	Has a mobile telephone
14	Has a mobile telephone	Has a television
15	Has a computer	Has a computer
16	Has a Access to the internet	*Country-Specific*
17	Has subscriptions to magazines/newspaper	*Country-Specific*
18	Has a security system	*Country-Specific*
19	Has anybody employed	*Country-Specific*
20	Has a second home	*Country-Specific*

I construct indicators of respondent's household position in the wealth distribution of the respondent's country. Therefore, I use the original sample of 287,732 observations rather than the sample of children-parent pairs used in the main analyses. Imputation of partial non-response was carried out using multivariate models, wherein the response of a given item is predicted using completed responses for the other items (Binary Logit for binary items, Ordered Logit for ordered categories items). Further details on this step can be provided upon request.

Country-specific wealth indexes were constructed using a principal component analysis (PCA) on the list of assets. Score estimates for the first factor of the PCA can be found in the table below. I only retained the first factor as it captures a reasonable part of the variance (23% in average, ranging from 14% in Ukraine to 32% in Guatemala).

Country	%(var) Factor 1	Asset / commodity Item																				% (-) values
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Bangladesh	24%	0.070	0.130	0.131	0.033	0.136	0.060	0.141	0.100	0.022	0.029	0.133	0.108	0.109	0.150	0.077	0.144	0.083	0.104	0.070	***-0.03***	5%
Bosnia	24%	0.060	0.063	0.052	0.098	0.100	0.075	0.057	0.126	0.153	0.064	0.125	0.112	0.094	0.125	0.085	0.114	0.147	0.153	0.058	0.080	0%
Brazil	21%	0.028	0.038	0.043	0.154	0.055	0.025	0.070	0.041	0.130	0.098	0.105	0.142	0.147	0.088	0.168	0.164	0.092	0.154	0.123	0.072	0%
Burkina	23%	0.066	0.094	0.113	0.103	0.170	***-0.009***	0.142	0.024	0.015	0.031	0.155	0.132	0.150	0.172	0.044	0.081	***-0.026***	***-0.077***	***-0.057***	0.123	20%
Chad	17%	0.069	0.157	0.160	0.076	0.163	0.144	0.144	0.127	0.029	0.039	0.142	0.141	0.154	0.171	0.083	0.153	0.116	***-0.025***	0.040	0.048	5%
China	22%	0.048	0.066	0.044	0.100	0.005	0.048	0.124	0.007	0.228	0.060	0.241	0.229	0.218	0.154	0.168						0%
Comoros	21%	0.042	0.126	0.105	0.114	0.182	0.095	0.149	0.056	0.050	0.023	0.195	0.160		0.197	0.066	0.124	0.019	0.083	0.026	0.105	0%
Congo	18%	0.316	0.557	0.585	0.131	0.632	0.156	0.612	0.133	0.107	0.194	0.640	0.324	0.600	0.715	0.332	0.444	0.346	0.092	0.083	0.280	0%
Côte d'Ivoire	22%	0.068	0.093	0.091	0.100	0.122	***-0.015***	0.134	0.020	0.027	0.032	0.162	0.126	0.159	0.166	0.069	0.123	0.044	0.098	0.062	0.160	5%
Dominican	23%	0.063	0.073	0.075	0.086	0.125	0.060	0.116	0.095	0.152	0.018	0.156	0.107	0.097	0.150	0.064	0.099	0.142	0.142	0.038	0.061	0%
Ecuador	20%	0.077	0.086	0.072	0.120	0.082	0.093	0.120	0.032	0.113	0.063	0.150	0.155	0.117	0.119	0.126	0.159	0.157	0.093	0.086	0.115	0%
Ethiopia	31%	0.061	0.067	0.077	0.065	0.110	0.056	0.113	0.089	0.020	0.025	0.102	0.125	0.050	0.129	0.016	0.085	0.124	0.124	0.124	0.075	0%
Georgia	21%	0.035	0.117	0.148	0.085	0.144	0.136	0.078	0.081	0.133	0.035	0.159	0.115	0.133	0.154	0.126	0.106	0.039	0.086	0.065	0.083	0%
Ghana	22%	0.041	0.091	0.105	0.125	0.187	0.014	0.183	0.029	0.057	0.039	0.217	0.152	0.170	0.219	0.098	0.129					0%
Guatemala	32%	0.090	0.018	0.036	0.064	0.084	0.070	0.059	0.021	0.089	0.051	0.119	0.109	0.106	0.112	0.088	0.097	0.118	0.055	0.125	0.124	0%
India	23%	0.066	0.146	0.143	0.081	0.117	0.043	0.107	0.053	0.102	0.041	0.145	0.142	0.083	0.152	0.071	0.125	***-0.051***	0.103	0.125	0.001	5%
Kazakhstan	17%	0.065	0.154	0.058	***-0.098***	0.189	0.161	0.105	0.123	0.133	0.041	0.165	0.102	0.126	0.162	0.168	0.133	0.038	0.114	0.074	0.082	5%
Kenya	22%	0.045	0.043	0.056	0.157	0.155	0.036	0.126	0.014	0.114	0.068	0.179	0.159	0.160	0.163	0.133	0.070	***-0.012***	***-0.037***	***-0.028***	0.080	15%
Lao	30%	0.047	0.114	0.115	0.086	0.111	0.054	0.108	0.003	0.090	0.020	0.132	0.111	0.100	0.121	0.046	0.046	0.078	0.129	0.128	0.025	0%
Malawi	18%	0.068	0.150	0.162	0.088	0.188	0.088	0.173	0.019	0.008	0.036	0.178	0.118	0.163	0.188	0.042	0.038	0.123	0.096	0.011	0.038	0%
Malaysia	25%	0.040	0.152	0.109	0.051	0.099	0.083	0.067	0.063	0.119	0.015	0.132	0.112	0.121	0.120	0.136	0.125	0.104	0.113	0.067	0.057	0%
Mali	20%	0.046	0.128	0.132	0.093	0.171	0.050	0.120	***-0.004***	0.015	0.043	0.147	0.131	0.156	0.171	0.074	0.088	0.139	0.097	0.144	***-0.025***	10%
Mauritania	22%	0.086	0.105	0.118	0.096	0.168	0.100	0.119	0.061	0.045	0.072	0.159	0.135	0.161	0.168	0.076	0.019	0.099	0.091	***-0.037***	0.006	5%
Mauritius	24%	0.048	0.143	0.105	0.034	0.098	0.076	0.096	0.087	0.125	0.059	0.135	0.086	0.089	0.125	0.154	0.150	0.091	0.080	0.114	0.054	0%
Mexico	22%	0.140	0.062	0.064	0.182	0.100	0.086	0.147	0.065	0.207	0.052	0.210	0.190	0.156	0.163	0.152						0%
Morocco	27%	0.056			0.100	0.166	0.061			0.134	0.042	0.187	0.120	0.142	0.150	0.074	0.061	***-0.111***	0.148	0.171	0.086	6%

Myanmar	17%	0.049	0.088	0.072	0.140	0.178	0.114	0.174	0.023	0.121	0.018	0.179	0.161	0.080	0.198	0.076	0.148	***-0.026***	0.163	0.013	***-0.087***	10%
Namibia	28%	0.070	0.089	0.106	0.117	0.150	0.065	0.114	0.052	0.134	0.064	0.163	0.134	0.128	0.163	0.098	***-0.004***	0.087				6%
Nepal	26%	0.049	0.126	0.133	0.047	0.128	0.063	0.130	0.082	0.015	0.025	0.108	0.122	0.041	0.147	0.050	0.085	0.137	0.146	0.001	0.098	0%
Pakistan	24%	0.064	0.128	0.121	0.076	0.106	0.054	0.119	0.071	0.155	0.038	0.155	0.129	0.095	0.145	0.096	***-0.014***	***-0.069***	0.092	0.026	0.120	10%
Paraguay	22%	0.061	0.051	0.057	0.156	0.103	0.034	0.104	0.016	0.159	0.051	0.148	0.147	0.133	0.136	0.124	0.148	0.046	0.051	0.129	0.065	0%
Philippines	26%	0.072	0.060	0.060	0.074	0.114	0.068	0.095	0.054	0.128	0.042	0.142	0.092	0.127	0.136	0.071	0.138	0.080	0.061	0.134	0.119	0%
Russia	22%	0.026	0.142	0.143	0.071	0.160	0.143	0.098	0.125	0.085	0.048	0.108	0.023	0.093	0.149	0.144	0.121	0.026	0.124	0.028	0.073	0%
Senegal	22%	0.018	0.121	0.122	0.081	0.162	0.035	0.122	0.019	0.011	0.033	0.154	0.138	0.151	0.163	0.059	***-0.094***	***-0.112***	***-0.106***	***-0.102***	***-0.102***	25%
South Africa	24%	0.089	0.080	0.089	0.149	0.104	0.104	0.097	0.061	0.154	0.093	0.148	0.134	0.119	0.147	0.130	0.028	0.026	***-0.005***	0.015	***-0.016***	10%
Sri Lanka	29%	0.086	0.090	0.100	0.054	0.120	0.011	0.087	0.049	0.086	0.033	0.120	0.103	0.080	0.121	0.060	0.099	0.120	0.074	0.130	0.120	0%
Swaziland	24%	0.004	0.149	0.148	***-0.132***	0.133	0.048	0.155	0.153	0.072	0.064	0.140	0.094	0.123	0.111	0.061	***-0.044***	***-0.034***	***-0.049***	0.059	0.040	20%
Tunisia	24%	0.093	0.129	0.134	0.094	0.060	0.067	0.120	0.003	0.137	0.028	0.139	0.127	0.113	0.117	0.092	0.059	0.138	0.084	0.108	0.074	0%
Ukraine	14%	0.060	***-0.010***	***-0.002***	0.183	***-0.007***	0.112	0.040	0.039	0.175	0.019	0.108	0.145	0.202	0.097	0.203	0.246	0.216	0.169	0.039	0.120	15%
Uruguay	25%	0.036	0.119	0.116	0.027	0.129	0.094	0.063	0.097	0.107	0.083	0.129	0.039	0.095	0.118	0.143	0.141	0.078	0.093	0.102	0.078	0%
Viet Nam	20%	0.061	0.113	0.111	***-0.017***	0.113	0.069	0.123	0.055	0.128	0.039	0.168	0.171	0.129	0.144	0.112	0.153	***-0.001***	0.158	0.067	0.110	10%
Zambia	19%	0.082	0.131	0.142	0.076	0.202	0.041	0.159	0.041	0.023	0.047	0.199	0.130	0.139	0.201	0.080	***-0.004***	***-0.039***	0.136	***-0.026***	0.015	15%
Zimbabwe	19%	0.004	0.065	0.091	0.083	0.188	0.024	0.127	***-0.024***	0.032	0.042	0.192	0.138	0.147	0.180	0.055	***-0.136***	***-0.145***	***-0.113***	***-0.104***	***-0.118***	30%
% Negative		0%	2%	2%	**6%**	2%	4%	0%	4%	0%	0%	0%	0%	0%	0%	0%	**13%**	**23%**	**15%**	**13%**	**13%**	4.71%

Lecture Notes:

The third column denotes the proportion of variance explained by the first factor of the PCA. Each cell in the subsequent columns corresponds to the score associated with the item. Blank cells correspond to items that were not part of the survey in the country considered. Black cells highlights items with a negative score. The last column contains the percentage of negative estimates for each country, while the last line summarizes the same figure for each item. Grey cells in the lasts line and column highlight the cases described in the main text of the appendix.

Although these coefficients are expected to be positive, 4.7% are negative. This issue particularly threats the last five items, which are country specific (13-23% of negative values). I focus first on the countries where three or more items from the country-specific list have a negative contribution to the score.

- In Burkina-Faso, items 17-19 record owning a charrette, a work animal and a charrue. Such assets reflecting agricultural labour, the negative sign is natural. Items 16 and 20 concern the possession of a radio and mobylette (positive sign).
- In Swaziland, items 16-18 report accessing subsistence farming, owning a cattle, having chickens and proxy rural conditions, whereas items 19-20 indicate whereas the household employs somebody or owns a second home.
- In Zambia, items 16, 17 and 19 correspond to having a boat, housing someone that used to have a house, owning a livestock. While the two latter items can proxy poverty, I cannot explain the sign of item 16 (which contribution to the score remains very low: -0.004).
- In Kenya, Senegal and Zambia, I could not have access to the questions corresponding to negative values.

The 4th item (owning a bicycle) is negative in three low income countries: Kazakhstan, Swaziland and Viet Nam. Bike transportation might reflect poverty in the first two countries. Yet, although the magnitude of the coefficient is low (-0.017), this seems rather strange in Viet Nam where bicycle is a common transport mean.

Owning a stereo system influences wealth negatively (marginally compared to the other assets) in Burkina Faso and Côte d'Ivoire. I cannot provide any explanation to this. This is similar for item 8 "owning a video camera" in Mali and Zimbabwe. Yet, the item has a negligible impact on the scores.

I obtain a continuous index for each household. The scales of the indexes are country specific: the wealth of a household in a given country can be compared with that of another household from the same country, but not from another country. I therefore categorize households in their corresponding wealth index centile; or in their quintile as the present paper does.