Aid and poverty in Africa. Do well-being measures understate the progress?

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Abstract

In the last 15 years international aid donors to Africa have shifted their focus dramatically toward health and education; the share of social sector support in total aid rose from 33% to 60% from 1990-94 to 2000-04 alone. If this aid has been effective, it is unlikely to be captured in GDP or income poverty figures. This paper uses Demographic and Health Survey at multiple points in time for ten Sub-Saharan African countries to explore changes in well-being over time in the region. We compare the evolution of both assets and health that are considered as the two dimensions of the well-being. These dimensions are simultaneously estimated using the structural equation models with latent variables that have been developed in the psychometric literature. The comparisons of well-being across time in each country are based on the stochastic dominance analysis. The main results suggest that assets and health have been improved during the last two decades in most of these countries. A decline in assets is observed for three countries while health deteriorates in two countries. The reducing poverty in most cases appears to be explained less by the aid alone than other factors.

Key words: Poverty, foreign aid, assets, health, latent model, structural equation model, stochastic dominance.

JEL Classification: C12, C30, I10, I32, I35.

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1 Introduction

International aid for Africa has been substantially concentrated in health and education over the last 15 years; the share of social sector support in total aid rose from 33% to 60% from 1990-94 to 2000-04 alone (IDA 2007). Several studies have tried to capture the effectiveness of these aids on economic growth and poverty reduction. Some of these studies found no robust link between foreign aid and growth[1]. Even if Burnside and Dollar (2000) observed no evidence that the amount of aid has a direct impact on economic growth, they found nevertheless that its effectiveness depend on the quality of economic policies in the recipient countries. Their results have been criticized by other papers including Hansen and Tarp (2000; 2001). According to these papers the effect of interaction between aid and policies vanishes when alternative specifications are considered. Easterly, Levine, and Roodman (2004) reached similar results by extending the database used by Burnside and Dollar (2000). However, Collier and Dollar (2002), using the World Bank's Country Policy and Institutional Assessment (CPIA) as the measure of policy environment, strengthen Burnside and Dollar's findings. Other studies have focussed on the impact of aid on poverty reduction. Mosley, Hudson, and Verschoor (2004) found that aid allows to rise social expenditures, which may reduce monetary poverty. Collier and Dollar (2002) emphasized that even if the present allocation of foreign aid enables annually about 10 million people to get out of poverty, it is far from a poverty-efficient allocation. According to Verschoor and Kalwij (2006), the aid effectiveness might be increased if the recipient government improves social policies. Moreover, Gomanee, Morrissey, Mosley, and Verschoor (2005) shown that aid may reduce infant mortality. If, for most of the authors, the effectiveness of aid need a good policy and institutional environment, there are some other potential determinants. Knowing that aid is more volatile than domestic fiscal revenues (Bulír and Hamann 2007), Mosley and Suleiman (2007) argue that its ability for reducing poverty could be improved if its inflows are stable and directed towards pro-poor sectors. The previous studies are necessary to better the donator's decisions. For instance, by focusing priorities on the social sectors (education, health, sanitation, etc.), the donators meet the view of the United Nations' Millennium Development Goals (MDGs) that consider education, health and poverty reduction as major concerns. Despite the many optimistic views, some authors consider as a myth the idea that aid allowed African countries to reduce poverty. In fact, in a recent book, Moyo (2009) argues that not only billions of dollars of aid spent have not significantly improved the well-being of Africans, but rather they have worsened the situation. This reopens the debate on the role of aid in Africa, especially

[1]For instance see Boone (1996), Easterly, Levine, and Roodman (2004) and Rajan and Subramanian (2005)

since studies, later than Moyo (2009), continue to recognize aid as an important tool in the prospects of development of poor countries (Arndt, Jones, and Tarp 2009).

Did the choice to provide more aid to social sectors at the expense of economic infrastructure result in poverty reduction? Even when this redirection could affect short-run growth, it might directly contribute to decreasing poverty and extreme poverty. The main goal of this paper is to capture the impact of the shift in aid allocation on well-being and poverty in Africa, by using Sen's (1985; 1992; 1995) capabilities approach. This approach consider well-being as a multidimensional phenomenon rather than a unidimensional measure depending only on income. Indeed, well-being may be directly measured by observing, for each dimension or capability, several indicators representing achievements or functioning. Unlike the previous studies which focus mainly on the macroeconomic impacts of aid, this one intends to analyze its possible effects on multidimensional well-being at households level. However, some issues could arise with this approach.

The first is related to the selection of the dimensions. In practice, most of the researchers select the dimensions in a straightforward way, without explicit justification. Alkire (2008) emphasized nevertheless that these choices are implicitly based on at least one of the following five criterions: (i) existing data or authoritative convention; (ii) assumptions about what people value; (iii) public consensus; (iv) ongoing deliberative participatory processes; and (v) empirical evidence regarding people's value or behavior. To analyze the dynamics of well-being in Africa, two dimensions namely assets and health are considered. Their selection is motivated, not only by some of the above criterions (criterions (i) and (iii) mainly), but also by the fact that health is one of the social sectors that have received large amounts of aid.

The second issue raised by the multidimensional approach could come from the concern of selecting a suitable aggregating method. Several approaches have been explored in the well-being and poverty literature including the fuzzy set approach (Cerioli and Zani 1990; Cheli and Lemmi 1994; Chiappero-Martinetti 2006), the distance function method (Lovell, Richardson, Travers, and Wood 1994; Anderson, Crawford, and Liecester 2005; Deutsch and Silber 2005) and the entropy measures approach (Maasoumi 1993; Deutsch and Silber 2005). Other more statistically oriented approaches such as the inertia method and the factor analysis are also applied. For instance, Klasen (2000) used the principal component analysis for measuring poverty and deprivation in South Africa while Sahn and Stifel (2000) derived an asset index in some Africa Countries using factor analysis. These methods are theoretically relevant when the question is to aggregate many indicators in only one dimension. However, the question may often be to aggregate indicators in two or more capabilities representing various dimensions of well-being such as assets,

health, employment, etc. In that case, the previous methods might fail to capture the possible interdependencies between capabilities inherent in the simultaneous nature of their determination. Moreover, there are other exogenous variables that likely affect capabilities. For instance, one can consider the variables such as the household size and the place of residence (urban vs rural) which, by influencing the household's needs, could explain in a certain extent the well-being dimensions. The MIMIC (multiple indicators and multiple causes) models and structural equation models (SEMs), that have been developed in the psychometric literature, are suitable to deal with these issues[2]. Some applications of these methods are made in a recent well-being literature (Wagle 2005; Di Tommaso 2007; Krishnakumar 2007; Krishnakumar and Ballon 2008).

This paper aims to apply the same model to estimate the multidimensional well-being for several Sub-Saharan African (SSA) Countries at multiple points in time. The assessment goes beyond the one of the previous studies since our objective is to compare, in statistically robust way, the possible changes in well-being for each country. This will be done through the stochastic dominance analysis based on univariate and multivariate well-being distributions. This ordinal approach enables to avoid the issue of choosing the poverty lines that could matter in cardinal approach, especially with multidimensional measures. By allowing poverty comparisons valid for both a wide range of poverty lines and a broad class of poverty indices, this approach is also normatively robust in the sense that it reflects the well-being comparisons through time.

The remaining of this paper is structured as follows. The next section analyzes the trend, the sectorial distribution and the effectiveness of aid in SSA. Section 3 describes the general theoretical framework for choosing and estimating the capabilities. Section 4 presents the stochastic dominance techniques and the statistical method for testing them. The empirical applications consisting in Data description, capabilities estimations and dominance analysis are found in section 5. Section 6 concludes.

2 Foreign aid in Africa

2.1 Trends and sectoral distribution

Figure 1 shows the trend in the sectoral distribution (in percentage) of the Official Development Assistance (ODA) commitments in SSA from 1992 to 2005. The shares allocated to the education and health sectors appear to have increased significantly since

[2]For more details about these models, see Muthén (1983; 1984) and Krishnakumar and Nagar (2008)

the early 1990s. For instance, the share of social sector has dramatically risen from about 23% in 1992 to more than 40% in 2000s with a peak of nearly 50% in 2002[3].

Figure 1: The distribution (%) by year of sector ODA commitments in SSA, 1992-2005.

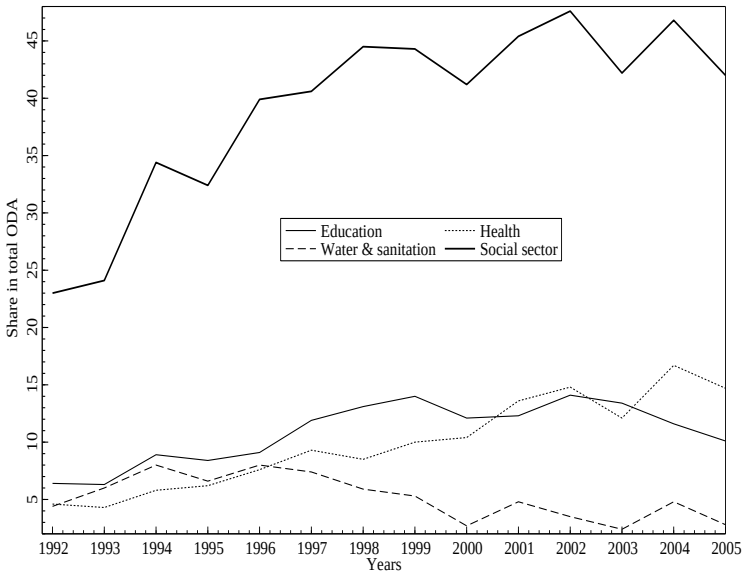
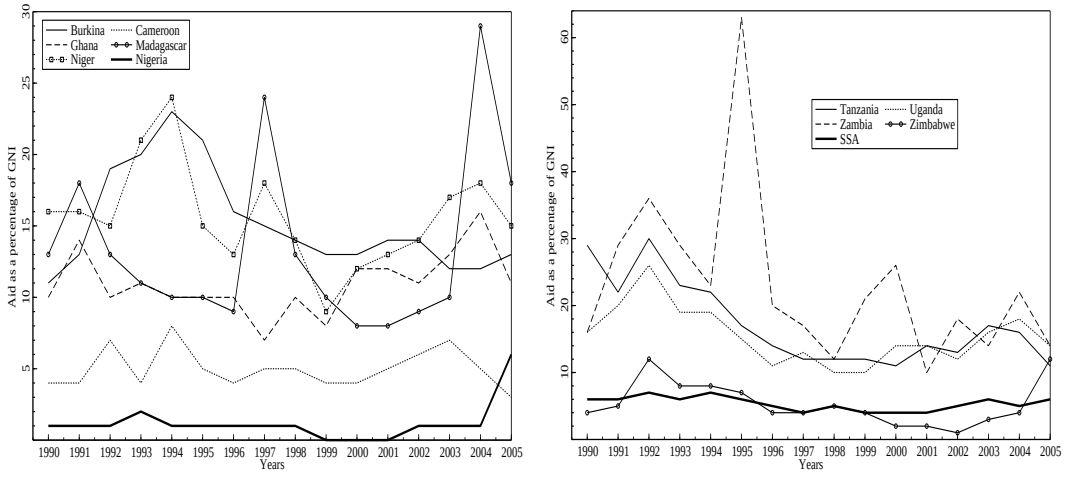


Figure 2 depicts the evolution of the ratio of aid compared to gross national income (GNI). For the whole SSA countries, the variations seem less marked and remain mainly characterized by a slight decline from the mid-1990s to the early 2000s where there is a slight rise.

Figure 2: Trends in aid to some African countries, 1990-2005.



The trend is less stable at our countries sample level. In fact, for most countries, there

[3]These numbers were computed by excluding, from the total aid amount, the component relative to debt.

is a change sawtooth. For example, the ratio of aid is around 10% except for 1991 (18%), 1997 (24%) and 2004 (29%) where peaks have been observed. These sharp rises may be explained mainly by a significant increase in ODA commitments for debt relief. The most striking example is the one of Zambia where the ratio of aid makes a jump to over 60% in 1995, due to the increase in ODA commitments for social sector and for debt relief.

In Burkina, aid has reached its highest levels in the mid-1990s, with a peak of 23% in 1994, which also appears to be the case of Niger, which has a similar economy. Both countries have experienced in 1995 a sharp increase in ODA commitments for social sector. Three countries have received relatively small amounts of aid compared to the GNI. These countries are Zimbabwe, Cameroon and Nigeria. Furthermore, in the latter country, the ratio of aid was 1% during 1990s. After that, it became almost nil from 1999 to 2001 before rising slightly and making a jump to 5% in 2005 due to ODA commitments for debt relief.

2.2 Aid and development outcomes

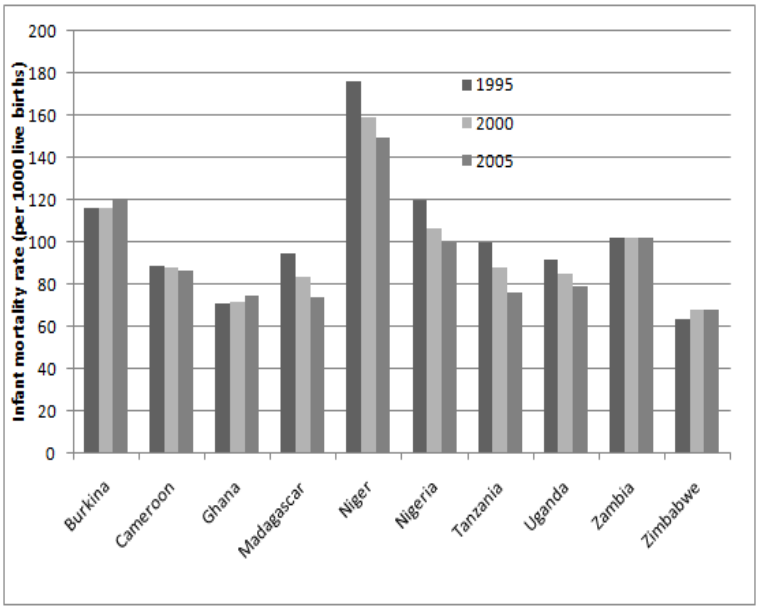
From the Figure 3, Niger has on average the highest infant mortality rate, followed respectively by Burkina, Nigeria and Zambia. However, it decreased gradually in the country between 1995 and 2005. The same pattern is observed for Madagascar, Nigeria, Tanzania and Uganda. The remaining countries are rather marked by stagnation and sometimes by a slight increase in infant mortality (Burkina, ghana and Zimbabwe). Is this evolution attributable to foreign aid?

Figure 4 depicts the evolution of infant mortality rate depending on the ratio of aid received. It can be observed that the amount of aid does not appear to have any impact on mortality. For instance, Niger has experienced a decline in mortality while the aid ratio, on average, has significantly decreased between the periods 1995-2000 and 2000-2005 and the previous period (1990-1995). The same could be observed in Uganda and Tanzania.

Furthermore, Zambia, whose the ratio of aid fell by more than half between the first and the third periods, experienced an almost stable mortality. Nigeria has known a decline in the mortality rate in spite of its low ratio of aid. Only Madagascar seems to display a gradual decrease of mortality consistent with the increase in aid.

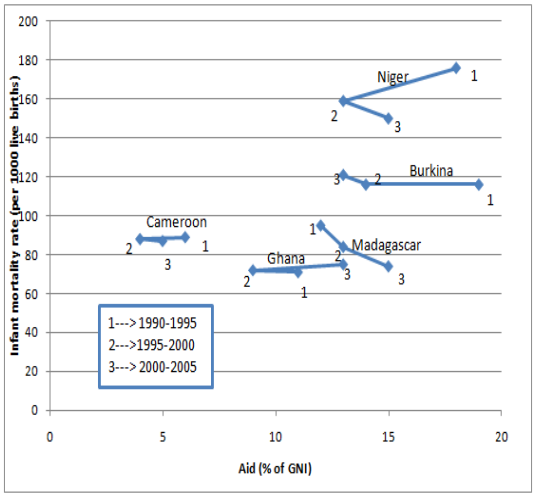
In fact, several reasons might explain the low correlation between aid and development outcomes. One of them is the phenomenon of aid fungibility, in the sense that it could be redirected by the recipient country toward sectors other than those originally provided in the commitments. According to Pettersson (2007), non-fungible aid, especially

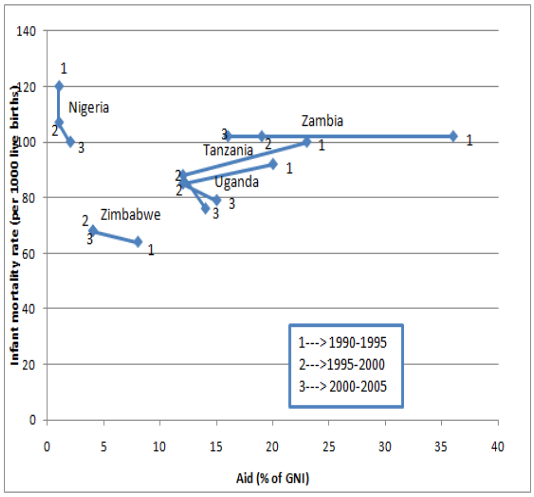
Figure 3: The comparisons of infant mortality in some SSA Countries.



those allocated toward pro-poor sectors, may allow to improve well-being, this is not the case for fungible aid.

Figure 4: Evolution of infant mortality in relation to aid ratio in some SSA Countries.





Another reason could be related to the kind of aid. For instance, Masud and Yontcheva (2005) show that, unlike bilateral aid, non governmental organizations (NGOs) aid reduces significantly infant mortality. Moreover, NGO aid is generally directed toward countries with high infant mortality such as Niger.

3 Theoretical framework

3.1 Choice of Dimensions

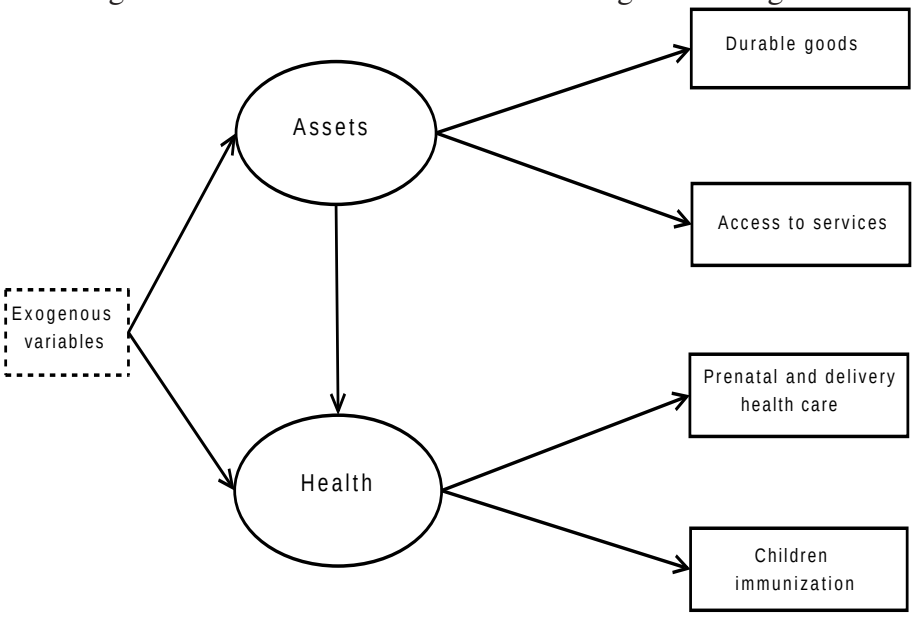
Two dimensions are retained to define the well-being, namely assets and health. The asset index is considered in some studies as a main dimension (Sahn and Stifel, 2000; 2003). Several indicators such as the possession of durable goods and the access to basic services are used to measure poverty in some African Countries. These standard indicators are also considered here for estimating the asset index. The second dimension is an index of health. A body health measure is defined as a dimension by Di Tommaso (2007) to study the well-being for a sample of Children from central states of India. Krishnakumar (2007) also distinguished health as an important dimension. Our health dimension concerns both mother's and child's health level. It is related not only to the mother's health care before and during the delivery, but also to the preventive health care of the child after the delivery. Although our approach is in phase with the MDGs and meets the concern of capturing the impact of the redirection in aid allocation, the choices of dimensions and theirs respective indicators are significantly influenced by our database.

3.2 Model specification

The estimation of the two dimensions will be done using the SEM approach with latent variables. Since all functioning indicators are expected to be dichotomous, the model is inspired by the one in Muthén (1983; 1984). The same approach is used by Krishnakumar and Ballon (2008) and Wagle (2005) for measuring the multidimensional poverty. This methodological approach is relevant since it takes account of the possible interdependencies between latent variables and, in so doing, settles the endogeneity issue. Moreover, it allows to include some exogenous variables susceptible to directly impact the latent variables.

Figure 5 presents the interrelationships between the variables of the model, namely the two latent variables (asset index and health), the observed endogenous variables representing the functioning, and the exogenous variables from structural equations. It is quite intuitive to assume that education, as exogenous variable, is likely to affect both the health level and the asset index. In the same way, one could expect a positive influence of asset on the health capability since a great wealth possession generally inclines individuals to better their health cares. On the other hand, a feedback effect of the health is not expected on the asset index in short and medium term. As in the specification used by Wagle (2005) and Krishnakumar and Ballon (2008), the present model consists of two sets of equations.

Figure 5: The multidimensional well-being model diagram



The first, a set of equations representing the structural model, defines each latent variable as a function of exogenous and other latent variables possibly. The second is also a set of equations called measurement model which links each observed endogenous variables with its respective latent variable.

The model is presented as follows:

$$\begin{aligned} f &= Bf + \Pi x + \epsilon \\ y &= \Lambda f + u \end{aligned} \tag{1}$$

The first equation in (1) is the SEM while the second is a measurement model. f is a (2×1) vector of latent capabilities containing f_1 and f_2, respectively assets and health. x is a $(q \times 1)$ vector of exogenous variables. Let m_1 and m_2 be the numbers of indicators respectively for assets and health, with $m = m_1 + m_2$. Then y is a $(m \times 1)$ vector of indicators. Π is a $(2 \times q)$ coefficient matrix of exogenous variables, B a (2×2) coefficient matrix of latent capabilities which captures their simultaneous nature and Λ a $(m \times 2)$ matrix of loadings relating y to f and emphasizing how capabilities influence the achievements. ϵ and u are respectively a (2×1) and a $(m \times 1)$ random vectors of residuals. Since the structural model is recursive, B is a lower triangular matrix of the form:

$$B = \begin{bmatrix} 0 & 0 \\ b_{21} & 0 \end{bmatrix}$$

In the presence of dichotomous indicators as in our case, we introduce an unobservable continuous response variables y_j^*, for each indicator $j = 1, ..., m$, that are linked with y_j as follows:

$$y_j = \begin{cases} 1 \text{ if } y_j^* \geq 0 \\ 0 \text{ if } y_j^* < 0 \end{cases} \tag{2}$$

The equation (1) becomes:

$$y_j^* = \lambda_j f + u_j \text{ with } j = 1, ..., m. \tag{3}$$

The following stochastic assumptions are made:

$E(\epsilon) = 0,$
$E(u) = 0,$
$V(\epsilon) = \Phi\,(2 \times 2)\,,$
$V(u) = \Psi\,(m \times m)\,,$

ϵ is uncorrelated with x and u while u is uncorrelated with x and f. Moreover, $I - B$ is not singular.

These assumptions allow to determine the covariance/correlation matrix of the observed variables y and x in terms of θ, where θ is a vector containing all the unknown parameter vectors and matrices of the model, that is B, Π, Λ, Φ and Ψ. The model is estimated once the identification is tested.

By assuming a multivariate normality for the distribution of f conditional on x, it is sufficient to consider the first and the second order moments. The estimating method will follow the Muthén's (1983; 1984) three-stage procedure described by Krishnakumar and Ballon (2008). This procedure uses weighted least squares to minimize the following fitting function:

$$F = \left[\widehat{\sigma} - \sigma(\theta)\right]' \Omega^{-1} \left[\widehat{\sigma} - \sigma(\theta)\right], \tag{4}$$

where $\widehat{\sigma}$ is the vector of sample estimates of $\sigma(\theta)$, obtained from the two by two correlations between the elements of f. $\sigma(\theta)$ is the corresponding vector to the theoretical covariance matrix. Ω is the optimal weighting matrix.

4 Estimating the stochastic dominance

4.1 Unidimensional orderings

Consider two distributions A and B with F and G as respective cumulative distribution functions (cdf_s). For a given set of variables of interest (for instance, income or any latent capability of the vector f), the cdf_s $F(z)$ and $G(z)$ give, at any level z, the proportions of individuals whose dotations in this variable are not greater than z, respectively for A and B.

Distribution B is said to dominate stochastically distribution A at first order if, for any level z, $F(z) \geq G(z)$. For instance, if z denotes a poverty line then this inequality means that the poverty in distribution A is at least as greater as the poverty in distribution B. When the focus is to compare two or more distributions through time (distributions drawn from the same population at multiple points in time) or through space (distributions from respective various populations across regions), the choice of any poverty line does not matter. By considering an ethically reasonable range of z, one may conclude that a distribution B dominates a distribution A in terms of poverty if, whatever the poverty line z choosen, the poverty remains greater in A than in B. This comparison is normatively robust since it closely involves the comparison between social welfare functions (SWF_s). We define a SWF as follows:

$$W = W(z) = W(z_1, ..., z_n), \tag{5}$$

where z_i is the level of the variable of interest for individual i from a n-size random sample. Rather than to specify a particular functional form SWF, it is possible to make partial orderings of distributions that represent various choices of SWF, by assuming some properties (Shorrocks 1983; Foster and Shorrocks 1988a). The first property is the Pareto principle or the monotonicity assumption which supposes that SWF is increasing in all its arguments. A second property is the symmetry or anonymity assumption for individuals who are considered as ethically equal. This assumption means that $W(z) = W(z')$, where z' is obtained from z by a permutation. A third property, the Pigou-Dalton principle or

Schur-concavity assumption, means that a mean-preserving and a rank-preserving transfers do not decrease welfare. Several authors have directly derived poverty dominance conditions with univariate distributions (Atkinson 1987; Foster and Shorrocks 1988a, 1988b). Duclos and Araar (2006) established an equivalence between welfare dominance, poverty dominance and the stochastic dominance simply based on the cdf and its integrals.

Now we can define the following sequence of functions:

$$D_F^1(z) = F(z) = \int_0^z dF(x),$$
and
$$D_F^s(z) = \int_0^z D^{s-1}(x)dx \text{ for } s \geq 2,$$

where s is the order of dominance.

Following Davidson and Duclos (2000), the above functions can be equivalently expressed as:

$$D_F^s(z) = \frac{1}{(s-1)!}\int_0^z (z-x)^{s-1}dF(x) \text{ for } s \geq 1. \tag{6}$$

Then, distribution B strictly dominates at order s distribution A if $D_F^s(z) > D_G^s(z)$ for all z. The strict dominance is preferred here in order to make unambiguous comparisons[4].

4.2 Multidimensional orderings

The dominance conditions in the previous subsection are extended here to bivariate distributions. Atkinson and Bourguignon (1982) have developed multidimensional stochastic dominance analysis, using the comparisons between expected social utility with many arguments. By assuming some standard properties[5] the poverty index needs to satisfy, some multidimensional poverty orderings conditions are derived (Bourguignon and Chakravarty 2002; Duclos, Sahn, and Younger 2006).

Consider two bivariate cdf_s $F(z_1, z_2)$ and $G(z_1, z_2)$, the related poverty indices are following:

[4]See for instance Davidson and Duclos (2006) and Batana and Duclos (2008).

[5]More details about these properties are provided by Bourguignon and Chakravarty (2002) and Tsui (2002).

$$P(F,z) = \int_0^{z_1} \int_0^{z_2} \pi(x_1, x_2; z_1, z_2) dF(x_1, x_2) \tag{7}$$

$$P(G,z) = \int_0^{z_1} \int_0^{z_2} \pi(x_1, x_2; z_1, z_2) dG(x_1, x_2). \tag{8}$$

x_1 and x_2 are two dimensions included in the analysis and z_1 and z_2, their respective thresholds. $\pi()$ is the individual poverty function. Its expression depends on the kind of poverty index retained. For instance, we consider the following two-dimensional extension of the well-known FGT poverty index (Foster, Greer, and Thorbecke 1984):

$$P_{s_1,s_2}(F,z) = \int_0^{z_1} \int_0^{z_2} (z_1 - x_1)^{s_1-1} (z_2 - x_2)^{s_2-1} dF(x_1, x_2). \tag{9}$$

s_1 and s_2 are the dominance orders and capture aversion to inequality in poverty for each of the two dimensions.

4.3 Dominance testing methods

Given the two distributions F and G, the dominance relations are tested by specifying the following null hypothesis of non dominance:

$$\begin{aligned} H_0 &: D_F^s(z) - D_G^s(z) \leq 0 \text{ for some } z; \\ \text{versus} & \\ H_1 &: D_F^s(z) - D_G^s(z) > 0 \text{ for all } z. \end{aligned} \tag{10}$$

That is a strict stochastic dominance testing where dominance unambiguously occurs when H_0 is rejected. The tests could be performed using the t-statistic approach (Duclos, Sahn, and Younger 2006) or the empirical likelihood ratio LR approach (Davidson and Duclos 2006; Batana and Duclos 2008)[6]. The procedure is the same in the bidimensional case, except that the threshold z becomes a pair (z_1, z_2).

[6]Both statistics are asymptotically equivalent as proved by Davidson and Duclos (2006).

5 Empirical results

5.1 Data and indicators selection

The Demographic and Health Surveys (DHS) provide the necessary data to analyze the evolution of the standard and quality of living in many countries in Africa. These surveys are nationally representative and are based on the same methodology. Ten countries are selected: Burkina, Cameroon, Ghana, Madagascar, Niger, Nigeria, Tanzania, Uganda, Zambia and Zimbabwe. Three rounds of DHS, called R1, R2 and R3, are considered for time comparisons. Table 1 provides details about countries and years of surveys.

For estimating the asset index f_1, several indicators are typically used: the ownership of durable goods (radio, television, refrigerator, bicycle, motorcycle, car) and the access to services and others (electricity, sanitation, drinking water, floor quality). These indicators were also selected by Sahn and Stifel (2000), Batana (2008) and Batana and Duclos (2008).

Table 1: Characteristics of samples from DHS

Country	Round1 (R1)		Round2 (R2)		Round3 (R3)	
	Years	Obs number	Years	Obs number	Years	Obs number
Burkina	1992-93	3600	1998-99	3178	2003	6411
Cameroon	1991	1965	1998	1663	2004	4263
Ghana	1993	1880	1998	2150	2003	2474
Madagascar	1992	3070	1997	2810	2003-04	3370
Niger	1992	3940	1998	3573	2006	5087
Nigeria	1990	4540	1999	2411	2003	3126
Tanzania	1992	4950	1996	3966	2004	5015
Uganda	1995	3608	2000-01	3601	2006	4417
Zambia	1992	3833	1996	3980	2001-02	3808
Zimbabwe	1994	2060	1999	2384	2005-06	3634

The health index f_2 is computed from information about prenatal and delivery health care (tetanus injections, prenatal consultation, delivery assist, place of delivery) and children immunization (BCG, DPT, polio and measles immunization). These last indicators along with those previously selected form the m elements of y, the vector of endogenous variables. The set of exogenous variables x includes education, household size and place of residence. The health level refers to the health care for both individuals and children while

the asset index concerns mainly the household welfare. Yet, we consider both an individual and his child as the unit of analysis.

The estimation of model (1) by minimizing the function in equation (4) allows to obtain $\widehat{f_1}$ et $\widehat{f_2}$ which are used for unidimensional and bidimensional comparisons across time. The estimation process includes, for each country, all the three rounds of surveys in an unique overall sample.

f_1 and f_2 are then normalized using the approach used for the human development index (Krishnakumar and Ballon 2008):

$$\widetilde{f^i} = \frac{\widehat{f^i} - min}{max - min} \tag{11}$$

$\widehat{f^i}$ is the estimated value ($\widehat{f_1}$ or $\widehat{f_2}$) for index i from the sample, and $\widetilde{f^i}$ is its normalized value. min and max are the extreme values for $\widehat{f_1}$ or $\widehat{f_2}$. Just for illustration, the results of structural equations model for Burkina are reported in the table 2. These results are almost the same for all countries. The causation of health by assets is confirmed as well as the relevance of the three exogenous variables (education, place of residence, household size).

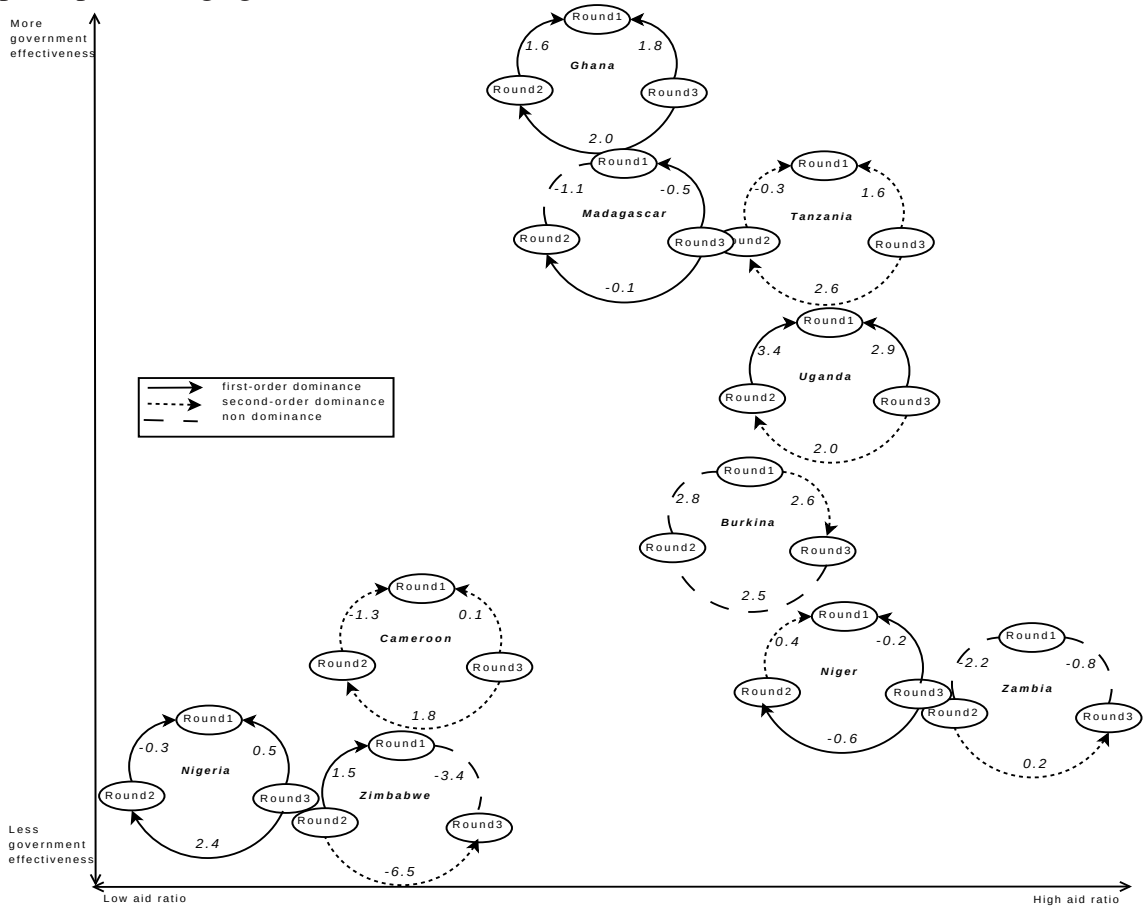
Table 2: Structural equations model results for Burkina

Variables	Asset index (f_1)		Health index (f_2)	
	Coefficient	P-value	Coefficient	P-value
Asset index (f_1)	–	–	0.117	0.000
Place of residence (x_1)	−2.199	0.000	−0.040	0.055
Education level (x_2)	0.128	0.000	0.012	0.000
Household size (x_3)	0.040	0.000	−0.004	0.000

5.2 Dominance relations results

As the share in international aid allocated to the social sector, especially to the health sector, has increased significantly since the mid-1900s, an expected outcome might be an improvement in health. However, the aid effectiveness could depend on several factors such as its regularity and intensity and the quality of economic policies (Burnside and Dollar 2000). According to Collier and Dollar (2002), the aid effectiveness could be also explained by the level of poverty.

Figure 6: Dominance in assets in relation with government effectiveness, aid ratio and GDP per capita average growth.

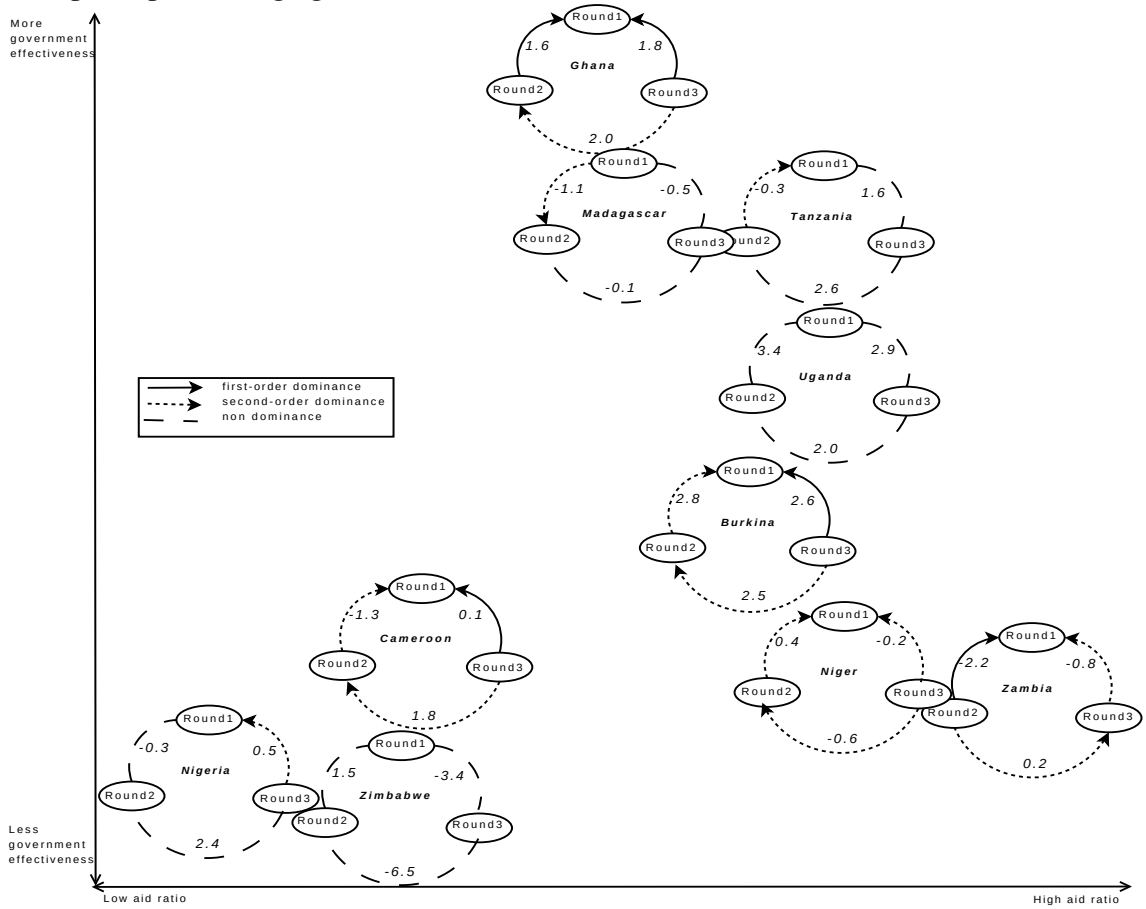


Figures indicate per capita average annual growth rates between rounds.

Figures 6, 7 and 8 show the welfare comparisons between three points in the time within ten SSA countries. These three points correspond to the three rounds of DHS mentioned in the preview subsection. The comparisons are done in relation with the ratio of aid and the government effectiveness. Ghana appears to be the country with the best government effectiveness while Nigeria and Zimbabwe are those with the worst. Both countries, in addition with Cameroon, are the lowest recipients of foreign aid in terms of the ratio of aid compared to national income. Moreover, Zambia and Niger receive large amounts of aid in spite of their low levels in government effectiveness. This means that these low levels are not necessary a barrier to the foreign aid. On the contrary, as suggested by Bräutigam and Knack (2004), high aid levels could be associated with declines in the quality of governance.

The comparisons in assets as the unique dimension of welfare is presented in the figure 6. Six countries, namely Cameroon, Ghana, Niger, Nigeria, Tanzania and Uganda, appear

Figure 7: Dominance in health in relation with government effectiveness, aid ratio and GDP per capita average growth.



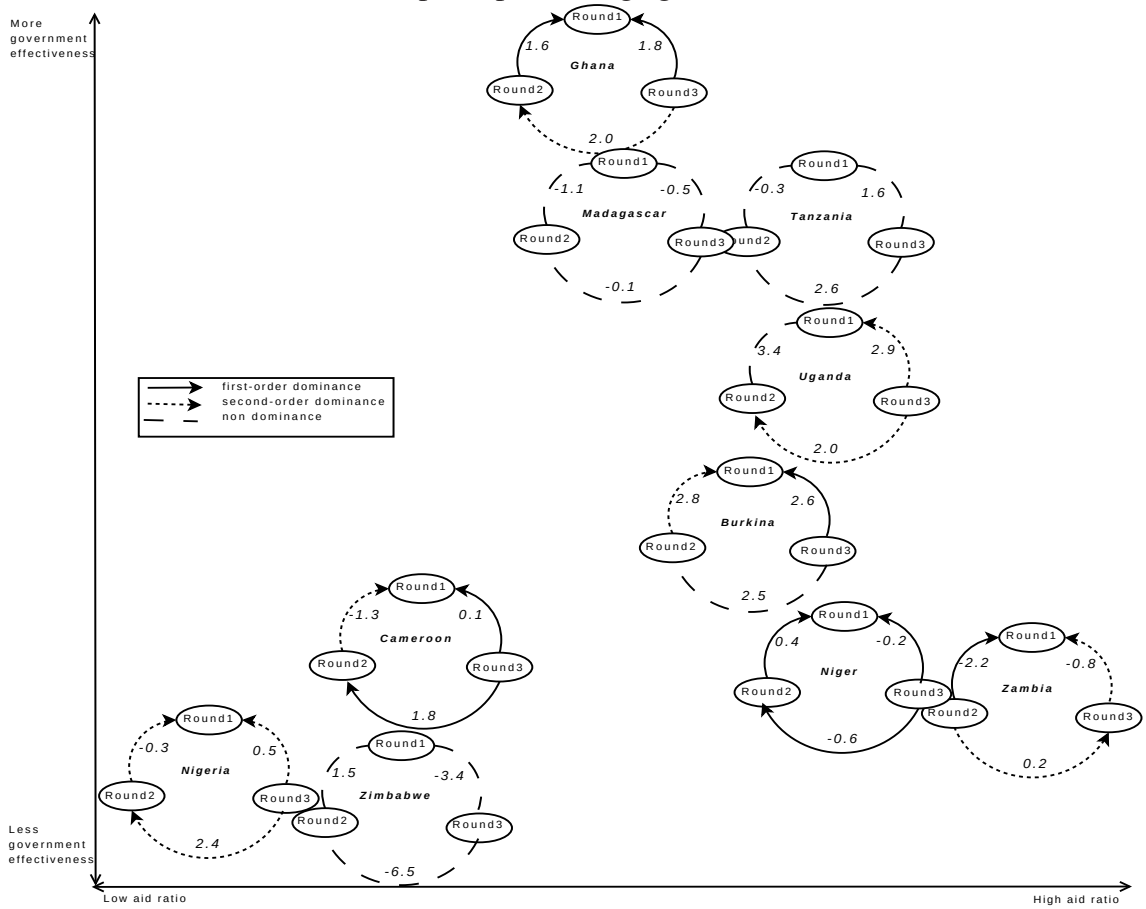
Figures indicate per capita average annual growth rates between rounds.

to have experienced a significant improvement in welfare during the three rounds. For Madagascar, round 3 dominates both rounds 1 and 2 while the non dominance is observed between the latter. The three remaining countries experienced rather declines in welfare between the first and the third round (Burkina), or between the second and the third (Zambia, Zimbabwe). The three countries are characterized by a low government effectiveness and a relatively high ratio of aid for Burkina and Zambia. However, Zimbabwe has been through an increase in welfare between the rounds 1 and 2 before the later decline likely due to the deterioration of the economical and political environment in the late 1990s. This is confirmed by the high negative growth rate (-6.5%) from the second round.

Figure 7 depicts the comparisons in welfare when health rather than assets is considered as the unique welfare dimension. This time, only four countries (Burkina, Cameroon, Ghana and Niger) have experienced a robust increase during the three rounds. An increase in well-being is obtained for Tanzania between round 1 and 2 only, and between round 1

and 3 only for Nigeria.

Figure 8: Multidimensional dominance (assets and health) in relation with government effectiveness, aid ratio and GDP per capita average growth.



Figures indicate per capita average annual growth rates between rounds.

Zambia has experienced a significant improvement in well-being during round 2 and 3 as compared to round 1. However, as in the asset case, a decline is observed between the second and the third rounds. Madagascar also knows a decline but between the first two rounds. Concerning Uganda and Zimbabwe, well-being seems unchanged during the three rounds.

Finally, bidimensional comparisons are performed using assets and health as both welfare dimensions. The well-being is then said to have increased or decreased between two rounds if, for each pair of thresholds for welfare (z_1, z_2), the proportion of individuals whose well-being is below (z_1, z_2) is always significantly higher in a round than in the other. Figure 8 illustrates the dominance analysis results. Cameroon, Ghana, Niger and Nigeria remain the countries where improvements are obtained between the three rounds.

In summary, seven out of the ten countries have improved the welfare from a round to another in terms of assets, health or both. Two of these countries (Nigeria and Cameroon) received low aids (in terms of ratio) and had a low government effectiveness. Two others (Burkina and Niger) received relatively high aids despite their low government effectiveness. The remaining countries (Ghana, Tanzania and Uganda) appear as those with the better relative government effectiveness. In Madagascar, we observe an improvement in the assets welfare during the third round compared to the other two, but a deterioration in health standards between rounds 1 and 2. Although the well-being significantly improved in Zambia since the first round, we note a relative decline in both assets and health since the second.

Moreover, the increase in well-being seems to be supported by the positive economic growth, during the three rounds, only in three countries (Ghana, Burkina, Uganda). Niger is characterized by low or even negative growth, which could suggest the possible role of NGOs aid in the decline observed in poverty (Masud and Yontcheva 2005). Despite the negative growth (-2.2%) that Zambia experienced between rounds 1 and 2, poverty (in health) has declined likely due to the aid received during this period. That is also the case for Cameroon. Madagascar is the only country whose average growth rate proved to be negative from a round to another. This had probably mitigated the effect of aid on welfare because, even if an improvement in assets is observed in the third round compared to the two others, there is a health deterioration between rounds 1 and 2.

Results generally show that ODA does not appear as a prominent determinant of well-being in Africa, since nothing suggests that countries which have received more aid had better outcomes in terms of poverty reduction. However, nothing in our study can also suggest that aid is useless. If, in its current form, aid created a legitimate skepticism (Moyo 2009), several studies show however that certain types of aid (eg via NGOs) can improve some dimensions of well-being and reduce poverty (Masud and Yontcheva 2005; Pettersson 2007).

6 Conclusion

The issue of aid effectiveness has always been a major concern in the literature of international development. While some studies find no correlation between aid and economic growth, others observe that it has helped reduce infant mortality in Africa and that more could be done if aid resources were allocated to pro-poor sectors. This led foreign donors to redirect aid to Africa mainly toward the education and health sectors since the 90s. A question that may arise therefore is whether this policy had the desired effect on the well-being and poverty reduction. The question becomes more acute since, in a recent book, Moyo (2009) argues that aid is ineffective, thus reviving the debate on that issue. Our study then aim to analyze whether changes in welfare in some SSA countries reflect the efforts of donors.

The results do not suggest that aid has contributed significantly to improve the well-being in Africa. In fact, seven countries, out of the ten considered, experienced a welfare improvement since the middle 90s. But, this improvement does not appear to be related neither to the amount of aid received, nor to the government effectiveness. However, these results could not lead to advocate the elimination of aid. Indeed, one can not deny that aid directed toward pro-poor sectors, through NGOs, may directly affect well-being. This may include, for example, to build schools or clinics in rural areas or to conduct vaccination campaigns with foreign assistance.

The point of view of Moyo (2009) can be understood in the sense that aid can not accomplish development in Africa. However, as recognized by Easterly (2007), despite the failures of aid, it could create opportunities for poor individuals by helping them to fill some particular needs in the areas of education, health and infrastructure. The debate on the issue of aid is far from over and will always be linked to development challenges. The questions on the dependence on aid, its duration and its true capacity to improve the welfare of beneficiaries will always arise. The recent financial crisis faced by developed countries suggests that Africa should not be dependent on foreign assistance to achieve its development goals.

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Appendices

Table A1: First-order dominance results for assets

Non dominance relations by country	Grids of variation for z_1	t-statistic
Cameroun		
R3 does not dominate R2	No restriction	0.466
Ghana		
R2 does not dominate R1	$]0.1 \quad 0.8]$	2.842***
R3 does not dominate R2	$]0.1 \quad 1[$	1.870*
R3 does not dominate R1	No restriction	2.070**
Madagascar		
R3 does not dominate R1	$[0.1 \quad 0.85]$	1.927*
R3 does not dominate R2	$[0.1 \quad 0.85]$	2.382***
Nigeria		
R2 does not dominate R1	$]0.1 \quad 0.8]$	2.700***
R3 does not dominate R1	$[0.05 \quad 0.8]$	4.970***
R3 does not dominate R2	$[0.05 \quad 0.8]$	1.708*
Niger		
R3 does not dominate R1	$[0.05 \quad 0.85]$	1.785*
R3 does not dominate R2	$[0.05 \quad 0.85]$	1.817*
Uganda		
R2 does not dominate R1	$[0.1 \quad 0.9]$	1.711*
R3 does not dominate R1	$[0.05 \quad 0.9]$	2.595***
Zimbabwe		
R2 does not dominate R1	$[0.05 \quad 0.85]$	4.872***
R3 does not dominate R1	$]0.1 \quad 0.9]$	1.272

Table A2: First-order dominance results for health

Non dominance relations by country	Grids of variation for z_2	t-statistic
Burkina		
R3 does not dominate R1	$[0.05 \quad 0.8]$	1.793*
R3 does not dominate R2	$[0.05 \quad 0.85]$	1.970**
Cameroon		
R2 does not dominate R1	No restriction	0.427
R3 does not dominate R1	No restriction	2.114**
R3 does not dominate R2	No restriction	1.272
Ghana		
R2 does not dominate R1	$[0.1 \quad 0.85]$	2.891***
R3 does not dominate R2	No restriction	1.334
R3 does not dominate R1	$[0.05 \quad 0.9]$	1.768*
Madagascar		
R1 does not dominate R2	$[0.1 \quad 0.8]$	0.464
R3 does not dominate R2	$[0.1 \quad 1[$	0.448
Tanzania		
R2 does not dominate R3	$]0.1 \quad 0.9]$	1.230
Zambia		
R2 does not dominate R3	No restriction	0.848
R2 does not dominate R1	$[0.05 \quad 0.85]$	2.427***

Table A3: Second-order dominance results for assets

Non dominance relations by country	Grids of variation for z_1	t-statistic
Burkina		
R1 does not dominate R3	No restriction	1.823*
Cameroon		
R2 does not dominate R1	[0.05 0.8]	1.774*
R3 does not dominate R1	No restriction	3.502***
R3 does not dominate R2	[0.1 1]	3.984***
Niger		
R2 does not dominate R1	[0.1 1]	2.429***
Tanzania		
R2 does not dominate R1	[0.2 1]	1.756*
R3 does not dominate R1	No restriction	3.734***
R3 does not dominate R2	No restriction	2.464***
Uganda		
R3 does not dominate R2	No restriction	4.584***
Zambia		
R2 does not dominate R3	No restriction	3.584***
Zimbabwe		
R2 does not dominate R3	No restriction	4.401***

Table A4: Second-order dominance results for health

Non dominance relations by country	Grids of variation for z_2	t-statistic
Burkina		
R2 does not dominate R1	$[0.05 \quad 0.8]$	1.277
Cameroon		
R2 does not dominate R1	No restriction	1.681*
R3 does not dominate R2	No restriction	6.497***
Ghana		
R3 does not dominate R2	$]0.05 \quad 1]$	1.754*
Madagascar		
R1 does not dominate R2	$]0.1 \quad 1]$	2.449***
R3 does not dominate R2	$]0.1 \quad 1]$	0.465
Nigeria		
R2 does not dominate R1	No restriction	1.488
R3 does not dominate R1	No restriction	2.356***
R3 does not dominate R2	No restriction	0.515
Niger		
R2 does not dominate R1	No restriction	9.185***
R3 does not dominate R1	No restriction	31.251***
R3 does not dominate R2	No restriction	20.864***
Tanzania		
R2 does not dominate R1	$]0.1 \quad 1]$	2.353***
R2 does not dominate R3	$]0.1 \quad 1]$	1.211
Zambia		
R2 does not dominate R3	$[0.1 \quad 1]$	1.741*
R3 does not dominate R1	No restriction	6.287***

Table A5: First-order bidimensional dominance results for both assets and health

Non dominance relations by country	Grids of variation for (z_1, z_2)	t-statistic
Burkina		
R3 does not dominate R1	$[0.2 \quad 0.7] \times [0.05 \quad 0.7]$	1.775*
Cameroon		
R3 does not dominate R2	$]0 \quad 1] \times]0 \quad 0.75]$	2.345***
R3 does not dominate R1	$]0 \quad 1] \times]0 \quad 0.75]$	3.208***
Ghana		
R2 does not dominate R1	$]0.1 \quad 1] \times]0.05 \quad 0.85]$	2.350***
R3 does not dominate R1	$]0 \quad 1[\times]0 \quad 1[$	1.868*
R3 does not dominate R2	No restriction	1.068
Niger		
R2 does not dominate R1	$]0.05 \quad 1] \times]0 \quad 0.7]$	2.840***
R3 does not dominate R1	$]0 \quad 1] \times]0 \quad 0.7]$	4.475***
R3 does not dominate R2	$]0 \quad 1] \times]0 \quad 0.7]$	3.171***
Zambia		
R2 does not dominate R3	$]0 \quad 1] \times]0 \quad 0.9]$	0.079
R2 does not dominate R1	$]0 \quad 1] \times]0 \quad 0.7]$	4.124***

Table A6: Second-order bidimensional dominance results for both assets and health

Non dominance relations by country	Grids of variation for (z_1, z_2)	t-statistic
Burkina		
R2 does not dominate R1	$]0.1 \quad 0.1] \times [0.05 \quad 0.8[$	1.900*
R3 does not dominate R2	No restriction	0.003
Cameroon		
R2 does not dominate R1	$]0 \quad 1]\times]0.05 \quad 1]$	1.948*
Ghana		
R3 does not dominate R2	$]0.1 \quad 0.1]\times]0.1 \quad 1]$	1.920*
Madagascar		
R2 does not dominate R1	No restriction	0.005
R3 does not dominate R1	No restriction	0.007
R3 does not dominate R2	No restriction	0.007
Nigeria		
R2 does not dominate R1	$]0.3 \quad 1]\times]0.05 \quad 1]$	1.730*
R3 does not dominate R1	$]0.05 \quad 1]\times]0 \quad 1]$	5.236***
R3 does not dominate R2	$]0.05 \quad 1]\times]0 \quad 1]$	2.947***
Tanzania		
R2 does not dominate R1	No restriction	0.001
R3 does not dominate R1	No restriction	0.001
R3 does not dominate R2	No restriction	0.001
Uganda		
R2 does not dominate R1	No restriction	0.006
R3 does not dominate R1	$]0.1 \quad 1]\times]0 \quad 0.8[$	3.556***
R3 does not dominate R2	$]0.1 \quad 1]\times]0 \quad 0.8[$	2.192**
Zambia		
R2 does not dominate R3	$]0.2 \quad 1]\times]0.1 \quad 1]$	1.746*
R3 does not dominate R1	$]0 \quad 1]\times]0.05 \quad 0.8]$	2.804***
Zimbabwe		
R2 does not dominate R1	No restriction	0.004
R3 does not dominate R1	No restriction	0.002
R3 does not dominate R2	No restriction	0.107