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## Rethinking aid for AIDS A public good approach

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## **Rethinking aid for AIDS – A public good approach**

### **Abstract**

This paper demonstrates why an increased quantity of funding as claimed by big health lenders is not effective to achieve Millennium Development Goal 6, stopping the spread of HIV by 2015. An alternative funding mechanism linking the disbursement of matching grants with a minimum provision level is suggested. In order to study the impact of conditional subsidies on the efficiency of international health-promoting public goods, non-cooperative multi-stage games are analyzed. In the participation stage, a subsidy which is contingent on some minimum provision level is determined. In later stages countries choose their contributions to a health-promoting public good and receive a subsidy if their supply is no less than a predetermined threshold. The analyses indicate that efficient provision levels can be achieved.

*JEL-Classification:* H87, F35, I18

*Keywords:* foreign aid, international organizations, international public goods, MDG 6

## 1. Introduction

The establishment of Millennium Development Goal 6 (MDG) to combat HIV/AIDS elevates the fight against AIDS to one of the highest development priorities in the world. Governments have renewed their promises to halt the spread of HIV by 2015 at a high-level event on the MDGs in October 2008 (UN, 2008a). Since countries are not on track towards achieving the MDGs, the World Health Organization (WHO) and other big health lenders have responded by calling for an increase in funds to strengthen health systems. Many institutions and funding mechanisms like the Global Fund to Fight AIDS, Tuberculosis and Malaria (henceforth, Global Fund), the International Finance Facility (IFF), and others have been established to collect additional resources (HM Treasury and DFID (2004, p. 2), Global Fund (2007, p. 9)).

Better-functioning health systems not only benefit recipients by improving capabilities to cope with the disease, but also yield to transnational benefit spillovers. Taking account the epidemiology of HIV, these public benefits stem from a reduced spread of HIV/AIDS and HIV-related contagious diseases like tuberculosis and other sexually transmitted infections (STIs) (Stillwaggon, 2006a, b). Moreover, AIDS is the leading cause of mortality among adults aged between 20 and 40 years (WHO 2004a, p. 2). Since this loss of life years is combined with an increased suffering of HIV-infected people, the financial burden of HIV/AIDS faced by low- and middle-income countries is huge compared to rich industrial countries. While the economic loss is valued at approximately 0.02 percent in the latter one, it varies between 6 and 53 percent in developing countries (Sonntag, 2010). Particularly, governments of Botswana, Namibia and South Africa bear the largest burden because of the highest national HIV prevalence rates among adults: 24.1 percent in Botswana, 19.6 percent in Namibia and 18.8 percent in South Africa are reported (UNAIDS, 2006). In Botswana, for example, more than half (53 percent) of the GNI is lost due to AIDS. It follows that a reduction of these burdens allows for a greater economic growth and may result in public benefits if resources triggered by HIV/AIDS can efficiently be reallocated.

In the recent years, public good characteristics of interventions addressing HIV/AIDS have been acknowledged by the international community and economists started to analyse the implications to the effectiveness of aid (Commission of the European Communities (2007, p. 52), International Bank for Reconstruction and Development and World Bank (2004, p. 25)). Causes of an inadequate supply of anti-HIV/AIDS programmes are attributed to missing incentives which follow directly from the public good characteristics, nonexcludability and nonrivalry (Teixeira 2006, Kaul 2005). Since experiences of the past indicate that scaling up

budgets seems not effective, a new approach of efficiency and resource allocation is needed as claimed by President Obama's 2011 World AIDS Day speech (The White House, 2011).

Multilaterals like the Global Fund recommend controlling the use of disbursed grants by different stakeholders acknowledging the risk of moral hazard (UNAIDS 2008, p. 27).<sup>1</sup> Motivated by the latest fund scandal in Uganda, where tens of millions of dollars in grants of the Global Fund have been requested for 400 non-existing non-governmental organizations, the primary propose of this paper is to offer an alternative funding mechanism encouraging transfer-receiving governments to reduce opportunistic behaviour before grant disbursement. Another key purpose here is to deepen the understanding of policymakers how international financial resources can be better tracked.

To foreshadow our results, the analysis indicates that mobilizing new financial resources to accelerate progress towards MDG 6 as recommended by multinational health lenders is only effective if two pivotal conditions are fulfilled. First, place high priority on recipients' own anti-HIV efforts. Linking aid to domestic programmes ensures aid effectiveness since gains from sitting back are hampered. Second, collaborate and coordinate funding policies on the donor side. Lacks in donor coordination cause information gaps between available and needed resources and impedes finally an increased amount of anti-HIV programmes.

The paper proceeds as follows: After outlining the baseline model, limits of aid effectiveness are addressed. Building on these results, an alternative funding mechanism ensuring higher effectiveness of subsidies compared to lump-sum transfers is developed. Furthermore, its strengths and weaknesses are discussed. Concluding remarks complete the paper.

## 2. Baseline Nash model

We consider a world of  $n$  countries. Each country maximises a strictly increasing and strictly quasi-concave utility function

$$U_i(y_i, G), \quad (1)$$

where  $y_i$  is country  $i$ 's private consumption which is used as numeraire and

$$G = g_i + \sum_{j \neq i} g_j \quad (2)$$

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<sup>1</sup> An empirical analysis about the effectiveness of ex-post rewards can be found in Dreher et al. (2012).

is the sum of country  $i$ 's and the others' contribution to a pure health-promoting public good. Curative health measures are examples of additive technologies. The overall level of treatment of HIV-positive patients depends on the sum of people who have been treated.<sup>2</sup> Similarly, the aggregated knowledge about HIV/AIDS accumulates with the amount of implemented anti-AIDS programmes (Sandler and Arce (2002, p. 207)). The more educational actions are carried out, the more people are educated about HIV and its transmission. Therefore, the stock of knowledge will be even larger.

Following the claim of the WHO and other big health lenders to mobilize new resources to overcome an inadequate supply of anti-HIV interventions, it is supposed that a subsidy has been instituted. A subsidy reduces the effective price per unit  $p_i$  that a subsidised country has to pay for a health-promoting public good. By defining that a subsidy is paid at the rate  $s$  with  $0 < s < 1$ , the price per unit can be expressed as  $\hat{p}_i = (1-s)p_i$ , where  $\hat{p}_i$  is the after-subsidy price. The budget constraint is given by:<sup>3</sup>

$$y_i + (1-s)p_i g_i = I_i, \quad (3)$$

where  $I_i$  represents country  $i$ 's income.

By excluding binding contracts and cooperative behaviour, non-cooperative behaviour is assumed and the subgame perfect equilibrium can be determined by maximisation of (1) subject to (2) and (3)

$$MRS_i = \hat{p}_i. \quad (4)$$

Country  $i$  provides a health-promoting public good up to the level where its marginal rate of substitution  $MRS_i$  equals its after-subsidy price  $\hat{p}_i$ . Equation (4) reveals a reduced right-hand side in contrast to the marginal condition for an interior optimum if a subsidy has not been disbursed ( $MRS_i = p_i$  for  $i = 1, 2, \dots, n$ ). To restore optimality, the left-hand side of (4) has to decline by an increasing the amount of the health-promoting public good  $G$ .

The analysis so far implies that conditional aid seems to be an effective policy tool to overcome underprovision. It possesses the potential to alter the equilibrium allocation of a public good. Warr's neutrality theorem (1982, 1983) indicating that an equilibrium allocation

<sup>2</sup> Note that treatment will be subject to exclusion if patients cannot pay high prices for anti-retroviral therapies (ART). Therefore, treatment is an impure health-promoting public good.

<sup>3</sup> As it is supposed that new resources are coming from outside, transfer-receiving countries are not taxed by a head tax.

of a public good cannot be altered by financing policies does not hold here. In contrast to a lump-sum transfer, a subsidy additionally causes a price effect which works in the same direction as the income effect. This results from the reduced marginal costs for the transfer-recipient. Therefore, the public good provision is higher than with a lump-sum transfer because of the price effect caused by the subsidy.

### 3. Limits of effectiveness

Funding new resources in form of matching grants, as recommended by the international community to respond to the fact that MDG 6 is not on track, seems effective. Yet, the mechanism will work only if a pivotal condition is satisfied. The model mentioned above implicitly supposes that the full amount of costs has to be covered. Funding gaps do not exist. This directly follows from (2),  $G = g_i + \sum_{j \neq i} g_j$ , if the costs of the public good are funded from outside the model as assumed here. Foreign assistance has to be large enough to subsidise each contribution to the public good  $g_i$  because the sum of these individual contributions determines the overall provision level  $G$ . However, if country  $i$ 's efforts are subsidised partially, a conditional transfer will only result in an income effect.

#### *Graphical treatment*

A graphical display facilitates the comparison between traditional conditional aid as claimed by multinational health lenders and our alternative funding mechanism. In Figure 1, the line  $y_i = h_i(G, p_i)$  represents country  $i$ 's income expansion curve before a subsidy has been received whereas the line  $y_i = h_i(G, \hat{p}_i)$  is country  $i$ 's income expansion curve after a subsidy. Country  $i$ 's expansion curve  $y_i = h_i(G, \hat{p}_i)$  is kinked at point  $D$ . This follows from the fact that the price reduction is only effective for the subsidised contributions  $g_i$ . However, if the financial support is utilised as in point  $D$ , the effective price per unit of further contributions to a health-promoting public good will not be reduced. As a result, only an income effect occurs while the price effect disappears.

**Insert Figure 1 about here**

The effective price-reducing effect is a reason why the neutrality theorem (Warr (1982, 1983)) does not hold here. It follows that conditional transfers become de facto unconditional

transfers in the absence of the price effect. The resulting implications on the public good provision level are particularly unfavourable in cases in which countries do not differ in productivity. The equilibrium allocation of a public good cannot be altered and, hence, the neutrality result applies. Underprovision of a health-promoting public good will not be solved because the countries' insufficient incentives for provision cannot be overcome. Even though productivity differentials among countries exist, subsidies do not seem preferable in comparison to lump-sum transfers. As a result of the disappearing price effect, the willingness of countries to provide a health-promoting public good falls because their effective prices are not reduced any further. As can be seen from Figure 1,  $y_i = h_i(G, p_i)$  is parallel to  $y_i = h_i(G, \hat{p}_i)$  after point  $D$  has been reached. Therefore, a subsidy does not result in a higher utility level than a lump-sum transfer.

Against this background, coordination problems among donors, i.e., an overlap of funding between organizations are fatal (Brainard et al. (2003, p. 7), Kanbur et al. (1999, p. 1)). In the field of HIV/AIDS, multilateral organizations like the WHO, the World Bank and UNICEF often support the same projects or programmes like several other agencies (Riddell (2007, p. 7)).<sup>4</sup> Since funding is duplicated on the one hand whereas the finance of other projects is not guaranteed on the other hand, sub-optimality cannot be overcome. Therefore, coordination is more than ever needed at the policy-making level, e.g., matching goals of multiple donors. However, an increase in funds without paying regard to the recipient side also fails. Opportunistic behaviour of transfer-recipients is well-known. Since additional funding depends on the current financial contributions of recipients, they have an incentive to demonstrate a low or even zero willingness to provide a health-promoting public good.<sup>5</sup> If multilaterals provide a larger amount of grants than necessary to close funding gaps, recipient countries can use these additional resources to increase their private consumption instead of transforming it into public good provision. Matching grants become de facto lump-sum transfers because the price effect disappears. In order to restrict strategic behaviour and, hence, to ensure the higher effectiveness of grants compared to lump-sum transfers, an alternative mechanism is developed.

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<sup>4</sup> As another example, Dreher et al. (2009) show that the allocation of aid provided by non-governmental organizations (NGOs) from various OECD countries gets clustered rather than complement official aid.

<sup>5</sup> Incentives to behave strategically will be limited if several rounds of financial support exist. If transfer-receiving countries use grants for other than the intended purposes, donors can reduce their financial commitments at the next round.

#### 4. An alternative subsidy mechanism

In this section, all assumptions are kept as above. However, a subsidy is now contingent on some minimum level of contribution. One can imagine that recipients have to cover the fixed costs of an anti-HIV programme before financial support is given by a multilateral organization. Therefore, contributions to a health-promoting public good will be subsidised only if a threshold has been surpassed. Otherwise, no conditional aid will be paid. Such a mechanism seems attractive because a threshold limits countries' incentives to act as free riders. Insufficient incentives in providing public goods are well-known reasons of underprovision (Sandler (1992, 1998)). Conditional aid in the form of subsidies is defined as:

$$s = \begin{cases} \tilde{s} & \text{if } g_i \geq \tilde{g}_i \\ 0 & \text{if } g_i < \tilde{g}_i \end{cases}, \quad (5)$$

where  $g_i$  is country  $i$ 's contribution to a health-promoting public good and  $\tilde{g}_i$  represents a threshold. In addition,  $\tilde{s}$  can be interpreted as the subsidy rate. Both  $\tilde{s}$  and  $\tilde{g}_i$  are announced by a multilateral organization.

##### *Graphical display*

The graphical treatment, introduced earlier, can be modified to allow for a subsidy which is conditional on a recipient's own provision level. A subsidy  $\tilde{s}$  will only be paid if country  $i$ 's contribution  $g_i$  is larger or equal to a threshold  $\tilde{g}_i$ ; otherwise,  $s = 0$  holds. Conditionality has been achieved by introducing a threshold. In contrast to the funding mechanism described above, a minimum threshold has to be met or surpassed before a subsidy is paid. This pivotal difference is illustrated in Figure 2 and can be explained as follows: country  $i$ 's new budget constraint  $I_i'$  has not turned to the left in the origin of the ordinates. Its budget constraint is kinked at point  $E$  which follows from (5). More precisely, country  $i$ 's budget constraint  $I_i'$  will possess the same slope like the budget constraint before a subsidy  $I_i$  if contributions to a health-promoting public good are lower than  $\tilde{g}_i$ . This follows from the fact that no financial support will be given if  $g_i < \tilde{g}_i$ . Yet, country  $i$ 's budget constraint  $I_i'$  becomes steeper from point  $E$  due to the price effect. As a further consequence, country  $i$ 's income expansion curve after a subsidy ( $y_i = h_i(G, \hat{p}_i)$ ) lies above  $y_i = h_i(G, p_i)$  after a threshold has been surpassed.



**Insert Figure 2 about here**

The efficiency of the mechanism depends on the critical value  $\tilde{g}_i$ . In order to determine  $\tilde{g}_i$ , the subsidy scheme is characterised as a two-stage game. Starting from a certain income distribution among the countries, a multilateral organization sets the subsidy rate equal for all, and the thresholds, one for each country in the participation stage (stage 1). Country  $i$  will only receive a subsidy if its contribution is larger or equal to the minimum contribution level in the expenditure stage (stage 2). Otherwise, a subsidy will not be funded by the multilateral organization. Solving backwards, country  $i$ 's maximisation problem is analyzed at first.

*Stage 2: Country  $i$ 's decision problem*

Whether or not a transfer-receiving country is willing to provide at least a threshold depends on the comparison between its utility received if a threshold has been met and its utility if it has not been met. Yet, if a threshold has not been surpassed country  $i$  must obtain at least the same utility level before the funding mechanism is implemented. Otherwise, conditional aid would be welfare-reducing.

If no subsidy is paid ( $s = 0$ ) country  $i$ 's contribution to a health-promoting public good will be  $g_i^* = \arg \max(I_i - p_i g_i, g_i)$ . Therefore, the utility in the initial Nash equilibrium can be expressed by  $U_i^N = U_i(I_i - p_i g_i^*, g_i^*)$ .

*Stage 1: A multilateral organization's choice of a threshold*

First, we consider  $\tilde{g}_i = 0$ . An introduction of a threshold does not have any impact because the financial support is not contingent on a minimum contribution level. Therefore,  $(g_1^*, g_2^*, \dots, g_n^*)$  represents the Nash equilibrium. The same holds if  $\tilde{g}_i < g_i^*$ . Such a threshold does not influence the equilibrium allocation as it is too low. Next, we consider the case  $\tilde{g}_i \geq \max\{g_i\}$ , where  $\max\{g_i\}$  represents the largest feasible provision level of a health-promoting public good among all countries. Due to the fact that the threshold is too large, the new Nash equilibrium can be represented by  $(g_1^*, g_2^*, \dots, g_n^*)$ .

*Proposition 1:* If there is a vector  $(\tilde{g}_1, \tilde{g}_2, \dots, \tilde{g}_n)$  such that  $\max\{g_i\} \geq \tilde{g}_i \geq g_i^*$  for each country  $i$ , then  $(\tilde{g}_1, \tilde{g}_2, \dots, \tilde{g}_n)$  is a Nash equilibrium.

*Proof*<sup>6</sup>: First, no country  $i$  provides less than the threshold. If  $g_i$  is reduced below the threshold, a country will not receive any subsidy and obtain its utility in the initial Nash equilibrium  $U_i^N$ . Country  $i$  can increase its welfare by providing  $g_i \geq \tilde{g}_i$  and thus obtain a subsidy  $\tilde{s}$ . Second, no country  $i$  provides more than the threshold. By assuming that both goods are normal, no country can increase its utility by providing more than a threshold. This follows from the equation (2)  $G = g_i + \sum_{j \neq i} g_j$ . Contributions to a health-promoting public good are perfect substitutes. Consequently,  $\tilde{g}_i$  is the best response for each country  $i$ . Moreover, this Nash equilibrium is Pareto-efficient. The following Lagrange function is considered:

$$L = U_j(I_j - p_j g_j - s p_i g_i, G) + \lambda [U_i(I_i - (1-s)p_i g_i, G) - U_i^N], \quad (6)$$

where  $\lambda$  is the Lagrange multiplier on the utility constraint and  $s p_i g_i$  determines the amount that a multilateral organization has to pay to country  $i$ . By using the fact that  $g_j + g_i = G$  and rearranging yields

$$\frac{\partial U_j / \partial G}{\partial U_j / \partial y_j} + \frac{s - \frac{p_j}{p_i}}{s-1} \frac{\partial U_i / \partial G}{\partial U_i / \partial y_i} = p_j. \quad (7)$$

Financial support is provided until the sum of the marginal rates of substitution between a health-promoting public and a private good equals the price per unit  $p_j$ . Equation (7) is just a modified Samuelson condition (Samuelson (1954, p. 387; 1955, p. 354)). The term  $\left(s - \frac{p_j}{p_i}\right)(s-1)^{-1}$  corresponds to the Samuelson condition for any  $p_j = p_i$ . In contrast to Samuelson's condition which is applied to one country, equation (7) is dependent both on the rate of subsidy and on a real exchange rate  $\frac{p_j}{p_i}$  which determines the international exchange of a health-promoting public good between two agents and thus, it is the rate at which a public good of one agent can be traded for that of another.

Equation (7) indicates that financial support which depends on a minimum provision level can result in Pareto-optimality. This follows from the fact that the recipient country does not

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<sup>6</sup> The proof is similar to Proposition 3 in Andreoni (1998, pp. 1194 ff).

possess an incentive to reduce its efforts because its own contribution to the public good determines whether or not a subsidy will be paid by a multilateral organization.

### **5. Discussion: Strengths and weaknesses**

The idea to link financial support to a threshold or a baseline is not new. However, it is pioneering to apply it to the field of health. This approach is comparable to the subsidy scheme of the Global Environmental Facility (henceforth, GEF) which was established by the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP) and the World Bank as a financing mechanism in the context of global environmental concerns (UNDP, 2007b). Weaknesses compared to our subsidy scheme result from the assumption that the threshold is based on current efforts and not on a minimum provision level. As a consequence, the financing mechanism of the GEF is not incentive-compatible. To circumvent this behaviour, we have assumed that the baseline is contingent on a minimum level of provision. Financial support will only be given if a threshold has been surpassed. In contrast to the GEF's financing mechanism, the implementation of a threshold  $\tilde{g}_i$  prevents a multilateral organization from becoming de facto the single financing institution while transfer-receiving countries act as free riders. A minimum provision level has to be met to receive financial assistance.

It is obvious that the implementation of this subsidy scheme is linked with some problems. The effectiveness of the mechanism depends on the ability to determine a threshold similar to the scheme of the GEF. After its determination, it has to be monitored whether a minimum provision level has been surpassed or not. With respect to the height of a threshold, it seems plausible to set  $\tilde{g}_i$  equal to the fixed costs in producing a health-promoting public good. Based on the experiences of the past, it is easy to calculate costs for technical assistance and administration. More difficulties arise if recipient countries do not meet a minimum provision level because of missing capacity. It is hard to decide whether it is politically justifiable to reject financial support if countries cannot fulfil the prerequisite. Refusing international assistance may not be an adequate penalty. Therefore, the introduction of several levels of sanctions is more appropriate.

## 6. Concluding remarks

The prospects graduating from the HIV/AIDS crisis are bleak; it seems that MDG 6 cannot be achieved in most developing countries by 2015. Experiences from the past indicate that the establishment of new financing mechanisms which are initiated to close funding gaps is not entirely effective.<sup>7</sup> Repeated pledges at international conferences to finance the implementation of anti-HIV programmes are not sufficiently binding. Governments that acquit themselves of their promises are not sanctioned since no enforcing authority exists. Our analysis has demonstrated that an increased funding will only be effective if the coordination of multiple donors does not lack. Otherwise, conditional aid becomes de facto unconditional. The same line of reasoning holds for opportunistic behaviour. As long as governments have not recognised that the implementation of national anti-HIV programmes benefits themselves and thus, aid is not target to increase national health programmes to combat HIV/AIDS, an increased funding is not effective. Therefore, this paper offers an alternative subsidy mechanism that reduces the incentive of transfer-recipients to behave opportunistically. In contrast to the mechanism of the Global Fund, opportunistic behaviour will be reduced before financial resources are disbursed. Governments do not gain from sitting back because its own anti-HIV effort determines whether or not financial resources will be received.

These findings provide some scope for further research. Acknowledging the criticism that pure health-promoting public goods are not dominating in the real world, the consequences of an increased funding in the case of joint products have to be analyzed. Joint products are some of the most prevalent kinds of public goods in the field of health. In contrast to pure public goods, joint products are health measures which yield more than one output and that can vary in its degree of publicness. For example, health measures as immunising or training health care workers result in country-specific and transnational benefits. If a country immunises its population, people will be less contagious and, hence, a disease's incidence will be reduced in the implementing region (Sandler and Arce (2002, p. 205)). In addition, the risk to transmit a disease abroad is lower.

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<sup>7</sup> Dreher et al. (2007) provide a nice overview how bi- and multilateral donors have prioritised aid in line with the MDGs in the past. They conclude that higher aid to achieve the MDGs will not have the desired effects if targeting aid will not be improved.

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**Figure 1 - Income effect**



**Figure 2 - An alternative subsidy mechanism**