Samaritan Agents

Rune Jansen Hagen[*]

Paper prepared for NCDE-2. Very preliminary - please do not quote

May 5, 2003

Abstract

Should an altruistic donor delegate the responsibility for allocating its aid budget to an agent that is less poverty-oriented than itself in order to alleviate the Samaritan's Dilemma that it is facing? Despite the intuitive appeal of this proposition, suggested by Svensson (2000), I show that in some cases it is optimal to do exactly the opposite. That is, delegating aid policy to an agent that is more poverty-oriented increases the degree to which the donor's objective are fulfilled.

1 Introduction

Donor countries distribute foreign aid to recipient countries in two main ways: directly or indirectly through intermediaries such as the World Bank. Most transfers are made bilaterally even though there are many arguments why multilateral aid may be more efficient. Firstly, it is often claimed that multilateral aid is less politically charged than bilateral aid (c.f. Cassen 1994). If this is the case, it should be more effective in generating poverty-reduction and growth in recipient countries. And empirical studies such as Rodrik (1995) and Alesina and Dollar (2000) do support this claim: multilateral aid is much less influenced by the strategic and commercial interests that govern the aid allocations of the large donor countries. Secondly, pooling their resources may allow donors to take advantage of economies of scale in information acquisition. More knowledge about the factors driving economic development in general as well as more country-specific knowledge should make for better aid policies. Thirdly, joining ranks may allow donors to more effectively pressurise recipient country governments that pursue ill-adviced or self-serving policies into adopting measures that will better serve the needs of their citizens. Fourthly, as in many other strategic contexts, delegating policy to an agent may allow donors to avoid problems of dynamic inconsistency. Specifically, delegation may help altruistic bilateral

[*]Department of Economics, Norwegian School of Economics and Business Administration, Helleveien 30, 5045 Bergen, Norway. E-mail: rune.hagen@nhh.no.

donors alleviate their Samaritan's Dilemma; the strategic adaptation of behaviour by recipient country governments in the expectation that donors will rush in to satisfy the needs that recipients leave unfulfilled.[1]

In this paper, I concern myself with this last issue. Svensson (2000) has suggested that delegating aid policy to an agent that is less poverty-oriented than themselves may result in better outcomes from the perspective of altruistic donors. I show that it is not in general true that an altruistic donor would choose an agent that is less poverty-oriented than itself. In fact, for some parameter values, it is optimal to delegate policy responsibility to an agent that is more poverty-oriented than the donor. The reason is that ex post, the allocation of aid tends to favour recipient countries where the productivity of aid is high. This means that the disincentive to domestic investment caused by the ex post aid allocation mechanism is stronger in low-productivity countries. However, these are the countries where investment is most valuable due to the large amount of aid that would be required in order to generate an equivalent increase in total income. Therefore, it is optimal to pick an agent that favours these countries more strongly than the donor, i.e., one that seeks to equalise incomes to a greater extent than the donor would if it was in charge of executing policy.

The model is outlined in the next section, where the optimal aid allocation and investment in the recipient countries are presented as well. In section 3, the results for the delegation decision that I have derived so far are presented. Section 4 presents a preliminary conclusion.

2 The Model

Consider the following three stage model. In the first stage, an aid donor may delegate aid policy to a hand-picked agent. This means that the responsibility for allocation the donor's fixed aid budget tbetween two recipient countries, L and H, is left to the agent. In the second stage, the recipients simultaneously choose how much to invest, taking into account both the direct returns to investment and the indirect effects that investment has on total income in stage 3 through its impact on the allocation of aid.

2.1 Ex post optimal aid allocation

The donor's preferences over the consumption levels in these two countries are[2]

$$W^D = U^D(C_L) + U^D(C_H) = \frac{(C_L)^{1-\eta^D}}{1-\eta^D} + \frac{(C_H)^{1-\eta^D}}{1-\eta^D};\ \eta^D > 0;\ \eta^D \neq 1. \quad (1)$$

[1] For applications of the Samaritan's Dilemma to foreign aid, see Pedersen (1996, 2001) or Svensson 2000.

[2] The logarithmic case, which is the limit of the objective function in 1 as $\eta \to 1$, is left for future revisions of the paper.

$\eta^D = -\frac{C_j U_{cc}}{U_c}$ is the elasticity of marginal utility. It is also a measure of the degree to which the donor is concerned with the distribution of consumption between the two recipients. The higher η^D is, the stronger is the inclination to smooth differences in consumption levels, other things being equal. I will speak of this parameter as the donor's degree of poverty-aversion.

In stage 3, the donor seeks to maxise this objective function subject to the following constraints

$$A_L + A_H \leq A; \tag{2a}$$
$$C_j = Y_j + \gamma_j A_j; \; j = L; H: \tag{2b}$$

That is, transfers to the two recipients cannot exceed the total aid budget. The consumption of each recipient is the sum of the income generated domestically and aid times the productivity of aid, γ_j. The productivity of aid, which is also the marginal impact of aid on consumption, might differ between the two recipients. For simplicity, I assume that it is constant.

Inserting these constraints into the objective function and taking the derivative with respect to A_L yields the following first-order condition for an optimal aid allocation:

$$\frac{\partial W^D}{\partial A_L} = (C_L)^{-\eta^D}\gamma_L - (C_H)^{-\eta^D}\gamma_H = 0: \tag{3}$$

From this condition, a first result is readily apparent:

Result 1

If $\gamma_L = \gamma_H$, the optimal ex post aid allocation is not a function of η^D.

That is, if aid is equally productive in the two recipient countries, the degree of poverty-aversion does not matter for the optimal split of the aid budget. The reason is that then the donor would always want to equalise consumption levels, i.e., have $C_L = C_H$.

From now on, I assume that $\gamma_L < \gamma_H$. Thus, aid is more productive in terms of generating consumption in recipient country H. It is not too strenuous to calculate that the optimal allocation is then

$$A_j^D = \Lambda_j^D (A + y) - y_j; \; j = L; H; \tag{4}$$

where $\Lambda_j^D = \frac{(\gamma_j)^{\frac{1-\eta^D}{\eta^D}}}{(\gamma_L)^{\frac{1-\eta^D}{\eta^D}} + (\gamma_H)^{\frac{1-\eta^D}{\eta^D}}}$ is the optimal share of total available resources measured in aid equivalents, $A + y$, going to j and $y_j = \frac{Y_j}{\gamma_j}$ is the domestic income of j measured in this way. In essence, the donor "confiscates" the domestic incomes of the recipients and returns a fraction of their combined incomes plus the aid budget.[3] Obviously, $\Lambda_H^D = 1 - \Lambda_L^D$, so that in the following we need only look at the share going to L. For future reference, note that

[3] I assume that the aid budget is always large enough to ensure an interior solution, i.e., that $A_j^D \geq 0$, $j = L; H$ regardless of the level of Y_j.

$\frac{\partial \phi_L^D}{\partial \eta^D} > 0$.[4] That is, the share going to L is increasing in the degree of poverty aversion of the donor. This is because L has the lowest level of consumption. The optimal levels of consumption are :

$$C_j^D = Y_j + \gamma_j A_j^D = \gamma_j \phi_j^D (A + y)\,;\; j = L, H. \tag{5}$$

As may be deduced directly from 3, $\frac{C_H^D}{C_L^D} = \left(\frac{\gamma_H}{\gamma_L}\right)^{\frac{1}{\eta^D}}$. Thus, H has the highest level of consumption regardless of the value of η^D.[5] However, the ratio $\frac{C_H^D}{C_L^D}$ is smaller the higher η^D is, as the donor is then more willing to sacrifice some of the overall power of aid in terms of raising the combined consumption levels in the recipient countries in order to have a more equal distribution of consumption between them. This is Result 2:

Result 2

ϕ_L^D is monotonically increasing in η^D.

We now turn to the decision problem facing the recipients.

2.2 Investment in the recipient countries

In stage 2 of the game, recipients choose investment levels in order to maximise the discounted value of their total income:

$$E - I_j + \delta\left(Y_j + \gamma_j A_j\right). \tag{6}$$

That is, investment is financed from an endowment of E, with investment generating a stage 3 domestic income of $Y_j = f(I_j)$, the value of which is discounted by a factor of δ. $f(I_j)$ is assumed to be of the form $(I_j)^{\beta}$, with $0 < \beta < 1$, so that the function is strictly increasing and concave.

Note that the recipients are assumed to be identical at this stage. However, recipients act strategically, taking into account the fact that the aid they receive in stage 3 is a function of the income they generate themselves. From (4) and (5), it is easily derived that

$$\frac{\partial C_j^D}{\partial Y_j} = 1 + \gamma_j \frac{\partial A_j^D}{\partial Y_j} = \phi_j^D\,;\; j = L, H. \tag{7}$$

That is, since $\frac{\partial A_j^D}{\partial Y_j} = \frac{1}{\gamma_j}\left(\phi_j^D - 1\right) < 0$, recipients see themselves as collecting only a fraction of the stage three returns to investment. As long as $\phi_L^D \neq \frac{1}{2}$, which is the case for $\eta \neq 1$, L and H experience different aid-adjusted returns

[4] This is most easily seen by calculating the effect of η on $\hat{\phi} = \frac{\phi_L^D}{1 - \phi_L^D} = \left(\frac{\gamma_L}{\gamma_H}\right)^{\frac{1-\eta^D}{\eta^D}}$, which is increasing in ϕ_L. Taking logs, one finds that $\frac{1}{\hat{\phi}}\frac{\partial \hat{\phi}}{\partial \eta^D} = -\frac{1}{(\eta^D)^2}\ln\left(\frac{\gamma_L}{\gamma_H}\right)$, which is positive since $\gamma_L < \gamma_H$.

[5] This is not the case in terms of aid equivalents. $\frac{C_H^D/\gamma_H}{C_L^D/\gamma_L} = \frac{\phi_H^D}{\phi_L^D}$. If $\eta^D > 1$ $\phi_L^D > 0.5$, and so this ratio is less than one.

to investment and will therefore invest different amounts even though they are identical in all respects save the productivity of aid. The first-order condition for optimal investment is

$$-1 + \delta\phi_j^D \beta (I_j)^{\beta - 1} = 0; j = L, H; \tag{8}$$

yielding

$$I_j^D = \left(\delta\beta\phi_j^D\right)^{\frac{1}{1-\beta}}; j = L, H. \tag{9}$$

This leads to underinvestment compared to the case without aid, when recipients keep the full returns to their investment: $I_j^D < (\delta\beta)^{\frac{1}{1-\beta}}$. This is the version of the Samaritan's Dilemma the donor is facing here; its effort to increase the consumption levels of the recipient countries ex post undermines their own efforts. They are in effect taxed at a rate $1 - \phi_j^D$ through the aid allocation mechanism, a portion of the increase in domestic income generated by investment being transferred to the other recipient country. Conscious of this, recipients reduce their investment levels, the result being that the level of resources available for consumption at stage three goes down. Naturally, the less they are taxed, the more they invest: $\frac{\partial I_j^D}{\partial \phi_j} > 0$. However, as a greater share going to one recipient inevitably means less to the other $y = y_L + y_H = \frac{1}{\gamma_L}\left(\delta\beta\phi_L^D\right)^{\frac{\beta}{1-\beta}} + \frac{1}{\gamma_H}\left(\delta\beta\left(1 - \phi_L^D\right)\right)^{\frac{\beta}{1-\beta}}$ need not increase. It turns out that the properties of total recipient incomes measured in aid equivalents as a function of ϕ_L^D depends critically on β:

$$\frac{\partial y}{\partial \phi_L^D} = \begin{cases} \left(\frac{\beta}{1-\beta}\right)\left[\frac{\rho_L}{\phi_L^D} - \frac{(\rho - \rho_L)}{1 - \phi_L^D}\right](A + y); & \beta \neq \frac{1}{2}; \\ \delta\beta\left(\frac{1}{\gamma_L} - \frac{1}{\gamma_H}\right); & \beta = \frac{1}{2}. \end{cases} \tag{10}$$

If we start with the case $\beta = \frac{1}{2}$, we see that y is then a strictly linearly increasing function of ϕ_L. As already noted, aid is less productive in L, but the other side of that coin is that a unit gain in the domestic income of L generates a greater increase in y than a corresponding gain in Y_H. This simple fact turns out to be very important for the question of what kind of agent the donor would like to delegate aid policy to, since the effect on y is the efficiency effect of shifting responsibility to an agent with other distributional preferences.

Things are slightly more complicated when $\beta \neq \frac{1}{2}$. In the expression for $\frac{\partial y}{\partial \phi_L^D}$, $\rho = \frac{y}{A+y}$ is the share of generated by the recipients themselves and ρ_L is the corresponding share for recipient L. $\frac{\partial y}{\partial \phi_L^D} = 0$ when the expression in square brackets is equal to zero. This is the case for $\phi_L = \frac{\rho_L}{\rho}$. The second derivative of y with respect to ϕ_L^D is

$$\frac{\partial^2 y}{\partial \left(\phi_L^D\right)^2} = \left(\frac{\beta}{1-\beta}\right)\left(\frac{\beta}{1-\beta} - 1\right)\left[\frac{\rho_L}{\left(\phi_L^D\right)^2} - \frac{(\rho - \rho_L)}{\left(1 - \phi_L^D\right)^2}\right](A + y) \tag{11}$$

We see that sign $\frac{\partial^2 y}{\partial(\pi_L^D)^2}$ = sign $\left(\frac{\beta}{1-\beta} - 1\right)$. Hence, $\frac{\partial^2 y}{\partial(\pi_L^D)^2} \gtreqless 0 \Leftrightarrow \beta \gtreqless \frac{1}{2}$. So far I have investigated the case $\beta < \frac{1}{2}$. y is then a strictly concave function of π_L^D and therefore $\pi_L^D = \frac{\rho_L}{\rho}$ is a maximum.[6] However, tedious but straightforward calculations show that sign $\frac{\partial y}{\partial \pi_L^D}$ = sign $\left[\left(\frac{\gamma_L}{\gamma_H}\right)^{\frac{\beta(2-\theta^D)-1}{\theta^D(1-\beta)}} - 1\right]$. As $\gamma_L < \gamma_H$, this implies that $\frac{\partial y}{\partial \pi_L^D} \gtreqless 0 \Leftrightarrow \beta \lesseqgtr \frac{1}{2-\theta^D}$. Consequently, for $\beta < \frac{1}{2}$ $\frac{\partial y}{\partial \pi_L^D} > 0$ for all possible values of π_L^D. That is, for such parameter values, the maximum of y is never attained. I summarise these findings in result 3:

Result 3

For $\beta < \frac{1}{2}$, y is a strictly increasing and concave function of π_L^D.

We are now in a position to investigate whether the donor at stage 1 would like to leave the responsibility for allocating A in stage 3 to an agent with preferences that differ from its own.

2.3 The Delegation Decision

In stage 1 of the game, the donor makes the delegation decision. That is, it decides whether to relieve itself of the task of executing aid policy in stage 3 by delegating the responsibility to an agent, and if so, what type of agent it would like to pick. The choice will be made knowing that the agent will be free to pursue an aid policy that satisfies its preferences. The solution will be an allocation of aid of the form shown in 4, with only the share of total available resources going to L being different. Since this share is monotonically increasing in θ, c.f. Result 1, the optimal choice of agent, which amounts to picking some θ^M, can be reduced to picking π_L^M. Therefore the donor's problem is

$$\mathrm{Max}_{\pi_L^M}\ W^D = \frac{\left[\gamma_L \pi_L^M (A+y)\right]^{1-\theta^D}}{1-\theta^D} + \frac{\left[\gamma_H \left(1-\pi_L^M\right)(A+y)\right]^{1-\theta^D}}{1-\theta^D}; \quad (12)$$

taking into account the fact that y is a function of π_L^M through the effect it has on investment in stage 3.[7]

The first-order condition for a maximum is

[6] When $\beta > \frac{1}{2}$, y is a strictly convex function of and so $\pi_L = \frac{\rho_L}{\rho}$ is a minimum. This makes it more complicated to determine whether the second-order conditions for the optimal choice of agent is satisfied. However, I intend to investigate this case in future revisions of the paper.

[7] For simplicity, the donor is assumed not to care about the resources recipients control in stage 2, i.e., $E - I_j$. One way to interpret this is that the donor sees the amount not invested as a waste, perhaps because it is consumed by the elite of the resipient countries only.

$$\frac{\partial W^D}{\partial \phi_L^M} = \left(C_L^M\right)^{-\eta^D}\frac{dC_L^M}{d\phi_L^M} + \left(C_H^M\right)^{-\eta^D}\frac{dC_H^M}{d\phi_L^M} \tag{13}$$

$$= \left(C_L^M\right)^{-\eta^D}\left\{\gamma_L\left[A + y + \phi_L^M\frac{\partial y}{\partial \phi_L^M}\right] + \left(\frac{\gamma_L}{\gamma_H}\right)^{-\frac{\eta^D}{\eta^M}}\gamma_H\left[\left(1-\phi_L^M\right)\frac{\partial y}{\partial \phi_L^M} - (A+y)\right]\right\} = 0.$$

Here we have made use of the fact that in stage 3, $\frac{C_L^M}{C_H^M} = \left(\frac{\gamma_L}{\gamma_H}\right)^{\frac{1}{\eta^M}}$. Also note that changing ϕ_L^M has both a distributional effect and an effect on total available resources in stage 3. An increase in ϕ_L^M obviously entails a gain for recipient L, while H loses $A + y$ at the margin. Whether the efficiency effect is positive or negative depends on the sign of $\frac{\partial y}{\partial \phi_L^M}$.

At the optimum, the expression in curly brackets must be zero. It may be rewritten as

$$\left(\frac{\eta^D - \eta^M}{\eta^M}\right)\ln\left(\frac{\gamma_L}{\gamma_H}\right) = \ln\left[\frac{A + y + \phi_L^M\frac{\partial y}{\partial \phi_L^M}}{(A+y) - \left(1-\phi_L^M\right)\frac{\partial y}{\partial \phi_L^M}}\right]; \tag{14}$$

which implicitly defines η^{M*}. From the results derived in the last sub-section, we know that for $\beta \leq \frac{1}{2}$ $\frac{\partial y}{\partial \phi_L^M} > 0$. This means that the expression in square brackets on the right-hand side is greater than 1, and so its logarithm is positive. Since $\gamma_L < \gamma_H$, the sign of the left-hand side is the negative of the sign of $\frac{\eta^D - \eta^M}{\eta^M}$. Therefore, at the optimum, $\eta^D < \eta^{M*}$. In other words, the optimal agent is more concerned with poverty than the donor, not less.

The second-order condition confirms that for $\beta \leq \frac{1}{2}$, we have found a maximum. The second derivative of the donor's objective function with respect to ϕ_L^M is

$$\frac{\partial^2 W^D}{\partial \left(\phi_L^M\right)^2} = -\eta^D\left(C_L^M\right)^{-\eta^D-1}\left(\frac{dC_L^M}{d\phi_L^M}\right)^2 - \eta^D\left(C_H^M\right)^{-\eta^D-1}\left(\frac{dC_H^M}{d\phi_L^M}\right)^2 \tag{15}$$

$$+ \left(C_L^M\right)^{-\eta^D}\frac{d^2C_L^M}{d\left(\phi_L^M\right)^2} + \left(C_H^M\right)^{-\eta^D}\frac{d^2C_H^M}{d\left(\phi_L^M\right)^2}$$

The first two terms can be seen to be negative. The second-order derivatives of stage 3 consumption with respect to the share allocated to L are

$$\frac{d^2C_L^M}{d\left(\phi_L^M\right)^2} = \gamma_L\left(2\frac{\partial y}{\partial \phi_L^M} + \phi_L^M\frac{\partial^2 y}{\partial\left(\phi_L^M\right)^2}\right); \tag{16a}$$

$$\frac{d^2C_H^M}{d\left(\phi_L^M\right)^2} = \gamma_H\left(\left(1-\phi_L^M\right)\frac{\partial^2 y}{\partial\left(\phi_L^M\right)^2} - 2\frac{\partial y}{\partial \phi_L^M}\right). \tag{16b}$$

We know that if $\beta = \frac{1}{2}$, $\frac{\partial^2 y}{\partial (\Gamma_L^M)^2} = 0$. Using 16a and 16b the last two terms of 15 then become $\left(C_L^M\right)^{-\delta^D} \gamma_L 2 \frac{\partial y}{\partial \Gamma_L^M} \left[1 - \left(\frac{\gamma_L}{\gamma_H}\right)^{\frac{\delta^D - \delta^M}{\delta^M}} \right]$. For $\delta^D < \delta^{M*}$, this expression is negative. When $\beta < \frac{1}{2}$, $\frac{\partial^2 y}{\partial (\Gamma_L^M)^2} < 0$, so clearly $\frac{\partial^2 W^D}{\partial (\Gamma_L^M)^2} < 0$ in this case too. Result 4 is therefore confirmed:

Result 4

When $\beta \leq \frac{1}{2}$, the optimal agent is more concerned with poverty than the donor itself.

The intuition behind this result is that redistributing towards L increases the amount of resources available in stage 3. Starting at $\delta^M = \delta^D$, this positive effect outweighs the negative effect from distorting the distribution of consumption according to the donor's preferences, which is negligible. As δ^M is moved away from δ^D, the cost in terms of a distorted distribution increases, which eventually makes it optimal to stop increasing δ^M. The end result is that policy is delegated to an agent more poverty-averse than the donor itself.

3 Preliminary Conclusions

It is known from analyses of the Samaritan's Dilemma in the context of aid that the intervention of an altruistic donor might produce counterproductive effects through strategic recipient behaviour. Svensson (2000) has suggested that the problem might be alleviated by delegating aid policy to an agent that is less poverty-averse than the donor. This result is intuitive, and, moreover, in line with other delegation results in political economy, e.g. the benefits from delegating monetary policy to a central bank that cares relatively less about unemployment and more abour inflation than society does. I show that in the simple model used here, the result of Svensson (2000) does not apply for at least some parameter values. That is, the donor would like to delegate aid policy to an agent that is more poverty-averse than itself, because this will spur investement in the recipient where the productivity of aid is the lowest and therefore increases in domestic income most valuable. I intend to investigate the results for the remaining parameter values (i.e., $\beta > \frac{1}{2}$ and $\delta = 1$) to see if this surprising conclusion still holds up.

4 References

References

[1] Alesina, A. and D. Dollar (2000): "Who Gives Foreign Aid to Whom and Why?" Journal of Economic Growth 5: 33-63.

[2] Cassen, R. et al: Does Aid Work? 2nd edition, Clarendon Press, 1994.

[3] Pedersen, K.R. (1996): "Aid, Investment and Incentives." Scandinavian Journal of Economics 98: 423-38.

[4] Pedersen, K.R. (2001): "The Samaritan's Dilemma and the Effectiveness of Foreign Aid." International tax and Public Finance 8: 693-703.

[5] Rodrik, D. (1995): "Why Is there Multilateral Lending?" Annual World Bank Conference on Development Economics.

[6] Svensson, J. (2000): "When Is Foreign Aid Policy Credible? Aid Dependence and Conditionality." Journal of Development Economics 61: 61-84.