Encouraging Trade Liberalization:
Theoretical and Empirical Analysis of Foreign Aid as Prize

By

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Abstract

We examine how foreign aid can be used to induce a recipient country to engage in trade-policy reforms. First, we develop a two-country and two-period theoretical model where the donor's promise of aid in period 2 depends on the recipient's chosen tariff in period 1. Without aid, optimal tariff is positive because of the presence of lobbying in the recipient country. We consider three variants of the model depending on whether the donor government is passive or active, and, when the donor government is active, whether the two governments move simultaneously or sequentially. When the donor government is active, it optimally chooses the degree of *ex-post* conditionality on aid. We find, *inter alia*, that if a passive donor government increases the level of *ex-post* unconditional aid, or decrease the degree of *ex-post* conditionality, optimal tariff goes up. Using a panel data, we then examine if there is any evidence for the *ex-post* conditionality of aid, and how this conditionality has affected the effectiveness of aid. We find some positive evidence on both counts.

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1 Introduction

Whether we like it or not, most donors do impose conditions on foreign aid (see, for example, Radelet, 2006).[1] Have the imposed conditions on aid increased the effectiveness of aid? This is a moot point. Devarajan et al. (2001), for example, found that in many cases conditional aid hampered the recipient countries from pursuing better policies and they became passive with donor countries dictating their policies. Burnside and Dollar (2000) and Collier and Dollar (2002) implicitly suggested that foreign aid should be used to persuade recipients to follow good policies as they found that aid is effective only in countries with good policies. Many economists object to such conditions for aid allocations because the link between policies and aid effectiveness is yet to be clarified (see, for example, Svensson, 2003 and Baliamoune-Lutz and Mavrotas, 2009). In fact, Hansen and Tarp (2001) and Easterly (2003) showed that the Burnside-Collier-Dollar results were very sensitive to model specifications and sample selection.

There is also a debate on whether conditionalities can be effectively implemented. Many studies have found that, for all intents and purposes, aid is fungible (see, for example, Pack and Pack, 1993; Boone, 1996; Feyzioglu et al., 1998; and Swaroop et al., 2000).

With these in mind, we consider a way of disbursement of aid where conditionalities on aid may be easier to implement. In fact, it does not put any explicit conditions for aid and allows the recipient government to pursue any policy it sees fit. However, good policies are rewarded *ex-post*. That is, aid is given as a prize after the policy regime pursued by the recipient country has been observed. We also focus on a very specific policy, *viz.*, trade policy in the form of tariff on imports, rather than a broad mix of policies as in, for example, Burnside and Dollar (2000).

[1] For a review of the literature on conditional aid, see Lahiri and Raimondos-Møller , 1997; Dalgaard and Hansen, 2001; Hansen and Tarp, 2000; Svensson, 2003; and Easterly, Levine, and Roodman , 2004.

We do so by developing a two-good, two-period, and two-country model of international trade. In period 1, the recipient country decides on the optimal level of tariff on imports. In the absence of any terms-of-trade effect, which we rule out with the assumption that the two economies are small open ones, the optimal tariff in our framework is positive because of special interest politics. In particular, we assume that owners of capital lobby the government for the imposition of tariff and the recipient government takes such lobbying into account in its political support function. The donor country is assumed to be altruistic toward the recipient and it decides on the level of disbursement of aid in period 2, which is negatively related to the level of tariff imposed by the recipient country in period 1. In particular, we assume a linear relationship with a component (intercept) that is not related to the level of tariff. Within this broad framework, we consider three alternative scenarios depending on whether the donor government is passive or active, and, when the donor government is active, whether the two governments move simultaneously or sequentially.

The main idea for the model presented in this study comes from the theoretical paper by Sayanak and Lahiri (2009) where aid is given as a prize and is related to poverty reductions. Lahiri et al. (2002) investigate how foreign aid and trade policies impact the welfare of the recipient and the donor country when aid and tariff are both endogenously determined, but in the same time period. In Lahiri and Raimondos-Møller (1997), aid is directly tied to tariff reforms but, once again, in a single-period framework.

We also test empirically if aid has in fact been disbursed in the past as a prize for trade policy reforms, and if such *ex-post* conditionality, if any, had implications for aid-effectiveness.

Empirical studies on the effectiveness of foreign aid can broadly be classified into three types of findings: foreign aid works (see for example Dalgaard and Tarp, 2001 and Hansen and Tarp, 2000); foreign aid does not work (see for example Bulir and Lane, 2002 and Rajan and Subramanian, 2005); and foreign aid works under some conditions (Burnside and Dollar,

2000 and Collier and Dollar, 2002).[2]

Most empirical studies acknowledge that the relationship between growth and aid can run both ways and efforts have been made to accommodate the endogeneity of aid in growth regressions. We do the same in this paper. In addition, we also consider the endogeneity of aid appearing via its interdependence with tariff with a lag, as in our theoretical analysis.[3] By doing so, we shall be able to empirically test if aid has indeed been used as an *ex-post* prize for trade-policy reforms, and if so, whether that has contributed to the effectiveness of aid.

The organization of this paper is as follows. Section 2 gives a detailed description of the theoretical framework. In subsection 2.1, we analyze the case where the donor is passive. In subsection 2.2 and 2.3, both the donor and the recipient are active and act simultaneously and sequentially respectively. Section 3 takes up the empirical analysis. In section 4, some concluding remarks are made.

2 The Theoretical Framework

There are two periods and two countries, called a recipient country and a donor country. The donor country gives an amount of aid F in period 2. There are many goods, but we focus on one importable good in the recipient country which is subject to tariff at an ad-valorem rate τ in period 1. We shall also call this the first good. The international price of this good is denoted by p and the prices of the rest of the goods are given by the vector P. Both countries are assumed to be small open economies so that p and P are exogenously given. The production side of the recipient country is given by two revenues functions, one for each period: $R^1\left[p\left(1+\tau\right), P, \overline{L}, \overline{K}\right]$ and $R^2\left[p, P, \overline{L}, \overline{K}+I\right]$ where $\overline{L}$ is the labor stock

[2]For a detailed review of the literature on foreign aid, see Lahiri, 2006 and McGilivray et al., 2006.

[3]The interdependence between aid and trade has also been considered by McGilliray and Morrissey, 1998; Osei et al., 2004; and Lloyd et al., 2000, albeit in a different conceptual framework.

in both periods, $\overline{K}$ is the initial capital stock in period 1, and I is investment in period 1 which is added to the capital stock in period 2. The consumption side is represented by the intertemporal expenditure function $E\left[p\left(1+\tau\right), P, \rho p, \rho P, U^r\right]$ where U^r is the intertemporal utility function of the recipient country and ρ is the recipient discount factor.[4] The following two equations describe the equilibrium in the recipient country.[5]

$$E\left[p\left(1+\tau\right), P, \rho p, \rho P, U^r\right] + I = R^1\left[p\left(1+\tau\right), P, \overline{L}, \overline{K}\right] + \rho R^2\left[p, P, \overline{L}, \overline{K}+I\right] + \tau p\left(E_1 - R_1^1\right) + \rho F, \tag{1}$$

$$\rho R_4^2\left[p, P, \overline{L}, \overline{K}+I\right] = 1. \tag{2}$$

Equation (1) is the intertemporal budget constraint of the recipient country where the left-hand side is the intertemporal total expenditure (consumption plus investment) and the right-hand side is the intertemporal total income. The first term on the right-hand side represents the first period total factor income and the second term is the discounted factor income for the second period. The third term is the tariff revenues from importing the first good in period 1 and the fourth term is the discounted amount of foreign aid. The second equation determines the optimal level of investment in the economy and is obtained by setting $\partial U^r/\partial I = 0$. The left-hand side of (2) is the marginal benefit of one unit investment in period 1, *i.e.*, the present value of the return on investment. The right-hand side is the marginal cost of investment in the sense of consumption foregone in period 1. The above two equations determine the variables U^r and I in terms of F and τ.

We now turn to the donor country which is assumed to be altruistic toward the recipient country. Hence, they derive satisfaction from giving aid to the recipient country. At the beginning of period 1, the donor makes a promise to give aid, which will be disbursed in

[4]Revenue (expenditure) functions are convex (concave) in prices. For a good, the partial derivative of the revenue (expenditure) function with respect to the price of the good gives the supply (compensated demand) of the good. For more properties of the revenue and expenditure functions, see Dixit and Norman (1980).

[5]For a function $f(\cdot)$, we denote by f_i the partial derivative of f with respect to the ith argument.

period 2. The donor's promise of aid is based on the following formula:

$$F = \alpha - \beta\tau, \tag{3}$$

that is, aid has two components: a fixed component α and a variable component $-\beta\tau$, which decreases with the tariff rate τ. That is, the recipient country is rewarded *ex-post* in period 2 if it lowers its trade protection level in period 1.

The donor's utility level U^D is given by

$$U^D = V\left(Y - \frac{F}{1+\gamma}\right) + \mu U^r, \tag{4}$$

where V is the indirect utility function with $V' > 0$ and $V'' < 0$, γ is the donor's exogenous discount rate, Y is the donor's intertemporal gross income, which we assume to be fixed, and μ is the altruism parameter.

The next step is to consider the donor and the recipient actions. For this purpose, we consider situations depending on whether the donor is passive or active. When the donor is passive, the recipient government chooses τ optimally and the donor does not optimize anything. When the donor is active, it chooses the conditionality parameter β optimally. The latter case has two sub-cases. In the first, the donor and the recipient act simultaneously and in the second they move sequentially: the donor first and then the recipient. These cases will now be analyzed in the following subsections.

2.1 Passive Donor

In this case, the recipient country optimally chooses its tariff rate τ. We assume that in choosing τ the recipient government is lobbied by the owners of capital and, rather than maximizing utility U^r, it maximizes a political support function S given by:

$$\underset{\tau}{Max} \quad S = U^r + \theta\left[R_4^1\overline{K} + \rho R_4^2\left(\overline{K} + I\right)\right], \tag{5}$$

where θ is the extra weight the government places on the income of the lobby group.[6]

In order to derive the first-order condition for the recipient government's optimization problem (5), let us first of all totally differentiate (1) and (2) to obtain:[7]

$$(E_5 - \tau p E_{15})\ dU^r = [\tau p^2(E_{11} - R^1_{11}) - \rho\beta\ ]\ d\tau + \rho\ d\alpha - \rho\tau\ d\beta \tag{6}$$

$$R^2_{44}\ d\left(\overline{K} + I\right) = 0. \tag{7}$$

From equation (6), we see that the recipient's utility decreases with both the tariff rate τ and the conditionality parameter β, but increases with the unconditional or the fixed part of aid α. An increase in tariff increases the dead-weight loss and reduces the variable component of aid and thus reduces recipient welfare on both counts. An increase in β also reduces aid and thus reduces welfare. An increase in α increases aid and thus welfare increases. None of these parameters/instruments has any effect on the equilibrium level of investment, as can be seen from equation (7).

From (5) and using (6) and (7), we get the first-order condition as:

$$S_\tau = -\tau p m \varepsilon_m - (1+\tau)\rho\beta + \theta\epsilon_K R^1_1 E_5(1 + \tau - \tau c_Y) = 0, \qquad \text{where} \tag{8}$$

$$\varepsilon_m = -\frac{\partial m}{\partial p(1+\tau)}.\frac{p(1+\tau)}{m} = -\frac{\partial(E_1 - R^1_1)}{\partial p(1+\tau)}.\frac{p(1+\tau)}{m} = -(E_{11} - R^1_{11}).\frac{p(1+\tau)}{m} > 0$$

$$m = E_1 - R^1_1 > 0, \quad \varepsilon_K = \frac{\partial R^1_1}{\partial \overline{K}}.\frac{\overline{K}}{R^1_1} = R^1_{14}.\frac{\overline{K}}{R^1_1} > 0, \quad 1 > c_Y = \frac{p(1+\tau)E_{15}}{E_5} > 0.$$

ε_m is the absolute value of the compensated elasticity of imports and m is the level of imports of good 1. Since we assume that the owners of capital lobby the government for the protection of sector 1, it is natural to assume that good 1 is capital intensive, and therefore the Rybczynski assumption $R^1_{14} > 0$. This is the *raison d'être* for lobbying. ε_K can be called the corresponding Rybczynski elasticity. c_Y is the marginal propensity to spend on good 1.

[6] See, for example, Van Long and Vousden (1991) for a discussion on political support functions.

[7] We assume that $E_5 - \tau p E_{15} > 0$. In the literature, this is known as the Hatta condition. If all goods are normal, this condition is satisfied.

The first two terms on the left-hand side of (8) are the marginal costs of tariff: it increases the dead-weight loss (first term) and reduces foreign aid (second term). The third term is the marginal benefit and this comes via an increase in income of the lobby groups. Note that marginal benefit of tariff goes down as the marginal utility of income (which is the reciprocal of E_5) goes up.

Equation (8) can be written in implicit functional form as

$$f(\tau, \beta, \alpha, \theta) = 0, \tag{9}$$

from which we obtain

$$f_\tau \; d\tau + f_\beta \; d\beta + f_\alpha \; d\alpha + f_\theta d\theta = 0, \qquad \text{where} \tag{10}$$

$$\begin{aligned}
f_\tau &= -\left[mp\epsilon_{_m} + \tau p^2 \epsilon_{_m}(E_{11} - R^1_{11}) + \rho\beta\right] + \theta\epsilon_K R^1_1 E_5(1 - c_{_Y}) \\
&\quad + \theta\epsilon_K(1 + \tau - \tau c_{_Y})(R^1_{11}E_5 + R^1_1 E_{51})p \\
f_\beta &= -(1+\tau)\rho - \tau f_\alpha, \quad f_\theta = \epsilon_K R^1_1(1 + \tau - \tau c_Y)E_5 \\
f_\alpha &= \frac{\rho\tau\epsilon_m}{(1 + \tau - \tau c_{_Y})}\left[-c_{_Y} + \frac{pmE_{55}}{(E_5)^2}\right] + \rho\left[1 + \frac{(1+\tau)\rho\beta E_{55}}{(1 + \tau - \tau c_{_Y})(E_5)^2}\right],
\end{aligned}$$

The second order condition for the recipient government's optimization problem requires that $f_\tau < 0$. The sign of f_θ is unambiguously positive. An increase in θ means that the recipient government cares more about the lobby group and this increases the marginal benefit of increasing τ. An increase in α has two opposite effects on the optimal level of τ. First, it increases the level of imports in the recipient country because of increased income there and thus the level of dead-weight loss. This increases the marginal costs of increasing τ. Second, the induced increase in income reduces the marginal utility of income and thus increases the marginal benefit of increasing τ. However, if the marginal propensity to spend on the importable good is small relative to the marginal utility of income, the positive effect of increasing α on τ would dominate. Since the marginal utility of income is likely to be

large and propensity to spend on importable low for a poor country, we shall make this assumption. Formally,

Assumption 1 $pmE_{55}/\left(E_5\right)^2 >> c_{_Y}$.

An increase in β is qualitatively similar to a decrease in α, and thus it will have the above two effects albeit in the opposite direction. Nevertheless, an increase in β also has an additional negative effect on optimal τ as it provides direct incentive for the recipient to reduce tariff. Thus, under assumption 1, we have $f_\alpha > 0$ and $f_\beta < 0$. Therefore, from (10), we find:

$$\frac{\partial \tau}{\partial \beta} < 0, \ \frac{\partial \tau}{\partial \alpha} > 0, \ \frac{\partial \tau}{\partial \theta} > 0. \tag{11}$$

Formally,

Proposition 1 *Under assumption 1 and when the donor is passive, we have:*

- *An increase in the aid-conditionality parameter β reduces the optimal level of tariff in the recipient country,*
- *An increase in untied foreign aid α raises the optimal level of tariff, and*
- *An increase in the lobbying parameter θ raises the optimal level of tariff.*

Having examined the case of passive donor, we now analyze the case of active donor. In particular, we assume that the donor government chooses the conditionality parameter β by maximizing its objective function. We consider two sub-cases depending on if the two governments act simultaneously or sequentially. These two cases are taken up in the following two subsections.

2.2 Active Donor: The case of simultaneous move

In this subsection, the donor and the recipient governments act simultaneously, taking each other's actions as given. The donor chooses its optimal policy instrument β, taking τ as given, and the recipient chooses its optimal tariff rate, taking β as given. The recipient's optimality condition is the same as in the passive donor game (equation (8)). The donor's optimization problem is formally stated as

$$\underset{\beta}{Max} \quad U^D = V\left(Y - \frac{(\alpha - \beta\tau)}{1+\gamma}\right) + \mu U^r. \tag{12}$$

where the variables and parameters are defined after (4). The first-order condition is:

$$[1 + \tau - \tau c_{_Y}]V' = \frac{\mu\rho(1+\tau)(1+\gamma)}{E_5}. \tag{13}$$

The left-hand side represents the marginal benefit of increasing the aid-conditionality parameter and the right-hand side the marginal costs. On one hand, an increase in β reduces the amount aid disbursed and increases disposable income and the welfare in the donor country. On the other hand, it reduces welfare in the recipient country by reducing the volume of aid, which is detrimental to the donor country because of its altruistic nature. Having described the equilibrium, we investigate the effects of changing θ, α, and the altruism parameter μ on the optimal level of the two policy instruments τ and β.

The first-order condition for the donor can be written in an implicit function form as:

$$g(\tau, \beta, \alpha, \theta) = 0, \qquad \text{where} \tag{14}$$

$$g_\tau = \frac{V'(1-c_{_Y})E_5\tau c_{_Y}}{1+\tau} + \frac{\beta V''(1+\tau-\tau C_Y)E_5}{1+\gamma} - \frac{p\tau\epsilon_m m E_{55}}{E_5}$$

$$g_\beta = -\frac{\rho\tau V' E_{55}}{E_5} + V''(1+\tau-\tau C_Y)E_5 < 0, \quad g_\alpha = -\tau g_\beta, \quad g_\theta = 0.$$

An increase in the lobbying parameter θ does not affect the first-order condition for the donor's optimization problem and thus $g_\theta = 0$. The sign of g_β is negative and this is consistent with second-order condition for the donor's optimization problem. An increase in α is qualitatively similar to a decrease in β and thus $g_\alpha > 0$. An increase in τ has two opposite effects on the first-order condition. First, it reduces the amount of aid given increasing the disposable income of the donor. This, in turn, reduces the marginal benefit of increasing β by reducing the marginal utility of income in the donor country. An increase in τ also increases both the marginal benefit and marginal costs on increasing β for a given level of V'. In addition, it affects E_5 via a change in U^r. The net effect is however negative under assumption 1. The effects of θ and α discussed above are the *direct* effects. As explained above, the direct effects of θ and α on β are zero and negative respectively. The indirect effects appear via induced changes in τ.

Differentiating (9) and (14), we find the total effects as:

$$\frac{d\tau}{d\theta} = \frac{-f_\theta g_\beta}{\Delta}, \quad \frac{d\beta}{d\theta} = \frac{f_\theta g_\tau}{\Delta}, \tag{15}$$

$$\frac{d\tau}{d\alpha} = \frac{-f_\alpha g_\beta + g_\alpha f_\beta}{\Delta}, \quad \frac{d\beta}{d\alpha} = \frac{-f_\tau g_\alpha + g_\tau f_\alpha}{\Delta}, \tag{16}$$

where $\Delta = f_\tau g_\beta - g_\tau f_\beta > 0$ for the stability of Nash equilibrium.

From (15), we find that $d\tau/d\theta > 0$ and $d\beta/d\theta < 0$. The first result has been explained before and there is no indirect effect of changing θ as it does not affect the first-order condition for the donor's optimization problem. The second result is due to the indirect effect of changing θ via an induced change in τ. An increase in θ increases τ and this reduces the net marginal benefit of increasing β as $g_\tau < 0$. From (16), we find that the indirect effects of a change in α on τ and β via changes in β and τ respectively, are of the opposite sign of the direct effects. However, $\Delta d\tau/d\alpha$ can be simplified to $(1-\tau)g_\beta[\rho - f_\alpha]$ which is positive. Thus, the direct positive effect dominates the negative effect. We shall assume the same to be true for the effect of α on β.

Proposition 2 *Under assumption 1 and when the donor and the recipient act simultaneously, an increase in the lobbying parameter θ or in the level of unconditional aid α increases the recipient's tariff rate and decreases the conditionality parameter β.*

2.3 Active donor: the case of sequential move

In this section, we examine a sequential game where the donor and the recipient countries take part in a two-stage game. In the first stage, the donor optimally chooses its policy instrument β taking the recipient's reaction function (its first-order condition (9)) as given. In the second stage, the recipient optimally chooses its policy instrument τ given the value of β. We use backward induction to solve this game. Therefore, the first step is to solve the second stage of this game, which is the same as the case of passive donor. In the first stage, the donor's optimization problem is:

$$\underset{\beta}{Max} \quad U^{DS} = V\left(Y - \frac{(\alpha - \beta\tau)}{1+\gamma}\right) + \mu U^r \quad s.\,t.\; f(\tau, \beta, \alpha, \theta) = 0. \tag{17}$$

The first-order condition for the above problem is:

$$\frac{\tau V'}{1+\gamma} + \beta\frac{V'}{1+\gamma}\frac{d\tau}{d\beta} + \mu.\frac{\partial U^r}{\partial \tau}\frac{d\tau}{d\beta} + \mu.\frac{\partial U^r}{\partial \beta} = 0,$$

which can be written as:

$$\frac{\tau V'}{1+\gamma} + \left[\beta\frac{V'}{1+\gamma} - \frac{\mu\tau p\varepsilon_m m + \rho\beta(1+\tau)}{E_5(1+\tau-\tau c_Y)}\right]\frac{d\tau}{d\beta} - \frac{(1+\tau)\mu\rho\tau}{E_5(1+\tau-\tau c_Y)} = 0. \tag{18}$$

Equation (18) is similar to the first-order condition (13) from the simultaneous game. The difference between the two first-order conditions is the second term on the left-hand side of (18). This term appears in this first-order condition due to the fact that τ now depends on β via the recipient's reaction function. From Proposition 1, we know that $d\tau/d\beta$ is negative. Thus, from (18) and substituting (13) in it, we find that

$$\left.\frac{\partial U^{DS}}{\partial \beta}\right|_{\beta=\beta_{\text{sim}}} = -\frac{\mu\tau p\varepsilon_m m}{E_5(1+\tau-\tau c_Y)} \cdot \frac{d\tau}{d\beta} > 0,$$

where β_{sim} is the optimal value of β in the simultaneous move game. Thus, the optimal value of β in this case is higher than β_{sim}. Formally,

Proposition 3 *The aid-conditionality parameter β is higher in the sequential game as compared to the simultaneous-move game.*

The intuition behind the above result is as follows. In the sequential game, the donor takes into account the reduction of the recipient tariff rate, which increases the conditionality parameter β. On one hand, an increase in β has an additional marginal cost to the donor via an increase in the amount of aid disbursed. On the other hand, an increase in β also has an additional marginal benefit via a reduction in the dead-weight loss (due to an induced reduction in the tariff rate). As these two effects conflict, we find that the second term in (18) is ambiguous. However, using (13), we find that the effect of an increase in marginal benefit dominates the effect of an increase in marginal costs and the net effect is positive. Thus, the optimal level of β is higher in the sequential game than in the simultaneous game.

3 Empirical Analysis

In this section, we shall examine the relationship between growth and aid. As mentioned before, there is a large literature on this subject, and most of it deal with the issue of endogeneity by acknowledging the two-way causality between aid and growth. In the first subsection, we shall do the same using a panel data set of 137 countries classified as low and middle income countries by the World Bank from 1995 to 2009 and using the well-known two-step Generalized Method of Moments (GMM).[8] However, in our theoretical analysis, we have analyzed a different type of endogeneity, *viz.*, that between aid and tariff (with a time lag), and this we shall do in second and the third subsections using a structural system of

[8]Two-step GMM estimators are considered asymptotically efficient and robust to heteroskedasticity (Asiedu and Lien, 2010).

equations. First, we shall consider an aid equation (in addition to the growth equation) and then add a tariff equation to allow for interdependence between aid and tariff (with a time lag) as in our theoretical analysis.

3.1 GMM estimator

The basic equation we want to estimate in this subsection is:

$$\begin{aligned} Log\ Y_{it} - Log\ Y_{it-1} = \beta_0 + \beta_1 \text{Aid}_{it} + \beta_2 \text{Tariff}_{it} + \beta_3 \text{Corr}_{it} + \beta_4 \text{Capit}_{it} + \beta_5 Y_{it-1} \\ + \beta_6 \text{Seceduc}_{it} + \beta_7 \text{Pop}_{it} + \beta_8 \text{Aid}_{it}^2 + \eta_i + \kappa_t + \varepsilon_{it}, \end{aligned} \tag{19}$$

where Y_{it} is the GDP per capita for country i at time t, Aid_{it} is official development assistance measured as a percentage of GDP,[9] Tariff_{it} is a trade policy variable measuring effective rate of protection, Corr_{it} captures the level of corruption as defined by the International Country Risk Guide (ICRG), Capit_{it} is gross domestic capital formation measured as a percentage of GDP, Seceduc_{it} captures human capital accumulation and is measured by the average number of years in secondary education for the relevant cohort, and Pop_{it} is the growth rate of population. Aid_{it}^2 is included in order to capture the diminishing returns of foreign aid.[10] The sample is a heterogeneous group of countries in size, income, population, etc. This heterogeneity and that over time must be taken into account in the estimation to avoid the problem of omitted variables. Thus, η_i represents an unobserved country-specific effect, κ_t is a time dummy, and ε_{it} is the error term. All these variables have been used in the literature.

To reduce the effect of short-run cyclical movement, the fifteen years time frame is divided into five non-overlapping three years averages: 1995-1997, 1998-2000, 2001-2003, 2004-2006, and 2007-2009. Table 1 in the appendix contains the list of countries in the sample. Most data are from the World Development Indicators (WDI) unless otherwise noted. Table 2

[9]The Development Assistance Committee (DAC) of the Organization for Economic Cooperation and Development (OECD) defines aid as "grants and concessional loans net of repayment of previous aid loans - a measure that treats forgiveness of past loans as current aid" (see Easterly, 2003).

[10]Except Corr_{it}, all other variables are in log form.

contains both the definition and the sources of each variable. Table 3 provides the descriptive statistics of each variable. The growth variable has a minimum of -18.56 % and a maximum of 48.04%. Iraq has the lowest growth rate of -18.56 % in the fifth period average (2007 to 2009) while Bosnia-Herzegovina has the maximum growth rate of 48.04 % in the first period average (1995 to 1997). The mean of the tariff rate is 10.61%. Our data shows that Nigeria has the highest tariff rate of 48.28 % and a gross capital formation of 9.87%. Lesotho has the highest level of capital formation 62.54%. The mean of population growth is around 1.68%.

The first step for obtaining GMM estimators is to take the first difference of (19), and this eliminates the time-invariant and country-specific effects. Having done that, there are two usual choices: the difference GMM (Arellano and Bond, 1991) and the system GMM (Blundell and Bond, 1998). As for dealing with the endogeneity issue, according to Arellano and Bover (1995), the lagged levels are usually not very good instruments for the first differences. The system GMM estimator uses additional moment conditions and combines the regressions, one in first differences and one in levels, using both lagged differences and lagged levels as instruments. This estimator reduces the potential biases in the difference GMM. The system GMM is also more appropriate in cases with large cross sections and a small number of time periods, which is the case here. Since the numbers of instruments in our case are much less than the numbers of observations, there is unlikely to be an increase in the bias in the system-based estimates.

Table 4 reports the empirical results of the two-step system GMM estimator.[11] The four regressions are different in the number of control variables employed. The signs of all the coefficients are as one would expect The coefficients of Aid, Secedu, and Capit are uniformly positive and significant, and those for Y_{t-1}, Tariff and Aid^2 uniformly negative and often significant.

These results are consistent and robust as suggested by the p-values of the Sargan test

[11] We use the software Stata 11.

and the second test of serial correlation. The system GMM estimate remains positive and highly significant even when we use deeper lags of the instrument variables, which further supports the robustness of our results.

3.2 Estimating a system of equations

In order for us to establish the determinant of aid, and in particular to see if aid has been used as a prize for trade policy reforms, we shall now first of all add another equation to (19) to form a system of equations. The main purpose of this is to consider the simultaneous determination of aid and tariff (with a time lag) as in our theoretical analysis. However, we shall now consider an aid equation and the tariff equation will be added later on. The equation for aid that we consider is:

$$\text{Aid}_{it} = \alpha_0 + \alpha_1 \text{Pop}_{it} + \alpha_2 Y_{it} + \alpha_3 \text{Tariff}_{it-1} + \alpha_4 \text{Tariff}_{it} + \alpha_5 \text{SSA}_i + \upsilon_{it}, \tag{20}$$

where $SSA$is regional dummy representing Sub-Saharan Africa.

We estimate (19) and (20) together using Two Stage Least Square (2SLS) methods. The estimated equation for (20) is given in table 6 and that of (19) in table 5. Interestingly, we find that the coefficient for Tariffs with a time lag is negative and significant providing some evidence that foreign aid has possibly been used as an *ex-post* prize for trade liberalization. We also include contemporaneous tariff,[12] and the coefficient of this is positive and significant. The coefficient for Aid, Pop, and Capit are uniformly positive and significant, and that of Corr negative and significant, in the growth regressions.

We now turn to the third equation, *viz.*, the tariff equation. Two points need to be noted. First, from our theoretical analysis, we know that a higher amount of aid in the second period (because of a decrease in the conditionality parameter or an increase in the amount of unconditional aid) increases the level of tariff set by the recipient country in the

[12]The correlation coefficient between contemporaneous tariff and tariff with a lag is 0.48.

first period. That is, in the tariff equation we shall expect a positive relationship between Aid and Tariffs (with a one-period lag). Second, the relationship between Tariff and Aid is negative in the aid equation. In fact, as we have seen, the sign of the coefficient of Tariff_{it-1} is indeed negative in the aid equation(table 6). Therefore, we need to be careful in specifying the tariff equation in order to identify it properly. The tariff equation that we consider is:

$$\begin{aligned}\text{Tariff}_{it-1} = \beta_0 + \beta_1\ \text{Aid}_{it} + \beta_2\ \text{Agriculture} + \beta_3\ \text{Gov.Expend} + \beta_4\ \text{SA} \\ + \beta_5\ \text{EAP} + \beta_6\ \text{LAC} + \beta_7\ \text{MENA} + \epsilon_{it}. \end{aligned} \tag{21}$$

We expect the sign of β_1 to be positive. The variable Agriculture (share of the agricultural sector in GDP) has been included to account for the structure of the economy. We expect its coefficient to be negative as the degree of protection is typically much higher in the manufacturing sector of the developing world. We would also expect government expenditure (as a proportion of GDP) — which usually follows economic progress — to have a negative effect on tariff.[13] We have added a number of regional dummies to reflect the differences in their historical/colonial experience and other institutional factors. The results of OLS regressions are present in table 7. The signs of the coefficients are as one would expect. In particular, the coefficient of aid is indeed positive and statistically significant.

Recognizing that both aid and tariff are endogenous variables in our theoretical analysis, we estimate the three equations (19), (20), and (21) as a simultaneous system using 2SLS. The results are presented in tables 8, 9, and 10. The results once again are consistent with theoretical predictions and the key coefficients are also uniformly statistically significant.

Finally, as a check for robustness of our results, we rerun the system of three simultaneous equation using 2SLS for a subset of the sample, namely the low-income countries (as defined by the World Bank), and the results are presented in table 11.[14] The earlier results more or less go through.

[13] see Rodrik (1998).

[14] A low-income country is defines as one whose per capita income is equal or less that $995 at 2005 prices.

4 Conclusion

Has foreign aid been effective in increasing economic wellbeing in recipient countries? Much has been written to address this question. Findings have been mixed, but everyone agrees that there are rooms for improvement in the way aid is disbursed. Can aid be disbursed in a way that encourages the recipient country to follow better economic policies, which in turn are likely to result in economic wellbeing? This paper deals with this last question restricting itself only to trade policies.

We developed a two-period, two-country model of international trade in which a recipient decides on the level of optimal tariff in the first period and the donor decides on the level of foreign aid in the second. A positive tariff rate in the recipient country is detrimental to its welfare but it exists because of lobbying by interest groups. The recipient knows that a higher level of tariff will imply a lower amount of aid in the second period. We consider two situations depending on whether the donor country and the recipient country act simultaneously or sequentially. We find that an increase in unconditional aid increases the level of optimal tariff, and an increase in the aid-conditionality parameter (which reduces the amount of aid for a given level of tariff) reduces the level of optimal tariff. Given these results, we would expect the level of aid to have a positive effect on the level of optimum tariff. In our model, an increase in the level of tariff reduces the level of aid, for a given value of the conditionality parameter. To summarize our theoretical findings, the level of aid, the level of tariff (with a lag), and economic wellbeing are all endogenous with both aid and freer trade increasing economic wellbeing, aid increasing the level of tariffs, and level of tariffs reducing the amount of aid received.

We also carry an empirical analysis using a panel data set of 137 recipient countries. The purpose of the exercise is to test the theoretical predictions mentioned above. We do so using two methodologies. First, we use the well-known Generalized Method of Moments

(GMM). Second, we consider a two simultaneous-equation system with only aid and growth (representing economic wellbeing) being endogenous, and estimate the two equations using Two Stage Least Squares (2SLS) technique. Finally, we also endogenize tariff and estimate a three simultaneous-equation system using 2SLS. Our results provide strong support of our theoretical predictions and in doing so also provide indirect support for a presence of *ex-post* conditionality in the disbursement of past aid.

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Table 1: List of Countries

Afghanistan, Bangladesh, Benin, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Comoros, Congo, Dem. Rep, Eritrea, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bisau, Haiti, Kenya, Kyrgyz Republic, Lao PDR, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger Rwanda, Sierra Leone, Solomon, Islands, Somalia, Tajikistan, Tanzania, Togo, Uganda, Zambia, Zimbabwe, Angola, Armenia, Belize, Bhutan, Bolivia, Cameroon, Cape Verde, Congo, Rep, Côte d'Ivoire, Djibouti, Ecuador, Egypt, Arab Rep., Georgia, Guatemala, Guyana, Honduras, India, Indonesia, Iraq, Jordan, Kiribati, Lesotho, Maldives, Micronesia, Fed. Sts., Moldova, Mongolia, Morocco, Nicaragua, Pakistan, Papua New Guinea, Paraguay, Philippines, Samoa, São Tomé and Principe, Senegal, Sri Lanka, Sudan, Swaziland, Syrian Arab Republic, Thailand, Timor-Leste, Tonga, Tunisia, Turkmenistan, Ukraine, El Salvador, Nigeria, Uzbekistan, Vanuatu, Vietnam, West Bank and Gaza, Yemen, Rep. Albania, Algeria, Argentina, Azerbaijan, Belarus, Botswana, Brazil, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, Fiji, Gabon, Grenada, Iran, Islamic Rep, Jamaica, Kazakhstan, Lebanon, Libya, Lithuania, Macedonia, FYR , Malaysia, Mauritius, Mexico, Montenegro, Namibia, Palau, Panama, Peru, Romania, Russian Federation, Serbia Bosnia and Herzegovina, Seychelles, South Africa, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Turkey, Uruguay, Venezuela, RB

Table 2: Definitions and Sources of Variables

Variables	**Definitions and Sources**
Growth	Annual growth rate of GDP per capita. (WDI)
Y	GDP per capita at constant(2005) prices. (WDI)
Aid	Official Development Assistance as percentage of GDP. (OECD)
Tariff	Average of effectively applied rates weighted by the product import shares corresponding to each partner country. (WDI)
Corruption	Corruption index from ICRG from (0 to 6). (ICRG) 0: most corrupted, 6:least corrupted
Capit	Gross domestic investment as % of GDP. (WDI)
Pop	Annual growth rate of population. (WDI)
Seceduc	Number of years in secondary school. (WDI)
Gov. Expend	General government final consumption expenditure as a percentage of GDP. (WDI)
Agriculture	Share of the agriculture sector in GDP. (WDI).
Regional Dummies	Countries in Sub-Saharan Africa (SSA), East Asia and Pacific (EAP), and Latin America and Caribbean (LAC) (WDI)

Table 3: Descriptive Statistics

Variables	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Growth	644	4.412442	4.482634	-18.56667	48.04908
Aid	616	3.443978	5.257911	0.0032987	51.27952
Tariff	449	10.61427	6.640109	0.485	48.28
Corr	426	2.315905	0.8411054	0.1666667	5
Capit	598	22.5096	7.994035	2.880364	62.54029
Pop	655	1.675248	1.179569	-1.772443	8.585386
Y	638	4233.197	3670.999	190.3492	19120.79
Seceduc	464	2284425	8032586	1999.5	9.53e+07
Gov. Expend.	587	14.69578	6.5882	2.231247	61.88457
Agriculture	603	20.61868	13.81613	1.285092	84.25134
SSA	655	0.3435	0.4752	0	1
SA	655	0.0610	0.2396	0	1
EAP	655	0.1374	0.3445	0	1
LAC	655	0.2137	0.4102	0	1

Table 4: TWO-STEP SYSTEM GMM ESTIMATOR

Dependent Variable: $Log\ Y_{it} - Log\ Y_{it-1}$

Exog. variables	**I**	**II**	**III**	**IV**
Aid_{it}	0.1356***	0.1762***	0.1423***	0.0974***
	(0.000)	(0.000)	(0.000)	(0.003)
Tariff	-0.0740**	-0.0649	-0.0922	-0.0969**
	(0.040)	(0.363)	(0.161)	(0.011)
Corr	-0.1307***			-0.1311***
	(0.002)			(0.003)
Capit	0.7981***	1.0248***	1.2246***	1.0181***
	(0.000)	(0.000)	(0.000)	(0.000)
Seceduc	0.0580***	0.1234***	0.1132***	0.0482***
	(0.001)	(0.000)	(0.000)	(0.002)
Y_{it-1}	-0.1479***	-0.0738***	-0.0847***	-0.1859***
	(0.000)	(0.005)	(0.002)	(0.000)
Aid_{it}^2	-0.0120**	-0.0145	-0.0091	-.0052
	(0.054)	(0.107)	(0.207)	(0.424)
Pop.			0.1560***	0.1605***
			(0.002)	(0.003)
Constant	-1.1854***	-3.1763***	-3.6678***	-1.6933***
	(0.009)	(0.000)	(0.000)	(0.000)
Observations	154	208	208	154
Sargan Test	0.129	0.166	0.169	0.116
Hansen Test	0.199	0.167	0.151	0.163
m-1 Test	0.031	0.018	0.051	0.22
m-2 Test	0.294	0.809	0.394	0.625

Notes for this and all subsequent tables:
p-values in parentheses.
$*$ denotes significant at 90% confidence level.
$**$ denotes significant at 95% confidence level.
$***$ denotes significant at 99% confidence level.

Table 5: TWO-STAGE LEAST SQUARES
Dependent Variable: $Log\ Y_{it} - Log\ Y_{it-1}$

Independent variables	**I**	**II**	**III**	**IV**
Aid_{it} (fitted values)	0.1246**	0.1605***	0.1301**	0.0898**
	(0.010)	(0.001)	(0.010)	(0.070)
Tariff	-0.0421	-0.1297	-0.1783**	-0.0843
	(0.618)	(0.140)	(0.047)	(0.323)
Corr	-0.1159**			-0.1116**
	(0.067)			(0.073)
Capit	0.7053***	0.6729***	0.7602***	0.8136***
	(0.000)	(0.000)	(0.000)	(0.000)
Seceduc	0.0092	0.0658**	0.0560**	0.0073
	(0.759)	(0.014)	(0.036)	(0.804)
Y_{it-1}	-0.0878	-0.0418	-0.0298	-0.0731
	(0.347)	(0.585)	(0.694)	(0.428)
Aid_{it}^2	-0.0153	-0.018	-0.0358	-0.0004
	(0.641)	(0.595)	(0.302)	(0.989)
Pop.			0.2086**	0.2202**
			(0.019)	(0.023)
Constant	-0.6306	-1.2972*	-1.3836**	-0.9286
	(0.359)	(0.067)	(0.049)	(0.179)
Observations	154	208	208	154
R-squared	0.1834	0.1361	0.1594	0.2121
F-value	4.68	5.28	5.42	4.88

Table 6: FIRST-STAGE REGRESSION FOR 2SLS
Dependent Variable: Aid as percent of GDP

Exog. Variables	**I**	**II**	**III**
Y_{it}	-1.2771***	-1.3878***	-1.2888***
	(0.000)	(0.000)	(0.000)
$Tariff_{it-1}$	-0.3445**	-0.4340**	-0.3693**
	(0.067)	(0.028)	(0.062)
$Tariff_{it}$	0.3192**	0.4474**	0.3709**
	(0.092)	(0.029)	(0.070)
Pop		-0.3085***	-0.3601***
		(0.007)	(0.002)
SSA			0.4867**
			(0.015)
Constant	10.2007***	11.0766***	10.1422***
	(0.000)	(0.000)	(0.000)
Observations	296	279	279
R-squared	0.4624	0.5023	0.5231
F-value	83.72	69.13	57.53

Table 7: Tariff Regressions: OLS

Dependent Variable: Tariff$_{it-1}$

Expl. Variables	**Coefficients**
Aid	0.0556**
	(0.018)
Agriculture	-0.0650
	(0.215)
Gov. Expend	-0.0803
	(0.391)
SA	0.6770***
	(0.000)
EAP	-0.1170
	(0.393)
LAC	0.1848**
	(0.057)
MENA	0.7081***
	(0.000)
Constant	2.5043***
	(0.000)
Observations	293
R-squared	0.1578
F-value	7.63

Table 8: AID REGRESSION WITH FITTED VALUES OF TARIFF (2SLS)
Dependent Variable: Aid as percent of GDP

Exog. Variables	**I**	**II**	**III**
Y_{it}	-1.3392***	-1.4027***	-1.2933***
	(0.000)	(0.000)	(0.000)
$Tariff_{it-1}$(Fitted values)	-0.5040**	-0.5406**	-0.4034**
	(0.062)	(0.045)	(0.010)
$Tariff_{it}$(Fitted values)	0.3130	0.3498	0.2686
	(0.263)	(0.211)	(0.332)
Pop		-0.2167**	-0.2742**
		(0.088)	(0.031)
SSA			0.5778***
			(0.006)
Constant	11.0070***	11.6014***	10.4004***
	(0.000)	(0.000)	(0.000)
Observations	236	236	236
R-squared	0.5001	0.5064	0.5222
F-value	77.37	59.25	50.28

Table 9: TARIFF REGRESSION WITH FITTED VALUES OF AID(2SLS)

Dependent Variable: Tariff$_{it-1}$

Instruments	**Coefficients**
Aid (Fitted values)	0.1178***
	(0.003)
Agriculture	-0.0372
	(0.521)
Gov. Expend	-0.0934
	(0.361)
SA	0.7025***
	(0.000)
EAP	-0.1484
	(0.317)
LAC	0.2402**
	(0.045)
MENA	0.7324***
	(0.000)
Constant	2.4852***
	(0.000)
Observations	246
R-squared	0.1755
F-value	7.24

Table 10: Growth Regressions with aid and tariff endogenous (2SLS)

Dependent Variable: $Log\ Y_{it} - Log\ Y_{it-1}$

Expl. variables	**I**	**II**	**III**	**IV**
Aid (fitted values)	0.0825**	0.0915***	0.0717**	0.1543**
	(0.020)	(0.002)	(0.019)	(0.095)
Tariff ((fitted values)	-0.1075	-0.0812	-0.1142**	-0.2111***
	(0.165)	(0.232)	(0.098)	(0.007)
Corr	-0.1389**			-0.1161**
	(0.010)			(0.027)
Capit	0.6712***	0.5285***	0.5725***	0.8841***
	(0.000)	(0.000)	(0.000)	(0.000)
Seceduc	0.0324	0.0490**	0.0455**	0.0352
	(0.197)	(0.010)	(0.017)	(0.165)
Y_{it-1}	-0.1856**	-0.2293***	-0.2188***	-0.3286**
	(0.023)	(0.001)	(0.002)	(0.014)
Aid^2_{it}	-0.0081	-0.0146	-0.0196	-0.0068
	(0.722)	(0.429)	(0.290)	(0.763)
Populat.			0.1418**	0.0997
			(0.026)	(0.183)
Constant	-0.7794	-0.9619**	-1.0191**	1.4711
	(0.185)	(0.050)	(0.037)	(0.252)
Observations	172	241	241	172
R-squared	0.2405	0.1893	0.2065	0.2065
F-value	7.42	9.11	8.66	7.46

Table 11: REGRESSIONS FOR LOW-INCOME COUNTRIES (2SLS)

Dependent Variables $\Longrightarrow$	**Aid as % of GDP**	**Tariff**$_{t-1}$	**Log** Y_{it}**- Log** Y_{it-1}
Pop	-0.1360		0.2518***
	(0.409)		(0.008)
Y_t	-0.6375***		
	(0.000)		
Tariff$_{it-1}$ (Fitted values)	-0.6918**		
	(0.019)		
Tariff$_{it}$ (Fitted values)	-0.0600		-0.2108**
	(0.850)		(0.070)
Aid (fitted Value)		0.2885**	0.2213***
		(0.015)	(0.003)
Agriculture		-0.0465	
		(0.580)	
Gov. Expend.		-0.1558	
		(0.261)	
Capit			1.0360***
			(0.000)
Seceduc			0.0210
			(0.515)
Corr			-0.2431***
			(0.001)
GDP$_{t-1}$			-0.1263
			(0.376)
Aid^2			-0.0135
			(0.904)
SA		0.9289***	
		(0.000)	
SSA	0.6885***		
	(0.005)		
EAP		-0.0216	
		(0.916)	
LAC		-0.4174**	
		(0.040)	
Constant	7.0422***	2.4664***	0.0015
	(0.000)	(0.000)	(0.999)
Observations	102	105	86
R-squared	0.4225	0.2453	0.4693
F-value	14.04	4.50	8.51