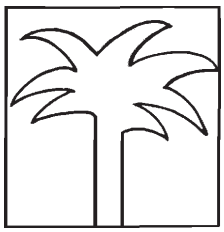

Causality analysis of development assistance and economic growth in Solomon Islands

Rukmani Gounder

This article applies a neoclassical production function to explain the relationship between aid and growth in Solomon Islands. Two hypotheses are tested: first, that domestic and/or foreign resources (that is, savings, investment, exports and aid flows) affect growth; second, that there is a causal relationship between foreign aid and economic growth. The results indicate that aid has a significant positive impact on economic growth and domestic resources. Granger causality tests indicate that aid causes growth and growth, in turn, causes aid flows. Thus, the causality proceeds in both directions.

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Solomon Islands is classified as a low-income country with per capita income of US$750 in 1998 (World Bank 2000). The islands are widely dispersed, lack well-developed infrastructure and major difficulties are faced in developing domestic markets. Economic activities are largely dominated by export-oriented agricultural production, such as plantation crops and commercial fishing and logging, supported by a large public sector. Since independence in 1978, aid has been a dominant feature of the economic landscape.

Social indicators improved in the 1990s, with the UNDP's Human Development Index increasing from 0.511 in 1992 to 0.616 in 1997, improving the country's ranking among the 174 countries from 125 to 118 (UNDP 1999). However, the primary school dropout rate remains high. There is a declining trend in fertility and mortality rates, but compared to other island nations these indicators are regarded as still being quite high. The Solomon Islands has seen many governments since independence, which was marked by ethnic tensions and political coups mainly due to the differences between the nine semi-autonomous provincial governments. The nation recently experienced significant political disturbances over land and job

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issues, which have adversely affected the country's economic performance and led to withdrawal of foreign investment.

Foreign aid inflows have been a major source of foreign exchange and revenue for Pacific island countries. While these economies rely heavily on aid, to what extent does aid contribute to economic growth? Studies on Pacific island countries have discussed the theoretical aspects of aid, however there is no empirical evidence about the aid–growth relationship in the case of Solomon Islands. This paper reports the results of estimation of a neoclassical production function specified to analyse the aid–growth nexus. Two hypotheses are tested: first, that domestic and/or foreign resources (that is, savings, investment, exports and aid) help determine economic growth; second, that there is a causal relationship between foreign aid and economic growth. The Granger causality test procedures are used to test the direction of causality, if any, between foreign aid and economic growth. The results suggest some policy implications for the donors and the recipient country.

Development assistance to the Solomon Islands

Foreign aid or official development assistance has been a dominant feature in the Pacific islands for over three decades, becoming a major source of development financing with a substantial capacity to influence growth (World Bank 1996). Foreign aid to Pacific island countries amounted to almost 27 per cent of gross national product (GNP) in the period 1980–97. This average, however, conceals substantial variations in aid flows within and between countries. For example, the Solomon Islands' aid share of GNP was 41.3 per cent in 1980 and fell to almost 12 per cent in 1997. This decline in aid share as a proportion of GNP compares to other Pacific island countries that have experienced similar declining trends in aid flows to GNP ratio of the past two decades. While aid to Solomon Islands as a percentage of GNP has declined in real terms, it has increased in per capita terms from US$105.2 in 1991 to US$126.3 in 1997 (UNDP 1999:Table 15). Among the island nations of the South Pacific, Solomon Islands receives a relatively higher level of per capita aid.

Japan, Australia, New Zealand and France are the major donors to Solomon Islands. The United Kingdom also provides aid to its former colony, although its aid flows have declined substantially. The major emphasis of the country's aid program is on human resource development, institutional strengthening, the provision of basic infrastructure and technical assistance. Multilateral agencies such as the Asian Development Bank, the International Bank for Reconstruction and Development (World Bank), and the International Development Association also provide substantial amounts of aid to Solomon Islands.

Development assistance to Solomon Islands has taken many forms. Of the bilateral aid component, the majority is in grant form, and a large proportion is provided as technical cooperation grants. The ratio of loans to total aid exceeds 15 per cent. The allocation of development assistance by sectors generally favours the social and economic infrastructure sectors, while the bulk of assistance in the production sector is allocated to agriculture. Technical cooperation has replaced assistance for public expenditure on schools, hospitals and some government ministries. Other forms of technical assistance are given as income to consultants for providing training and advice and for training of Solomon Islanders in the donor country. Solomon Islands' development budget is mainly aid driven, thus, aid may be a major determinant of growth. However, the ability of aid to

influence growth depends on its various forms and the effectiveness of its utilisation.

Aid is generally allocated for the purpose of assisting in the process of economic development. The Chenery–Stout (1966) model focuses on the causal chain relationship: aid lead to an increase in savings, leading to an increase in investment, which in turn leads to an increase in growth. Thus, aid fills the savings and foreign exchange gaps. Since Solomon Islands is constrained by low savings and foreign exchange earnings, aid can supplement these gaps. But filling these resource gaps may not be possible in the future due to the diversion of foreign aid to other areas as a result of civil strife. After a temporary suspension of aid during the 2000 political crisis, aid flows have been directed towards peacekeeping and law and order. Aid targeted to development projects has declined following severe deterioration of the political and security situation. The New Zealand Government has refocused NZ$8 million (US$4.18 million) of bilateral aid, based on changes that have emerged from political instability. Therefore, New Zealand's bilateral aid allocation has been adjusted to take into consideration needs arising out of job loss, increasing numbers of people in poverty, health, education, provincial development and peace building priorities (New Zealand Ministry of Foreign Affairs and Trade 2000).[1]

Aid, growth and causality

The aid–growth literature can be traced back to the suggestion that

> …the strictly economic purposes of the aid program would be: first to make available sufficient capital to permit the low-income countries to launch an ultimate self-sustaining process of economic development (Millikan and Rostow 1957:65).

The 'two-gap' model focused on domestic savings and foreign exchange constraints on growth. While it was recognised that many other factors would be needed to achieve satisfactory growth, the critical issue was believed to be the shortage of investment due to low savings rates. The role for foreign aid followed logically from this analysis (see also Krueger 1986:57). The 1950s and 1960s saw a substantial flow of aid to developing countries. The 1970s and 1980s witnessed slower growth and emphasised aid and trade, while in the 1990s prospects were bleak for development assistance.

The magnitude of aid flows and their effect on growth have generated considerable debate over the past four decades. In opposition to the argument that aid supplements domestic savings and foreign exchange earnings and stimulates investment, it is argued that there is a negative relationship between aid and savings. Aid utilisation has been a major concern, with arguments that wastefulness of scarce resources adversely impacts on the growth potential of the recipient country. The lack of a positive effect of aid on growth has also been explained in terms of aid being siphoned off for other uses, that is, the aid fungibility argument. Recently, it has been noted that large inflows of foreign aid can have de-industrialising effects (the 'Dutch disease' or 'booming sector' effect) (see Weisman 1990 on Papua New Guinea and Laplagne, Treadgold and Baldry 2001 on the Pacific). White (1998) provides a critical survey of the macroeconomic impact of aid and aid effectiveness.[2]

It is not surprising that the contribution of foreign aid to development has been evaluated sceptically and its effects often criticised.[3] The time-series studies by Islam (1992) for Bangladesh and Mbaku (1992) for Cameroon conclude that it is domestic resources that contribute to growth rather than foreign aid. This result differs from Gounder (2001) which concludes that

foreign aid to Fiji, rather than domestic resources, contributes to growth. Indirect effects arise when aid is afforded the potential to influence a number of variables simultaneously (such as investment), which could in turn affect economic growth. While there is the possibility of two-way causality between aid and growth, there are various political, economic, social and institutional factors that influence whether or not aid contributes to growth. Disagreements between recipients and donors have occurred. These disputes relate not only to the magnitude of aid provided, but also to its allocation and the way in which the resource transfers are made, for example, tying of aid can be a source of friction between the donors and the recipients where tied aid has economic and political advantages for the donor.

Since the globalisation process has accelerated, the policy emphasis has implied a further shift in aid to lower and upper middle-income developing countries. One unfortunate consequence of this tendency is that low-income countries receive a disproportionately small amount of aid. With the continuing downward trend in the disbursement of assistance, in future these countries may have to count less on aid flows and create an environment that will encourage private sources of finance. Thus, a donor seeking to maximise its 'influence' from aid, may concentrate its efforts on sparsely populated countries, given that this 'costs' them less in terms of financial resources (Gounder 1995). Generally, relatively richer and less populous countries have better economic performance prospects than do the poorer and more populous countries, as indicated in the aid-bias literature. A possible reaction to such circumstances is that donors may get better 'value' for their aid resources if they are directed to the smaller and richer countries. There is also an urgent need to recognise that efficiency in distribution calls for a partnership between a recipient and the donor country to overcome the problem of the tying of aid and its contribution to growth.[4]

Recently, the effectiveness of aid, the institutional and policy environment and aid conditionality issues have received a lot of attention, as the developing countries have not been successful in realising their development goals. Studies questioning the role and effectiveness of conditionality (Killick 1998) and the need for a favourable institutional and policy framework for aid to be effective (Burnside and Dollar 2000; World Bank 1998) indicate that aid has a positive impact on growth in the presence of good fiscal, monetary and trade policies, while countries with poorly designed policies do not experience similar impacts.

The motivations underlying the provision of aid are clear, however, what remains unclear is whether higher economic growth attracts higher aid flows, or if higher aid flows lead to higher economic growth. The effective utilisation of aid could promote growth and also be used as a criterion by which donor nations allocate aid. Causation may in fact run in both directions.

These relationships suggest a positive correlation between aid and economic growth. Arvin and Cater (2000) explore the causal relationship in European Union aid to developing countries and note that aid should not be presumed to promote growth in all countries, nor should growth be the ultimate goal of foreign aid. Their results show that aid–growth causality varies considerably across sub-samples. The next section undertakes an empirical investigation to examine the aid–growth relationships in Solomon Islands.

Models and methodology

It is generally argued that aid contributes positively to island countries' economic

growth and justifies the large amounts of aid received in per capita terms (Bertram 1993; Siwatibau 1997). However, there has been little empirical analysis of the relationship between aid and economic growth in the island economies. Various modeling approaches are utilised here to evaluate the aid–growth nexus for Solomon Islands (the methodology used is based on Gounder 2001). First, the aid–growth relationship is estimated using actual allocations of total aid flows (that is, official development assistance) for the period 1975 to 1997. Second, Granger causality tests estimate the direction of causality between aid and growth. The data are from OECD (1999) and World Bank (1999), and are in constant 1995 prices.

The aid–growth relationship model takes the form

$$\frac{\Delta Y}{Y_{-1}} = \beta_0 + \beta_1 \frac{\Delta L}{L_{-1}} + \beta_2 \frac{I}{Y_{-1}} + \beta_3 \frac{X}{Y_{-1}} + \beta_4 \frac{ODA}{Y_{-1}} + \mu_{1t} \quad (1)$$

where $\Delta Y/Y_{-1}$ is the annual growth rate of real GDP, $\Delta L/L_{-1}$ is the annual growth rate of population,[5] I/Y is the investment–output ratio, X/Y is the exports to GDP ratio, ODA/Y_{t-1} is the ratio of aid to GDP and $\mu_{1t,}$ is the random error term.

Equation 1 represents the neoclassical growth model, extended to include exports and official development assistance. The theoretical predictions for the model are that the $b > 0$. The autoregressive distributed lag (ARDL) approach to cointegration for time-series methodology has been used to minimise the estimation of spurious relations while retaining long-run information. In line with standard practice in time-series analysis, an ARDL specification of an appropriate lag order has been used,[6] and the initial lag length on all variables is set at two periods. The estimated long-run multiplier coefficients reported in the results indicate the impact on the dependent variable due to a one per cent change in each independent variable. Diagnostic tests of serial correlation, functional form, the normality of the residuals, structural stability and heteroscedasticity have been performed to avoid concerns generally encountered in time-series estimation.

In the next step, the direction of causality between aid and growth is examined. A Granger (1969) causality test procedure examines the direction of causality, if any, between aid and growth. The test is based on past values. According to the definition, Y 'Granger' causes X if the precision of the estimated current value of X is improved by controlling for the current and past values of Y. This methodology leads to estimation of the direction of causality for both variables. The specification forms for the causality equations for X and Y are as follows

$$Y_t = a + \sum_{i=1}^{I} b_i X_{t-1} + \sum_{j=0}^{J} c_j ODA_{t-j} + \phi_t \quad (2)$$

$$ODA_t = d + \sum_{k=1}^{K} e_k Y_{t-k} + \sum_{l=0}^{L} f_l Y_{t-l} + \psi_t \quad (3)$$

where a and d are constants, Y is the growth rate of GDP, ODA is aid flows, ϕ_t and ψ_t are serially uncorrelated, zero mean stochastic error terms and c_j and f_l are estimated coefficients. If the c_js are jointly significant, then ODA_t can be said to Granger-cause Y_t. If the f_ls are jointly significant, then Y can be said to Granger-cause ODA. If both are significantly different from zero, then the causality is said to be in both directions simultaneously.

Equations 2 and 3 indicate the bivariate case of testing different patterns of causality by identifying the estimated regressions of Y (that is, the real GDP growth rate of

Solomon Islands) and ODA (that is, the real official development assistance to GDP share of Solomon Islands). The testing of Granger causality considers the lags to be taken, and therefore the specification of the equation is critical. Maddala (1992) points out that the chosen lag lengths are to some extent arbitrary. However, in this study the lag lengths have been statistically determined based on time-series data using *Microfit 4* (Pesaran and Pesaran 1997).

Estimated results

The estimated results for the aid–growth models are reported in Table 1. The equations have a relatively high explanatory power in terms of adjusted R^2 and the F statistics are statistically significant at the one per cent level. The model diagnostics reported here pose no concerns. First, the total investment to GDP share is used with total aid to measure the impact on economic growth. Lensink and Morrissey (1999) point out that while investment should be a principal determinant of growth, it is problematic as aid and investment may be related. Several tests undertaken by Lensink and Morrissey demonstrate that aid appears to have an additional effect to that of investment. Thus, once the investment variable is included in the model, another variable is said to affect growth via the 'level of efficiency', whereas if investment is omitted it is not clear whether the effect of another variable on growth is via investment or via efficiency. Thus, the savings to GDP ratio has also been used to measure this specific effect by excluding the investment variable.

The effects of various domestic growth determinants (Equation 1a in Table 1) show that the short-run impact of investment (IY) and exports (XY) contribute to economic growth in Solomon Islands.[7] The estimated long-run coefficients for both variables are positive and significant, indicating that GDP growth is determined by investment and exports. Although positive, the population growth rate (used as a proxy for the labour force) is not significant in the long run. But the estimated coefficient in Equation 1b is statistically significant at the one per cent level and contributes to economic growth. The estimated short-run and long-run foreign direct investment (FDIY) coefficients are positive and significantly contribute to growth.

The total aid (that is, ODAY) coefficient is negative and significant. This may be the case as investment and aid variables can be correlated. Generally, in the island economies, foreign aid plays a substantial role in financing investment. If aid supplements government resources to finance public investment, that directly increases investment via an increase in public expenditure and there is a positive correlation between aid and domestic investment.[8] Moreover, aid also increases total investment indirectly via private investment, through an increase in income. Even though aid to Solomon Islands is declining in terms of its GDP ratio, it is still a resource available to the government for public investment expenditure and other development projects. Thus, investment and foreign aid are principal determinants of growth.

Considering the correlation between aid and investment, in the next step investment is substituted by savings (see Equation 1b). As expected, the ODAY coefficient is positive and statistically significant at the one per cent level, suggesting that aid is an important determinant of growth in Solomon Islands. Domestic resources, that is, labour force and exports, contribute positively to growth, and the savings to GDP ratio (SY) coefficient is also positive and statistically significant. It is notable that development assistance exerts a stronger impact than exports on economic growth. The significance of the total official development assistance (ODA) coefficient

Table 1 **Solomon Islands: the relationship between aid and growth, 1975–97**

Growth equation—investment with total aid (Equation 1a)

$$\dot{Y} = \underset{(1.15)}{1.81} - \underset{(5.81)}{2.23}\dot{Y}_{t-1} - \underset{(4.45)***}{1.36}\dot{Y}_{t-2} + \underset{(1.45)}{0.67}\Delta\dot{L}_t + \underset{(4.60)***}{3.10}\Delta IY_t + \underset{(3.01)**}{2.12}IY_{t-1} - \underset{(2.31)**}{0.64}IY_{t-2} + \underset{(3.93)***}{0.04}\Delta FDIY_t$$

$$+\underset{(2.07)*}{0.02}FDIY_{t-1} - \underset{(3.06)***}{0.02}FDIY_{t-2} + \underset{(1.59)***}{0.002}\Delta X/Y_t + \underset{(2.89)***}{0.009}_{t-1} - \underset{(2.89)***}{0.20}\Delta ODAY_t + \underset{(2.60)**}{0.24}ODAY_{t-1}$$

$\bar{R}^2 = 0.52$ $F_{(6,14)} = 4.63***$ SEE= 0.05 SC$\chi^2(1) = 0.25$, FF$\chi^2(1) = 0.98$, N$\chi^2(2) = 0.82$, H$\chi^2(1) = 0.004$

Long-run coefficient: $\dot{Y} = \underset{(1.46)}{0.15}\dot{L} + \underset{(5.71)***}{1.00}IY + \underset{(5.45)***}{0.008}FDIY + \underset{(6.61)***}{0.002}X/Y - \underset{(4.34)***}{0.09}ODAY$

Growth equation—savings with total aid (Equation 1b)

$$\dot{Y} = \underset{(2.22)}{2.64} - \underset{(4.86)***}{1.18}\dot{Y}_{t-1} - \underset{(2.85)***}{0.51}\dot{Y}_{t-2} + \underset{(2.66)***}{0.91}\Delta\dot{L}_t + \underset{(1.81)*}{0.003}\Delta SY_t + \underset{(2.11)**}{0.003}\Delta X/Y_t + \underset{(2.54)***}{0.12}\Delta ODAY_t$$

$^2 = 0.59$ $F_{(6,14)} = 5.74***$ SEE= 0.04 SC$\chi^2(1) = 0.57$, FF$\chi^2(1) = 4.96$, N$\chi^2(2) = 0.72$, H$\chi^2(1) = 1.12$

Long-run coefficient: $\dot{Y} = \underset{(2.77)***}{0.33}\dot{L} + \underset{(1.86)*}{0.001}SY + \underset{(2.25)**}{0.001}XY + \underset{(2.80)***}{0.04}ODAY$

$\bar{R}^2$ / Y

Notes: ***, **, and * are significance levels at one, five and ten per cent levels. *t* ratios in brackets. Critical values for the various tests are as follows: $\chi^2(1) = 6.63$, $\chi^2(2) = 9.21$. Test statistics are as follows: SC = Lagrange multiplier test for serial correlation, FF = Ramsey test for functional form; N = Jarque-Bera test for normality of the residuals, H = Engle's autoregressive conditional heteroscedasticity test.

supports the view that foreign aid plays a significant role in Solomon Islands' economic development. Looking at the size of the aid coefficient, it can be said that foreign resources make a greater contribution to economic growth than domestic resources (the long-run savings and exports coefficients are smaller than the ODA coefficient).

As this result is similar to that for Fiji (Gounder 2001), where total foreign aid flows are estimated to have a positive and statistically significant impact on economic growth, it can be said that foreign aid plays a substantial role in financing domestic investment that contributes significantly to growth in these two Pacific island economies. This result differs from that of Islam (1992) for Bangladesh, and Mbaku (1993) for Cameroon, where the results indicated that ODA does not contribute to economic growth, and which concluded that foreign resources in their highly aggregate form do not show any significant contribution to growth.

Overall, it can be said that foreign aid plays a very significant role in the growth process of Solomon Islands. Also important is the contribution of domestic resources to growth (exports and investment shares). The significant contribution of aid to Solomon Islands' economic growth suggests that this island economy is largely dependent on foreign aid to finance its development. The positive and significant contribution of foreign aid indicates that development assistance allocated to crucial economic and

Table 2 **Causality test for the Solomon Islands: relationship between aid and growth, causality test results**

Bivariate Granger Model	X = f (Y)	Y = f (X)
Period: 1975–97	Y→X(+)**	X→Y(+)*
Maximum order of lags used is 2	17.83 (<0.000)	8.78 (0.02)

Notes: Variables are defined as follows: X is aid to GDP ratio, Y is growth rate in GDP. Notation → indicates Granger causality with the sign of the impact noted. **, * Significant at the 1 and 5 per cent levels, respectively. The values shown are the log-likelihood ratio statistics asymptotically distributed at χ^2 (2), and the figures in parentheses indicate the probability of the null hypothesis.

social sectors has been used to fund productive expenditures that contribute to growth. Private capital flows to small island nations have been low, and thus are unlikely to replace foreign aid. Political instability in Solomon Islands may also contribute to it becoming an unattractive destination for private capital. Reduction of aid or termination of aid, as suggested by Bauer's (1991) study of aid and development in the Pacific islands, would undermine economic growth in this island nation.

The causality of the aid–growth relationship was tested and results are reported in Table 2. The log-likelihood ratio statistic values are positive and statistically significant, providing support for bivariate causality in the case of Solomon Islands. In other words, foreign aid 'Granger causes' economic growth and economic growth 'Granger causes' foreign aid. Thus, it appears that Solomon Islands obtained value for its aid which has been mainly directed towards economic and social development projects with backward and forward linkages to other growth determinants. Thus, good management of aid contributes significantly to growth, and better growth performance attracts aid. This result is congruent with the results of Burnside and Dollar (2000) and the World Bank (1998).

The significance of the results implies that effective allocation of aid contributes to long-term growth. Development assistance combined with domestic and foreign capital enhances growth prospects. For aid to continue to be effective in Solomon Islands it would seem necessary for the political, social and institutional environment to be improved to provide a favourable environment for growth.

Conclusion

Although aid to the Solomon Islands has declined over time, foreign aid still forms a major proportion of this nation's national budget. Solomon Islands has recently implemented economic reforms, with an emphasis on creating a domestic environment that encourages private flows and uses the aid most effectively.

The empirical results indicate that foreign aid contributes positively to economic growth in Solomon Islands. The positive contribution of aid suggests that aid conditionality delivers benefits. The causality tests indicate positive and statistically significant values that show patterns of causality in both directions. Thus, aid causes economic growth and economic growth leads to increased foreign aid. This

finding gives a signal to the Solomon Islands' government that administrative efficiencies and good management of aid funds must be maintained.

The results also emphasise the importance of regaining political stability and reducing risks facing investors, as these are the pre-conditions for attracting aid and investment to achieve sustainable economic growth. The recent political instability and the resulting diversion of aid will adversely impact on social and economic projects that might have otherwise been undertaken.

Notes

1 Funding has been set aside for assistance with the peace process and peace monitoring activities, particularly those relating to New Zealand's contribution to the International Peace Monitoring Team. The Australian Government has undertaken similar actions and activities.

2 Empirical studies have generally found a negative relationship between aid and savings, an inverse relationship between aid and current account deficits, and no relationship between aid and economic growth. While the need for foreign aid can relate to a shortfall in a country's domestic resources or in its foreign exchange availability, or both, various studies question whether foreign capital acts as a substitute for domestic capital.

3 Gounder (1995) presents a detailed discussion on earlier studies of aid flows and its impact on growth.

4 Prospects for an increase in aid are limited, and donors have become more selective in their allocation of aid. Some potential recipients have performed poorly and suffered reduced aid flows. Whether due to weak donor commitments or to poor recipient performance, aggregate aid to traditional low-income claimants has fallen. What is needed is a new version of aid (World Bank 1998:35).

5 Due to lack of labour force data for Solomon Islands, population data have been used here as a proxy for the labour force.

6 This procedure does not ignore long-run relationships between the variables. Therefore Equation 1 has been estimated using the general-to-specific modeling procedure that minimises the possibility of spurious relations while retaining the long-run information, see Hendry (1995).

7 Onchoke and In (1994) obtained a positive relationship in their empirical investigation of the long-run relationship between export revenues and economic growth in the South Pacific.

8 The estimated correlation coefficient calculated between aid and investment indicates a high value of 0.819. Therefore, equations are also estimated without the investment variable.

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