Philippine Review of Economics and Business
Volume XXXIV, No. 1, June 1997

THE NEGATIVE CORRELATION BETWEEN FOREIGN SAVINGS AND DOMESTIC SAVINGS*

Maria Claret M. Mapalad[a] and Petros K. Liverakos[b]

We show that the negative correlation between foreign and domestic savin arises from the non-stationarity of these variables. We propose a more appropria technique for testing a causal relation such as the one claimed by the revisionist view

1. Introduction

The empirical basis of the revisionist view (Griffin and Ffrenc Davis, 1964; Griffin, 1970; and Griffin and Enos, 1970) that foreign a causes domestic savings to fall is the negative correlation betwe these variables.[1] Snyder (1990) pointed out that such correlation spurious, i.e., due to the omission of other explanatory variables fro the domestic savings equation estimated. In his paper, he showed th per-capita income is one of these omitted variables and, when add into the domestic savings equation, makes the negative correlatic insignificant.

---

* We acknowledge the helpful comments of Professors Arsenio Balisacan, Ma Socorro Gochoco-Bautista, Fidelina Natividad-Carlos, and Emmanuel de Dios. We al thank Ms. Gloria D. Lambino for excellent clerical assistance.

[a] Assistant Professor, School of Economics, University of the Philippin Diliman, Quezon City.

[b] Senior Economist, Budget Directorate, Ministry of Finance, Athens, Greece.

[1] Although these authors focused their discussion on foreign aid, they (and number of other authors) used net foreign capital inflows as given by current accou deficits in their empirical studies.

The present paper recognizes the validity of Snyder's criticism of the revisionist view, but questions his choice of per-capita income as 'the' omitted variable and the source of the spurious correlation above. Relatedly, we will show that the correlations found by Snyder between per-capita income and domestic savings rate, and between per-capita income and foreign aid (as proportion of income) are themselves spurious.

This paper differs from Snyder's in that, firstly, it uses total foreign capital inflows (defined as the sum of foreign aid, direct foreign investment, portfolio investment, foreign loans, and other capital inflows) instead of foreign aid; secondly, it uses Philippine annual data from 1954 to 1992; and thirdly, it strongly points out that the revisionist view claims the existence of a causal relation between foreign savings and domestic savings and must be tested using a more appropriate methodology.

The paper is designed as follows. Section 2 contains a brief review of the relationship among domestic and foreign savings and income. Section 3 presents Snyder's critique of the revisionist view. In section 4, we present our critique of Snyder's argument and an alternative model. Section 5 inquires into the causal relation between foreign and domestic savings when per-capita income is included in the model. Section 6 concludes the paper.

2. The Basis for the Foreign Savings-Domestic Savings Relation

The early analysis of the effect of foreign aid (or, without altering the model's implications, total foreign capital inflows) on income growth was based on standard growth models of the Harrod-Domar or neoclassical type. These models suggest that the growth of real income of a country is determined positively by the productivity of capital and the savings rate, the latter being an indication of the resources available to finance investment. That is,

$$g = \alpha (s + f) \tag{1}$$

$$i = s + f, \tag{2}$$

where g is the growth of real income, α is the marginal productivity capital, s is the domestic savings rate, f is the foreign savings rate (i. foreign capital inflows as a proportion of income), and i is the gro domestic investment rate.

The implication of these models is that, on the one hand, forei capital inflows will increase the amount of total savings (foreign sa ings will add to domestic savings) which the receiving country will u to pay for investment. Hence, for a given labor force and technolo growth, the higher is the investment rate, the faster will be the grow of real income. On the other hand, a country's dependence on forei savings to finance investment is expected to be temporary. This is because, as seen above, the use of foreign savings will enhance incor growth which, according to the life cycle theory will increase the pr portion that is saved and, hence, the domestic savings ratio. As incor growth is sustained, domestic savings rate will continue to rise so th continued increases in investment rate can be financed by using le and less of foreign savings. Eventually, the country mobilizes sufficie domestic savings to finance investment that she becomes independe of foreign savings.

That foreign savings will enhance the economic growth of t recipient country has been challenged by several authors, beginning 1964 when Griffin and Ffrench-Davis argued that foreign capital i flows (or aid, in particular) may not increase economic growth wh foreign savings simply substitute for domestic savings, i.e., high inflows of foreign capital will lead to lower domestic savings.[2] Th objection to the prediction of the above model was what came to known as the "substitution thesis". The motivation for the revision argument is the concern over the notion of "dependence", i.e., shou the above thesis hold, the recipient country "would somehow increa dependence on the aid-giving country." (Grinols and Bhagwati, 1976, 416)

[2] They also argued that economic growth may decrease further because capi imports lower the productivity of capital (or equivalently, increases the capital-out ratio).

This thesis was first tested empirically by Rahman (1968) who referred to it in his paper as the 'Haavelmo's hypothesis' which says that domestic savings do not only depend on income but (negatively) on foreign savings, as well. His test consisted of estimating a domestic savings function, $s = a + b\,f$, using OLS and focusing on the statistical significance of b which was estimated to be –0.2473 (p.137). He used 1962 cross-sectional data for 31 countries.

In 1970, Griffin, and Griffin and Enos estimated the same regression function as that used by Rahman and found the effect of foreign savings on domestic savings to range between –0.73 (from cross-sectional data between 1962 and 1964 for 32 countries) and –0.84 (for time-series data for Colombia between 1950 and 1963) (Griffin, pp. 105-6; and Griffin and Enos, pp. 321-2).[3]

3. Snyder's Critique of the Revisionist View

Snyder explained that the revisionist view focused on the negative and statistically significant value of b which is estimated from the following domestic savings function:

(3) $\quad s = a + b\,f,$

where s is domestic savings-income ratio, f is foreign aid-income ratio, and a and b are OLS-estimated coefficients.

Snyder argued that equation (3) excludes other explanatory variables, one of which is per-capita income. He then modified equation (1) as follows:

(4) $\quad s = b'\,f + c\,y,$

and also specified a foreign aid function as follows:

[3] Griffin's estimates of b also include 0.82 for 13 Asian and Middle East countries, 0.67 for 18 Latin American countries.

(5) $f = ds + ey,$

where y is per-capita income, b', c, d, and e are OLS-estimated coe cients.

Snyder's results are summarized in Table 1 (p. 177) of his pap First, using OLS, he regressed equation (3) without the constant tern and found b to be negative (i.e., –0.40) and statistically significa Then, he regressed equations (4) and (5) using both OLS and 'fix effect' estimation and found b' and d to be negative but insignifican positive and statistically significant, and e negative and highly sign cant. Based on these results, he concluded that "previous findings o strong negative relationship appear to be explainable in terms o combination of factors: a failure to control for omitted variables (es cially per capita income),..." (p. 179).[4]

4. The Problem with Snyder's Conclusion

The substance of Snyder's critique of the revisionist view is val However, we take position with Snyder's choice of per-capita inco as 'the' omitted variable and the source of spurious correlation tween foreign savings and domestic savings. To illustrate the poi equations (4) and (5) above are regressed (a constant term is allowed each equation) using Philippine data to obtain the following results: the inclusion of y made b' insignificant (t = –0.53), though still negat (–0.29); (ii) similarly, d became insignificant (t = –0.53), with an es mated value of –0.05; and (iii) the coefficients of y in both equations found to be statistically significant (t-ratios are –2.27 and 2.43 equations (4) and (5), respectively).[5]

---

[4] "...use of an unsuitable aid proxy (foreign capital inflows), and problems v sample size and compostion."

[5] The variables used are as follows: Domestic savings rate = (GDP – private public consumption)/GDP; Foreign savings rate = (direct foreign investment + portf investment + foreign loans + foreign aid + other capital)/GDP; Per-capita = GDP in 1 pesos/population. Data were taken from the International Monetary Fund, *Inte tional Financial Statistics Yearbook 1979, 1995.* Time period is 1950-1972, un otherwise noted. We used TSP5 to process regressions.

The above results are consistent with those obtained by Snyder in that the inclusion of per-capita income made the negative correlation between domestic and foreign savings rates insignificant (see points (i) and (ii) above).[6] However, we will continue to argue that the cause of spurious correlation identified by Snyder was incorrect. What he overlooked is that the negative correlation between domestic and foreign savings (as also found in the Philippines) exists, not because of the omission of per-capita income from equation (1) but because of the omission of a different variable: a time trend, i.e., the negative correlation exists because both variables (and per-capita income, as well, as will be shown) are non-stationary. This was verified by introducing a time trend into equation (1) and finding its coefficient to be statistically significant. The same is true for f_t.[7]

We confirm this result by using an augmented Dickey-Fuller (ADF) test[8] which reveals that all three are integrated of degree one, i.e., I(1) processes.[9] A test for cointegration yielded the result that the three variables are not cointegrated and must each enter the regression equations in their first-differenced form.[10] We then modified equations (4) and (5) above as follows:

---

[6] The results of our regressions are as follows:

$$s = \underset{(6.06)}{15.25} - \underset{(-0.32)}{0.18f} - \underset{(-2.27)}{0.00003y} \qquad f = \underset{(-0.47)}{-0.76} - \underset{(-0.32)}{0.03s} + \underset{(2.92)}{0.00001y},$$

where t-ratios are in parentheses. The signs are the opposite of Snyder's and may reflect the nonstationarity of variables.

[7] Let T represent a time trend which is used as an explanatory variable in the regression of s_t and f_t. We obtained the following results:

$$s = \underset{(2.59)}{712.2} - \underset{(-0.35)}{0.19f} - \underset{(-2.55)}{0.36T} \qquad f = \underset{(-2.49)}{-282.41} - \underset{(-0.35)}{0.03s} + \underset{(2.52)}{0.145T},$$

where t-ratios are in parentheses.

[8] This test and others used here are explained elsewhere (see Mapalad, and Giles, Giles, and McCann).

[9] F-statistics from the ADF tests are 2.17 for s_t, 4.61 for f_t, and 7.45 for y_t. Critical value is approximately 7.5, lag order is one, number of observation is 21, with four parameters.

[10] An F-ratio of 5.22 is obtained for the test of cointegration as compared to the critical value of approximately 7.5. Hence, the hypothesis of 'no integration' cannot be rejected.

(6) $\Delta s_t = \alpha_0 + \alpha_1 \Delta f_t + \alpha_2 \Delta y_t$

(7) $\Delta f_t = \beta_0 + \beta_1 \Delta s_t + \beta_2 \Delta y_t$

where Δ indicates the first-difference of the variable, α_0 and β_0 are O estimated constant terms, and α_1, α_2, β_1,and β_2 are OLS-estima coefficients.

Equations (6) and (7) are regressed using OLS and the following rameter estimates are obtained (t-ratios in parentheses):

$\alpha_0 = -1.24$ (-0.98) $\quad \alpha_1 = -0.24$ (-0.44) $\quad \alpha_2 = 0.006$ (1.0

$\beta_0 = -0.26$ (-0.49) $\quad \beta_1 = -0.04$ (-0.44) $\quad \beta_2 = 0.002$ (0.8

The above results suggest that, when all three variables are tr formed into stationary data series, the statistical significance of correlation estimates between *s* and *y* (given by α_2) and between *f* a (given by β_2) disappear. Hence, they are also spurious.

5. A Test of Causality

Snyder's approach to analyzing the effect of foreign saving 176) on domestic savings continues to be inadequate. Regardles whether this effect is positive (as suggested by Harrod-Domar or classical growth models) or negative (as argued by the revisionists) nature is one of a causal relation, i.e., foreign savings cause dom savings to increase or decrease. Evaluating a causal relation suc this requires more than a correlation test.

A review of the literature on the debate over whether for savings increase or reduce domestic savings reveals only two atte of usin g standard Granger causality models to test for the ca relation between foreign and domestic savings.[11] In this section

[11] These two attempts are Mapalad (1996), and Paul Bowles, "Foreign Ai Domestic Savings in Less Developed Countries: Some Tests for Causality," *Development*, 15(1987): 789-96.

also attempt to establish the existence and direction of this causal relation using a Granger causality test. We use a three-variable model with a lag order of three for each variable. The three variables used are domestic savings rate, foreign savings rate, and per-capita income. Since all three were I(1) processes but not cointegrated, they were transformed by first-differencing to make them stationary.

The Model

Our model is given by the following system of regression equations:

$$\Delta s_t = \gamma_0 + \Sigma_{i=1}^{n} \gamma_{1i} \Delta s_{t-i} + \Sigma_{i=1}^{n} \gamma_{2i} \Delta f_{t-i} + \Sigma_{i=1}^{n} \gamma_{3i} \Delta y_{t-i} + \nu_{st} \quad (8)$$

$$\Delta f_t = \phi_0 + \Sigma_{j=1}^{n} \phi_{1j} \Delta s_{t-j} + \Sigma_{j=1}^{n} \phi_{2j} \Delta f_{t-j} + \Sigma_{j=1}^{n} \phi_{3j} \Delta y_{t-j} + \nu_{ft} \quad (9)$$

$$\Delta y_t = \theta_0 + \Sigma_{j=1}^{n} \theta_{1k} \Delta s_{t-k} + \Sigma_{j=1}^{n} \theta_{2k} \Delta f_{t-k} + \Sigma_{j=1}^{n} \theta_{3k} \Delta y_{t-k} + \nu_{yt}, \quad (10)$$

where Δs_t, Δf_t, and Δy_t are first differences, and ν_{st}, ν_{ft}, and ν_{yt} are regression error terms of s_t, f_t, and y_t respectively, and i, j, and k are time indices indicating the lag order (= 1, 2, 3).

In equation (8), if $\gamma_{2i} \neq 0$ for some i, then 'f Granger causes s' and if $\gamma_{3i} \neq 0$ for some i, then 'y Granger causes s'.

In equation (9), if $\phi_{1j} \neq 0$ for some j, then 's Granger causes f' while $\phi_{3j} \neq 0$ for some j, then 'y Granger causes f'.

In equation (10), if $\theta_{1k} \neq 0$ for some k, then 's Granger causes y' and if $\theta_{2k} \neq 0$ for some k, then 'f Granger causes y'.

As regards acceptance of the revisionist view, it must be that $\gamma_{2i} < 0$ for some i.

The Empirical Results

The above model is applied using Philippine data between 1 and 1992.[12] The technique employed is OLS as no simultaneity ex among the three equations. We obtain the following findings. First, find the s is exogenous of f and y, i.e., domestic savings rate was influenced by foreign savings and per-capita income. This leads t rejection of the revisionist view, as it shows that domestic savings w not reduced by the flow of foreign savings into the country. It a confirms that per-capita income is not a significant determinan domestic savings rate, contrary to Snyder's conclusion. This is con tent with other studies which found real income growth, not level, t an important determinant of domestic savings rate (Tanhueco, 19 Mapalad, 1997).

Second, we find that f is negatively affected by s, with a two-y lag, as given by the estimate of $\phi_{12} = -0.26$ (with a corresponding t-ra of -2.35). That the sign is negative reflects the role of foreign saving reliever of the recipient country's domestic savings constraint. Her in order to maintain or increase the rate of investment, lower dome savings rate would require more foreign savings as additional finar The converse is also true. Furthermore, that this relationship does occur simultaneously, but with a two-year lag, suggests that the per mance of domestic savings rate over several years (i.e., some "avera instead of annual, rate) is more important in determining the count foreign financing needs.

On the other hand, we find that foreign savings were independ of per-capita income. While some forms of foreign savings tend to more responsive to per-capita income (which proxies market cor tions), others are not as responsive. For instance, direct foreign inv ment, portfolio investment, and other short-term capital are attrac to countries with more favorable market conditions (e.g., a relativ well-off country will better attract these forms of foreign savings as infrastructure will tend to be more adequate and its investment clim

[12] Using data for a short period, 1954-1972, we obtained no significant ca relation among domestic savings, foreign savings, and per-capita income in any poss direction.

is more stable). On the other hand, foreign aid flow may respond less to per-capita income and more so to political and social factors. Somewhere in between are foreign loans which are influenced by both market and non-market factors (the latter includes funds obtained from "forced" lending in order to avoid default of a number of large debtor countries since such an event would produce a greater negative externality on the international financial system). Our results suggest that the effects of the different forms of foreign savings on domestic savings rate net out.[13]

Third, our findings show that per-capita income is enhanced by foreign savings, as indicated by $\theta_{22} = 63.99$ and $\theta_{23} = 48.98$ (t-ratios are 3.58 and 2.06, respectively). This reflects the other role of foreign savings, i.e., as reliever of a country's foreign exchange constraint. A country at a lower level of development tends to rely on imports of capital goods and raw materials which are required in domestic production but could not yet be produced domestically. In order to pay for these imports, foreign exchange is necessary. To the extent that the country may be unable to earn sufficient foreign exchange from its exports, the availability of foreign savings can ease this constraint. The higher production that foreign savings make possible increases per-capita income.

This explanation is consistent with the finding that domestic savings rate does not affect per-capita income. This result appears to be heavily influenced by the period of study, which included years during which foreign savings were easily obtainable so that per-capita income was not constrained by the domestic savings rate.[14]

---

[13] Preliminary results of another study reveal that, given a lag order of three, causality tests reveal no causal relation between pairwise combinations of domestic savings rate and each of the following forms of foreign savings (expressed as proportion of GDP): direct foreign investment, portfolio investment, foreign loans, and foreign aid and grants. When the lag order was increased to five, earlier results remain except that an increase in domestic savings rate causes foreign aid and grants to fall (Mapalad, 1997).

[14] Thomas E. Weisskopf, "The Impact of Foreign Capital Inflow on Domestic Savings in Underdeveloped Countries," *Journal of International Economics*, 2(1972): 25-38, esp. 33, where Weisskopf classified the Philippines between 1953-62 as a country where the savings constraint is binding and the trade (and foreign exchange) constraint is not.

6. Conclusion

In this paper, we focus on the empirical basis of the revisio view that foreign savings substitute for domestic savings in the rec ing country. We join Snyder in arguing that the negative correla which authors have generally used to lend empirical support for above view is spurious in nature. We, however, disagree with Sny over his choice of omitted variable (i.e., per-capita income) which is source of the spurious correlation. We show that the significant corr tions he obtained when per-capita income was included in the mc are themselves spurious, arising from the non-stationarity of the v ables included.

More importantly, we argue that the revisionist view is concer with the existence of a causal relation between foreign and dome savings and must be tested as such. This means that a correlation t even one that is based on a better-specified domestic savings funct continues to be inadequate. From the test of causality, we find support for the revisionist view nor for the significance of per-ca income as a determinant of domestic savings rate. Hence, altho foreign savings did complement domestic savings to some degree, goal of increasing domestic savings rate in order to sustain high rate investment must rely on factors which aid in domestic savings mob zation other than increases in per-capita income.

References

Bowles, Paul (1987), "Foreign Aid and Domestic Savings in Less De loped Countries: Some Tests for Causality," *World Developm* 15(6):789-96.

Giles, David E. A., Judith A. Giles, and Ewen McCann (1992), "Cau ity, Unit Roots and Export-Led Growth: The New Zealand Ex rience," *Journal of International Trade and Economic Devel ment*, 1(3):195-218.

_____ (1970), "Foreign Capital, Domestic Savings and Economic velopment," *Bulletin*, 32(2):99-112.

_____ and Ricardo Ffrench-Davis (1964), "El Capital Extranjero Desarrollo," *Revista Economia*, 3(1):11-33.

_____ and John L. Enos (1970), "Foreign Assistance: Objectives and Consequences," *Economic Development and Cultural Change*, 18(3):313-27.

Grinols, Earl and Jagdish Bhagwati (1976), "Foreign Capital, Savings and Dependence," *Review of Economics and Statistics*, 58(4):416-24.

International Monetary Fund (1979), *International Financial Statistics Yearbook*, Washington, D.C.

_____ (1995), *International Financial Statistics Yearbook*, Washington, D.C.

Liverakos, Petros K. (1994), *The Causal Relation Between Budget and Trade Deficits: The Case of Greece, 1952-92,* Ph.D. Dissertation, Department of Economics, University of Utah, Salt Lake City.

Mapalad, Maria Claret M. (1996), *The Causal Relation Between Foreign and Domestic Savings in Four Southeast Asian Economies*, Discussion Paper 96-09, School of Economics, University of the Philippines, Diliman, Quezon City.

_____ (1997), "The Impact of Foreign Capital Inflows on Domestic Savings: The Case of the Philippines," unpublished.

Rahman, Md. Anisur (1968), "Foreign Capital and Domestic Savings: A Test of Haavelmo's Hypothesis with Cross-Country Data," *Review of Economics and Statistics*, 50(1): 137-8.

Snyder, Donald (1990), "Foreign Aid and Domestic Savings: A Spurious Correlation?" *Economic Development and Cultural Change*, 39(1):175-81.

Tanhueco, Honorina (1994), "Determinants of Savings and Investment in the Philippines," in Raul V. Fabella and Hideyoshi Sakai, eds., *Resource Mobilization and Resource Use in the Philippines*, Institute of Developing Economies.