Alguacil, M. Teresa; Cuadros, Ana; Orts, Vicente

Working Paper

CREDIT Research Paper, No. 02/09

Provided in Cooperation with:
The University of Nottingham, Centre for Research in Economic Development and International Trade (CREDIT)


This Version is available at:
http://hdl.handle.net/10419/81837

Terms of use:
Documents in EconStor may be saved and copied for your personal and scholarly purposes. You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

by

M Teresa Alguacil, Ana Cuadros and Vicente Orts

Centre for Research in Economic Development and International Trade, University of Nottingham
The Centre for Research in Economic Development and International Trade is based in the School of Economics at the University of Nottingham. It aims to promote research in all aspects of economic development and international trade on both a long term and a short term basis. To this end, CREDIT organises seminar series on Development Economics, acts as a point for collaborative research with other UK and overseas institutions and publishes research papers on topics central to its interests. A list of CREDIT Research Papers is given on the final page of this publication.

Authors who wish to submit a paper for publication should send their manuscript to the Editor of the CREDIT Research Papers, Professor M F Bleaney, at:

Centre for Research in Economic Development and International Trade,
School of Economics,
University of Nottingham,
University Park,
Nottingham, NG7 2RD,
UNITED KINGDOM

Telephone (0115) 951 5620
Fax: (0115) 951 4159

CREDIT Research Papers are distributed free of charge to members of the Centre. Enquiries concerning copies of individual Research Papers or CREDIT membership should be addressed to the CREDIT Secretary at the above address. Papers may also be downloaded from the School of Economics web site at: www.nottingham.ac.uk/economics/research/credit
Does Saving Really Matter for Growth?

by

M Teresa Alguacil, Ana Cuadros and Vicente Orts

Centre for Research in Economic Development and International Trade,
University of Nottingham
The Authors
M Teresa Alguacil and Ana Cuadros are respectively Lecturer at the Department of Economics, University Jaume I, Castellón, Spain. Vicente Orts is Professor at the same Department. They all belong to the Institute of International Economics.

Acknowledgements
The authors would like to thank Oliver Morrissey for his valuable comments. They are also indebted to the projects: Fundación Caixa Castellóë BANCAIXA P1B99-15 and CICYT SEC 1999-0598 for financial support.

May 2002
Abstract
This paper uses the Granger non-causality test procedure developed by Toda and Yamamoto (1995) to analyse the saving-growth nexus in Mexico. Contrary to the reverse causation between national saving and domestic income found in recent empirical studies, evidence is presented in favour of Solow’s model prediction that higher saving leads to higher economic growth. The confirmation of a saving-growth nexus in this country seems to be related to the inclusion of foreign direct investment (FDI) in the model. As this study will try to show, this last variable enhances economic growth and reinforces the connection between the two focus variables.

Outline
1. Introduction
2. Theoretical Considerations and Empirical Studies
3. Data and Methodological Approach
4. Empirical Results
5. Concluding Remarks and Policy Implications
6.
Does Saving Really Matter for Growth?


Mª Teresa Alguacil, Ana Cuadros* and Vicente Orts

Department of Economics and Institute of International Economics

University Jaume I of Castellon, SPAIN

May 14, 2002

Abstract

This paper uses the Granger non-causality test procedure developed by Toda and Yamamoto (1995) to analyse the saving-growth nexus in Mexico. Contrary to the reverse causation between national saving and domestic income found in recent empirical studies, evidence is presented in favour of Solow’s model prediction that higher saving leads to higher economic growth. The confirmation of a saving-growth nexus in this country seems to be related to the inclusion of foreign direct investment (FDI) in the model. As this study will try to show, this last variable enhances economic growth and reinforces the connection between the two focus variables.

*Corresponding author. Mail Address: Departamento de Economía, Universidad Jaume I, Campus Riu Sec, 12071, Castellón (Spain). Tel.: +34-964-728606; fax: + 34-964-728591. E-mail address: cuadros@eco.uji.es (Ana Cuadros).
1 Introduction

The central presumption of Solow’s (1956) type growth models is that higher saving precedes and causes economic growth. The main policy implication of these models for development is that countries that manage to increase their saving rate, and therefore investment, will increase their rate of growth. Alternatively, if the reverse sequence occurs, the policy emphasis should be shifted away from saving and concentrated on removing impediments to growth.

The existence of a positive association between saving and growth is a robust empirical finding (see, for example, Modigliani, 1970, Bosworth, 1993, Carrol and Weil, 1994, and Edwards, 1995). However, correlation does not imply causality and the debate about the saving-growth nexus is far from being settled. The controversy concerning the temporal precedence between these two variables is one of the most questioned issues in current macroeconomics, as noted by Schmidt-Hebbel et al. (1996). Nevertheless, the determination of the direction of the causal link between saving and growth is a crucial economic problem as it has important policy implications for developing countries.

The view that growth appears to cause saving has found support in several recent papers. For instance, Gavin et al. (1997) argue that: “Higher growth rate precedes higher saving rather than the reverse... According to this view, Latin America’s chronically low rate of saving is primarily the consequence, more than the cause, of the region’s history of low and volatile economic growth” (p. 13). Sinha and Sinha (1998) vindicate these assertions and conclude that the conventionally accepted view that higher saving rate causes higher economic growth does not hold for Mexico. Their principal finding is that causality goes in the opposite direction.
In this paper, we present an alternative perspective on the saving-growth relationship in Mexico for the period 1970-2000. Our main objective is to highlight that in an open economy, domestic investment can be financed by domestic or foreign saving, through inflows of international capital. That is, net foreign resource inflows might supplement domestic saving and help countries reach higher rates of investment and growth. This hypothesis seems to be particularly relevant for certain types of capital inflows, principally for foreign direct investment (FDI).

The relatively successful implementation of macroeconomic stabilisation measures and liberalisation programs since the beginning of the eighties have increased the participation of FDI in total capital inflows in the Mexican economy. These programs have created a more favourable economic environment augmenting foreign investors confidence in this country. A large proportion of foreign flows has been directed to innovative “greenfield” investments in the manufacturing sector, particularly the maquiladoras, where international trade links are strong (Ramírez, 2000). The Mexican experience can thus provide an interesting case study to evaluate the influence of FDI on the saving-growth nexus.

Contrary to Sinha and Sinha (1998), our findings support the dominant view that higher saving precedes higher growth in Mexico. As we will demonstrate, the lack of support for the saving-growth nexus found by these authors could be related to the omission of foreign direct investment (FDI). By omitting this variable, they do not consider either the role played by foreign inflows in complementing domestic saving, or the beneficial effects of FDI on domestic income.

The rest of the paper is organised as follows. Section 2 discusses the the-
oretical reasons for considering FDI when analysing the saving-growth nexus. Section 3 contains a description of data and the estimation procedure. Section 4 presents the empirical results. Concluding remarks are given in Section 5.

2 Theoretical Considerations and Empirical Studies

Theoretically, the link between saving and growth operates through two relations. The first is given by the aggregate production function, and relates the increases in output with capital stock accumulation. The second relation is an equilibrium condition that states the equality between saving and investment. Accordingly, an increase in saving induces capital accumulation and eventually higher output level.¹

Nevertheless, in an open economy saving and investment need not be equal. A country may invest more than it saves and borrow from the rest of the world, running current account deficits. Formally, this can be written as

\[ I_t \equiv S_t - CA_t \]  \hspace{1cm} (1)

where \( S_t \) and \( I_t \) are domestic saving and investment, respectively, and \( CA_t \) is the current account balance.

Consequently, domestic investment can be financed by domestic or foreign saving, through inflows of international capital.² However, Identity (1) does not

¹Even if the increase in the saving rate leads to temporary higher investment and economic growth rates, higher saving rates can permanently affect the level of output and the standard of living.
²Capital inflows either finance a current account deficit or add to reserve accumulation,
capture any causal relationship among its components. An exogenous change in international capital inflows may modify either of the variables of this identity depending on the type and nature of these capital movements: foreign direct investment (FDI), portfolio investment or other financial flows (primarily bank loans).

There is increasing evidence, indicating that the effects of these three types of capital inflows are different. As Reinhart (1999) mentioned, when “there are important behavioural differences among the various types of capital flows, then their effects on economic activity, such as saving and investment, are also likely to differ”. There exists a general belief that the most important of these flows is FDI, which has been considered as “good coleserol” for developing economies (Hausmann and Fernández Arias, 2000). Bosworth and Collins (1999) find that FDI appears to have highly beneficial effects on domestic investment. The results obtained by these authors suggest a near one-for-one relationship. In contrast, portfolio capital inflows appear to have no discernible impact on investment, and the effect of loans lies between the other two (p. 164).

Moreover, FDI seems to have a higher permanent component, as it is more persistent than other components of capital flows, in terms of its volatility and predictability (see, for example, Sarno and Taylor, 1997 and Lipsey, 1999). In each of the last three financial and exchange rate crises (Latin America in 1982, Mexico in 1994, and East Asia in 1997), direct investment inflows into the affected countries were more stable than inflows of portfolio or other forms of investment (Lipsey, 2001).³

³This author points out that after the 1994 crisis, direct investment inflows declined in
Finally, foreign direct investment may also accelerate growth through the transfer of managerial and technological know-how.\textsuperscript{4} In a survey on the impact of inward foreign direct investment on growth in developing countries, de Mello (1997) argues that FDI is believed to be a very important source of human capital augmentation and technological change, since it promotes the use of more advanced technologies by domestic firms and provides specific productivity-increasing labour training and skill acquisition.\textsuperscript{5} In the Mexican case, quite a few studies have supported the claim that FDI has led to significant positive spillover effects on the labour productivity of domestic firms. This is for instance the case of Blomström (1986), Blomström and Wolf (1994), Kokko (1996), and Ramírez (2000).

The results of the above empirical studies lend support to the hypothesis that FDI is “different” when compared with other capital inflows, and the “preferred” type of flow for promoting growth. Thus, the shift of the composition of capital flows to developing countries toward foreign direct investment and away from loans after the 1982 crisis can be contemplated as “good news” for these countries. The 1980s and 1990s witnessed an unprecedented increased in FDI flows in the more dynamic economies. Capital flows to developing economics are concentrated among a few countries in Asia and Latin America. Five countries (in descending order, China, Mexico, Korea, Thailand and Brazil) accounted for nearly two-thirds of financial flows to developing countries in the 1990-95 period (Bosworth and Collins, 1999).

\textsuperscript{4}See Borensztein et al (1998) and Balasubramanyam et al (1996) for evidence pertaining to the favourable effects of FDI.

\textsuperscript{5}Nevertheless, according to Blomström et al (2000), FDI contributes to economic growth only when a sufficient absorptive capability of the advanced technologies is available in the host economy.
To summarise, the key point that we try to stress is that estimates of domestic saving effects on growth, which ignore the role of FDI (in countries with an important openness process) may give a misleading picture of the true saving-growth nexus. This study attempts to close this gap and to identify the channels through which FDI may affect this connection in Mexico.

3 Data and Methodological Approach

In this section, we investigate Granger causality between domestic saving and income in Mexico. It is well documented that the exclusion of relevant variables induces spurious significance and inefficient estimates (see e.g. Gujarati, 1995, and Canova, 1995). As Fair (1988) demonstrated, when the omitted variables are correlated with the included ones, the non-causality test will be misspecified. Therefore, we evaluate the saving-growth nexus in a multivariate setting, in which foreign direct investment is also allowed to exert its influence over these two focus variables.

The data employed in this work are annual and are taken from the World Development Indicators (World Bank), except foreign direct investment flows, which are obtained from the International Financial Statistics (IMF). All series are in real dollars (1995 prices) and in all regressions they are expressed in natural logarithms. Gross domestic product is employed in place of domestic income and domestic saving and FDI are both deflated by using the GDP deflator. The sample period runs from 1970 to 2000.

Figure 1 presents the cross plots of domestic saving and foreign investment flows in relation to domestic income. As we can see, except for the period from
mid-eighties to early-nineties (coinciding with economic recession in Mexico), both saving and foreign direct investment appear positively related to domestic output. This effect is even more pronounced in the saving-income relation. However, this correlation does not imply causality but only a positive association, thus leaving unsettled the debate concerning the direction of the saving-growth nexus.

Theoretically, the relationship between saving and output, and between these two variables and foreign direct investment may run in either or both directions and potentially cause simultaneity bias. In fact, the reverse causation between saving and growth reported by Sinha and Sinha (1998) does not contradict the prediction of Solow’s model. Just as domestic economic activity is likely to depend on saving, so too can the level of output influence saving, as economic growth is one of its main determinants. Additionally, greater domestic income as an indicator of higher expected profits might attract new foreign investment projects. In these circumstances, the estimation of a VAR model to test causality hypotheses is more reliable than that of a single equation model. VAR models treat all variables as potentially endogenous avoiding thus infecting the model
with false identifying restrictions (Sims, 1980).

Accordingly, to undertake our empirical analysis, we specify the following three-variable vector autoregressive model comprised of gross domestic savings \( (S) \), gross domestic product \( (Y) \) and foreign direct investment flows \( (FDI) \).

\[
x_t = \mu + \beta t + \Phi_1 x_{t-1} + \cdots + \Phi_s x_{t-s} + u_t \quad t = 1, \ldots, T
\]

where \( x_t = (S_t, Y_t, FDI_t)' \), \( \Phi_i (i = 1, \cdots, s) \) are all matrices of coefficients and \( u_t \sim IN(0, \Sigma_u). \)

Following the Solow’s model prediction, we would expect to obtain a causal relationship running from \( S \) to \( Y \), which amounts a rejection of the null hypothesis that all of the coefficients on lagged savings are equal to zero in the output equation (that is, \( H_0 : \phi^{(21)} = 0 \), where \( \phi^{(21)} = \phi_1^{(21)}, \phi_2^{(21)}, \ldots, \phi_s^{(21)} \)).

The reverse causation between saving and output, as established by Sinha and Sinha (1998), will require the significance of the lagged output variable in the saving equation to be found (i.e., to reject \( H_0 : \phi^{(12)} = 0 \), where \( \phi^{(12)} = \phi_1^{(12)}, \phi_2^{(12)}, \ldots, \phi_s^{(12)} \)).

A general problem for Granger causality testing in time series analysis is the possible existence of stochastic trends in the variables. The traditional \( F \)-test and its Wald test counterpart to determine whether some parameters of a stable VAR model are jointly zero are not valid for non-stationary processes,

---

\(^{6}\)It was found necessary to include three impulse dummy variables in 1984, 1988 and 1994. The first one tries to capture the transition from an inward to and outward-oriented model of economic development, beginning with the Miguel de la Madrid Administration (1982-1988). The other two account for the economic crises experienced by Mexico.

\(^{7}\)As proposed by Granger (1969), in this study causality is synonymous with predictability. That is, \( x \) is said to Granger cause \( y \) if and only if \( y(t) \) is predicted better by using the past history of \( x \), together with the past history of itself, rather than by using just the past history of \( y \).
as the test statistics do not have a standard distribution (Sims et al., 1990; Toda and Phillips, 1993). Although alternative procedures have been developed to improve the power and size of the Granger non-causality test (Engle and Granger, 1987, Johansen, 1988, Johansen and Juselius, 1990, and Mosconi and Giannini, 1992\(^8\)), they are cumbersome and involve pre-testing for integration and cointegration. As Engle and Granger (1987) demonstrate, if the original series are non-stationary, valid results in Granger causality are obtained simply by first differentiating the VAR model. Nevertheless, this transformation may lead to loss of information about the long-run relationship between the trend components of the original series. In that case, Granger causality will further require the inclusion of an error correction term in the stationary model in order to capture the short-term deviations of series from their long-term equilibrium path.

However, as Giles and Mirza (1999) pointed, the above testing sequence may induce an over-rejection of the non-causal null (i.e., pre-testing for non-stationarity can often convey the wrong conclusion of causality), leaving us open to the possibility of distortions in the inference procedure. Additionally, Toda (1994) and Ho and Sorensen (1996) demonstrate that the reduced rank methodology, devised by Johansen and Juselius (1990) has limitations in the detection of economic long-run relationships.

To deal with these problems, Toda and Yamamoto (1995) and Dolado and Lütkepohl (1996), hereafter TYDL, propose a technique that is applicable irrespective of the integration and cointegration properties of the system (and so to the possible pre-test biases). This method involves using a Modified Wald

\(^8\)Mosconi and Giannini (1992) proposed a likelihood ratio test for cointegrated systems
statistic (denoted MWald) for testing significance of the parameters of a VAR(s) model (where s is the lag length in the system).\(^9\) In this case, the estimation of a VAR\((s + d_{\text{max}})\) guarantees the asymptotic \(\chi^2\) distribution of the Wald statistic, where \(d_{\text{max}}\) is the maximal order of integration we believe may occur in the model.\(^10\) As we are not interested in the cointegration relationships themselves but rather in testing restrictions on the coefficients of the model, this testing procedure will be preferable to the two-step methodology of the error correction models. Following Dolado and Lütkepohl (1996), we construct these tests based on multivariate least squares estimation.

### 4 Empirical Results

Prior to applying the TYDL technique for Granger non-causality testing, we proceed to establish the optimal lag length of the system and the maximum order of integration of variables. The order of integration of the series is tested here by means of the Augmented Dickey and Fuller (1979, 1981), and Phillips and Perron (1988) tests. According to the \(\tau\) and \(Z(t)\) statistics, shown in Table 1, the null hypothesis of a unit root is not rejected for \(S, Y,\) and \(FDI.\) The null hypothesis of variables integrated of order one is however clearly rejected in the differentiated variables (denoted with \(\Delta\), indicating that they have a unit root in their levels.

To select the lag structure of the VAR model, we employ the Akaike’s Infor-

---

\(^9\)By means of a Monte Carlo experiment, Zapata and Rambaldi (1997) demonstrate that the MWald test has a comparable performance in size and power to the Wald and likelihood ratio tests.

\(^{10}\)Toda and Yamamoto (1995) show that if variables are integrated of order \(d\), the usual selection procedure is valid whenever \(k \geq d\). Therefore, if \(d = 1\), the lag selection procedure is always consistent.
Table 1: Test of the Unit Root Hypothesis

<table>
<thead>
<tr>
<th>Variable (lag)</th>
<th>ADF statistics</th>
<th>PP statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\tau_{\tau}$</td>
<td>$\tau_{\mu}$</td>
</tr>
<tr>
<td>---------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>$Y$ (1)</td>
<td>-2.56</td>
<td>-1.02</td>
</tr>
<tr>
<td>$S$ (1)</td>
<td>-2.27</td>
<td>-2.25</td>
</tr>
<tr>
<td>$FDI$ (2)</td>
<td>-2.50</td>
<td>-0.67</td>
</tr>
<tr>
<td>$\Delta Y$ (1)</td>
<td>-3.03</td>
<td>-3.05</td>
</tr>
<tr>
<td>$\Delta S$ (1)</td>
<td>-2.85</td>
<td>-2.77</td>
</tr>
<tr>
<td>$\Delta FDI$ (1)</td>
<td>-5.28</td>
<td>-5.42</td>
</tr>
</tbody>
</table>

Critical values for 100 observations

Sig. levels:

<table>
<thead>
<tr>
<th></th>
<th>1%</th>
<th>5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\tau$</td>
<td>-4.07</td>
<td>-3.46</td>
</tr>
<tr>
<td>$\mu$</td>
<td>-3.51</td>
<td>-2.89</td>
</tr>
<tr>
<td>$\tau$</td>
<td>-2.59</td>
<td>-1.94</td>
</tr>
<tr>
<td>$Z(t_{\tau})$</td>
<td>-3.51</td>
<td>-2.89</td>
</tr>
<tr>
<td>$Z(t_{\mu})$</td>
<td>-2.59</td>
<td>-1.94</td>
</tr>
<tr>
<td>$Z(t_{\tau})$</td>
<td>-4.07</td>
<td>-3.46</td>
</tr>
</tbody>
</table>

Notes: (i), (ii) and (iii) indicate the model statistics with drift and trend, with drift, and without drift or trend, respectively. The optimal lag used for the Augmented Dickey-Fuller tests (ADF), and the truncation lag parameter in the Phillips and Perron tests (PP) was determined using Akaike Information Criteria.

In Table 2, we report the $\chi^2$-test statistics obtained for Granger non-causality testing together with the estimate p-values. The results for the multivariate and bivariate causality tests are both obtained from the estimation of a three-equation system, in which $S$, $Y$, and $FDI$ have been jointly determined, as

\[\text{Higher orders of the VAR model produce singular variance-covariance matrices.}\]
### Table 2: Granger Causality Test

<table>
<thead>
<tr>
<th>$H_0:$</th>
<th>Lag length / VAR order</th>
<th>MWald (d.o.f)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$S \rightarrow Y$</td>
<td>4 / 5</td>
<td>34.73 (4)</td>
<td>0.000</td>
</tr>
<tr>
<td>5 / 6</td>
<td>28.29 (5)</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>$FDI \rightarrow Y$</td>
<td>4 / 5</td>
<td>32.77 (4)</td>
<td>0.000</td>
</tr>
<tr>
<td>5 / 6</td>
<td>31.50 (5)</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>$S, FDI \rightarrow Y$</td>
<td>4 / 5</td>
<td>62.05 (8)</td>
<td>0.000</td>
</tr>
<tr>
<td>5 / 6</td>
<td>59.53 (10)</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>$Y \rightarrow S$</td>
<td>4 / 5</td>
<td>9.44 (4)</td>
<td>0.051</td>
</tr>
<tr>
<td>5 / 6</td>
<td>7.91 (5)</td>
<td>0.161</td>
<td></td>
</tr>
<tr>
<td>$S \rightarrow FDI$</td>
<td>4 / 5</td>
<td>21.32 (4)</td>
<td>0.000</td>
</tr>
<tr>
<td>5 / 6</td>
<td>70.22 (5)</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>$FDI \rightarrow S$</td>
<td>4 / 5</td>
<td>7.77 (4)</td>
<td>0.100</td>
</tr>
<tr>
<td>5 / 6</td>
<td>5.69 (5)</td>
<td>0.338</td>
<td></td>
</tr>
<tr>
<td>$Y, FDI \rightarrow S$</td>
<td>4 / 5</td>
<td>22.04 (8)</td>
<td>0.005</td>
</tr>
<tr>
<td>5 / 6</td>
<td>13.58 (10)</td>
<td>0.193</td>
<td></td>
</tr>
</tbody>
</table>

Note: $\rightarrow$ denotes “do(es) not cause”. To determine the appropriate lag length, $p$, we employ Akaike’s Information Criterion and Hannan-Quinn Criterion. Figures in parentheses are degree of freedom (d.o.f).

shown in Equation (2). The outcomes for the optimal model are reported in bold letters.

As can be appreciated, irrespective of the choice of the lag length, there is strong evidence of a causal relationship running from domestic saving to output. This result supports the Solow’s model prediction that saving precedes and causes economic growth. We find also that foreign direct investment Granger-causes domestic output in all cases considered, which confirms the expected beneficial effects of FDI on domestic investment and income in Mexico. Moreover, the multivariate causality test indicates that both saving and FDI jointly cause economic growth. Furthermore, the $\chi^2$ statistics obtained provide support for the findings of Sinha and Sinha (1995), which is consistent with a positive impact of an increase in output over domestic saving. In our specifications,
however, this causation relies on the lag structure of the model. Only for the optimal lag length do we obtain evidence of bi-directional causality between saving and output.

The findings of this paper also suggest a uni-directional causal relationship going from saving to foreign investment but not in the opposite direction. The null hypothesis of Granger non-causality from $S$ to $FDI$ is strongly rejected at 1% level, regardless of the lag length of the system. Conversely, the hypothesis of Granger non-causality from $FDI$ to saving cannot be rejected at standard significance levels in either model. The significant impact of saving on FDI probably reflects the increasing confidence of foreign investors when domestic saving rises.

In summary, the overall effect of FDI on the Mexican economy seems to be not negligible. Its impact over domestic investment and output is probably reinforcing the relation between national saving and output, which confirms our perception about the importance of including foreign investment flows when analysing this connection in an open economy.

5 Concluding Remarks and Policy Implications

As we have tried to stress, both the direction of causality between saving and growth, and the interpretation of their causal relationship are still open issues. The view that growth appears to precede saving and not vice versa has found support in several recent papers. Thus, the causation between these two variables is far from being settled and this can be a crucial element in policy design.

Our analysis starts off from the premise that saving and investment need
not be equal in an open economy. Indeed, domestic investment can be financed by domestic or foreign saving, through inflows of international capital. This is particularly evident for foreign direct investment, which shows important behavioural differences with other types of capital flows.

Thus, we investigate the saving-growth nexus in Mexico by taking into account both the role played by foreign inflows in complementing domestic saving and the beneficial effects of FDI on domestic investment and income. The results obtained, using the Granger non-causality test procedure developed by Toda and Yamamoto (1995) and Dolado and Lütkepohl (1996), add empirical support to the central presumption of Solow’s model that higher saving precedes economic growth. This outcome is to some degree contrary to that of Sinha and Sinha (1998), which indicates that higher growth rate is a precursor of saving rather than the reverse. We proved that this one-way causality might be related to the omission of foreign direct investment. In fact, by also considering the influence of foreign capital inflows, we show that the causation between saving and output is bi-directional instead of uni-directional. Moreover, the causal relationship running from FDI to output, that has been identified in this work, confirms the importance of these investment projects in stimulating economic growth in Mexico. Additional evidence has been found on a saving-FDI linkage, providing further support to the crucial role of domestic saving for economic growth.

The main policy implication of our analysis is the need to achieve a proper combination of an outward oriented strategy with policies that promote saving and guarantee macroeconomic stability. As demonstrated, without saving, neither investment nor growth occurs.
Acknowledgements

References


CREDIT PAPERS

00/1 **Robert Lensink**, “Does Financial Development Mitigate Negative Effects of Policy Uncertainty on Economic Growth?”

00/2 **Oliver Morrissey**, “Investment and Competition Policy in Developing Countries: Implications of and for the WTO”

00/3 **Jo-Ann Crawford and Sam Laird**, “Regional Trade Agreements and the WTO”

00/4 **Sam Laird**, “Multilateral Market Access Negotiations in Goods and Services”

00/5 **Sam Laird**, “The WTO Agenda and the Developing Countries”


00/7 **Henrik Hansen and Fin Tarp**, “Aid and Growth Regressions”

00/8 **Andrew McKay, Chris Milner and Oliver Morrissey**, “The Trade and Welfare Effects of a Regional Economic Partnership Agreement”

00/9 **Mark McGillivray and Oliver Morrissey**, “Aid Illusion and Public Sector Fiscal Behaviour”

00/10 **C.W. Morgan**, “Commodity Futures Markets in LDCs: A Review and Prospects”

00/11 **Michael Bleaney and Akira Nishiyama**, “Explaining Growth: A Contest between Models”

00/12 **Christophe Muller**, “Do Agricultural Outputs of Autarkic Peasants Affect Their Health and Nutrition? Evidence from Rwanda”

00/13 **Paula K. Longelly**, “Are There Gender-Separate Human Capital Effects on Growth? A Review of the Recent Empirical Literature”

00/14 **Stephen Knowles and Arlene Garces**, “Measuring Government Intervention and Estimating its Effect on Output: With Reference to the High Performing Asian Economies”

00/15 **I. Dasgupta, R. Palmer-Jones and A. Parikh**, “Between Cultures and Markets: An Eclectic Analysis of Juvenile Gender Ratios in India”

00/16 **Sam Laird**, “Dolphins, Turtles, Mad Cows and Butterflies – A Look at the Multilateral Trading System in the 21st Century”

00/17 **Carl-Johan Dalgaaard and Henrik Hansen**, “On Aid, Growth, and Good Policies”

01/01 **Tim Lloyd, Oliver Morrissey and Robert Osei**, “Aid, Exports and Growth in Ghana”

01/02 **Christophe Muller**, “Relative Poverty from the Perspective of Social Class: Evidence from The Netherlands”

01/03 **Stephen Knowles**, “Inequality and Economic Growth: The Empirical Relationship Reconsidered in the Light of Comparable Data”

01/04 **A. Cuadros, V. Orts and M.T. Alguacil**, “Openness and Growth: Re-Examining Foreign Direct Investment and Output Linkages in Latin America”

01/05 **Harold Alderman, Simon Appleton, Lawrence Haddad, Lina Song and Yisehac Yohannes**, “Reducing Child Malnutrition: How Far Does Income Growth Take Us?”
01/06 Robert Lensink and Oliver Morrissey, “Foreign Direct Investment: Flows, Volatility and Growth”
01/07 Adam Blake, Andrew McKay and Oliver Morrissey, “The Impact on Uganda of Agricultural Trade Liberalisation”
01/08 R. Quentin Grafton, Stephen Knowles and P. Dorian Owen, “Social Divergence and Economic Performance”
01/09 David Byrne and Eric Strobl, “Defining Unemployment in Developing Countries: The Case of Trinidad and Tobago”
01/10 Holger Görg and Eric Strobl, “The Incidence of Visible Underemployment: Evidence for Trinidad and Tobago”
01/12 Eric Strobl and Frank Walsh, “Minimum Wages and Compliance: The Case of Trinidad and Tobago”
01/13 Mark McGillivray and Oliver Morrissey, “A Review of Evidence on the Fiscal Effects of Aid”
01/14 Tim Lloyd, Oliver Morrissey and Robert Osei, “Problems with Pooling in Panel Data Analysis for Developing Countries: The Case of Aid and Trade Relationships”
01/15 Oliver Morrissey, “Pro-Poor Conditionality for Aid and Debt Relief in East Africa”
01/17 Michael Bleaney and Lisenda Lisenda, “Monetary Policy After Financial Liberalisation: A Central Bank Reaction Function for Botswana”
01/18 Holger Görg and Eric Strobl, “Relative Wages, Openness and Skill-Biased Technological Change in Ghana”
01/19 Dirk Willem te Velde and Oliver Morrissey, “Foreign Ownership and Wages: Evidence from Five African Countries”
01/20 Suleiman Abrar, “Duality, Choice of Functional Form and Peasant Supply Response in Ethiopia”
01/21 John Rand and Finn Tarp, “Business Cycles in Developing Countries: Are They Different?”
01/22 Simon Appleton, “Education, Incomes and Poverty in Uganda in the 1990s”
02/01 Eric Strobl and Robert Thornton, “Do Large Employers Pay More in Developing Countries? The Case of Five African Countries”
02/02 Mark McGillivray and J. Ram Pillarisetti, “International Inequality in Human Development, Real Income and Gender-related Development”
02/03 Sourafel Girma and Abbi M. Kedir, “When Does Food Stop Being a Luxury? Evidence from Quadratic Engel Curves with Measurement Error”
02/04 Indraneeel Dasgupta and Ravi Kanbur, “Class, Community, Inequality”
02/05 Karuna Gomane, Sourafel Girma and Oliver Morrissey, “Aid and Growth in Sub-Saharan Africa: Accounting for Transmission Mechanisms”
02/06 Michael Bleaney and Marco Gunderman, “Stabilisations, Crises and the “Exit” Problem – A Theoretical Model”
02/07 Eric Strobl and Frank Walsh, “Getting It Right: Employment Subsidy or Minimum Wage? Evidence from Trinidad and Tobago”

02/08 Carl-Johan Dalgaard, Henrik Hansen and Finn Tarp, “On the Empirics of Foreign Aid and Growth”


02/10 Simon Feeny and Mark McGillivray, “Modelling Inter-temporal Aid Allocation”

02/11 Mark McGillivray, “Aid, Economic Reform and Public Sector Fiscal Behaviour in Developing Countries”
SCHOOL OF ECONOMICS DISCUSSION PAPERS
In addition to the CREDIT series of research papers the School of Economics produces a discussion paper series dealing with more general aspects of economics. Below is a list of recent titles published in this series.

00/1  Tae-Hwan Kim and Christophe Muller, “Two-Stage Quantile Regression”
00/2  Spiros Bougheas, Panicos O. Demetrides and Edgar L.W. Morgenroth, “International Aspects of Public Infrastructure Investment”
00/3  Michael Bleaney, “Inflation as Taxation: Theory and Evidence”
00/4  Michael Bleaney, “Financial Fragility and Currency Crises”
00/5  Sourafel Girma, “A Quasi-Differencing Approach to Dynamic Modelling from a Time Series of Independent Cross Sections”
00/6  Spiros Bougheas and Paul Downward, “The Economics of Professional Sports Leagues: A Bargaining Approach”
00/7  Marta Aloï, Hans Jørgen Jacobsen and Teresa Lloyd-Braga, “Endogenous Business Cycles and Stabilization Policies”
00/8  A. Ghoshray, T.A. Lloyd and A.J. Rayner, “EU Wheat Prices and its Relation with Other Major Wheat Export Prices”
00/9  Christophe Muller, “Transient-Seasonal and Chronic Poverty of Peasants: Evidence from Rwanda”
00/10 Gwendolyn C. Morrison, “Embedding and Substitution in Willingness to Pay”
00/11 Claudio Zoli, “Inverse Sequential Stochastic Dominance: Rank-Dependent Welfare, Deprivation and Poverty Measurement”
00/12 Tae-Hwan Kim, Stephen Leybourne and Paul Newbold, “Unit Root Tests With a Break in Variance”
00/13 Tae-Hwan Kim, Stephen Leybourne and Paul Newbold, “Asymptotic Mean Squared Forecast Error When an Autoregression With Linear Trend is Fitted to Data Generated by an I(0) or I(1) Process”
00/14 Michelle Haynes and Steve Thompson, “The Productivity Impact of IT Deployment: An Empirical Evaluation of ATM Introduction”
00/15 Michelle Haynes, Steve Thompson and Mike Wright, “The Determinants of Corporate Divestment in the UK”
00/16 John Beath, Robert Owen, Joanna Poyago-Theotoky and David Ulph, “Optimal Incentives for Incoming Generations within Universities”
00/17 S. McCorriston, C. W. Morgan and A. J. Rayner, “Price Transmission: The Interaction Between Firm Behaviour and Returns to Scale”
00/18 Tae-Hwan Kim, Douglas Stone and Halbert White, “Asymptotic and Bayesian Confidence Intervals for Sharpe Style Weights”
00/19 Tae-Hwan Kim and Halbert White, “James-Stein Type Estimators in Large Samples with Application to the Least Absolute Deviation Estimator”
00/20 Gwendolyn C. Morrison, “Expected Utility and the Endowment Effect: Some Experimental Results”
00/21 Christophe Muller, “Price Index Distribution and Utilitarian Social Evaluation Functions”
<table>
<thead>
<tr>
<th>Date</th>
<th>Authors</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>00/22</td>
<td>Michael Bleaney</td>
<td>“Investor Sentiment, Discounts and Returns on Closed-End Funds”</td>
</tr>
<tr>
<td>00/23</td>
<td>Richard Cornes and Roger Hartley</td>
<td>“Joint Production Games and Share Functions”</td>
</tr>
<tr>
<td>00/24</td>
<td>Joanna Poyago-Theotoky</td>
<td>“Voluntary Approaches, Emission Taxation and the Organization of Environmental R&amp;D”</td>
</tr>
<tr>
<td>00/25</td>
<td>Michael Bleaney, Norman Gemmell and Richard Kneller</td>
<td>“Testing the Endogenous Growth Model: Public Expenditure, Taxation and Growth Over the Long-Run”</td>
</tr>
<tr>
<td>00/26</td>
<td>Michael Bleaney and Marco Gundermann</td>
<td>“Credibility Gains and Output Losses: A Model of Exchange Rate Anchors”</td>
</tr>
<tr>
<td>00/27</td>
<td>Indraneel Dasgupta</td>
<td>“Gender Biased Redistribution and Intra-Household Distribution”</td>
</tr>
<tr>
<td>00/28</td>
<td>Richard Cornes and Roger Hartley</td>
<td>“Rentseeking by Players with Constant Absolute Risk Aversion”</td>
</tr>
<tr>
<td>00/29</td>
<td>S.J. Leybourne, P. Newbold, D. Vougas and T. Kim</td>
<td>“A Direct Test for Cointegration Between a Pair of Time Series”</td>
</tr>
<tr>
<td>00/30</td>
<td>Claudio Zoli</td>
<td>“Inverse Stochastic Dominance, Inequality Measurement and Gini Indices”</td>
</tr>
<tr>
<td>01/01</td>
<td>Spiros Bougheas</td>
<td>“Optimism, Education, and Industrial Development”</td>
</tr>
<tr>
<td>01/02</td>
<td>Tae-Hwan Kim and Paul Newbold</td>
<td>“Unit Root Tests Based on Inequality-Restricted Estimators”</td>
</tr>
<tr>
<td>01/03</td>
<td>Christophe Muller</td>
<td>“Defining Poverty Lines as a Fraction of Central Tendency”</td>
</tr>
<tr>
<td>01/04</td>
<td>Claudio Piga and Joanna Poyago-Theotoky</td>
<td>“Shall We Meet Halfway? Endogenous Spillovers and Locational Choice”</td>
</tr>
<tr>
<td>01/05</td>
<td>Ilias Skamnelos</td>
<td>“Sunspot Panics, Information-Based Bank Runs and Suspension of Deposit Convertibility”</td>
</tr>
<tr>
<td>01/06</td>
<td>Spiros Bougheas and Yannis Georgellis</td>
<td>“Apprenticeship Training, Earnings Profiles and Labour Turnover: Theory and German Evidence”</td>
</tr>
<tr>
<td>01/07</td>
<td>M.J. Andrews, S. Bradley and R. Upward</td>
<td>“Employer Search, Vacancy Duration and Skill Shortages”</td>
</tr>
<tr>
<td>01/08</td>
<td>Marta Aloi and Laurence Lasselle</td>
<td>“Growing Through Subsidies”</td>
</tr>
<tr>
<td>01/09</td>
<td>Marta Aloi and Huw D. Dixon</td>
<td>“Entry Dynamics, Capacity Utilisation, and Productivity in a Dynamic Open Economy”</td>
</tr>
<tr>
<td>01/10</td>
<td>Richard Cornes and Roger Hartley</td>
<td>“Asymmetric Contests with General Technologies”</td>
</tr>
<tr>
<td>01/11</td>
<td>Richard Cornes and Roger Hartley</td>
<td>“Disguised Aggregative Games”</td>
</tr>
<tr>
<td>01/12</td>
<td>Spiros Bougheas and Tim Worrall</td>
<td>“Cost Padding in Regulated Monopolies”</td>
</tr>
<tr>
<td>10/13</td>
<td>Alan Duncan, Gillian Paull and Jayne Taylor</td>
<td>“Price and Quality in the UK Childcare Market”</td>
</tr>
<tr>
<td>01/14</td>
<td>John Creedy and Alan Duncan</td>
<td>“Aggregating Labour Supply and Feedback Effects in Microsimulation”</td>
</tr>
</tbody>
</table>
Members of the Centre

Director

Oliver Morrissey - aid policy, trade and agriculture

Research Fellows (Internal)

Simon Appleton – poverty, education, household economics
Adam Blake – CGE models of low-income countries
Mike Bleaney - growth, international macroeconomics
Indraneel Dasgupta – development theory, household bargaining
Norman Gemmell – growth and public sector issues
Ken Ingersent - agricultural trade
Tim Lloyd – agricultural commodity markets
Paula Lorgelly – health, gender and growth
Andrew McKay - poverty, peasant households, agriculture
Chris Milner - trade and development
Wyn Morgan - futures markets, commodity markets
Christophe Muller – poverty, household panel econometrics
Tony Rayner - agricultural policy and trade

Research Fellows (External)

V.N. Balasubramanyam (University of Lancaster) – foreign direct investment
David Fielding (University of Leicester) – investment, monetary and fiscal policy
Ravi Kanbur (Cornell) – inequality, public goods – Visiting Research Fellow
Henrik Hansen (University of Copenhagen) – aid and growth
Stephen Knowles (University of Otago) – inequality and growth
Sam Laird (UNCTAD) – trade policy, WTO
Robert Lensink (University of Groningen) – aid, investment, macroeconomics
Scott McDonald (University of Sheffield) – CGE modelling, agriculture
Mark McGillivray (RMIT University) – aid allocation, aid policy
Doug Nelson (Tulane University) - political economy of trade
Shelton Nicholls (University of West Indies) – trade, integration
David Sapsford (University of Lancaster) - commodity prices
Eric Strobl (University College Dublin) – labour markets
Finn Tarp (University of Copenhagen) – aid, CGE modelling
Howard White (IDS) – aid, poverty