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# COMISIÓN ECONÓMICA PARA AMÉRICA LATINA Y EL CARIBE – CEPAL



## DOCUMENTOS DE TRABAJO

### INDICATORS AND DETERMINANTS OF SAVINGS FOR LATIN AMERICA AND THE CARIBBEAN

Günther Held and Andras Uthoff  
with the collaboration of Daniel Titelman

Working Paper No. 25  
April 1995



NACIONES UNIDAS



**ECONOMIC COMMISSION FOR LATIN AMERICA  
AND THE CARIBBEAN**



**UNITED NATIONS**

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FOR LATIN AMERICA AND THE CARIBBEAN\***

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- \* A draft version of this paper was submitted to the Conference on "Growth and Long-Term Development" sponsored by the World Bank and held at El Escorial, Madrid, 11-13 July, 1994.
- \*\* The authors are ECLAC staff members. They thank Graciela Mognillansky, Roberto Frenkel and Edgardo Noya for valuable comments. The views expressed in this document are their responsibility and do not necessarily reflect those of the United Nations.
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Working Paper - ECLAC, N° 25  
April 1995 C. 2

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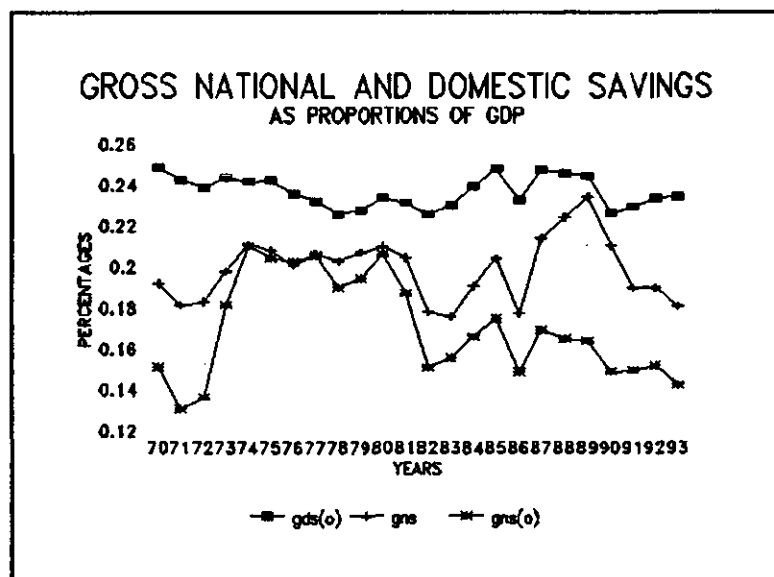
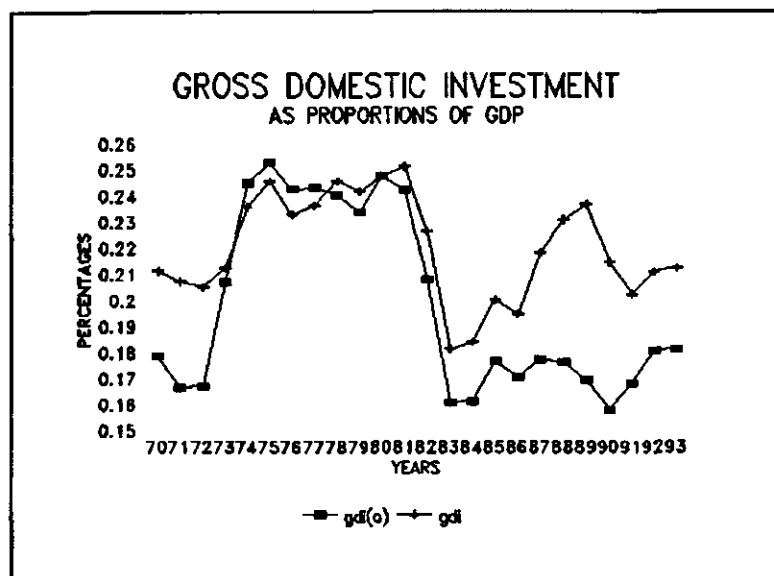


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Figure 1

## LATIN AMERICAN AND THE CARIBBEAN



Source: ECLAC, on the basis of official data.

- gds(o) = Gross domestic savings at constant prices as a proportion of GDP at these prices.
- gns = Gross national savings at current prices as a proportion of GDP at these prices.
- gns(o) = Gross national savings at constant prices as a proportion of GDP at these prices.
- gdi = Gross domestic investment at current prices as a proportion of GDP at these prices.
- gdi(o) = Gross domestic investment at constant prices as a proportion of GDP at these prices.

## I. CONCEPTS AND DEFINITIONS OF SAVINGS

### 1. Alternative definitions of savings in systems of national accounts

Table 1 contains definitions of savings which are part of four systems of accounts: two are based on national savings and two on domestic savings; in each case, one measures variables at current prices and the other at constant prices.

The system of accounts (1a) to (1e) are part of the usual definitions of savings and investment at current prices (United Nations, 1968); here all variables have already been defined as proportions of GDP at these prices. Identity (1a) is the relation between GDP (here made equal to one) and its allocation to total consumption (c), gross domestic investment (gdi), exports of goods and non factor services (x), net of similar imports (m). Account (1b) defines gross disposable national income (gdny) as the sum with its corresponding sign of GDP, net factor payments to abroad (nfp), and net transfers from abroad (nt). Identity (1c) defines gross national savings (gns) as the residual between gross disposable national income (gdny) and total consumption (c). Expression (1d) defines foreign savings (fs) as the balance with opposite sign of foreign current account transactions. This definition is already implicit in the one of gross national savings. Equalling GDP of (1a) and of (1b) and rearranging yields the identity (1e) between total savings and gross domestic investment:  $(gdny - c) + (m - x - nfp + nt) = gdi$ . The second bracket of the left is equal to foreign savings as defined in (1d).

The variables in (1a) on the allocation of GDP at current prices are of the "commodity type" in the sense that they can be split up in a quantum component and a price component. It is therefore possible to deflate each nominal variable with its "own" price index and to denominate them at constant prices of a base year. Thus, if "pc" is the price index of total consumption, "pgdi" is the price index of gross domestic investment, "px" is the price index of exports of goods and non factor services, "pm" is the price index of imports of goods and non factor services, and "pgdp" is the implicit deflator of GDP (the latter being an harmonic average of the former price indexes), the quantum of the above variables can be obtained as follows:  $GDP^{\circ} = GDP/pgdp$ ,  $C^{\circ} = C/pc$ ,  $GDI^{\circ} = GDI/pgdi$ ,  $X^{\circ} = X/px$ , and  $M^{\circ} = M/pm$ .

Real GDP and its allocation is the first identity of a system of accounts based on national savings at constant prices elaborated by the Economic Commission for Latin America and the Caribbean (ECLAC) as part of statistics on capital accumulation (see, for instance, ECLAC, 1994); here all variables have already been expressed as proportions of GDP at constant prices:

$$1 = c^{\circ} + gdi^{\circ} + x^{\circ} - m^{\circ} \quad (2a)$$

A factor which leads GDP at constant prices to differ from gross disposable national income at these prices, and which is not present in a system of accounts at current prices, is the terms of trade effect of foreign trade. ECLAC uses mainly the following formula to measure this effect on account of its simplicity, here in units of GDP at constant prices (tte<sup>o</sup>):

$$tte^{\circ} = x^{\circ}(px/pm - 1) \quad (2a-1)$$

Thus, if  $px < pm$ , product is transferred abroad diminishing real disposable national income below real GDP and vice versa.

### i) Relative price of capital formation

The relation between the proportions of gross domestic investment derived from variables at current prices and at constant prices, can be established through the relative price defined by the price index of gross domestic investment and the implicit deflator of GDP, (pgdi/pgdp):

$$gdi^{\circ} = gdi / (pgdi/pgdp) \quad (5)$$

Gross domestic investment stemming from variables at constant prices ( $gdi^{\circ}$ ), is a decisive step of capital formation. Given the consumption of capital, it stands for the impact of investment on productive capacity and the growth potential of a country. Yet, achieving a certain "result" as regards expansion of productive capacity, depends as formula (5) shows, both from the investment "effort", represented by the proportion of investment derived from variables at current prices ( $gdi$ ), and from the relative price of gross domestic investment ( $pgdi/pgdp$ ). If this relative price keeps the ratio of the base year, both investment proportions will be equal. However, if this relative price falls, the proportion standing for the effect on productive capacity will be larger than the investment proportion stemming from variables at current prices and vice versa. This outcome highlights the need to take into account both investment proportions when analyzing capital formation (Carneiro and Werneck, 1993).

### ii) Savings, the budgetary restriction and net asset changes

Gross national savings at current prices as defined in (1c) and foreign savings at these prices as defined in (1d) of table 1, are both actually made by economic agents and are thus in line with the corresponding changes in their net asset positions. In both cases, savings stem from current incomes which are "disposable", that is, which are part of the budgetary restriction facing economic agents when they make their savings and consumption decisions<sup>1</sup>.

All the other definitions of savings which are shown in table 1 do not stand for changes in the net asset position of economic agents. In the case of gross domestic savings, this lack of correspondence derives from definitions related to gross domestic products which are not part of the budgetary restriction facing economic agents. The definition of gross disposable national income at current prices in (1b) of table 1 indicates that it differs from gross domestic product at these prices due to net factor payments to abroad (nfp) and net transfers from abroad (nt). In the case of gross disposable national income at constant prices defined in (2b) of table 1, it additionally differs from gross domestic product at these prices on account of terms of trade effects ( $tte^{\circ}$ ). These variables show readily up when making explicit the relation between gross domestic savings and gross national savings both at current prices and at constant prices:

$$gds = (1-c) = gns + nfp - nt \quad (6a)$$

$$gds^{\circ} = (1-c^{\circ}) = gns^{\circ} - tte^{\circ} + nfp^{\circ} - nt^{\circ} \quad (6b)$$

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<sup>1</sup> The budgetary restriction also takes into account the relative prices of the goods and services which can be purchased with the disposable income at current prices.



Thus, if gross domestic savings at current prices are to stand for actual savings, net factor payments to abroad should not take place (since otherwise they would not be disposable), and the marginal propensity to save of domestic agents out of this income as well as out of transfers from abroad should be one. If gross domestic savings at constant prices are to stand for a measure of actual savings at these prices, it is necessary in addition that no negative terms of trade effects take place (since otherwise real income which is transferred abroad would not be disposable), and that the marginal propensity to save of domestic agents out of this income is one. If the terms of trade effect is positive, the marginal propensity to save of these agents out of the real income which is transferred from abroad should also be one.

Since gross domestic savings do not stand for actual savings of domestic agents, it is preferable to define the residual between gross domestic product and total consumption as a gross domestic "surplus". Similar comments apply to their complements of foreign savings defined as the balance with opposite sign of exports of goods and non factor services net of similar imports. Since this balance does not stand for the savings done by foreign agents either, it is preferable to define it as a "transfer of goods and non factor services". If such exports are larger than imports, there is transfer to abroad and vice versa.

The transfer of goods and non factor services opens up an issue of its own. A transfer from abroad at current prices actually takes place when  $m > x$ . However, at constant prices the transfer may not only be of a different magnitude but also of a different sign. An adverse change in the foreign terms of trade can mean that at the same time  $m^o < x^o$ , that is, that at constant prices there is transfer to abroad. This feature affects the concepts of domestic surpluses at current and at constant prices as well (denominated above instead of domestic savings) as the latter are the complements to (given) gross domestic investments at these prices.

The lack of correspondence between savings at constant prices and the changes in the net asset position of economic agents, also derives from the fact that the "quantum" meaning of savings depends on the deflators which are used in their derivation, and which are not asset-related in the definitions set out in table 1. Moreover, savings at current prices are not a "commodity type" variable and therefore do not have an "own" price index which can perform as a deflator in order to arrive at savings at constant prices. Thus, national and domestic savings at these prices were not derived by applying a deflator to these savings at current prices, but as a residual of all deflated variables leading to their definition. On account of the various deflators which are involved, the meaning of national and domestic savings at constant prices also lack transparency<sup>2</sup>.

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<sup>2</sup> Foreign savings at constant prices as defined in (2b) in table 1 do however have a clear meaning. A simplification of its terms shows that all variables were deflated with the price index of imports (see formulas 2a-1, 2a-2 and 2a-3 above). This yields the following relation between the proportions of foreign savings stemming from variables at constant and at current prices:

$$fs^o = (m - x + nfp - nt) / (pm / pgdp) = fs / (pm / pgdp)$$

Thus, if the relative price made up of the price index of imports and the GDP deflator keeps the ratio of the base year, both proportions will be equal. If the relative price of imports rises, the proportion of foreign savings at constant prices will be smaller than the proportion at current prices and vice versa.

### iii) Indicators of savings and capital formation

The above arguments are very much in favor of the proportions of national savings, foreign savings and gross domestic investment, all derived from variables at current prices, and which make up the system of accounts (1a) to (1e) in table 1, as indicators when analyzing the "accumulation effort". On the other hand, the indicator to appraise the "result" of this effort, is gross domestic investment derived from variables at constant prices as defined in formula (5). The following accounts sum up this view:

$$1 = c + gdi + x - m \quad (1a)$$

$$(1a)gny = 1 - nfp + nt \quad (1b)$$

$$gns = gny - c \quad (1c)$$

$$fs = -(x - m - nfp + nt) \quad (1d)$$

$$gdi = gns + fs \quad (1e)$$

$$gdi^{\circ} = gdi / (pgdi / pgdp) \quad (5)$$

This system by no means excludes real disposable national income and its determining factors like the effect of the foreign terms of trade, as well as other variables, in explaining the behavior of the proportion of national savings derived from variables at current prices. However, the inclusion of a measure of real disposable national income ( $y^{\circ}$ ), and of other variables ( $z$ ), will be in the right hand side of an equation, that is, in the form of:  $gns = f(y^{\circ}, z)$ . Real disposable national income is thus envisaged as a variable explaining the behavior of the savings proportion (derived from variables at current prices) instead of considering this income as a variable leading to a "quantum" definition of national savings in a system of accounts at constant prices.

The absence of an own deflator of national savings also opens questions on the relation between savings and investment. While total saving and gross domestic investment at current prices are part of identity (1e) of table 1 and are thus equal by definition, it is "assumed" that they are equal at constant prices in account (2e) of that table<sup>3</sup>. This assumption excludes the relation between investment at current prices and at constant prices shown in (5). If for instance, the relative price of gross domestic investment were to fall, accounts of capital accumulation at constant prices would ignore the effect of this fall on real domestic investment and attribute the larger quantum of investment to more real national savings<sup>4</sup>.

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<sup>3</sup> This assumption is seen in the sign of the terms of trade effect which figures in the definitions of gross disposable national income of (2b) and of foreign savings in (2d). To sure the equality between savings and investment, the sign of the terms of trade effect in the latter is the opposite as in the former.

<sup>4</sup> The composition of total real savings in national savings and foreign savings, also depends on the formula which determines the foreign terms of trade effect and on the deflators which are applied to net factor payments to abroad and to net transfers from abroad. A different formula and/or different deflators will by themselves change real national income and thus also change real national savings; if the latter rises, real foreign savings will fall and vice versa.

## II. SAVINGS AND INVESTMENT PROPORTIONS OF LATIN AMERICA AND THE CARIBBEAN

The tables which follow show weighted average savings and investment proportions of a sample of fifteen countries of the region in 1970-1993 derived from ECLAC's database<sup>5,6</sup>. The tables include on their left hand side the average gross disposable national income per capita of the countries in the sample in constant dollars of 1980 ( $y^o$ )<sup>7</sup>, as a proxy of the budgetary restriction facing domestic economic agents<sup>8</sup>. Subperiods were chosen depending both on the levels of foreign savings and real disposable income per capita.

Table 2 contains the proposed "indicators" made up of savings proportions derived from variables at current prices; in the case of investment, as proportions stemming from variables at constant prices as well. The period 1976-1979 can be chosen as a reference: a national savings rate of around 20% (of GDP) although already fairly large capital inflows equivalent to foreign savings of around 3% of GDP, but before abnormally large capital inflows in the following years lead to debt crises in many countries of the region as of 1982. The table shows that the proportion of gross national savings (gns) registered a sharp drop in 1982-1986 on account of a similar fall of real disposable national income, as drastic adjustments triggered off by debt crises took place. The proportion of national savings recovered in 1987-1989 in line with real disposable per capita income. Thus, the drop of gross domestic investment as a proportion of GDP at current prices (gdi) in around three points by the turn of the nineties, as compared to the reference period, appears mainly related to factors which led to a similar fall of foreign savings as a proportion of GDP at these prices (fs).

It is striking that in spite of a substantial increase of capital inflows and thus of foreign savings in 1992-1993, as compared to previous years, gross domestic investment as a proportion of GDP at current prices remained stagnant. Table 2 shows that while foreign savings increased around two percentage points of GDP between 1987-1989 and 1992-1993, gross national savings fell at the same time almost four percentage points of GDP.

The last two columns of table 2 highlight the importance of the relative price of capital formation (pgdi/pgdp) in achieving a certain proportion of real domestic investment. The continuous rise of this price in the eighties significantly reduced the quantum proportion of domestic investment

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<sup>5</sup> National accounts were taken as published. They are subject to comments regarding the conversion of dollar denominated variables into national currencies and viceversa, due to the use of exchange rates which may have differed from equilibrium rates, the estimation of variables at current prices in countries undergoing hyperinflation and other factors which may undermine reliability.

<sup>6</sup> It can be shown that the weights which are required to obtain averages of this and of other variables, are the share of GDP of each country in the aggregate GDP of the countries in the sample in each year covered by the statistics, and where GDP's are measured in a common currency at current prices. Here, GDP's were measured at current prices in dollars.

<sup>7</sup>  $2y^o = \sum_i \text{GDNY}_i^o / \sum_i N_i$ , where  $\text{GDNY}_i^o$  is gross disposable national income of a country  $i$  and  $N$  is the size of its population.

<sup>8</sup> Properly measured budgetary restrictions would have considered relative prices of the ongoing period instead of relative prices of a base year.

This table also highlights large quantum transfers of goods and non factor services to abroad as of 1983, due partly to the negative terms of trade effect reported in table 4 below. In this condition, large and even growing domestic surpluses as proportions of GDP at constant prices ( $gds^{\circ}$ ) would be seen as calling forth only a falling proportion of gross domestic investment at these prices ( $gdi^{\circ}$ ) at the end of the eighties. It is thus heavier quantum transfers of goods and non factor services to abroad, as compared to transfers at current prices, which would have determined much lower domestic investments as proportions of GDP at constant prices, as compared to domestic investments as proportions of GDP at current prices.

Table 4 presents on its left hand side the proportions of gross national savings ( $gns^{\circ}$ ), foreign savings ( $fs^{\circ}$ ), and gross domestic investment ( $gdi^{\circ}$ ), all derived from variables at constant prices (and defining foreign savings as the balance with opposite sign of foreign current account transactions).

Table 4

LATIN AMERICA AND THE CARIBBEAN: SAVINGS AND  
CAPITAL FORMATION AT CONSTANT PRICES

(Percentages derived from variables at constant prices)

Period Year	$y^{\circ}$ (1980 dollars)	$gns^{\circ}$	$fs^{\circ}$	$gdi^{\circ}$	$gds^{\circ}$	$tte^{\circ}$	$(nt^{\circ} - nfp^{\circ})$	$gns^{\circ}$
1970-1973	1385	15.0	3.0	18.0	24.3	-7.2	-2.1	15.0
1974-1975	1647	20.7	4.2	24.9	24.2	-1.6	-1.9	20.7
1976-1979	1809	19.8	4.2	24.0	23.0	-1.0	-2.3	19.8
1980-1981	1967	19.6	4.8	24.5	23.2	-0.4	-3.2	19.6
1982	1821	15.1	5.7	20.8	22.5	-2.4	-5.1	15.1
1983-1986	1757	16.1	0.6	16.7	23.7	-3.0	-4.6	16.1
1987-1990	1808	16.6	0.8	17.4	24.6	-4.3	-3.7	16.6
1990-1992	1786	14.9	1.4	16.3	22.7	-5.1	-2.7	14.9
1992-1993	1793	14.7	3.4	18.1	23.3	-6.4	-2.2	14.7

Source: ECLAC, on the basis of official data.

$$y^{\circ} = (GDNY^{\circ}/N)$$

$$gns^{\circ} = (gdny^{\circ} - c^{\circ})$$

$$fs^{\circ} = -(x^{\circ} - m^{\circ} + tte^{\circ} - nfp^{\circ} + nt^{\circ})$$

$$gdi^{\circ} = gns^{\circ} + fs^{\circ}$$

$$gds^{\circ} = (1 - c^{\circ})$$

$$gns^{\circ} = gds^{\circ} + tte^{\circ} - nfp^{\circ} + nt^{\circ}$$

Sample of countries: Brazil, Colombia, Costa Rica, Chile, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, Uruguay and Venezuela.

National savings at constant prices exhibit a very different behavior when compared with national savings at current prices. While the latter recovered since 1987 its level of 1976-1979, in line with real national per capita income (see table 2), the former fell since then not less than three and up to five percentage points of GDP at constant prices.

The right hand side of this table provides an explanation of this fall, taking the definition of gross domestic savings derived from variables at constant prices as defined in table 1 for granted. Assuming that the marginal propensity to save of domestic agents out of net incomes transferred abroad (on account of terms of trade effects, net factor payments and net transfers) is equal to one, these incomes are at the same time transfers of domestic savings abroad. The latter are thus seen as having diminished gross national savings as a proportion of GDP at constant prices ( $gns^o$ ), around eight percentage points below gross domestic savings as a proportion of GDP at these prices ( $gds^o$ ) in 1987-1993, as compared to around three points in the reference period of 1976-1979.

The definitions of capital accumulation at constant prices would thus conclude that the factors which led to a substantial transfer of savings (or of goods and non factor services) abroad and the ensuing fall in the proportion of national savings, coupled to those which caused a drop in foreign savings up to 1990-1991, were at work to significantly diminish gross domestic investment as a proportion of GDP at these prices in Latin American and the Caribbean since 1983. While the fall in foreign savings is also a feature of national accounts at current prices, it is the factors which led to a sharp rise in the relative price of capital formation up to 1990-1991, and when foreign savings increased in 1992-1993 to an important drop in national savings, which stand out in the "indicators" shown above, when explaining the lacking result as regards the quantum of gross domestic investment. The above price effect is however left out in the accounts at constant prices; its underlying assumptions lead to attribute this result to a fall in national savings instead.

### III. STATISTICAL EVIDENCE ON SAVINGS AND CAPITAL FORMATION

Three important hypothesis on savings and capital formation derived from the indicators discussed above will be tested. Two relate to savings, and the third to relative price determinants:

First, gross disposable national income per capita at constant prices ( $y^o$ ) is an important determinant of gross national savings as a proportion of GDP at current prices (gns);

Second, net substitution of national savings by foreign savings takes place when the positive income effect on national savings stemming from capital inflows is smaller than the substitution effect of national savings of these inflows;

Third, the relative price of gross domestic investment ( $pgdi/pgdp$ ) is positively related to the real exchange rate when investment is highly dependant on imports.

#### 1. Savings determinants

Tests distinguishing between alternative savings theories are difficult to carry out in practice (Marglin, 1984). The approach used here regresses savings in a set of relevant variables with the view to highlight important savings determinants.<sup>9</sup> The following savings function will be tested:

$$gns = f(y^o, z), \quad d(gns)/d(y^o) > 0 \quad (7)$$

where:

$y^o$  is real gross per capita disposable national income,  
 gns is gross national savings as a percentage of GDP at current prices,  
 z is a vector of other determinants of savings.

The panel data used to regress savings efforts (measured by gns) and  $y^o$  consists of a pool of 15 countries and 24 year by year observations; in total 360 observations. As this is a pool of country and time observations, one can assume either fixed or random effects between countries and thus use two alternative methods of estimation: the least squares dummy variables method (LSDV) which assumes fixed effects; or the general least squares method (GLS) which assumes random effects<sup>10</sup>.

Table 5 presents the results of the two estimation procedures. Due to hyperinflationary periods in Brazil and Peru during the time-span of the sample, regressions were also run excluding these countries from the sample. The results highlight the two "most robust" determinants of gross national savings: real gross disposable national income per capita (as a proxy of the agents budget constraint), and per capita gross domestic product growth (as a proxy for a growing economic environment). It also shows a systematic and negative effect on savings of positive external shocks,

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<sup>9</sup>. There are two main problems with this approach. First, the estimates of semi-reduced forms may be affected by endogeneity which is difficult to overcome without a general macroeconomic model. Second, adding variables may capture spurious correlations rather than economic relationships. For these reasons our results are a step for future research.

<sup>10</sup> See annex 2 for a justification of these alternative methods.

Table 5

**NATIONAL SAVINGS DETERMINANTS**  
(gns = GNS/GDP)

	(1)	(2)	(3)	(4)
Constant			0.051 (2.464)	0.050 (2.301)
Per capita income (10 <sup>-3</sup> )	0.063 (8.21)	0.065 (7.96)	0.036 (9.33)	0.041 (10.32)
Inflation	0.001 (2.01)	-0.002 (0.33)	0.001 (2.868)	-0.024 (3.978)
Growth	0.217 (5.01)	0.246 (4.91)	0.214 (4.52)	0.208 (3.42)
Dependency ratio	0.037 (1.53)	0.048 (1.85)	0.096 (4.52)	0.092 (4.19)
Terms of trade effect	-0.124 (3.92)	-0.124 (3.78)	-0.081 (2.47)	-0.062 (1.89)
Foreign savings	-0.433 (9.34)	-0.440 (8.93)	-0.424 (8.03)	-0.421 (7.78)
Method	LSDV	LSDV	GLS	GLS
No. Observations	360	312	360	312
R <sup>2</sup>	0.67	0.69	0.45	0.50

Source: ECLAC, on the basis of official data.

- (1), (3) Full sample.  
(2), (4) Excludes Brazil and Peru.

t-statistics in parenthesis

The estimated model is:  $gns_{it} = \alpha_1 + \beta_1 y_{it}^o + \beta_2 i_{it} + \beta_3 rp_{it}^o + \beta_4 d_{it} + \beta_5 t_{it} + \beta_6 fs_{it} + u_{it}$

- where:  $gns_{it}$  = gross national savings as a proportion of GDP at current prices  
 $y_{it}^o$  = disposable national income per capita at constant prices  
 $i_{it}$  = inflation  
 $rp_{it}^o$  = growth of gross domestic product per capita at constant prices  
 $d_{it}$  = demographic dependency ratio  
 $t_{it}$  = effect of terms of trade  
 $fs_{it}$  = foreign savings as a proportion of GDP at current prices

whereas that of the real industrial wage is positive and very large. In such an economy wages and mark ups in import substitution industries appear as determining factors of their prices. In large countries opening their economies like Mexico, similar results are obtained with respect to the elasticity to the real exchange rate, but very different results follow for the elasticity to real industrial wages. In this case, the real wage elasticity is significant but negative in the short run and not significant in the long run. They stand for the effects of the adjustment process which is taking place, where the appreciation of the domestic currency has reduced capital import costs and allowed for an improvement of real wages.

Middle size countries which have opened or are in an advanced stage of opening their economies, have a capital import substitution industry and indexation mechanisms, such as Chile and Colombia, show similar and consistent results: positive elasticities in the short and long term and both in relation to the real exchange rate and real wage rates. These countries exhibit a large elasticity to the real exchange rate especially in the longer term (in the case of Colombia, the elasticity to real wages is significant with one period lag).

In the case of economies with similar characteristics but a less significant capital import substitution industry, such as Uruguay, the short term elasticities are significant and large, but only the price elasticity to the real exchange rate is significant and large in the long run.

Small and quite open economies with little capital import substitution industry, such as Costa Rica<sup>17</sup>, show that currency appreciation does both: it reduces the relative price of investment goods and it increases real wages, thus showing positive elasticities to the real exchange rate and negative elasticities to the real industrial wage.

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<sup>17</sup> Paraguay and Peru do not show clear results.



## MAIN CONCLUSIONS

1. Gross national savings as a proportion of GDP (or of national income itself), both variables measured at current prices, stands out among savings proportions as the best indicator of the accumulation "effort" of domestic economic agents. National savings at current prices are derived from "disposable" incomes which are part of the budgetary restriction facing these agents. They are actually done and are thus in line with changes in their net asset positions. On the other hand, gross domestic investment as a proportion of GDP, both variables measured at constant prices, stands out as the best indicator of the "result" of accumulation; gross domestic investment at constant prices have a direct bearing on the expansion of productive capacity and the growth potential of the economy.
2. Other concept related to capital accumulation, specially the transfer of resources, provide an insight of their own as regards the level of domestic investment which can be achieved out of given domestic savings or surpluses. They are thus also useful for analyzing the behavior of investment.
3. The statistical results of this paper support previous findings on the main determinants of national savings. These are: gross real disposable national income per capita and the macroeconomic environment (mainly through the growth rate of real GDP per capita). There are also additional independent negative net effects of positive income shocks due to changes in the terms of trade, and of the larger availability of foreign savings. The results are ambiguous as regards the relevance of other factors such as the age structure of the population and inflation.
4. The savings effort, as measured by gross national savings as a percentage of GDP at current prices, recovered in latin american and caribbean countries at the turn of the nineties the twenty percent level which prevailed on average at the end of the seventies. However, the national savings rate which follow from projecting real gross disposable national income per capita, product growth rates and inflation rates, are insufficient to sustain high growth rates of GDP in the foreseeable future. In fact, relying on the estimated parameters of the national savings function (4) of table 5, by the turn of the century the rate of gross national savings would still be around the historic 20% of GDP (as compared to 18,5% achieved in 1992-1993) making the following assumptions: real disposable percapita income would increase around US\$260 in the rest of the decade (at a 2% per year), real percapita GDP would grow also grow 2% per year (as compared to 1.3% in 1992-1993), the average level of inflation of the region would drop a further 10 percentage points and reach one digit rates of inflation (excluding Brazil and Peru from the sample), and foreign savings would be equivalent to two percentage points of GDP ( as compared to 2.7% in 1992-1993).

Thus, relying mainly on a larger real national income which will "endogenously" increase the proportion of national savings, that is, sliding along the savings function, does not solve the problem of lacking national savings in the region. To sustain substantially higher GDP growth rates, policies have to be put in place which shift "exogenously" the savings function upward and/or which lead to higher investment and growth rates able to pull up savings.



**ANNEX 1**  
**TABLES**



Table A.1

LATIN AMERICA AND THE CARIBBEAN EXCLUDING BRAZIL:  
INDICATORS OF SAVINGS AND OF CAPITAL FORMATION

(Savings percentages derived from variables at current prices)  
(Gross domestic investment percentages derived from variables  
at current and at constant prices)

Period year	y° (1980 dollars)	gns	fs	gdi	gdi°	pgdi pgdp
1970-1973	1463	18.6	2.0	20.6	15.4	1.34
1974-1975	1704	22.1	1.2	23.4	23.2	1.01
1976-1979	1831	21.3	3.5	24.8	23.8	1.05
1980-1981	2039	21.5	3.8	25.3	25.9	0.98
1982	1894	18.6	4.0	22.6	21.8	1.04
1983-1986	1773	19.2	-0.4	18.9	16.5	1.14
1987-1989	1744	19.6	1.3	20.9	17.1	1.22
1990-1991	1789	19.3	1.0	20.3	17.2	1.18
1992-1993	1818	16.8	5.3	22.0	20.0	1.10

Source: ECLAC, on the basis of official data.

y° = (GDNY°/N)  
gns = (gdny-c)  
fs = -(x-m-nfp+nt)  
gdi = gns + fs  
gdi° = gdi/(pgdi/pgdp)

Sample of countries: Colombia, Costa Rica, Chile, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, Uruguay and Venezuela.

Table A.2

## LATIN AMERICAN AND THE CARIBBEAN: BASIC INDICATORS 1970-1992

Countries	Savings	Gross disposable national income per capita (1980 dollars)	Rate of growth of Gross Domestic Product per capita	Rate of Inflation	Demographic Dependency Ratio	Effect of Terms of Trade	Foreign Savings
Brazil	19.1	1681	2.6	301.0	72.0	-0.1	2.5
Colombia	18.9	1146	2.3	22.6	77.8	-1.8	0.3
Costa Rica	15.2	1261	1.0	19.8	77.0	-5.6	9.5
Chile	12.3	1954	1.1	91.2	65.8	-2.5	5.0
Ecuador	16.7	1109	2.4	26.2	86.8	-7.6	5.4
El Salvador	13.8	732	-0.2	14.6	95.0	-1.2	1.9
Guatemala	11.3	975	0.4	13.5	94.9	-0.4	3.7
Haiti	11.4	218	0.4	9.4	94.0	-1.1	3.7
Honduras	12.7	611	0.6	9.3	99.4	0.3	6.7
Mexico	20.5	2177	1.4	40.7	89.2	-3.2	1.8
Panama	20.9	1622	0.9	4.3	79.5	2.5	2.5
Paraguay	18.8	1130	2.5	17.3	85.7	2.1	4.3
Peru	18.8	1034	-1.1	607.1	81.4	-1.2	3.5
Rep. Dom.	17.7	1066	1.8	19.7	83.7	1.3	5.1
Uruguay	11.2	1966	0.9	64.4	61.6	0.8	2.0
Venezuela	27.8	3160	-1.6	17.5	80.0	-17.5	-2.3

## Cross Correlations

Savings		1						
Gross disposable income per capita	0.27	1						
Gross domestic product growth per capita		-0.08	-0.05	1				
Inflation rate	-0.38	-0.09	-0.12	1				
Demographic Dependency Ratio		0.72	-0.18	-0.14	-0.66	1		
Effect of Terms of Trade		-0.22	0.80	-0.11	0.23	-0.66	1	
Foreign Savings		-0.38	-0.001	0.28	-0.17	0.03	-0.13	1

Source: ECLAC, on the basis of official data.

## Annex 2

Econometric methods for pool regression analysis.

The equation to be estimated can be written as follows:

$$\text{gns}_{it} = \alpha_i + \beta x_{it} + u_{it} \quad (\text{a.1})$$

Where  $i$  denotes a country and  $t$  a period (year).  $\alpha_i$  is a country specific effect.  $\text{gns}$  represents the ratio between national savings and GDP in nominal terms and  $x$  is a matrix with the explanatory variables. The key issue is how the country-specific effect is treated and consequently how the parameters should be estimated (Hausman and Taylor, 1981; Hsiao, 1986; Greene 1990 Ch. 16).

Two alternative estimation methods are used here. The first assumes that  $\alpha_i$  is time invariant and thus OLS provides estimations for  $\alpha_i$  and  $\beta$  which are consistent by regressing  $\text{gns}_{it}$  on  $x_{it}$  and country dummies. This is the least squares dummy variables (LSDV) approach known as "fixed effects" or "within-groups" estimator.<sup>18</sup>

The alternative method considers  $\alpha_i$  as a random variable, which can be written as  $\alpha + v_i$ , where  $v_i$  is a white noise. This specification changes the error term in the above equation into  $u_{it} + v_i$ . Since  $v_i$  is common for all the time series of a given country, the covariance matrix of the residuals is no longer diagonal. The method should be estimated using GLS. This method allows to include time invariant variables for each country. The disadvantage appears whenever the unobserved effects,  $v_i$ 's, are correlated with the regressors, so the estimates of  $B$  are inconsistent and biased. To check for this later problem, Hausman specification tests are performed.

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<sup>18</sup> . There are three problems with this method: (i) it does not consider variations across countries in the sample, so there is a loss of efficiency; (ii) it uses a large amount of degrees of freedom; and (iii) it can not include variables that are time invariant for each country, because they are perfectly collinear with the dummies.

### Annex 3

#### The econometric implications of dynamic models

The regressions in section III.1 are performed with a dynamic model between the relative price of investment goods and two cost determinants (e.g. in equation 5.1. these are the real exchange rate and the real wage in the industrial sector).

$$P_i/P_t = A \cdot (E_t \cdot P_i^e/P_t) \cdot (W_t/P_t) \cdot e^{u_1} \quad (\text{a.2})$$

$$\log(P_i/P_t) = a_0 + a_1 \cdot \log(E_t \cdot P_i^e/P_t) + a_2 \cdot \log(W_t/P_t) + u_1 \quad (\text{a.2.a})$$

These type of models which have a dynamic structure with important econometric implications. The dynamic model may be viewed as follows:

$$y_t = \beta_1 x_t + \beta_2 y_{t-1} + \beta_3 x_{t-1} + u_t \quad (\text{a.2.b})$$

The long term solution to this type of models is given by:

$$Y^* = K X^* \quad (\text{a.2.c})$$

where  $K = (\beta_1 + \beta_3)/(1 - \beta_2)$ .

Rewriting (5) in first differences by using the following linear transformation  $\Delta y_t = y_t - y_{t-1}$  and performing the same for  $x$ , we obtain:

$$\Delta y_t = \beta_1 x_t + \beta_3 x_{t-1} + (\beta_2 - 1) y_{t-1} + u_t \quad (\text{a.2.d})$$

$$\Delta y_t = \beta_1 \Delta x_t + (\beta_1 + \beta_3) x_{t-1} + (\beta_2 - 1) y_{t-1} + u_t \quad (\text{a.2.e})$$

$$\Delta y_t = \beta_1 \Delta x_t + (\beta_2 - 1) (y - Kx)_{t-1} + u_t \quad (\text{a.2.f})$$

This last equation, reflects the structure of an error correction model. It results from a simple reparametrization of equation (2.2.a). This equation relates changes in the dependent variables with changes in the explanatory variable ( $x$ ), and the gap between  $y_{t-1}$  and its long term relation  $K x_{t-1}$ .

This model captures the short term adjustment, but it is guided by the long term equilibrium. The term  $(\beta_2 - 1)$  is the adjustment of the short term disequilibrium. A statistical test for this term is, therefore, a test for the disequilibrium component.<sup>19</sup>

In equation (5.2.d) the term  $\beta_1$  is the short term elasticity of  $X$  over  $Y$ ;  $(\beta_2 - 1)$  is the adjustment coefficient in each period;  $K$  represents the long term elasticity, and  $(1 - \beta_1)/(1 - \beta_2)$  is the average lag. We report only on the short and long term elasticities in this paper.

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<sup>19</sup> Two benefits from this model are the following. First,  $\Delta x_t$  and  $(y - Kx)_{t-1}$  are orthogonal and this allows to include both short and long term information. Second, the reparametrization does not include any additional constraint and thus, it does not bias the estimates.



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