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Working Paper

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Center Discussion Paper, No. 146

Provided in Cooperation with:
Yale University, Economic Growth Center (EGC)

Suggested Citation: Diaz-Alejandro, Carlos F. (1972) : The Determination of Observed Merchandise Imports and Their Link to Capital Formation, Center Discussion Paper, No. 146, Yale University, Economic Growth Center, New Haven, CT

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New Haven, Connecticut

CENTER DISCUSSION PAPER NO. 146

THE DETERMINATION OF OBSERVED MERCHANDISE IMPORTS AND THEIR LINK TO CAPITAL FORMATION*

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June 1972

Chapter II

The Determination of Observed Merchandise Imports and Their Link to Capital Formation*

The purpose of this chapter is to explore the possibility of measuring an "import function" for the post war Colombian economy, to examine how imports were divided into different categories, and to analyze the crucial link between imports and capital formation. A later chapter will deal with the mechanisms of import control in greater detail.

The "import function" to be estimated is somewhat unusual. Time series giving merchandise imports entering Colombia (legally) cannot be assumed to result solely from the interplay of the ex-ante domestic demand for imports, itself the difference between the domestic supply and demand for importables, and a perfectly price-elastic foreign supply of imports. During most of the period under study, the institutional mechanism of import control explicitly aimed at regulating import permits in such a way that actual imports would be "in line" with foreign exchange availability. Such actual and expected availability influenced the amount of import permits granted, and, as seen in Chapter I, payment crises were blamed on departures from "prudency".

The Aggregate Import Function

It would seem, therefore, better to seek econometrically the implicit average rules of prudency, than to follow the usual path of making observed imports a function of income, relative prices, etc. Indeed, that usual path is open to serious conceptual criticisms where imports are regulated as in Colombia. It can be argued that imports in such a case should be considered the independent variable, with income and relative prices both becoming dependent variables.

In what follows, an attempt is made to explain observed annual and quarterly imports as a function of variables which those in charge of the control mechanism typically regarded as proxies for actual and expected foreign

exchange availability, i.e., the level of reserves, expected merchandise exports and aid.

Why reserves? If the authorities had a desired level of reserves, and always forecasted exactly foreign exchange earnings, imports would fluctuate following the latter, showing no correlation with the former. It may be supposed, however, that forecasting is far from perfect, and that unexpected increases or decreases in reserves will be followed by relaxation or tightening of controls, which will be reflected in the level of imports gradually, with some lag. The hypothesis is that imports in a given year or quarter will be influenced by the difference between actual and desired Central Bank reserves during previous years or quarters.

In the regressions which follow, gross Central Bank reserves will be used. Earlier experiments showed that gross, rather than net, reserves gave the best fits. This may be due to data problems involved in defining accurately net reserves, but it could reflect a certain type of liquidity preference of Central Bankers. "Desired (gross) reserves" were defined in a straightforward unsophisticated way: the average gross reserves to imports ratio for the whole period under study was first computed; that ratio was then applied to actual annual or quarterly imports to obtain "desired" reserves. The average reserves/imports ratio implied desired reserves amounting to about three months worth of imports.

Note that from the time an import license is granted to the entry into Colombia of the imported commodity, at which point it enters our time series, an average of six months are said to elapse. Imports of a given time period can then be made to depend on lagged (actual and desired) reserves, avoiding most problems of interdependence, particularly in quarterly regressions.[1]

There are several possible ways of handling expected (non-aid) foreign exchange earnings, the bulk of which, and probably its most volatile major part, are merchandise exports. One way is to use lagged changes in reserves as a proxy for those expectations; that approach was tried, yielding on the whole poor results. Another (not tried), would be to rely on lagged changes in coffee prices. In what follows, it was simply assumed that for a given time period, the ex-ante guesses of the authorities on average came close to actual, realized merchandise exports. Because of the lag in the granting and using of import licenses, it should be clear that a given quarter's actual exports can have little direct (Keynesian or monetary) effect on that quarter's realized imports, so the simultaneous use of imports and exports of the same quarter in a regression need not give rise to identification problems. For the annual observations it is not so easy to dismiss the possibility that exports will influence imports via income or money multipliers; for that case one must rely primarily on a priori knowledge of how import controls operated, and of the chronic (but variable) existence of excess demand for imports.

The inclusion of aid as a variable explaining imports in a "foreign-exchange constrained" economy seems natural. As the aid variable is based on disbursements, which are in fact typically measured by documentation regarding import flows, one may view the regressions as measuring the impact of the other two independent variables on the level of non-aid financed imports. It was, however, difficult to measure accurately quarterly, as contrasted with annual, aid flows. Repayments of principal were subtracted from gross disbursements, to yield the "net aid" used in the regressions.

Table II-1 presents data used in the annual regressions; it also gives more detail on how the reserve and aid independent variables were constructed. The best fit using those data was the following:

$$(II\text{-}1)\quad Mt = \underset{}{-58.06} + \underset{(0.7)}{1.03}\ Xt + \underset{(6.3)}{0.71}\ GR_{t-1} + \underset{(2.2)}{1.23}\ At \qquad \underset{(3.7)}{}$$

$$R^2 = 0.82$$

$$F\text{-test} = 25.9$$

$$DW = 1.87$$

$$\text{Observations} = 21$$

Where,

Mt = merchandise imports during year t

Xt = merchandise exports during year t

GR_{t-1} = Actual minus desired reserves throughout previous year

At = net aid during year t

The t-statistics are given in parentheses under the corresponding coefficients.

The fit of equation (II-1) is good; from the last column of Table II-1 it may be seen that it is particularly good for post-1966 years. Taking that equation as embodying the average rule of thumb followed by prudent import control authorities, its residuals should be of interest, and not exempt of "runs" reflecting persistent departures from "prudency". For example, the 1955-56 excesses come out clearly, and are followed by the 1958 austerity. Similarly, the swing from extreme tightness to liberalization during 1965-66 is also reflected in the residuals. A more insightful look at those subphases, however, will be obtained from quarterly data.

Table II-1

Basic Data and Yearly Series Used in Import Regressions

(Million Current U.S. Dollars)

Year	Merchandise Imports, cif	Average Gross Reserves during the Same Year	Actual minus Desired Reserves Throughout Previous Year	Net Aid	Merchandise Exports	Actual Imports as Percentages of those Predicted by Equation (II-1)
1950	364.7	122.2	25.9	-4.0	395.6	100.3
1951	419.0	111.8	25.9	5.0	463.3	94.2
1952	415.4	140.8	1.2	46.0	473.3	85.1
1953	546.7	183.4	31.1	22.0	596.0	90.2
1954	671.8	223.0	39.1	21.0	657.1	99.7
1955	669.3	157.6	45.6	20.0	579.6	112.1
1956	657.2	126.0	-19.1	20.0	599.1	115.0
1957	482.6	165.8	-47.5	9.0	511.1	108.0
1958	399.9	133.4	38.4	6.0	460.7	88.5
1959	415.6	186.2	27.8	-3.0	474.3	92.9
1960	518.6	198.4	76.5	12.0	465.7	105.5
1961	557.1	143.8	61.5	77.0	434.8	105.3
1962	540.3	122.0	-3.3	80.0	463.2	104.7
1963	506.0	92.4	-20.6	104.0	446.1	98.1
1964	586.3	97.6	-41.2	85.0	545.7	101.0
1965	453.5	82.0	-57.2	79.0	539.1	81.7
1966	674.3	63.8	-37.7	98.0	507.6	120.5
1967	496.9	77.8	-114.2	93.0	509.9	99.1
1968	643.3	115.2	-53.4	131.0	558.3	100.3
1969	685.3	183.0	-54.6	128.0	607.5	99.7
1970	844.0	247.0	2.1	147.0	731.6	96.0

Sources and Method: Data on imports, exports and reserves obtained from IMF-IFS. "Average gross reserves during previous year" corresponding to, say, 1969, were computed averaging gross reserves reported for December 1967, and March, June, September and December 1968. "Net Aid" refers to disbursements, as registered in the IMF Balance of Payment Yearbook, covering long term loans received by central and local

Table II-1 Continued

governments, as well as those received by the private non-monetary sector from the IADB, the IBRD, the IFC and the U.S. government, minus amortizations of those loans. Data for 1950 through 1955 on these loans involved rough estimates.

The coefficients for exports and net aid are not significantly different from one, while the constant term is insignificant, all of which corresponds to what one would expect a priori. The coefficient for the difference between actual and desired reserves has the expected sign and is significant; it implies that 71 percent of the excess (or short fall) in gross reserves during last year is spent on (or reduced) imports during this year. Experiments introducing further lags in the GR variable were unsuccessful.[2]

Reliable quarterly data start in 1957; Table II-2 presents series used in the following regression, as well as in other not shown:

$$\text{(II-2)} \quad \underset{}{Mt} = \underset{}{77.24} + \underset{(4.3)}{0.22}\ Xt + \underset{(1.4)}{0.15}\ GR_{t-1} + \underset{(2.2)}{1.72}\ At \qquad \underset{(5.0)}{}$$

$$R^2 = 0.49$$

$$\text{F-test} = 17.4$$

$$\text{DW} = 1.65$$

$$\text{Observations} = 58$$

The subscript t now refers to a given quarter; GR_{t-1} refers to actual minus desired reserves throughout the previous three quarters only. In contrast with regression (II-1), current exports do not reach high levels of significance; indeed, dropping exports from the regression leads to only a slight drop in the R^2 (to 0.47), but to an increase in the F-test (to 24.7), and in the t-ratios of the other variables, including the constant term. The rivalry between the constant term and exports for significance in equations (II-1) and (II-2) suggest that "fine-tuning" import licensing to (expected) quarterly export changes is not attempted, or if attempted is not fully reflected within one quarter, requiring a longer time period to work itself out on observed imports.

Table II-2

Basic Data and Quarterly Series Used in Import Regressions

(Million Current U.S. Dollars)

Year and Quarter	Merchandise Imports, cif	Average Actual minus Desired Gross Reserves Throughout Previous Three Quarters	Net Aid	Merchandise Exports	Actual Imports as Percentages of those Predicted by Equation (II-2)
1957-1	91.5	-44.5	2.3	140.0	86.5
2	98.2	- 3.3	2.3	117.4	91.9
3	138.9	49.0	2.3	138.2	118.5
4	148.0	52.0	2.3	124.1	127.3
1958-1	120.9	51.0	1.5	105.7	109.1
2	99.4	20.0	1.5	93.1	96.1
3	89.3	- 5.8	1.5	134.3	82.0
4	90.4	8.5	1.5	119.7	83.9
1959-1	86.3	27.0	-0.8	101.5	84.2
2	107.3	52.3	-0.8	118.9	97.5
3	116.9	71.3	-0.8	141.9	99.2
4	104.9	75.0	-0.8	111.9	93.8
1960-1	124.3	85.3	3.0	112.2	103.8
2	129.6	84.5	3.0	97.4	111.3
3	134.7	82.5	3.0	122.1	110.8
4	128.6	77.8	3.0	133.2	104.2
1961-1	124.5	60.3	19.3	101.0	88.0
2	147.9	45.3	19.3	113.4	104.1
3	138.0	18.8	19.3	112.5	100.0
4	146.7	5.3	19.3	106.5	108.9
1962-1	145.9	- 7.0	20.0	99.3	110.0
2	141.6	-19.8	20.0	109.4	106.5
3	147.3	-12.5	20.0	146.8	103.4
4	105.5	-19.5	20.0	107.8	79.5
1963-1	93.4	-22.5	26.0	87.2	67.7
2	136.6	-16.5	26.0	111.3	94.7
3	139.3	-23.3	26.0	141.5	92.9
4	136.6	-29.0	26.0	106.1	96.7
1964-1	143.4	-36.5	21.3	127.8	104.8
2	147.6	-45.8	21.3	131.7	108.3
3	156.4	-50.8	21.3	140.1	113.7
4	138.9	-55.0	21.3	148.5	100.1

Table II-2 Continued

Year and Quarter	Merchandise Imports, cif	Average Actual minus Desired Gross Reserves throughout Previous Three Quarters	Net Aid	Merchandise Exports	Actual Imports as Percentages of those Predicted by Equation (II-2)
1965-1	110.4	-51.5	19.8	119.8	84.7
2	126.9	-48.5	19.8	138.2	94.1
3	111.0	-54.8	19.8	141.6	82.4
4	105.2	-47.5	19.8	138.2	77.9
1966-1	140.4	-40.8	24.5	123.8	99.6
2	168.0	-59.8	24.5	140.7	118.4
3	193.4	-72.5	24.5	131.6	140.1
4	172.4	-96.5	24.5	110.3	132.8
1967-1	149.3	-118.5	23.3	114.1	119.2
2	111.1	-111.8	23.3	129.0	85.7
3	118.1	-90.8	23.3	129.9	88.9
4	118.5	-66.0	23.3	136.8	85.9
1968-1	157.4	-50.8	32.8	128.4	101.8
2	167.0	-56.5	32.8	140.1	106.8
3	162.7	-60.0	32.8	144.0	103.8
4	156.2	-56.0	32.8	145.7	99.0
1969-1	133.8	-43.3	32.0	131.5	86.3
2	168.5	-12.3	32.0	168.2	100.4
3	203.1	0.8	32.0	149.2	122.8
4	180.6	2.3	32.0	156.3	108.0
1970-1	161.8	8.0	36.8	210.4	85.9
2	176.9	28.0	36.8	202.2	93.4
3	209.7	54.8	36.8	175.1	112.0
4	206.3	68.8	36.8	139.0	113.9
1971-1	91.8	58.3	36.8	161.6	49.7
2	232.2	50.0	36.8	186.0	122.9

Sources and Method: As in Table II-1. "Average actual minus desired gross reserves throughout previous three quarters" calculated using the relevant data for actual and desired reserves at the end of t-1, t-2, t-3 and t-4, where t refers to quarters. Yearly net aid figures were allocated to quarters in equal parts; data on net aid for 1971 were set equal to those for 1970, which are provisional.

As the GR_{t-1} variables in equations (II-1) and (II-2) are very similar (contrast the figures corresponding to the first quarter of each year in Table II-2 to those for the same year in Table II-1), the coefficient for GR_{t-1} in equation (II-2) should be multiplied by four, yielding 0.583, before comparing it to that in (II-1). The lower figure for the quarterly regression is partly explained by the fact that its GR_{t-1} refers only to three quarters, while it covers four quarters in regression (II-1).

The coefficient for net aid in equation (II-2) is higher than the expected 1.0; similar results were also obtained using gross aid. It should be noted that the quarterly aid figures are rough estimates; nevertheless, an aid coefficient significantly higher than one may be picking up the effect of aid "leverage" on import liberalization, an avowed policy goal of aid-providers during the period under study. It could also reflect a perverse de facto positive correlation of aid disbursements with "good times" (compare the figures for 1967 with those for earlier and later years).

Experiments introducing seasonal dummy variables, as well as actual minus desired reserves further lagged yielded insignificant results, but no systematic effort was made to calculate the best reserve lag structure.

The last column of Table II-2 presents actual imports as percentages of those predicted by equation (II-2). Quarterly import series naturally reflect more clearly than annual data brief unusual events, some which are interesting for our study, e.g., a temporary closing of the office issuing import permits, as during late in 1962, but also other, less relevant events (harbor and shipping strikes, etc.). The swings around a prudent norm are also more visible in the quarterly residuals, without leading to a catastrophic Durbin-Watson statistic.[3] Noteworthy "runs" in actual imports are those of 1958-3 through 1959-1 (austerity), and the remarkable swings from austerity

(1965-1 through 1965-4) to excess (1966-2 through 1967-1) and back to austerity (1967-2 through 1967-4).[4]

The Allocation of Observed Merchandise Imports into Different Categories

Having derived an overall import function, the next step is to analyze how that import capacity was distributed among commodity types. Several ways of classifying imports are possible. This section will use three subdivisions, based on annual data: consumer goods, raw materials and intermediate goods, and capital goods.

The allocation of imports among those categories will, of course, be influenced by long and short term forces; among the former import substituting industrialization looms large. But from the viewpoint of this study, it will be of greater interest to explore hypotheses regarding whether (and how) import control authorities modify import structure depending on import capacity.

Table II-3 presents the data to be analyzed, from two different sources. As the borderline between the three broad categories are not always unambiguous, there are differences between the two sources. It may be seen in Table II-4 that clear significant trends appear both for BdlR and ECLA data for consumer good shares (downward) and capital good shares (upward); the results are, however, mixed for the share of raw materials and intermediate goods.

It is part of the conventional wisdom that import control authorities squeeze capital goods first during difficult times, while trying to maintain the flow of raw materials and intermediate goods. If so, the share of capital goods in the import bill should be positively related with the level of imports, while that for raw materials and intermediate goods should show an inverse relationship. The latter expectation is confirmed by the results

Table II-3

Allocation of Merchandise Imports Among Major Categories

(Percentages of total imports, cif, all data expressed in U.S. dollars at current prices)

Year	Consumer Goods plus Residual Category		Raw Materials and Intermediate Goods		Capital Goods including Construction Materials	
	BdlR	ECLA	BdlR	ECLA	BdlR	ECLA
1951	13.1	18.3	53.6	42.3	33.4	39.2
1952	11.9	18.4	50.8	38.7	37.3	42.9
1953	16.0	19.8	45.7	33.7	38.3	46.5
1954	18.4	22.1	44.6	33.3	37.0	44.6
1955	14.9	17.8	44.8	35.1	40.3	47.1
1956	9.6	12.9	50.0	38.5	40.4	48.7
1957	9.6	12.0	57.6	48.2	32.8	39.8
1958	8.3	12.5	58.7	45.8	33.0	41.7
1959	7.5	12.5	55.7	45.1	36.8	42.5
1960	7.8	12.5	48.8	42.5	43.5	45.1
1961	10.1	18.2	42.4	39.5	47.4	42.4
1962	9.5	14.8	47.8	42.6	42.7	42.6
1963	8.3	8.5	50.5	48.9	41.2	42.6
1964	8.9	6.2	45.9	46.4	45.2	47.4
1965	8.3	4.0	47.4	43.9	44.3	52.1
1966	8.4	6.6	56.8	52.1	34.8	41.3
1967	9.9	3.7	46.0	43.3	44.2	53.0
1968	9.8	5.4	46.4	41.7	43.9	53.0
1969	11.5	n.a.	46.0	n.a.	42.5	n.a.

Sources and Method: BdlR-XLV and XLVI IAGJD, page 167; ECLA-SB, several issues.

Initials "n.a." mean data are not available.

of Table II-4, but the former does not clearly emerge as statistically significant, although the sign is the expected one. There is little doubt that the severe import restrictions of 1957-58 were particularly harsh on machinery and equipment imports; however, the regressions for the whole period warn us against generalizing from that experience, and from assuming that more liberal import policies will necessarily lead to a bigger share for capital good imports. Observe how in 1966 that share fell as imports rose dramatically.

A positive link between the share of consumer goods and import levels, however, can be established with confidence for the whole period, at least for the BdlR data.[5]

In countries with weak machinery and equipment industries, one can expect aid flows, partly designed to promote investment, to influence the share of capital goods in total imports. Such influence, of course, need not be dollar-for-dollar; for example, food aid which supports a shift of agricultural workers to construction projects can contribute to capital formation even though it has no direct impact on the imports of capital goods. But typically, a significant link can be expected; this is indeed the case for Colombia, as shown in the last two regressions of Table II-4; very similar results are obtained if net, rather than gross, aid disbursements are used. The following tabulation collapses the relevant data into pre- and post-Alliance for Progress averages:

	Gross Aid as Percentage of Imports	Net Aid as Percentage of Imports	Share of Capital Goods in Import Bill	
			BdlR	ECLA
1951 through 1960	6.0	3.0	37.3	43.8
1961 through 1968 or 1969	22.6	17.0	42.9	46.8

Table II-4

Trends and Other Variables "Explaining" Shares in the Import Bill:

Regression Results, with Coefficients (and t-statistics)

	Constant	Trend	Import Level	Aid as a Percentage of All Imports	R^2
Consumer Goods					
--BdlR	5.38	-0.38	0.017	---	0.59
	(2.0)	(4.3)	(3.3)		
--ECLA	15.74	-0.98	0.012	---	0.79
	(4.1)	(7.5)	(1.6)		
Raw Materials and Intermediate Goods					
--BdlR	62.30	-0.03	-0.023	---	0.23
	(10.5)	(0.2)	(2.1)		
--ECLA	47.91	0.63	-0.022	---	0.48
	(8.8)	(3.4)	(2.1)		
Capital Goods					
--BdlR	32.37	0.42	0.006	---	0.34
	(6.4)	(2.5)	(0.7)		
--ECLA	36.24	0.36	0.010	---	0.28
	(6.7)	(2.0)	(1.0)		
--BdlR	30.19	---	0.011*	0.34	0.42
	(5.7)		(1.1)	(3.4)	
--ECLA	34.52	---	0.014*	0.30	0.32
	(6.0)		(1.3)	(2.7)	

*Import level defined differently than in previous regressions. See Below.

Sources and Method: Basic data as in Table II-3 and Chapter I. "Import level" refers to total merchandise imports, in current U.S. dollars, except in the last two regressions, where it is defined as all imports minus "aid". Gross aid disbursements were used as a measure of "aid". Regressions refer to 1951 through 1968 (ECLA) or through 1969 (BdlR). Average shares for other data for the whole

period were as follows:

	BdlR	ECLA
Consumer Goods	10.6	12.6
Raw Materials and Intermediate Goods	49.4	42.3
Capital Goods	40.0	45.1
Gross Aid as Percentage of Imports	13.9	13.3
Net Aid as Percentage of Imports (regressions not shown)	9.7	9.2

It is not possible to separate statistically the effects of the trend and aid variables; when they are run in the same regression, both become insignificant.

Unregistered Merchandise Imports

Given the long Colombian coasts on both the Pacific and the Atlantic and its frontiers with Venezuela, Brazil, Peru, Ecuador and Panama, which yield more than nine thousand kilometers of sea and land borders, coupled with the rigorous import control system, it is natural to wonder whether some merchandise imports escape official registration, control and taxes.[6]

It is obvious that some smuggling does take place. During August 1971 smuggled foreign cigarettes were openly sold in Bogota's main avenues, and this author was pleasantly startled to find Cuban cigars available in a Cartagena restaurant. Businessmen often tell of sending an employee to Miami to bring back, well-hidden in his suitcase, small but critical parts and pieces, which they feel would be unduly delayed or excessively taxed by the import control mechanism. Some cities on the Venezuelan and Ecuadorian borders are well-known centers of two-way unregistered trade. But the exact extent of such commerce is, of course, difficult to ascertain. Yet for the purpose of this chapter, it is necessary to try to establish at least whether or not unregistered imports invalidate the results obtained manipulating registered import data.

A first appraoch will compare Colombian official import data with what trade partners claim they have exported to Colombia. This is done, for three broad geographical categories, in Table II-5. As Colombia reports imports c.i.f., and most countries register their exports f.o.b., a gap of roughly ten percent is to be expected between the two sets of figures. For 1958 through 1969 this is close to what one obtains, on average. There is, however,

Table II-5

Ratio of Registered Colombian Imports (cif) to

Exports to Colombia Registered by Other Countries, 1958-70

	World	United States, United Kingdom and Canada	European Common Market	Other Countries
1958	1.07	1.24	1.09	0.63
1959	1.13	1.16	1.03	1.12
1960	1.13	1.17	1.08	1.02
1961	1.11	1.11	1.08	1.18
1962	1.18	1.20	1.18	1.09
1963	1.03	1.00	1.06	1.08
1964	1.11	1.09	1.11	1.14
1965	1.08	1.07	1.07	1.11
1966	1.07	1.06	1.11	1.05
1967	1.12	1.06	1.18	1.23
1968	1.02	1.01	1.06	1.00
1969	1.03	1.02	1.04	1.04
Averages	1.09	1.10	1.09	1.06

Sources and Method: Basic data obtained from IMF-DOT, several issues. The corresponding ratios for the group formed by the U.S., U.K. and Canada during 1948-58 were as follows:

1948	=	1.17
1949	=	1.09
1950	=	1.09
1951	=	1.17
1952	=	1.16
1953	=	1.13
1954	=	1.16
1955	=	1.23
1956	=	1.25
1957	=	1.16

considerable year-to-year fluctuations, and a downward trend, if U.S., U.K., and Canadian figures for 1948-58 are compared to those for 1958-70. A good deal of the year-to-year variation appears to simply reflect statistical difficulties, but some of it can be linked to events in the Colombian payments system. For example, the unusual gaps between Colombian and foreign data in 1955-56 (for the U.S., U.K. and Canada) and in 1962 suggest that overinvoicing was used as a means to speculate against an overvalued peso.[7]

Most smuggled merchandise will appear neither in the official trade figures of the importing nor the exporting country, or if they appear in the latter they will not be allocated correctly among importing countries (i.e., much merchandise apparently sent to Panama and Venezuela may end up in Colombia; note that apparent per capita Panamerican and Venezuelan imports in 1970 were $245 and $158, respectively, to Colombia's $40). It is, of course, difficult to measure accurately such trade, but its importance has prompted "guesstimates" of its value, one of which is presented in Table II-6. Columns two and three reflect minor statistical adjustments to import data as reported to the IMF by Colombia; the first column represents an attempt to estimate import smuggling. The "border trade" has fluctuated between 4 and 10 percent of registered imports. Not surprisingly the high point was reached during troubled 1962, while the estimates for liberal 1966 are much lower. One may speculate that most (but not all) border trade imports involve consumer goods (liquor, cigarettes, radios, watches, and even pornographic materials). But given the orders of magnitude involved it appears that neither the results of Table II-4 nor of earlier regressions would be much changed by their neglect of border trade.

Table II-6

Unregistered Merchandise Imports, c.i.f.

(Million U.S. dollars)

	Border Trade (Imports)	Ships Purchased by the Great-Colombian Fleet	Other (Including Parcel Post)	Border Trade as Percentages of Registered Imports
1957	20	5	0	4
1958	20	6	0	5
1959	20	2	0	5
1960	20	3	0	4
1961	20	3	0	4
1962	51	0	0	10
1963	40	0	0	8
1964	50	7	0	9
1965	30	7	-11*	7
1966	25	19	0	4
1967	28	4	1	6
1968	33	0	10	5
1969	37	0	10	5
1970	43	0	12	5

Sources and Method: IMF-BOPY, several issues.

* Refers to military grants, which by international convention are omitted from the Balance of Payments.

Imports and Capital Formation

Chapter I noted the important link which exists in Colombia between foreign trade and capital formation (and not between current GDP or manufacturing output and trade.)[8] Such a link does not involve subtle and mysterious relationships between exports (or terms of trade) and propensities to save. The matter is much simpler. In 1950 imported commodities accounted for 96 percent of Colombian gross investment in machinery and equipment; by 1969 that share was still a remarkable 75 percent in spite of an average annual growth of 14 percent in the local output of machinery and equipment. Even granting a likely underestimation of local production of (small) machinery and equipment, the brute fact remains that during the period under study physical non-construction Colombian investment could hardly be realized, at least during a longish medium-term, without a matching capacity to import. Coffee, and later aid and minor exports, were the basis of non-construction capital formation. Note that nothing in the argument assures us that the flow of imported capital goods will be assigned wisely, so that even in the long run no rigid link need exist between growth and the capacity to import. Indeed, it can be argued that periods of import bonanza can lead to a careless allocation of investment, while austerity strengthens the hand of benefit-cost analysts, leading to fluctuations in the marginal capital-output ratio which offset (partly or totally) variations in the import capacity. But without that import capacity, even heroic ex-ante savings decisions are likely to be frustrated before becoming tangible ex-post non-construction investments.

Table II-7 documents the capital formation-import link, where imports and trend, the latter reflecting the expansion of local capital goods production, appear as the independent variables. Total merchandise imports, both in

Table II-7

Links between Capital Formation and Imports: Regression Results

(All variables, except trend, transformed into logarithms)

	Constant	All Imports, Current U.S. $	Import Quantum	Trend	R^2	F-test	DW
Building and Construction	5.16 (7.4)	0.32 (2.8)	----	0.041 (10.6)	0.91	88.6	1.23
	5.67 (10.4)	----	0.31 (2.6)	0.047 (13.0)	0.91	86.0	1.20
Transport Equipment and Machinery	0.68 (0.8)	1.11 (7.8)	----	-0.002 (0.4)	0.81	35.8	1.99
	2.17 (3.6)	----	1.12 (8.7)	0.016 (4.1)	0.84	44.3	1.83
All Gross Real Fixed Domestic Capital Formation	3.60 (7.2)	0.72 (8.7)	----	0.020 (7.1)	0.93	109.2	2.59
	4.61 (12.5)	----	0.72 (9.2)	0.031 (13.0)	0.93	119.1	2.41
Imports of Capital Goods, BdlR	-0.20 (0.2)	1.26 (8.3)	----	-0.019 (3.8)	0.80	34.1	2.15
	1.49 (2.3)	----	1.27 (9.4)	0.001 (0.3)	0.84	43.8	2.00

Sources and Method: Time series (at constant 1958 Colombian prices) on gross investment and imports of capital goods obtained from BdlR-CN, including unpublished estimates. All regressions cover the period 1950 through 1969. Merchandise imports, both dollar values and quantum indices, were obtained from IMF-IFS. Building and Construction plus Transport Equipment and Machinery add up to Total Gross Real Fixed Domestic Capital Formation.

current dollars and as quantum indices, are used. The link emerges quite clearly from these regressions; one can discount part of the excellence of the fit (on grounds of national accounting methodology) without losing the main conclusion.

The elasticity of real gross investment in machinery and equipment with respect to merchandise imports is not significantly different from one; that for all investment emerges as slightly below one. Even investment in construction shows some significant elasticity with respect to imports, although its trend variables, as expected, show heftier t-statistics than those for machinery and equipment. The Durbin-Watson statistics for the construction regressions also hint that we are leaving out important independent variables in the explanation of that type of investment, a fact we know from Chapter I.

Differences between trend coefficients in regressions using quantum versus current dollar values for imports reflect the upward creep in dollar prices paid by Colombia, which may be estimated at between one and two percent per year. The trend coefficient for machinery and equipment implies that, with a stagnant import quantum, that kind of investment could rise at only 1.6 percent per annum.

The last pair of regressions presented in Table II-7 compare the time series for imports of capital goods used in the BdlR national accounts [9] with total imports. In apparent contrast to the results presented earlier in this chapter (Table II-4), the elasticity of capital goods imports with respect to import levels seems greater than one. But such result is not quite significant, leaving our earlier conclusion of proportionality (excluding trend and/or aid) unchanged.

The fits obtained in Table II-7 could be further improved by making investment depend not on total imports, but on just imports of capital goods. Such refinement, however, seems unnecessary, and even inelegant, given the proportionality conclusion, as well as national accounts methodology. Furthermore, there are at least three time series on imports of capital goods; two from BdlR sources, one in constant Pesos and one in current dollars, and one from UNECLA, in current dollars. The three series, however, tell essentially the same story.[10]

The rapid growth observed, for the whole period, in the domestic production of machinery and equipment suggests that in the future the link between imports and capital formation will be less tight than in the past. However, national accounts data show a sharp decline in the expansion of locally produced industrial capital goods, from an annual rate of 20.7 percent registered between 1952 and 1962, to a modest 6.6 percent observed during 1962 through 1969. Such a decline may partly reflect a failure of statistical coverage, although it could also indicate a lessening of policy emphasis on import substitution for machinery and equipment.

Footnotes to Chapter II

* Besides those thanked in Chapter I, this chapter owes much to Albert Fishlow's criticism of an earlier draft, and to Miguel Urrutia's kind help.

1. Note that the definition of desired reserves makes one independent variable (actual minus desired reserves) partly a function of the lagged dependent variable.

2. The (economic) expectation was that proper specification of the lags would yield coefficients for the GR variables adding up to one. But that expectation cannot be realized econometrically.

3. Although given the definition of the GR variable, the legitimacy of using the Durbin-Watson statistic is in doubt.

4. Given a priori knowledge regarding import licensing during these "runs", a case could be made for introducing different dummy variables for those periods, improving the regression results. But little of substance would be gained by such procedure.

5. Note that "import levels" refer to import values at current dollar prices.

6. The Colombian islands of San Andrés, off the coast of Nicaragua in the Caribbean, have free-port privileges. Heavy tourist traffic between those islands and the Colombian mainland add to the smuggling possibilities.

7. Thus, some of the departures from prudency detected in the first part of this chapter should be interpreted broadly, to include excesses in the licensing of imports and/or capital exports.

8. Correlating year-to-year percentage changes in real GDP ($\hat{GDP}$) and manufacturing output ($\hat{MA}$) with those for the dollar value of merchandise imports ($\hat{M}$), during the same year (t), and the year before (t-1), the following results are obtained, for the period 1951 through 1969:

	(1)	(2)
Constant	4.71	4.95
	(20.7)	(17.1)
CGM-UNECLA	0.63	---
	(14.4)	
CGM-BdlR(Dollar)	---	0.60
		(10.5)
Trend	0.015	0.014
	(7.7)	(5.4)
R^2	0.97	0.95

$$(\hat{GDP})_t = \underset{(15.4)}{4.60} + \underset{(3.6)}{0.05}\ (\hat{M})_t + \underset{(1.5)}{0.02}\ (\hat{M})_{t-1} \qquad R^2 = 0.46$$

$$(\hat{MA})_t = \underset{(18.6)}{6.06} + \underset{(3.4)}{0.05}\ (\hat{M})_t + \underset{(1.0)}{0.02}\ (\hat{M})_{t-1} \qquad R^2 = 0.43$$

The mean values were as follows:

$(\hat{GDP})_t = 4.96$

$(\hat{MA})_t = 6.40$

$(\hat{M})_t = 4.78$

$(\hat{M})_{t-1} = 5.25$

Thus, while there is a significant link between import and output growth, the constant terms account for 93 and 95 percent, respectively, of GDP and manufacturing average year-to-year growth. See also the interesting article by Alberto Corchuelo R. and Luis Bernardo Florez E., "El Sector Externo y las Fluctuaciones de Corto Plazo de la Economía", in DANE, Boletín Mensual de Estadística, No. 244, Noviembre 1971, pp. 9-21.

9. Alas, these constant-peso series are not identical to those (constant-dollar) series shown in Table II-3, above, also labelled "BdlR". Let us refer to them as BdlR(Peso) and BdlR(Dollar) series, respectively.

10. The R^2 between the UNECLA series, and that of the BdlR(Dollar) for 1950 through 1969 is 0.87. With the logarithm of real gross domestic capital formation as the dependent variable, and with those two series on (the logs of) capital goods imports (CGM), as well as trend, as independent variables, the following results are obtained: