Exchange Rate Controls and Illegal Trade in Brazil: A Lesson From the 80´s

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ABSTRACT

The coexistence of exchange rate control, a black market for foreign currency and illegal trade has been a common characteristic of developing economies. The paper undertakes an empirical investigation about the interaction between high premia on the black market for the Dollar and illegal trade for the case of Brazilian economy. It develops a new approach to access the size of illegal trade and shows that during the 80s' illegal trade accounted for a significant portion of Brazilian international transactions.

KEY WORDS

exchange rate, illegal trade, Brazilian economy

RESUMO

A coexistência de controles cambiais, mercados paralelos de divisas estrangeiras e comércio ilegal tem sido uma característica comum de vários países em desenvolvimento. O artigo realiza uma investigação empírica da interação entre ágios elevados no mercado paralelo de Dólar e o comércio ilegal para a economia brasileira. Ele desenvolve uma nova metodologia para para medir o tamanho do comércio ilegal e mostra que durante os anos 80 ele respondeu por uma parcela significativa das transações internacionais do País.

PALAVRAS-CHAVE

taxa de câmbio, comércio ilegal, economia brasileira

JEL classification

F17, F31

INTRODUCTION

The world economy in the 90's has been characterized by successive foreign exchange market crises. First there was the European Monetary System (EMS) crisis in 1992 that ended the peg between the main European Currencies, notably the British Pound. Then in 1994 there was the Mexican crisis, when a sudden reversal of capital flow to that country triggered an international financial crisis that affected most of the developing economies. Finally, in 1997-1998 the world economy was shaken by a succession of crises, first in many East Asian countries such as Thailand and Indonesia, then in more developed economies like South Korea and ultimately in such diverse economies as Russia, Venezuela and Brazil.

For some, the crises were not new phenomena, but more the result of bad fundamentals in the respective economies. For others, they were a consequence of liberalization in the foreign exchange (FX) markets. In this case they point to the necessity for more government interventions. Here, the suggestion goes from the adoption of Tobin-type tax on capital flows to returning to the gold-standard regime of fixed exchange rate. (Frankel, 1995)

Besides the operational difficulties in implementing effective controls in a highly integrated and technology intensive market, such as the FX market, there is always the problem of distortion in resource allocation. In case of FX markets, a common consequence of exchange rate controls is the development of parallel (black) markets.

Parallel markets develops as producers, traders and consumers tries to evade government interventions in terms of price and quantity controls. In case of price control, parallel markets arise whenever an economic agent is compelled by authorities to sell his endowments or production at a lower level than what another market could offer.

The presence of a parallel market, usually operating with an exchange rate which is more devalued than that of the official market, creates incentives for exporters and importers to engage in illegal trade.

Exporters try to increase their profits by transferring some of their sales of foreign currency to the black market. In this case they obtain a greater amount of domestic currency for the same export transaction. An equivalent attitude is also found in the case of importers who try to buy cheap foreign currency in the official market to profit from the selling of a portion of this money on the black market.

The use of economic analysis to study illegal trade has been present in many articles about international trade.[1] The main focus of the literature has been the development of theoretical models to study equilibrium solutions relative the welfare of illegal trade. Empirical works have not been as much frequent. Our objective in this paper is to make an empirical study about illegal trade that is induced by exchange rate controls. For that we consider the case of Brazil.

The paper is organized as follow. Section 1 presents a model for illegal trade. The model is empirically tested and the results are analyzed in section 2. In section 3, some inferences about the size of illegal trade in Brazil are made. The conclusions are presented in the last section.

1. ILLEGAL TRADE

The model to be developed in this paper is based on illegal exports. The formulation, however, can be adapted to the case of illegal imports.

Most of the smuggling models developed in the literature are based on illegal trade that results from the existence of non-prohibitive taxes on exports. In the present study the basic motivation for illegal trade comes from the existence of high premia in the black market for foreign exchange.

One can argue that both situations are similar. The imposition on the exporter, forcing him to sell his foreign exchange at a price lower than he otherwise could obtain in the black market, can be interpreted as a tax levied on the export transaction. In this case the tax rate is the level of the black market premium.

There is, however, an important difference. In the case of taxes on exports, the tax structure is very stable and predictable, and so is the difference between the official export-tax-distorted price and the illegal tax-free-smuggled price. In the second case however, the difference between the government-determined official exchange rate and the market-determined black market exchange rate is far from being a stable and predictable variable. Indeed, table 1 shows that the black market premium is a very volatile variable.

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1   As a small sample of this literature I can list the papers of: SHEIK (1974, 1976, 1989), PITT (1981, 1984), BHAGWATI (1981), MARTIN and PANAGARIYA (1984), JONES and ROEMER (1987), and FAUSTI (1992).

TABLE 1 - BLACK MARKET PREMIUM (%) BRAZIL 1975-1990

Year	Quarterly Averages				Yearly
	I	II	III	IV	
75	3.2	9.4	15.2	27.1	13.7
76	30.2	23.9	19.8	24.2	24.5
77	17.9	12.3	21.7	22.6	18.6
78	18.3	13.1	19.8	25.0	19.0
79	18.1	17.8	16.7	24.7	19.3
80	4.8	5.5	13.8	11.3	9.4
81	2.3	8.4	20.8	22.1	13.4
82	30.6	30.6	43.7	66.7	42.9
83	70.6	46.6	61.9	39.5	54.6
84	20.8	6.3	13.2	17.2	14.4
85	17.1	15.7	33.0	35.2	25.2
86	29.9	43.9	64.2	90.9	57.2
87	55.4	19.8	23.6	24.3	30.8
88	25.1	35.6	49.0	57.7	41.8
89	61.7	133.9	71.5	111.5	94.6
90	96.4	48.4	17.1	12.9	43.7

Period	Average Premium	Standard Deviation
76I – 79IV	20.4	4.6
80I – 84IV	26.8	21.4
85I – 90IV	48.9	32.5
80I – 90IV	38.1	29.8

Source: Serfina S/A.

In the last stage of the export process the firm sells the foreign currencies obtained from its trade activity in the financial markets. The existence of two foreign exchange markets (Official and Black) places the firm in a position similar to a firm that faces two alternative markets to sell its production.

The selling of Dollars in the Black market is an illegal activity. The income generated from this market is not known for sure since the selling is subject to financial penalties when detected by the authorities.

The decision of an export firm wishing to maximize its expected profit can be formulated as:

$$\text{Max} \in [(\pi)] = EX_O + BX_S - \mu(X_S)F(X_S) - C(X_O + X_S) \qquad (1)$$
$$X_O, X_S$$

$$\text{S.T.} \quad X_O > 0, \ X_S > 0$$

where,
π = firm's profit,

E = relative price of official exports,

E = P*e(1+s)/Pd,

P* = external price denominated in foreign currency,

e = official exchange rate, units of domestic currency /unit of external currency,

Pd = domestic price,

s = export subsidy

B = relative price of illegal exports,

B = P*b/Pd,

b = black market exchange rate,

Xo = official exports,

Xs = illegal exports,

μ = probability of getting caught operating in the black market,

F = financial penalty paid if caught operating in the black market,

C = firm's cost of production.

The model assumes that F is a function of illegal exports: $F=f(Xs)$, $df/dXs = F_{Xs} > 0$. It also assumes that the probability of getting caught, μ, is high the higher is the amount of exports sold in the black market: $\mu = g(Xs)$, with $dg/dXs = \mu_{Xs} > 0$.[2]

Other assumptions are (1) firms behave as a price-takers abroad; (2) firms are risk averse;[3] (3) firms have strictly concave production function, with fixed costs, that implies U-shaped average cost curves; (4) the black market premium is independent of the firm's decisions which is equivalent to suppose that the firm is small relative to the market.

Notice that in the maximization problem we ruled out the extreme cases where Xs=0 and Xo=0. The case where Xo=0 is ruled out by the assumption that firms can produce profitably for the official export market. The case where Xs=0 is only possible with a prohibitive expected penalty which is not considered here.

The first order conditions for profit maximization are:

$$d\in [(\pi)]/dXo\ (Xo^*, Xs^*) = E - C'(Xo^* + Xs^*) = 0 \tag{2}$$

$$d\in [(\pi)]/dXs\ (Xo^*, Xs^*) = B - (\mu_{Xs}F + \mu F_{Xs}) - C'(Xo^* + Xs^*) = 0 \tag{3}$$

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2   PITT (1981) suggests that the risk of being caught is also a function of the quantum of official exports which would work as a cover for illegal exports. This hypothesis seems appropriate when the underinvoicing of exports is made, predominantly, through quantity misreporting but not when it is made through price misreporting, which is the case more common for exports of semi-industrial countries like Brazil.

3   BARBOSA, CYSNE & HOLANDA (1992) show that the risk-aversion hypothesis is the only one compatible with diversification by the firm toward the official and parallel markets. I am grateful to an anonymous referee of this journal for comments on this point.

where (Xo^*, Xs^*) is the solution to the maximization problem.

Firms operate in the black market until the expected marginal revenue from this market $(B - \mu_{Xs}F - \mu F_{Xs})$ equals the marginal revenue from the official market (E). At this point, they shift over to the official market and continue to produce until marginal costs reach E. The selling of part of exports in the black market increases the profit of the firm, but since the marginal revenue from this market falls to E, the marginal revenue from the official market, before the rising marginal cost reaches E, this extra profit does not result in additional exports. The volume of exports produced for both markets is equal to the volume that would be produced for the official market alone at price E. The price of the Dollar in the black market just affects the share of exports going to be sold in the official market.

From EQ.(2), we have :

$$Xs_i = (X_s + X_o)s_i = f(E) \tag{4}$$

where X^s_i = export supply function of firm i,

$E = P^* e(1+s)/Pd$

From EQ.(2) and EQ.(3) we have:

$$X_{si}^s = f(E, B, \mu, F) \tag{5}$$

$$X_{si}s = f(P, \mu, F) \tag{6}$$

Where:
X_{si}^s = illegal export supply function of firm i,
$B = P*b/Pd$,
P = the black market premium.

Since $X_{oi}s = Xs_i - X_{si}s$, we have that:

$$X_{oi}^s = f(E, P, \mu, F). \tag{7}$$

Where:
X_{oi}^s = official export supply function of firm i.

Assuming that $X_{oi}s$ is a well-defined and nicely behaved function and that we have N firms, an aggregate supply function for exports is given by:

$$X_o s = \Sigma\, X_{oi} s\ ,\ \ i=1,\ldots\ldots,N \qquad \text{or} \quad X_o s = f(E,P,\mu,F,) \qquad (8)$$

The assumption that the firm takes the price of exports as given, implies a perfectly elastic demand function for its exports. In this case, equation (8) can be considered as a reduced form specification for aggregate exports:

In previous empirical studies of Brazilian exports, a proxy for world income (YW) is frequently included in equation 8, with the estimated coefficients for this variable tending to be very significant:

$$X_o = f(E,\ P,\ \mu,\ F,\ YW) \qquad\qquad\qquad\qquad\qquad\qquad (9)$$

The inclusion of variable YW in the export function, although empirically attractive, contradicts the assumption of a perfectly elastic demand for exports. One can argue, however, that the demand is perfectly elastic in the long run, but not in the short-run. In the short-run, as a result of information and transaction costs, demand would not adjust, automatically, to changes in prices. On the other hand, demand, although perfectly elastic, can be subjected to quantitative restrictions, such as the imposition of quotas by importing countries. In both situations, an increase in world trade, proxied here by world income, can result in an increase of the domestic exports, with such an increase not, necessarily, being followed by changes in prices.

The endowments of the economy in terms of production factors are expected to be limited in the short-run. This means that a variable representing the level of utilization of the economy's installed capacity (K) should be included in the model, since production for the external and domestic markets is restricted by such a constraint:

$$X_o = f(E,\ P,\ \mu,\ F,\ YW,\ K) \qquad\qquad\qquad\qquad\qquad (10)$$

In order to complete our reduced-form equation, we have to consider the role that official exchange rate expectations have in the determining of the country's official exports. Usually, exports are made through export contracts where, among other things, a price, denominated in foreign currency, is agreed. The relevant price for the firm, however, is not such foreign currency denominated price but the price denominated in domestic currency, which is a function of the official exchange rate. The price in foreign currency is the same during the entire period of the contract, but not the price in domestic currency, which is a function of the official exchange rate at the time of each shipment.

As stated earlier, Brazilian exporters are required to sell their foreign currencies to the country's Central Bank at an exchange rate determined by the Bank. Such an official exchange rate is not market determined. Authorities set it, and frequently it is used as a tool of economic policy. In forming their expectations, exporters have to come up with some guess about the government's policy toward such a variable. This paper assumes that exporters form their expectations based, primarily, on the assumption that the level of the country's foreign exchange reserves affect the authorities decisions with respect to the setting of future values of the official exchange rate.

High levels of foreign exchange reserves reduce the country's foreign exchange constraint and so, the willingness of the authorities to promote nominal devaluation in the official exchange rate. That is especially true in countries, such as Brazil, which have simultaneously problems of balance of payments and high inflation. Devaluation of the exchange rate helps to ease the balance of payments problem but, at the same time, they complicate the inflation problem as the higher costs of imports are transferred to the final prices of the goods and services sold domestically. With the reduction of the pace of the devaluation of the exchange rate, the exporter can expect an overvalued domestic currency to occur soon. The overvalued domestic currency will turn official exports less attractive, relative to the domestic market as well as to the illegal export market, negatively affecting their levels. On the other hand, low levels of foreign exchange reserves very probably will force the government to accelerate the rhythm of devaluation of the official exchange rate as a way to promote exports and to avoid any liquidity problem in the country's balance of payments.

In our final equation for Brazilian exports we add, therefore, to the set of explanatory variables the variable foreign reserves as a proxy for the expectations of exporters relative to the official exchange rate.

$$X_o = f(E, P, \mu, F, YW, K, R) \tag{11}$$

The equation defined in EQ.(11) has two important features: (1) it takes into account not only the present value of the exchange rate but also the expectations of its future values, and (2) it realizes that the officially-registered data about exports does not reflect the true magnitude of the country's total exports, since the first is affected by the existence of illegal trade. To what extent illegal trade is empirically significant is a question that we will try to answer in the next two sections.

2. EMPIRICAL RESULTS

The empirical investigation that is reported in this study is based on equation (11).[4]

$$Xo = f(E, YW, K, P, R) \qquad (12)$$

The economic interpretation for it works as follow. Exporters respond positively to an increase in the price paid for the goods they produce. They also respond positively to an increase in the demand for these goods. An increase in the utilization of installed capacity of firms means an increase in the internal demand that is satisfied at a cost of a reduction in exports. As the premium on the black market for foreign currency increases, so also do the incentives to illegal trade, implying that fewer exports are going to be sold in the official market. High levels of foreign exchange reserves increase the chances of an overvalued domestic currency, which affects negatively the exports.

The variable Xo is the current Dollar value of Brazilian exports. The variable E (real official exchange rate) is equal to the product of the Dollar price of exports (Px), the subsidy rate $(1+s)$ and the official nominal exchange rate, divided by the country's wholesale price index. For the variable YW (world income) we adopted as a proxy the combined GDP of the OECD countries and in the case of variable K (installed capacity utilization) we adopted the related index calculated by the Getulio Vargas Foundation.

Variable P represents the black market premium, which is the percentage difference between the nominal exchange rate for the U.S. Dollar in the official and black markets. Finally, as a proxy for exporters expectations relative future values of the official exchange rate we adopted the variable R which is the ratio of the country's international reserves to the external debt.

All variables are on a quarterly basis and the sample period goes from the first quarter of 1975 to the fourth quarter of 1990.

We started from an unrestricted autoregressive distributed lag model (see HENDRY, PAGAN & SAGAN, 1984) of equation (12). That is:

$$Xo_t = \alpha(L)Xo_{t-1} + \Sigma \, \beta_j(L) \, Z_{jt} + \varepsilon t; \quad j=1,...,5 \qquad (13)$$

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4   The variables μ and F were dropped because they are unmeasurable and are not exogenous to Xo since the variables Xo, μ, and F are all function of Xs. A possible alternative for that would be the construction of proxies for these variables, which represent the expected cost of doing illegal trade. We were not able, however, to identify data that allowed such construction.

$\alpha(L)$ is a polynomial in the lag operator L ($LX_t = X_{t-1}$) of order m_o, $\beta_j(L)$ is a polynomial of order m_i, ε_t is assumed to be white noise and the variables Z_{jt} are given by: $Z_{1t} = E_t$, $Z_{2t} = K_t$, $Z_{3t} = YW_t$, $Z_{4t} = P_t$, $Z_{5t} = R_t$.

Table 2 contains the estimated parameters of a restricted specification of equation (13).[5] All variables are in natural logarithms. The dependent variable here is exports of manufactured goods. In the empirical estimations, we used dummy variables for the periods of transition between new a old presidencies (78I-78II, 85I-85II, 90I-90II), which in Brazil are characterized by great political and economic uncertainties, and for the period in which the country declared an unilateral moratorium on its external debt (86IV-87I).

All variables have the expected signs and are statistically significant at the 1% level, except the variable K, which is significant at the 5% level. The specification has a high explicative power as shown by R2. The stationarity of the error term is required for robust estimation of the equation. The augmented Dickey-Fuller test, (ADF), was applied to verify the stationarity of the error term. The test rejected the unit-root hypothesis (t-value equals -5.41 for the null of nonstationarity).[6]

TABLE 2 - DEPENDENT VARIABLE: EXPORTS OF MANUFACTURED GOODS

Variables	Coeffi.	St.Errors	T-Student	Part R^2
Constant	-24.68	4.169	-5.92	.422
Trend	-.041	.008	-5.09	.350
Xo(-1)	.452	.060	7.52	.541
Xo(-4)	.424	.058	7.23	.521
E	.276	.070	3.92	.243
YW	6.145	.926	6.63	.478
K(-1)	-.592	.241	-2.45	.111
P(-2)	-.076	.018	-4.11	.260
R(-1)	-.213	.042	-5.03	.345

R2=.988   F(11,48)=388.43   s=.0684   DW=2.37

Notes: Econometric package used : PC-GIVE Version 6.1.

Tests for autocorrelation ,heteroskedasticity, autoregressive conditional heteroskedasticity (ARCH), normality of residual and correct specification of the original model (RESET) were performed and were all rejected at the 5% level.

5   The decision about the most appropriate lag structure was based primarily on the level of statistical significance ("t-student" statistic) of each lag, on the equation standard error, and on the Schwartz information criteria.

6   By now, it is widely recognized the low power problem of unit roots test in short finite sample series, specially when they show structural breaks. (CHOCRANE, 1988; PERRON, 1989; KWIATKOWSKI, 1992) Since this is the case of many variables considered here, we restricted the unit root test to the residuals of the regressions.

The value, sign and statistical significance of the variable black market premium (P) support the hypothesis of underinvoicing of exports. The R^2 of the variable P shows that it is capable of explaining 26% of the variation of the official value of exports, while its coefficient points to an elasticity of 0.08. The low elasticity should not be overlooked since the volatility of the black market premium is very high.

Table 3 shows the results for the case of total exports as dependent variable.

TABLE 3 - DEPENDENT VARIABLE: TOTAL EXPORTS

Variables	Coeffi.	T-Student	Part R^2
Constant	-14.70	-2.76	.132
Trend	-.018	-1.9	.067
Xo(-1)	.267	3.63	.208
Xo(-4)	.437	6.04	.422
E	.304	3.67	.213
YW	3.601	3.31	.180
P(-1)	-.052	-2.54	.114
R(-1)	-.165	-3.30	.179

$R^2=.960$ $F(9,50)=136.63$ $s=.084$ $DW=1.96$

Note: Tests for autocorrelation ,heteroskedasticity, autoregressive conditional heteroskedasticity (ARCH), normality of residual and correct specification of the original model (RESET) were performed and were all rejected at the 5% level.

As mentioned earlier, the same type of model developed to study illegal exports can be applied to the case of illegal imports. In the framework of this article, illegal imports are carried-out through the overinvoicing of official imports. The importer here, by overinvoicing and selling on the black market the amount corresponding to the overinvoiced portion of imports, manages to spend less local currency for the same transaction. This implies contrary to the case of exports, a positive relationship between the black market premium and the official value of imports.

A correspondent of equation (12) for the case of imports assumes the following form:

$$Mo = f(E, YD, P, R) \qquad (14)$$

Mo is the official value of total imports of Brazil, except for oil-related imports. The variable E is the real exchange rate and is equal to the product of the official nominal exchange rate by the Dollar price of imports (Pm), divided by the country's wholesale price index. The variable YD is the domestic income and is given by the country's GDP. The variables P and R are the same as in the case of exports.

It should be noted that here the variable R, international reserves/external debt, plays a double role: it works not only as a proxy for official exchange rate expectations, but also as a proxy for government quantitative controls in terms of emissions of import permits.[7]

As in the case of exports, we start from an unrestricted autoregressive distributed lag model:

$$Mo_t = \eta\,(L)\,Mo_{t-1} + \Sigma\,\theta j\,(L)\,W_{jt} + u_t; \quad j = 1, ..., 4 \tag{15}$$

Where $\eta(L)$ is a polynomial in the lag operator L of order m_0, $\theta_j(L)$ is a polynomial of order m_j, u_t is a white noise random variable, and the variable W_{jt} are given by: $W_{1t} = E_t$, $W_{2t} = YD_t$, $W_{3t} = P_t$, $W_{4t} = R_t$. Table 4 presents the results for a restricted specification of equation (15). The results are statistically satisfactory and all variables have the expected sign and are significant at the 5% level.

The signs of the variables black market premium and foreign reserves are, as expected, the opposite from the case of exports. That is, while high premia in the black market induce underinvoicing of exports and negatively affect the official value of exports, they also induce overinvoicing of imports with positive effects on the official value of imports. In the same way, a higher level of reserves is associated with an overvalued domestic currency, which negatively affects exports but has positive effects on imports.

TABLE 4 - DEPENDENT VARIABLE: TOTAL IMPORTS

Variables	Coeffi.	T-Student	Part R^2
Constant	-1.376	-2.10	.080
Mo(-1)	.761	8.60	.592
Mo(-2)	-.438	-3.70	.212
Mo(-3)	.507	5.89	.405
E	-.224	-1.63	.049
E(-1)	.222	1.53	.044
YD	.649	5.41	.364
P(-3)	.056	2.74	.128
R(-1)	.203	6.07	.420

$R^2 = .913$ $F(8,51) = 67.54$ $s = .0871$ $DW = 2.48$

Note: Tests for autocorrelation ,heteroskedasticity, autoregressive conditional heteroskedasticity (ARCH), normality of residual and correct specification of the original model (RESET) were performed and were all rejected at the 5% level.

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7   In Brazil, importers were required to obtain a import permission issued by the government agency for international trade (CACEX) in order to be allowed to by foreign exchange at the official exchange rate.

3. THE SIZE OF ILLEGAL TRADE

Illegal trade transactions have been known to account for a large portion of the international trade of many developing countries. For obvious reasons, official statistics about illegal trade are not available. As an alternative, the empirical literature on this subject has relied on inferences from the behavior of officially-recorded trade.

The approach adopted in most cases involves the comparison of a country's official reports of its trade activity with the corresponding reports of its trade partners[8] In this case, trade data discrepancies, once controlled for insurance and freight costs, would provide an estimate for the amount of illegal trade.[9]

The data discrepancy approach presents some pitfalls. Besides the insurance and freight costs factor, data discrepancies can results from shipping lags, misinformation in terms of merchandise classification and country of destination and origin, existence of multiple exchange rates, and difference in quality.[10]

The approach implicitly assumes that one of the trade partners, the obvious candidate being a developed country, systematically reports its trade records without any misinformation, i.e., it always reports the true values of its transactions. But this is not necessarily true. It should be noted that the fact that industrial countries do not misinvoice when they trade with each other (CUMBY & LEVICH, 1986), does not imply, necessarily, that they will have the same behavior when trading with developing countries.[11]

Finally, the approach produces estimates of underinvoicing/overinvoicing that are somehow not intuitive. For the year of 1983, for example, when the black market premium was held, on average, at the 55% level, with average monthly rates as high as 88%, the approach indicates underinvoicing of exports of just 537 millions U.S. Dollars, while the estimate for the year of 1984, a year in which the black market premium was held at a much lower level (14%), is of 1,327 millions U.S. Dollars. Indeed, it is the lack of evidence of a close relationship between the incentive to misinvoice foreign trade and discrepancies in trade data that led McDonald

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8   See NAYAK (1977), GULATI (1987), MEYER & MARQUES (1989).

9   The basic idea is quite simple: if country A reports exports to country B of X units of Dollars but country B reports imports from A of Y units of dollars,(Y>X), this would imply that in country A exports were underinvoiced in an amount equal to the difference between Y and X (Y-X).

10   A seminal analysis on this topic is found in MORGENSTERN (1965).

11   The *Businessweek* magazine in its May 25, 1992 edition reports about the existence of massive underinvoicing on the U.S. of imports of textile products from China.

(1985) to conclude that "*a great caution should be exercised in using trade data discrepancies to infer the scale of smuggling activity*."

A different approach to measure illegal trade is adopted in this article and it will be called the econometric approach. The methodology is quite simple. The first step is to estimate econometric specifications for the value of exports (imports) which take into account the incentives to misinvoice records on foreign trade, resulting from the existence of high premia in the black market for foreign exchange. Estimates for the amount of illegal trade are obtained, in a second step, through a simulation exercise using the econometric specifications previously derived. That is, the official registered values of exports (imports) are compared to the estimated values of exports (imports) that are obtained under the assumption of a zero premium, i.e., no incentive to misinvoice. In other words, the inferences about the size of illegal trade are made comparing the values of exports (imports) that are officially registered when there is a significant incentive to misinvoice, to the values that would be reported in the case of the nonexistence of such an incentive.

The approach is not error-free, but it is able to produce estimates that are complementary to the estimates that are obtained using the data discrepancy approach..[12]

Table 5 contains the yearly estimates for the underinvoicing (overinvoicing) of exports (imports), for the case of Brazil, calculated under the two alternative approaches.

The figures suggested by the econometric approach for the magnitude of illegal trade in Brazil are quite large, but they are not unrealistic.[13] The last decade, particularly its second half, was a very turbulent period for the Brazilian economy, in which the combination of high premia on the black market for foreign exchange and great government administrative turmoil made the practice of illegal trade very attractive and relatively riskless.

Notice that in the case of imports, the data discrepancy approach points to the underinvoicing of imports rather than to the overinvoicing of them. The results in this case should not be misinterpreted. The approach's estimates just confirm a

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12   The main concern is the implicit "ceteris-paribus" assumption that is made to perform the simulation exercise.

13   One of the country's most important newspaper, *Jornal do Brasil*, reports in its October 27,1989 edition that: "*in according to calculations of a big bank, the total of underinvoiced exports in the year already surpassed the 4.5 billions mark and it is expected to be 6.0 billions U.S. Dollars by the year's end.*"

widely-held suspicion that a significant portion of Brazilian imports are smuggled or underinvoiced due to the existence tight quantitative controls. But this does not exclude the possibility of overinvoicings in the imports carried-out through the official market as suggested by the econometric approach.

TABLE 5 - ILLEGAL TRADE IN BRAZIL (U.S.$ MILL.) 1976-1990

Year	Underinvoicing of Exports			Black Market Premium	Overinvoicing of Imports		
	A US$	**B** US$	%		**A** US$	**B** US$	%
76	-298	1257	12.4	24.5	119	947	11.1
77	362	1671	13.8	18.6	-686	121	1.4
78	125	2554	20.1	19.0	-557	852	8.9
79	1294	1768	11.6	19.3	-595	1112	9.5
80	1292	792	3.9	9.4	-820	916	6.9
81	960	1572	6.7	13.4	-725	378	3.4
82	1649	3161	15.6	42.9	-2322	190	2.0
83	577	4615	21.1	54.6	-1188	1120	15.4
84	1327	3506	13.0	14.3	-2991	620	8.7
85	3136	4004	15.6	25.2	-1856	594	7.2
86	3217	5973	26.7	57.2	-2040	1326	11.7
87	3504	4266	16.2	30.8	-2878	857	7.6
88		5080	15.0	41.8		787	6.9
89		7386	21.4	94.6		1981	13.3
90		6594	21.0	43.7		2245	13.7

Notes: A = Data discrepancy Approacah (From MEYER & MARQUES, 1989).
         B = Econometric Approach.
         % = Percentage of Total.

Contrary to the conclusions of Gulati (1987) and Meyer and Marques (1989) who found that illegal trade was not an important "source" of capital flight, our results indicate that a substantial amount of capital flight was financed by underinvoiced (overinvoiced) exports (imports). Actually, the conclusion that illegal trade is not a significant source of capital flight is somehow questionable if one considers that in Brazil, balance of payment capital account transactions are closely monitored and residents are prohibited from having foreign bank deposits.

As pointed-out by Bhandari and Decaluwe (1987), the black market operates in a floating exchange regime and so, by definition, perfect segmentation between the official (pegged) and black (floating) markets would imply that no net accumulation of private domestically held foreign assets (capital flight) would occur. It is incomplete segmentation, leakage between the two markets (illegal trade), that allows net capital accumulation of foreign assets in the black market. In this case what is zero is the sum of black market current and capital account and leakage from the official current account transactions.

The process works as follow: high inflation rates and great uncertainty about future economic policies induce individuals and firms to look for foreign assets as a way to preserve the value of their investments. Since private capital account transactions are made through the black market and since this market works under a floating regime, ceteris paribus, the black market exchange rate, and consequently the premium, would increase up to the market-clearing point, implying that no net accumulation of foreign assets would occur. What happens, however, is that as the premium goes up, so also does the volume of illegal trade, meaning that resources are being transferred from the official to the black market. It is this interaction between the two markets that turns possible a net accumulation of foreign assets in the black market.

CONCLUSION

During most of the 80s', one of the characteristics of the Brazilian economy was the existence of an active black market for foreign exchange where foreign currencies, especially the U.S. dollar, were bought and sold at very high premia. The average yearly premium for the entire 1980-1990 period was 39%. This average increases to 54% for the 1986-1990 period with average yearly rates as high as 95%.

A natural question that arises when one is confronted with such high premia, is that concerning the impact these premia caused to the country's economy in terms of illegal trade.

This paper performed an empirical investigation about illegal trade in Brazil and concludes that the data support the hypothesis of systematic underinvoicing of exports and overinvoicing of imports. It develops a new approach to assess the size of illegal trade. The empirical investigation shows that the magnitude of illegal trade in Brazil increased continuously throughout the 80s', reaching very significant levels by the end of this period.

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