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Devaluation in Developing Countries: Expansionary or Contractionary?

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Abstract. This paper discusses the effects of devaluation on output growth in Less Developed Countries (LDCs). The issue has played an important role in the economic and political agendas of developing countries for several decades during which devaluation has been one of the most frequently used policy tools under both IMF-regulated and independent stabilization programs in these countries. Whether devaluation of the currency affects national income positively or negatively has also received considerable attention among academic researchers. In this paper, in order to analyze empirically whether or not devaluation results in output contraction in LDCs, data from 18 sample countries are used in a fixed-effect procedure. LDCs are divided into two categories and two different regression analyses are conducted. First, data from a group of 10 countries, including both manufacturing product exporters as well as agricultural and primary product exporters, are used to estimate a model of real output behavior for a period of 25 years. Then, to investigate if there exists a qualitative difference between different countries in terms of the effect of devaluation on economic growth, data from two different groups of countries (8 manufacturing exporters, 8 agricultural and primary exporters) are analyzed for a 20-year period. In addition to the change in real exchange rates, the role of monetary and fiscal policies, as well as terms of trade changes, are incorporated into the model as the possible determinants of real output growth. The results indicate that devaluation creates a contractionary effect on output in the first year, whereas it has an expansionary effect in the following year. Also, the results suggest that there is no qualitative difference between manufacturing exporters and agricultural exporters in terms of the effect of devaluation on output growth. Fiscal expansion (increasing relative size of government expenditure) has a significant positive effect on output growth for all countries, regardless of their export composition. The effect of terms of trade changes on output is generally negative for agricultural and primary exporters, but fluctuating for manufacturing exporters. Manufacturing product exporters have a higher output growth trend than agricultural and primary exporters.

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I. Introduction

Over the past three decades many Less Developed Countries (LDCs) have implemented economic stabilization and structural adjustment programs under the initiative and supervision of the International Monetary Fund (IMF). As stated by Khan and Knight (1981) and Doroodian (1994), a typical IMF stabilization program contains the following policy measures: (1) real devaluation; (2) reduction in government expenditures, and increase in taxes; (3) decrease in growth of domestic credit; (4) increase in domestic real interest rates. The effect of real devaluation on output growth is therefore important for a country implementing this policy. Obviously, devaluation does not have to be part of an IMF-guided stabilization program. Regardless of their level of economic development, many countries have "resorted either voluntarily or by some coercion to devaluation as a key policy choice for propelling economic growth. These countries embrace devaluation as a strategy that will result in increased output growth and further development." (Nwanna, 1994, p.70)

In other words, the issue of devaluation has long been a major item on the economic and political agendas of LDCs. These countries needed to devalue their currency for a variety of reasons, including correcting the price distortions and getting the right prices for the market forces to function properly, and changing relative prices of traded to nontraded goods, hence increasing competitiveness in the foreign markets. As a result, it would be possible to decrease foreign trade deficit and improve the balance of payments (BOP); and, above all, to achieve a viable economic growth. Needless to say, increasing the rate of growth of output is crucial for economic development. Output growth is essential for LDCs in order to raise national income per capita, achieve higher standards of living for their population, and close the development gap between themselves and the industrialized countries.

Devaluation as a policy instrument is relevant especially in the context of misalignment. A variety of reasons could lead to price misalignments in LDCs: government policies of high tariffs on imports;

taxes on exports in some cases; overvaluation of the currency associated with import substitution for industrialization as opposed to export promotion policies; and restrictions on commodity as well as capital flows. As a result of some combination of these policies, domestic prices deviate from world prices. Devaluation might play a key role in eliminating the market distortions and correcting the price misalignment. However, since economic growth is indispensable, the question of whether or not there is a trade-off between output growth and devaluation becomes a critical issue.[1]

Until the late 1970s the dominant view on this issue was that devaluation has expansionary effects on output. However, in recent years a growing literature questions this view and puts forward a variety of reasons that devaluation could lead to contraction in output.

Within this framework, the objective of this study is to analyze the role of devaluation on output growth, which has been part of the stabilization programs[2] that many LDCs had to implement voluntarily or involuntarily in recent decades, and to investigate empirically whether devaluation is expansionary or contractionary.

Given the fact that the agricultural sector has a significant share in the overall national income as well as being a major source of employment for many LDCs, the link between devaluation, economic growth and agricultural policy is not a puzzle. Growth in the agricultural sector contributes considerably to overall economic growth. Devaluation policy changes the relative price of tradable goods to nontradable goods. As a result of devaluation, therefore, agricultural exports, hence agricultural production, and total export earnings as well as overall output growth will be affected.

Another point that should be emphasized is perhaps the changing character of devaluation policies. Until the 1980s the vast majority of LDCs followed fixed exchange rate policies. Starting from the late 1970s and

[1] See Appendix 1 for the pattern of growth rates and real exchange rates over the period 1976-88 for a group of LDCs.

[2] An economic stabilization program can be defined, in a broad sense, as a program consisting of several economic measures, which are designed to achieve a viable macroeconomic balance in the country concerned. In general, achieving a viable macro balance implies improving the balance of payments (BOP), obtaining a higher rate of output growth, curbing inflation towards reasonable levels, and decreasing the rate of unemployment. Essentially, a stabilization program is believed to be an effective tool kit for achieving these goals.

early 1980s, however, many LDCs switched from a fixed to a flexible system as a result of a series of internal and external factors.[3] For this reason, we have to deal with not only devaluation, but also depreciation so long as the analysis covers the more recent years. But in essence, devaluation and depreciation function in the same way, in the sense that they both change relative prices in favor of tradable commodities. Therefore, the fact that some LDCs have switched to a floating exchange-rate system does not create a major problem in terms of the focus of our analysis.

Another interesting observation in international economic relations in recent years is worth noting. The emergence of regional trading blocs in different parts of the world, i.e. the European Union (EU) in Europe, the North American Free Trade Agreement (NAFTA) in North America, and the Association of South East Asian Nations (ASEAN) in the Asia-Pacific Rim is phenomenal. These blocs directly affect more than half of the world's trade.[4] Exchange-rate systems seem to be affected by this process as well. For instance, members of the EU have been trying to peg their currencies with respect to one another within certain limits. This observation implies that the possibility of going back to some form of fixed exchange rate system, at least within a certain group of countries, is not totally out of question.

As far as the potential policy implications of this analysis are concerned, one can argue that the qualitative results of such a study might bring about some important implications. In other words, if the objective of the policy makers of a developing country is to achieve economic development and hence increase output growth, the effect of devaluation on the rate of growth of real output becomes crucially important. Also important is whether the effect of devaluation on output is the same for all LDCs regardless of their income level, infrastructure, or export composition, etc. Could it be the case that this effect is qualitatively different for different categories of LDCs? Our empirical test will shed light on this issue as well. The paper proceeds in the following form: in Section II, a theoretical background on the opposing views is presented and existing

[3] Some of the developing countries that switched from a fixed to a flexible exchange rate regime in this period are Costa Rica, India, Indonesia, Kenya, Morocco, Nigeria, Pakistan, Sri Lanka, Thailand and Turkey. For a detailed analysis of this transition see Little, *et al*. (1993).

[4] Baldwin and Venables (1995) state that 40% of world trade is directly affected by Regional Trading Arrangements as a result of the initiatives of the EU and NAFTA alone.

literature is briefly evaluated. Section III introduces the empirical model used to test the contractionary devaluation hypothesis. The results are discussed in Section IV, and in Section V some conclusions are drawn.

II. The Effects of Devaluation on Output: A Theoretical Background

There was no serious controversy over the possible effects of devaluation on economic growth until the late 1970s. The dominant view up to that period was that devaluation would improve trade balance, alleviate balance of payments difficulties and accordingly expand output and employment. The mechanism behind these positive effects is that devaluation switches demand from imports to domestically produced goods by increasing the relative prices of imports, and makes export industries more competitive in international markets by stimulating domestic production of tradable goods and inducing domestic industries to use more domestic inputs.

The economic policies directed towards affecting external balance and output by changing the composition of expenditures are called expenditure-switching policies. One of the most frequently used policy instruments for expenditure-switching policies has been exchange rate devaluation.[5]

However, the consensus on this issue (i.e. the devaluation leads to output expansion) was broken at the end of the 1970s. An alternative line of approach has emerged since, which has raised the possibility that devaluation could be contractionary, especially in developing countries. This approach is sometimes referred to as *structuralist* because it usually tends to consider the economic problems of LDCs as "structural."[6] Contrary to the traditional approach, this view argues that devaluation is highly likely to have a contractionary effect on output and employment, especially for LDCs. The channels through which devaluation might cause a reduction in

[5] More precisely, we should say "exchange rate readjustment", because not only devaluation, but also revaluation affects the relative prices of traded and nontraded goods, and hence changes the composition of expenditures. But we are primarily concerned with devaluation in this paper.

[6] To give an example, Krugman and Taylor (1978) argue that "In the short run the balance of payments deficit is 'structural,' that is, both imports and exports are not very sensitive to price changes for a given level of domestic output." (p.454)

national output can be divided into two categories: demand side channels and supply side channels. As these names suggest, channels in the first category are considered to be effective primarily on aggregate demand, while those included in the second category are effective rather on aggregate supply.

Among others, Cooper (1971), Caves, Frankel and Jones (1996), Krugman and Taylor (1978) and Edwards (1986) mention the following channels through which devaluation may create negative effects on aggregate demand that lead to a reduction in output and employment.

Import Cost Channel: Devaluation usually takes place when countries have a foreign trade deficit and related external balance difficulties. This is the typical case for the vast majority of developing countries. Krugman and Taylor (1978) show that if a country initially has a trade deficit, the effect of devaluation on aggregate demand will be negative. Following the devaluation, given that imports exceed exports, price increases of traded goods reduce the home country's real income and raise the real income of the outside world, since foreign exchange payments (import costs) exceed foreign exchange receipts (export revenues). "Within the home country the value of 'foreign savings' goes up *ex ante*, aggregate demand goes down *ex post*, and imports fall along with it. The larger the initial deficit, the greater the contractionary outcome." (p.446)

A parallel argument concerning import cost channel stresses the importance of elasticities. Devaluation increases the cost of imports in domestic currency terms. Even if the Marshall-Lerner condition[7] is satisfied, trade balance may worsen in domestic terms. If domestic demand does not increase at the same time to offset this deterioration in trade balance, the overall effect on output will be negative. One might argue that in the presence of sufficiently high elasticities, such a problem would not exist. But whether the demand elasticities of exports and imports of LDCs are high enough to improve trade balance in response to relative price changes is open to debate. Authorities from LDCs as well as some economists have long argued that these elasticities of LDCs are low so that it is not easy to increase exports and decrease imports in the short run. This view is often referred to as elasticity pessimism.[8]

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[7] The Marshal-Lerner condition states that in order for a devaluation to improve the trade balance, the sum of price elasticity of demand for exports and price elasticity of demand for imports have to be greater than one: $e_x + e_m > 1$.

[8] See, for example, Caves *et al*. (1996), p.361.

Real Balance Channel: As a result of devaluation, prices of traded goods will increase relative to nontraded goods. This will lead to an increase in the general price level. As prices rise, real money balances (M/P) decline. The larger the share of traded goods in the consumption, the more severe is the increase in general price level and decrease in real money supply. As real money balances go down, expenditures will fall. At this point, we can think of two different possibilities.

In the case of price flexibility, total output and employment do not change. The contraction of domestic spending or the decline in absorption is offset one-for-one by improvement in net exports, so the total output remains unchanged. In the case of price rigidities, however, prices of nontraded goods will adjust slowly to the new situation. Therefore, falling domestic spending may lead to an excess supply of goods. In this case, total output will decrease if demand for nontraded goods decreases by more than the rise in net foreign demand for traded goods.

Income Distribution Channel: Income distribution effect is based on the argument that there are different classes of consumers in a given society (Diaz-Alejandro [1963], Krugman and Taylor [1978]). In a broader context, these classes may be divided into two categories: wage earners and profit (and rent) earners. The Marginal Propensity to Consume (MPC) for wage earners is presumably higher than for profit earners. This is mainly because the income level of workers is lower, and hence saving possibilities is limited for them.[9] Under these circumstances, devaluation creates an important income redistribution effect in two ways.

First, it increases the relative income of profit earners via increased prices of traded goods. Secondly, if wage rigidity exists so that wages do not immediately follow price increases, real wages (W/P) fall, since nominal wages are the same but prices are now higher. As a result, workers' share in national income falls while profit earners' share increases. Given the fact that the MPC for wage earners is higher than profit earners, there will be an eventual decline in aggregate demand. The magnitude of the reduction is determined by the difference between consumption propensities of workers and of firm (and land) owners. Another redistribution effect of devaluation

[9] "Those living closer to the margin of subsistence are likely to have little saving and even less scope for borrowing, so their marginal propensity to consume is likely to be very close to 1. This is why redistributional effects are likely to be larger in LDCs." (Caves, Frankel and Jones, p.477)

comes into question with the transfer of income from the private to the public sector, which will be discussed below.

External Debt Channel: One of the critical factors that play a role in macroeconomic difficulties of LDCs is the existence of a large amount of accumulated external debt stock and the interest burden on it. Most of the time external debt is denominated in dollars or in another strong foreign currency. If the country having a sizable external debt devalues its domestic currency, then both residents and the government are affected negatively.[10] This is because one unit of foreign currency now costs more units of local currency. Debtors need more local currency to pay for the same amount of debt. In other words, the debt burden of the private and public sectors increases; hence the net wealth decreases as a result of devaluation. The higher the amount of debt and the interest rate charged on it, the higher the deterioration in net wealth. In this case debt holders (households and firms as well as government) may decrease their expenditures in response to the increase in the value of their debt stock and debt service requirements. As an obvious example, Caves, Frankel and Jones (1996) mention that following the sudden devaluation of the Mexican currency at the end of 1994, the resulting rise in the cost of large external debt led to bankruptcy in some businesses and contributed to the recession in the Mexican economy.

Speculative Demand Channel: Another potential negative effect of devaluation on aggregate demand may occur through increased speculative demand for goods. Expecting a real devaluation in the near future, people may try to protect themselves against the deteriorating effects of devaluation on their wealth by buying more today. Such a speculative demand for physical goods may arise especially in countries where the financial markets are not developed and hence there are no other forms of protective tools (bonds, securities, etc.) available. Even though such behavior might create an expansionary effect initially, the situation reverses and expenditures fall when devaluation hits the economy.

Trade Liberalization Channel: Many LDCs have a variety of restrictions on foreign trade, among which import quotas are very common. The trade liberalization effect may arise if the import quotas are removed and trade is liberalized together with devaluation. Devaluation is often considered as a substitute policy for restrictions on imports. Moreover, trade liberalization (practically this means removal of import controls) may

[10] Assuming that external debts are held not only by government, but the private sector as well.

quite possibly be part of an IMF stabilization program or a condition to obtaining loans from international financial organizations such as the World Bank. Under these circumstances, if a country suddenly removes controls on imports, then imports may increase sharply in the short run. Since imported goods are competing with domestically produced goods, demand for import-competing products may decline, which may further lead to a reduction in domestic output.

Tax Channel: Another negative effect on aggregate demand may be observed when significant ad valorem tariffs on exports and imports exist. Since devaluation increases the value of both exportable and importable goods in terms of domestic currency, the amount of tax revenue will be higher following the devaluation. In essence, this is income redistribution from the private to the public sector. An increase in taxes means a fall in the purchasing power of the private sector. Private expenditures are likely to fall parallel to the reduction in private disposable income. Assuming the MPC for the public sector is lower than the private sector, overall expenditures will be lower.[11] As a result, aggregate demand will be negatively affected. The higher the share of ad valorem tariffs in government budget revenues, the more serious is the negative effect on aggregate demand.

Although not as many compared to the demand side, there are also a few supply side channels through which devaluation may be contractionary. These channels function so as to decrease the level of output supply for any given level of prices. There are basically three supply side channels:

Imported Input Cost Channel: This is one of the main channels mentioned by several studies including Krugman and Taylor (1978), Edwards (1986) and van Wijnbergen (1986). In many developing countries the production process is highly dependent on imported inputs in the form of raw materials, intermediate or capital goods. Devaluation increases the cost of imports in particular, and the cost of domestic production in general, via imported inputs. Decreasing imports in this context implies insufficient inputs necessary for production. Eventually, because of the lack of enough inputs and increasing costs, production will slow down, leading to a contraction in total supply. Typical examples of this problem can be seen

[11] MPS for the public sector is presumably higher than the private sector. It is sometimes considered to be closer to unity in the short run. "Devaluation redistributes income from the private sector to the government, which has a saving propensity of unity in the short run." (Krugman and Taylor, p.446)

particularly in oil-importing LDCs. Once the price of oil rises, the cost of production immediately increases. As the cost of production increases relative to the prices of their products, firms tend to produce less, which leads to a reduction in aggregate supply and an increase in unemployment. In the 1970s and 1980s, oil-importing LDCs suffered deeply from oil shocks because of increased production costs. Similarly, devaluation may create the same negative effect on output and employment through increased production costs in developing countries in which the production process is heavily dependent on imported inputs.

Wage Indexation Channel: Another supply side channel through which devaluation may be contractionary is related to the wage system prevailing in the economy. As devaluation increases the prices of traded goods and eventually the general price level, resulting in a decrease in real wages, it is reasonable to suppose that workers will ask for nominal wage increases to protect their purchasing power. If wages are flexible they will adjust to the new prices following the devaluation. Similarly, if there exists a wage indexation mechanism, which automatically increases nominal wages in proportion to price changes, then production costs will increase through higher wages. This process will bring a reduction in production, causing output to contract. Wage indexation is not unusual in developing countries. Israel, Argentina and Brazil in the 1970s and 1980s can be given as examples. More importantly, demand for nominal wage increases is not always put forward in a peaceful manner in LDCs where strikes often result in a significant loss of man-hours, hence output.

Cost of Working Capital Channel: Finally, the cost of working capital can be stated as another supply side channel through which devaluation may create contractionary effects. In standard economic theory, capital as a factor of production is usually assumed to be fixed in the short run. Therefore the variable cost comes from the labor cost, intermediate inputs and raw materials. In an economy where the financial markets are developed, firms can easily borrow from these markets in case they need short-term funds. However, it is a well-known fact that in most LDCs financial markets are not developed and borrowing facilities are not easily available. Therefore, it is argued that working capital[12] is another variable factor of production in LDCs. Under these circumstances, as mentioned by van Wijnbergen (1986), if devaluation occurs, then the real volume of credit

[12] Working capital is basically short-term funds that firms need to carry out their daily business such as inventory, payrolls, etc.

available in the market declines and interest rates tend to rise. This will push up the cost of production, hence negatively affecting the quantity supplied. This negative effect stemming from higher costs is quite analogous to wage indexation. The mechanism that pushes up the interest rates is very similar to the real balance channel mentioned above. The only difference is that here the contractionary effect is associated with the supply side rather than the demand side.[13]

As far as the empirical evidence is concerned, the literature on the effects of devaluation on economic growth shows an interesting outlook where one can find different and conflicting results. These results differ not only quantitatively, but also qualitatively. Some studies conclude that devaluations are expansionary (e.g. Krueger [1978], Connoly [1983], Taylor and Rosensweig [1984], Kamin [1988]), while others conclude that devaluations are contractionary (e.g. Cooper [1971], Gylfason and Radetzki [1985], Branson [1986], Sawyer and Sprinkle [1987], Nwanna [1994]). More interestingly, some other studies come up with a mixed result (e.g. Gylfason and Schmidt [1983], Gylfason and Risager [1984], Edwards [1986], Little, *et al*. [1993]). In short, existing evidence is mixed and no simple generalization is possible. This leaves room for new empirical research.

The difference between the results of the various studies can be mainly attributed to three factors, which are related to methodology: (1) composition of countries, (2) time period subject to the analysis, and (3) structure of the model. Some studies are country-specific (e.g. Branson [1986], Taylor and Rosensweig [1984]), while others use a group of countries including either a mixture of developed and developing countries, or just developing countries. The time period also differs across studies. In terms of the structure of the model, most of the aforementioned studies are subject to the following shortcomings. They use either a "before and after" approach, where the performance of the economy around the devaluation is compared, and do not take into account the changes in other important variables (fiscal and monetary policies), or they perform indirect tests using simulation models with parameter values imputed from other studies. Edwards (1986) and Nwanna (1994) employed different procedures than others, which were not subject to these shortcomings.

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[13] That is, devaluation pushes up the price level, hence the real money supply (M/P) decreases. This leads to a decline in the real volume of credit. As credit supply contracts relative to demand, interest rates tend to rise.

III. The Model

In this study, a simple macro model is used to analyze the effects of devaluation on real output. This model relies on the models developed by Khan and Knight (1981) and Edwards (1986). Khan and Knight (1981) developed a model to investigate the effects of stabilization programs on economic growth in LDCs. They argued that the economic activity in LDCs is affected by different variables, among which are the prevailing money market disequilibrium and the fiscal expenditures of the government. Edwards (1986) modified this model in three ways. First, the excess money supply term in Khan and Knight (1981) is replaced by a money surprise term in accordance with the rational expectations literature. Secondly, the role of the terms of trade changes on the economic activity is incorporated into the model. Thirdly, an exchange rate term is added into the regression analysis in order to investigate the effect of devaluation on real output. The model used in this study relies mainly on Edwards' model. The explanatory variables incorporated into the output equation are basically the same with slight modifications in derivation. One of the differences between this study and Edwards' is that a different functional form is utilized (log vs. semi-log) to explain the real output behavior. Also, a different composition of countries is used. Lastly, the time period subject to the empirical analysis is different.

Empirical tests are conducted for two different groups of countries as explained below. The reduced form equation for output in this model is the following:

$$log\ y_t = \alpha + \gamma T + \beta_1 G_t + \beta_2 \Delta M^s{}_t + \beta_3 TT_t + \beta_4 E_t + \varepsilon_t \qquad (1)$$

where

y: real output

α: constant term

γ: parameter that captures the trend rate of growth

T: time period

G: relative size of government (the ratio of government expenditures to nominal output)

M^s: money surprise term (the difference between actual and expected rate of growth of nominal money supply)

TT: terms of trade

E: real exchange rate

ε: error term with mean zero and constant variance.

What can we expect as to the signs of the parameters? We have a priori expectations for some variables, but not for others. For instance, we normally expect β_1 to be greater than 0, i.e. an increase in government expenditures will positively affect output. β_2 is also expected to be positive, i.e. surprise increases in money supply are expected to affect output positively. A rise in terms of trade could affect output in both ways, depending on the magnitude of price elasticities of exports and imports, hence there is no particular expectation for β_3. The parameter β_4 will capture the effect of devaluation on output growth. For the purpose of this study, the sign of this parameter is critical. As long as the parameter is statistically significant, a positive sign will indicate an expansionary, while a negative sign will indicate a contractionary, effect.

There are three groups of sample countries used in this study.[14] Group 1 consists of 10 developing countries, including both manufacturing exporters and agricultural and primary product exporters: Colombia, El Salvador, Greece, India, Israel, Malaysia, the Philippines, South Africa, Sri Lanka and Thailand. Group 2 is composed of two subgroups, which include 8 agricultural and primary exporters and 8 manufacturing exporters. Group 2a (agricultural and primary product exporters) consists of Bangladesh, Burundi, Gambia, Haiti, Nepal, Niger, Rwanda and Togo. Group 2b (manufacturing exporters) includes Malaysia, Thailand, Israel, Greece, South Africa, Sri Lanka, the Philippines and India. There were important real exchange rate changes (devaluations and revaluations) in these countries during the period in question[15].

Definitions of the concepts and the sources of data used in the analysis are explained in Appendix 2. The period of analysis is 1970-1994 (25 years) for Group1 (mix of manufacturing exporters and primary product

[14] Different criteria could be applied to categorize sample countries: export composition, GNP per capita, etc. In this study, countries are grouped on the basis of their export composition.

[15] See Appendix 1 for the exchange rate changes in some of these countries.

exporters), and 1973-1992 (20 years) for Group 2a (agricultural and primary exporters) and Group 2b (manufacturing exporters).

IV. Results

In order to estimate the output equation stated above, it was necessary to find a "money surprise" series to be incorporated into equation (1). In this context, money surprise is defined as the difference between the actual and expected change in money supply.[16] Expected growth of money supply is constructed by a money creation equation formulated in the following way:

$$\Delta M_t = a_0 + a_1 \Delta M_{t-1} + a_2 \Delta M_{t-2} + a_3 FDR_t + u_t \qquad (2)$$

where

M_t: broadly defined money in nominal terms (M2) in the current period

FDR_t: fiscal deficit ratio term (the ratio of government budget deficit to monetary base of the previous period)

u_t: error term.

As mentioned by Edwards (1983), in many developing countries government uses money creation as a source of deficit financing.[17] That is why the fiscal deficit term was incorporated into the money creation equation along with lagged money variables. Then equation (2) was estimated for each individual country. Estimation results indicated that for these countries the effect of fiscal deficit term on growth of money supply is positive and significantly different from zero. This finding provided support

[16] In the rational expectations literature it has been argued that only unexpected increases in money supply matter in affecting output, because rational economic agents will adjust themselves to the expected changes in the policy. In other words, expected changes in monetary variables do not affect real variables such as output and employment. See Barro (1978).

[17] There are basically four possible ways for governments to finance deficit: 1) external borrowing, 2) internal borrowing, 3) increased taxes and 4) money creation. For the governments of developing countries it is extremely hard to increase taxes for political reasons (this is also true for developed countries). Even increased tax rates do not guarantee that tax revenues will increase because of the problems associated with the efficiency of the tax system and bureaucracy. External and internal borrowing brings additional burdens on government budgets. As a result, money creation seems the easiest and the least problematic way to finance deficit.

for the argument that money creation is employed by LDC governments as a tool for deficit financing.

Parameter values obtained from the estimation of equation (2) were used to calculate the expected change in money supply.[18] Then a *money surprise* series was produced for each country by taking the difference between the *actual change* and the *expected change*. This series was incorporated into equation (1) as one of the explanatory variables. Then the following output equation was estimated:

$$Log\ y_{n,t} = \gamma T + \beta_1 G_{n,t} + \Sigma\beta_{2i}\, \Delta M^s_{n,\,t-i} + \Sigma\beta_{3i}\, TT_{n,\,t-i} + \Sigma\beta_{4i}\, E_{n,\,t-i} + \varepsilon_{n,t} \quad (3)$$

where

n=1,…,10 (countries), t=1970,…,1994 (25 years) for group 1

n=1,…,8 (countries), t=1973,…,1992 (20 years) for group 2a

n=1,…,8 (countries), t=1973,…,1992 (20 years) for group 2b, and i=0,1.[19]

Estimation results of equation (3) for different groups of countries are given in the following tables.

[18] i.e. use estimated values of a_0, a_1, a_2 and a_3 with changes in lagged values of money supply and fiscal deficit to get "expected change" in money supply in the current period: ΔM_t^*.

[19] Whether or not lagged values of explanatory variables should be included in the estimation of the output equation in a rational expectations setting is controversial. One can find arguments both in support of and against it in the literature. For some authors (e.g. McCallum [1979]) it is all right to include lagged values of independent variables, while for others (e.g. Barro [1978]) it is not a good idea.

Table 1: Regression results for Group 1: 1970-1994

Independent Variables	Equation		
	(3.1)	**(3.2)**	**(3.3)**
ΔM^s_t	0.089**	0.076*	0.080**
	(1.894)	(2.722)	(1.695)
ΔM^s_{t-1}	0.177***	-	0.206***
	(1.298)	-	(1.395)
G_t	0.240*	0.284*	-
	(2.637)	(4.567)	-
TT_t	-0.363**	-0.389*	-0.142**
	(-2.319)	(-2.589)	(-1.703)
TT_{t-1}	0.221***	0.267**	-
	(1.476)	(1.854)	-
E_t	-0.349*	-0.263**	-0.0281**
	(-2.722)	(-2.090)	(-2.011)
E_{t-1}	0.305*	0.178***	0.389*
	(2.577)	(1.613)	(3.009)
Adjusted R sq.	0.76	0.77	0.75
Number of observations	250	250	250
F-statistic	(27.226)	(22.512)	(26.534)

t-statistics are given in parentheses.

* significant at 1%, ** significant at 5%, *** significant at 10%.

Table 2: Regression results for Group 2a: 1973-1992

Independent Variables	Equation		
	(3.1)	**(3.2)**	**(3.3)**
ΔM^s_t	0.225**	0.122***	0.117***
	(2.228)	(1.295)	(1.292)
ΔM^s_{t-1}	0.204**	-	-
	(2.121)	-	-
G_t	0.050*	0.040*	0.039*
	(3.333)	(2.722)	(2.740)
TT_t	-0.026***	-0.008	-
	(-1.291)	(-0.974)	-
TT_{t-1}	-0.029	-	-
	(-0.817)	-	-
E_t	-0.065*	-0.043**	-0.040**
	(-2.438)	(-1.671)	(-1.668)
E_{t-1}	0.088**	0.116***	0.114**
	(1.727)	(1.357)	(1.752)
Adjusted R sq.	0.77	0.79	0.79
Number of observations	160	160	160
F-statistic	(22.193)	(24.466)	(27.129)

t-statistics are given in parentheses.

* significant at 1%, ** significant at 5%, *** significant at 10%.

Table 3: Regression results for Group 2b: 1973-1992

Independent Variables	Equation		
	(3.1)	**(3.2)**	**(3.3)**
ΔM^s_t	0.054**	0.045**	0.047***
	(1.688)	(1.729)	(1.746)
ΔM^s_{t-1}	0.050***	-	-
	(1.303)	-	-
G_t	0.274*	0.271*	0.266*
	(2.438)	(2.424)	(2.409)
TT_t	-0.237**	-0.059***	-
	(-1.717)	(-1.391)	-
TT_{t-1}	0.269	-	-
	(1.249)	-	-
E_t	-0.360**	-0.314**	-0.322**
	(-1.749)	(-1.794)	(-1.862)
E_{t-1}	0.217**	0.177***	0.179**
	(1.668)	(1.297)	(1.752)
Adjusted R sq.	0.78	0.79	0.81
Number of observations	160	160	160
F-statistic	(23.006)	(26.446)	(29.101)

t-statistics are given in parentheses.

* significant at 1%, ** significant at 5%, *** significant at 10%.

Table 4: Country specific trend rate of growth (γ)

Group 2a	Equation			Group 2b	Equation		
	(3.1)	(3.2)	(3.3)		(3.1)	(3.2)	(3.3)
Bangladesh	0.019	0.018	0.021	Greece	0.120	0.114	0.117
	(3.04)	(2.77)	(3.32)		(6.70)	(6.60)	(7.59)
Burundi	0.030	0.023	0.030	S. Africa	0.157	0.154	0.157
	(4.63)	(3.65)	(4.65)		(9.86)	(9.82)	(10.91)
Gambia	0.046	0.035	0.042	Israel	0.112	0.100	0.102
	(6.52)	(5.46)	(6.22)		(3.11)	(3.71)	(3.90)
Haiti	0.078	0.073	0.077	Sri Lanka	0.117	0.143	0.144
	(10.3)	(9.92)	(10.65)		(8.59)	(8.63)	(8.96)
Nepal	0.024	0.023	0.026	India	0.117	0.111	0.116
	(3.71)	(3.51)	(4.20)		(6.58)	(6.49)	(9.03)
Niger	0.076	0.082	0.079	Malaysia	0.143	0.137	0.139
	(11.28)	(12.72)	(12.67)		8.09)	(8.03)	(8.92)
Rwanda	0.045	0.040	0.040	Philippines	0.167	0.166	0.168
	(6.09)	(5.57)	(5.87)		(12.19)	(12.20)	(13.30)
Togo	0.062	0.053	0.060	Thailand	0.064	0.064	0.065
	(9.31)	(8.49)	(9.29)		(4.94)	(4.95)	(5.28)

t-statistics are given in parentheses.

All coefficients are significant at 1% level.

Notice that the possibility of a different short-run and long run effect of these variables is allowed by the inclusion of lagged variables. Also, in the estimation of equation (3) the γ coefficient was allowed to differ across countries to reflect the differences in trend growth of real output. As can be seen from Table 4 above, country specific γs were generally higher for manufacturing exporters, implying that these countries have a higher trend growth rate of output relative to primary exporters. For instance, in equation 3.1, estimation results show that Bangladesh (primary and agricultural product exporter) has a 0.019 value for trend growth rate output as compared to S. Africa's (manufacturing exporter) 0.157. The same

conclusion is valid for all countries in the respective categories, except for Thailand.

V. Conclusion

In this paper, we have looked into the effects of devaluation on output growth in LDCs. The issue has played an important role in the economic and political agendas of developing countries for several decades, during which devaluation has been one of the frequently used policy tools under both IMF-regulated and independent stabilization programs. In order to analyze empirically whether devaluation results in output contraction in LDCs, data from 18 sample countries were used in a fixed-effect procedure. The following results can be highlighted from the regression analysis.

First of all, the F-statistics indicate that parameter values are *together* significantly different from zero, implying that the set of variables used in the analysis were relevant *together* to explain the output behavior. Secondly, the coefficients of money surprises were positive, as expected, and statistically significant mostly at the 5% level. This finding supports the argument in the *rational expectations* literature that government can affect the real variables through surprise increases in money supply. Thirdly, the coefficient of fiscal policy term, defined to be the ratio of government expenditures to nominal income, was significantly positive at the 1% level in all equations where it was included as an explanatory variable in the regression equation. This implies that, *ceteris paribus*, an increase in government expenditures will have a strong positive affect on output growth. From this finding, it should not be surprising that governments in Less Developed Countries frequently use expansionary fiscal policies.

As far as the coefficients of terms of trade term are concerned, the sign of the parameter was generally negative for the current period and positive for the following period for manufacturing exporters, whereas it was negative for both periods for agricultural and primary exporters. One might interpret this finding as an indication that exports and imports of manufacturing exporters are more sensitive to price changes than primary exporters. Nevertheless, given the fact that the lagged term was not statistically significant in some cases, it is hard to make a generalization on the effects of terms of trade changes on output growth.

More important than the above findings is that a systematic pattern was observed as far as the effect of devaluation on output growth is concerned. The coefficients for the real exchange rate terms turned out to be negative for the current period and positive for the following period. The parameter estimates were statistically significant at the 5% level in most cases. It is also interesting to note that this result did not change qualitatively when the regression was run for two different groups of countries separately. This finding provided some support for the *contractionary devaluation* hypothesis in the short run.[20] Based on the estimation results and hypothesis testing, the interpretations and implications of our results can be summarized as follows:

1. Devaluation is likely to be contractionary in the very short run (within the same year devaluation occurs), expansionary in the medium run (the year following devaluation) and neutral in the long run, i.e. negative and positive effects offset each other over time.
2. The results appear to be valid for both manufacturing exporters and agricultural and primary exporters.
3. Fiscal expansion (increasing the relative size of government expenditures) has a significant positive effect on output growth for all countries regardless of their export composition.
4. Similarly, unexpected monetary expansion also positively affects output growth.
5. The effect of terms of trade changes on output is generally negative for agricultural and primary exporters, but fluctuating for manufacturing exporters.
6. Manufacturing product exporters have a higher output growth trend than agricultural and primary exporters.

In conclusion, these findings imply that policy makers in developing countries should be cautious when taking a decision on devaluing the currency or using the policy instruments under their control in such a way as to create real depreciation. More particularly, it is not advisable to call for devaluation if the major concern is increasing output in the short run. Along the same lines, we can say that it is not recommended for the LDC

[20] This is consistent with Edward's (1986) findings.

governments implementing a flexible exchange rate system to allow for a major depreciation, since it may hurt economic growth.

Appendix 1: Growth Rates and Real Exchange Rates for Some Developing Countries in 1976-1988

	Real exchange rate index		Real Devaluation(*)	Average growth rate	
Country	**1976-79**	**1984-88**	**(76-79)-(84-88)**	**(1975-79)**	**(1984-88)**
Cameroon	103	109	(6)	10.2	1.5
Chile	86	63	37	7.5	5.5
Colombia	97	77	26	5.7	4.5
Costa Rica	89	72	24	6.4	4.5
Côte d'Ivoire	94	83	13	5.6	0.8
India	90	87	3	2.4	5.7
Indonesia	108	70	54	7.4	5.2
Kenya	103	88	17	6.5	5.0
Korea, Rep.	104	89	17	10.7	10.3
Mexico	87	71	23	6.2	1.2
Morocco	103	72	43	5.8	5.3
Nigeria	93	100	(7)	4.2	2.9
Pakistan	101	83	22	5.2	6.5
Sri Lanka	84	106	(21)	5.1	3.5
Thailand	92	89	3	8.6	7.7
Turkey	123	69	78	4.0	6.1

(*) Real devaluation between the two periods is measured as the change in eP*/P. It is calculated as the change as a proportion of the lower (devalued) figure; hence a decrease in index indicates a real devaluation.

Source: Little, *et al*. (1993), table 8.4, p. 237.

Appendix 2: Definitions of the concepts and sources of the data

Real Output (y): Real GDP. Data were taken from the IMF's International Financial Statistics (IFS), line 99b. The data, which were given in National Currency Units, were deflated by nominal exchange rate and then converted into the real GDP index where 1990 was taken to be the base period.

Money Supply (M): The broad definition of money (M2) was taken as the proxy for money supply and it is calculated by adding the data from line 34 (money) and 35 (quasi-money) of the IFS.

Money Surprise (M^s): The difference between actual and expected rate of growth of nominal money supply ($\Delta M^s = \Delta M - \Delta M^e$).

Fiscal Deficit (FDEF): Government revenues minus government expenditures (line 80 of the IFS).

High-powered money (HPM): Monetary base. The following formula was used to calculate HPM: Cash = M1 – demand deposits, HPM = Cash + Reserves. Data are taken from the IFS.

FDR: Fiscal deficit ratio, defined as the ratio of fiscal deficit (FDEF) in the current period to one-period lagged high-powered money (HPM): $DER_t = (FDEF_t) / (HPM_{t-1})$.

Terms of trade (TT): Relative price of exports to imports. Calculated by unit price of exports divided by unit price of imports (TT = Px / Pm).

Nominal Exchange Rate: Units of domestic currency per US $, given in line "ae" of IFS.

Real Exchange Rate (e): Relative price of tradables to nontradables. The proxy for this variable was constructed by multiplying the nominal exchange rate by the ratio of US wholesale price index to domestic consumer price index. Then the series was converted into the real exchange rate index where 1990 was taken to be the base period. Harberger (1986) mentions that many researchers have adopted this index as the best proxy for the relative price of tradables to nontradables.

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