Accumulation of Foreign Exchange Reserves and Long-Term Growth*

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Introduction

Cross-country regressions, reported in this paper for 1960-1999, seem to suggest that the accumulation of foreign exchange reserves (FER) contributes to economic growth of a developing economy by increasing both the domestic and foreign direct investment/GDP ratios as well as the share of exports in GDP. We offer the following interpretation of these stylized facts. Permanent FER accumulation influences economic growth through two different mechanisms, each of them dominates at different stages of development. After the early stage of industrialization is finished and the manufacturing sector is ready to compete at the world market, FER accumulation causes real exchange rate undervaluation that allows to take full advantages of export externality and triggers export-led growth. Export expansion facilitates knowledge transfer and creates incentives for improvements of production quality. At the same time, real depreciations result in a substitution of imports by domestic production that may be advantageous due to learning by doing externality, if the country dependence on imports is weak. At the later stage, FER build up attracts foreign direct investment because it increases the credibility of the government of a recipient country and lowers the dollar price of real assets. If the net inflow of FDI is larger than the in-

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crease in FER, or if the FDI externality is strong enough, then growth acceleration may be reached inspite of overvaluation of the real exchange rate.

Whereas it is widely recognized that devaluation can increase output in the short run, bringing actual output above the potential level, it is generally assumed that in the long-term growth rates of output do not depend on the exchange rate. On the contrary, the exchange rate itself in the long run is considered as an endogenous variable determined by the growth rates of prices and outputs in trading countries. Nevertheless, there is strong empirical evidence (provided below) that the accumulation of foreign exchange reserves (FER) may lead to lower exchange rates, which in turn stimulate export-led growth. Countries with rapidly growing FER/GDP ratios, other things being equal, exhibit higher investment/GDP ratios, higher trade GDP/ratios, higher capital productivity and higher rates of economic growth.

The FER build up should be financed – either through a government budget surplus or via money printing, or through the accumulation of debt. In either case, there is a net loss in the current consumption because a part of the potentially available resources is not used. So if FER accumulation not only stimulates economic growth, but results in the increase of total welfare, it should be considered as a puzzle: by limiting consumption today it becomes possible to increase the integral discounted consumption in the long run. The analogy may be with the Keynesian policy of fiscal expansion that takes the country out of recession. In the words of Joan Robinson, when the government of a country in a recession hires the unemployed to do any kind of work, even totally senseless work such as digging pits and filling them with soil again, the actual GDP approaches the potential GDP. In a similar way, it appears that under certain conditions (externalities associated with international trade and/or various kinds of traps in which developing countries often find themselves due to market failures), the authorities/central bank can boost economic growth by building up the stock of FER instead of using them for consumption. The important difference with the standard Keynesian effect, of course, is that here we are talking about long-term

growth rates of GDP, not about the deviation of actual from potential income.

In this paper we have in mind the following explanation as to why exchange rate under-valuation can promote long-term economic growth. First, accumulation of foreign exchange reserves has the conventional short-term expansionary effect – relative prices of tradables increase with respect to prices of non-tradables and wages. In the long run this effect disappears as increased profits are invested and lead to increased demand for non-tradables and labor. But if there are subsequent unexpected rounds of FER build up, the long-term growth rates may increase. Second, undervaluation of the currency stimulates the increase in exports. This increase in exports raises accumulated knowledge due to learning from external trade and therefore economic productivity as well. The rate of growth rises and this outweighs the potential gain from spending reserves for current needs. Third, undervaluation lowers foreign currency prices of domestic real assets and thus attracts foreign direct investment. Besides, continuing FER build up (especially in periods of trade deterioration) gives a powerful signal to investors that the government is in full control of the situation and can afford costs for the sake of pursuing a consistent policy. Even if FER accumulation outweighs the FDI flow, FDI externalities may be strong enough to accelerate growth. For obvious reasons technologically backward countries have much more to gain from export externality and from the inflow of foreign direct investment. That is why the benefits of reserve accumulation should be especially promising for developing countries.

The paper is organized as follows. In the next section we briefly review the literature and the basic stylized facts on the dynamics of foreign exchange reserves, exchange rates, relative prices, investment/GDP ratios and economic growth. Section 3 contains the results of cross-country regressions for the period 1960-99 that examine the relationship between reserve accumulation and economic growth. Section 4 concludes the paper.

1. Review of the Literature and Stylized Facts

Undervaluation of domestic currency is a common feature for most developing and transition countries. Unlike in mature market economies, in most of the poorer countries the exchange rates of national currencies are low as compared to PPP (Table 1). For resource rich countries, however, there is a danger of "Dutch disease," which arises because resource exports are so profitable that they allow a country to earn a trade surplus even under the overpriced exchange rate. Thus, Middle East countries (mostly oil exporters) are the only major group of states in the developing world with the exchange rate close to PPP (Table 1).

There are a number of explanations why the equilibrium exchange rate in poorer countries is well below the PPP rate (Froot & Rogoff, 1995). On a theoretical level, the references are usually to the Balassa-Samuelson explanation (smaller productivity gap between developing and developed countries in the non-tradable goods sector than in tradables, but equal wages in both sectors) and to the Bhagwati – Kravis-Lipsey effect (non-tradables, which are mostly services, are more labor intensive, so if labor is cheap in developing countries, prices for services should be lower).[1]

The Balassa-Samuelson effect states that, if productivity grows faster in sectors producing tradable output (mainly goods) than in sectors producing non-tradable output (mainly services) and if wage rates are equalized across sectors – with the result that economy-wide real wage increases lag behind productivity growth – then the real exchange rate can appreciate without undermining business profits.

A recent study (ESE, 2001) found evidence of the Balassa-Samuelson effect in transition economies of Eastern Europe and the former Soviet Union in the 1990s. The period is too short, however, and the increases in real exchange rate that actually took place in most transition economies may be the reaction to the

1 For a general description and references see Chapter 16 of Krugman & Obstfeld (1994).

Table 1. Ratio of Actual Exchange Rate of National Currencies in $US to PPP for Selected Countries in 1993, % (1996 figures in brackets)

Countries/regions	Ratio, %	Countries/regions	Ratio, %
OECD*	116	Transition economies*	81
- Germany	126 (133)	- Central Europe*	54
- Japan	165 (158)	- Bulgaria	30 (25)
- U.S.	100 (100)	- Croatia	65 (94)
- Portugal	73 (77)	- Czech Republic	36 (48)
Developing countries*	44	- Hungary	62 (63)
- Asia*	36	- Poland	48 (59)
- India	24 (23)	- Romania	31 (34)
- Indonesia	30 (33)	- Slovak Republic	37 (47)
- Korea	72 (81)	- Slovenia	69 (78)
- Malaysia	(44)	- USSR*	91
- Philippines	35 (34)	- Armenia	(20)
- Thailand	43 (45)	- Azerbaijan	(32)
- Turkey	54 (48)	- Belarus	8 (30)
- Latin America*	46	- Estonia	29 (64)
- Argentina	(90)	- Georgia**	(29)
- Brazil	(70)	- Kazakhstan	(39)
- Chile	(43)	- Kyrghyzstan	(19)
- Mexico	58 (45)	- Latvia	27 (50)
- Peru	(56)	- Lithuania	19 (47)
- Venezuela	(36)	- Moldova	14 (28)
- Middle East*	83	- RUSSIA	26 (70)
- Kuwait	(67)	- Tajikistan	(3)
- Saudi Arabia	(68)	- Turkmenistan	(45)
- United Arab Emirates	(100)	- Ukraine	19 (39)
- Africa*	37	- Uzbekistan	(22)
- Ethiopia	(20)	China	22 (20)
- Mozambique	(17)	Mongolia	(21)
- Nigeria	36 (90)	Vietnam	(20)

*1990. ** 1995.

Sources: "UN International Comparison Program," *Russian Statistical Yearbook 1997.* Moscow: Goskomstat, 1997, p. 698; *Finansovye Izvestiia*, November 10, 1995); World Bank, 1998; Transition Report, 1997.

overshooting initial devaluations that occurred in the beginning of the 1990s, when convertibility was introduced. The services sector in transition economies was generally underdeveloped before transition and was expected to show stronger productivity gains than the traded goods sector. The increases of the relative prices of services that occurred in many countries were most probably caused by previous "distortions" in relative prices (housing, health care, education were virtually free) rather than by faster growth of productivity in manufacturing than in services.

Grafe and Wyplosz (1997) argue that even if the appreciation of the exchange rate in transition economies undermines business profits (in the export sector and in industries that compete with imports), this should not necessarily lead to a deterioration of the current account, since the need for capital accumulation in transition economies declines – that is, they can operate with lower savings ratios than they could before the transition. Indeed, the evidence shows that the ratio of investment to GDP was abnormally high in most centrally-planned economies because of the need to compensate for low capital productivity (Shmelev & Popov, 1989) and that, in virtually all cases, when these economies move into the transition phase, investment ratios initially fall. Even after a country's recovery, its investment ratio usually does not return to the levels that existed prior to the reforms (Popov, 1998a). But even though the decline in investment-to-GDP ratios has now ended in most transition economies, Halpern and Wyplosz (1997) argue that real appreciation in transition economies will continue until the transition is over, which may be "decades away."

On the other hand, many other developing countries (including those rich in resources) pursue the conscious policy of low exchange rates as part of their general export orientation strategy. By creating a downward pressure on their currencies through building-up foreign exchange reserves, they are able to limit consumption and imports and to stimulate exports, investment, and growth. To put it differently, there are generally two major reasons for relatively low exchange rates – (1) the generally lower level of development, leading to lower prices of non-tradable and perhaps even tradable goods and imposing the burden on the bal-

ance of payments in the form of capital flight and debt service payments (non-policy factor), and (2) the governments/central banks conscious policy to underprice the exchange rate in order to use it as an instrument of export-oriented growth (policy factor).

At an intuitive level, undervaluation of the exchange rate, while fighting inflation through tight fiscal and monetary policy (sterilization of increases in money supply caused by the growth of foreign exchange reserves), seems to be a way to encourage exports, restructuring, and growth. Undervalued currency appears to be a necessary component of export led growth. It used to be the strategy of Japan, Korea, Taiwan and Singapore some time ago, when those countries were still poor and were catching up with high income states. This is currently the strategy of many new emerging market economies, especially that of China, which continues to keep the exchange rate at an extremely low level (5 times lower than PPP rate) by accumulating foreign exchange reserves at a record pace. It is by no means an accident that all very fast growing economies are also famous for high and rapidly growing international reserves: China (including Hong Kong), Taiwan, Singapore, Malaysia, and Thailand account for a good 20% of total world reserves, whereas the reserves to GDP ratio for these countries is normally above 20% as compared to only 7% for the world as a whole and only about 5% for Russia in the 1990s.

Similar arguments were made with respect to transition economies. Hölscher (1997) believes that EE countries can gain from underpricing their national currencies, drawing on the West German experience with an undervalued mark in the 1950s. Pomfret (1997) argues that the undervalued exchange rate in China during the reform period (since 1978) was a powerful factor in stimulating economic growth. Some scholars concluded that the overvaluation of the Russian ruble in 1996-98 was the major reason for the Russian 1998 currency crisis (Illarionov, 1998; Montes & Popov, 1999; Popov, 1998a; Shmelev, 1998). Indeed, unlike in East Asian countries, where economic recession followed devaluation, In Russia one month after the devaluation output started to grow.

It has been shown for developing countries that overvaluation of the exchange rate is detrimental for economic growth by including the variable that characterizes the undervaluation of the exchange rate into standard growth regressions (Dollar, 1992; Easterly, 1999). Rodrik (2003) believes that large real exchange rate devaluations have played a big role in some of the more recent growth accelerations, notably in Chile and Botswana, although not in East Asia.

However, there is evidence and theoretical arguments that exchange rate devaluation may have contractionary effect (Edwards (1989), Kamin, Rogers (2000), Rodric (1986), see also references in these papers). Rodrik (1986) developed a model demonstrating how overvalued real exchange rate could lead to the acceleration of growth. In this early paper Rodrik assumes a two sector economy. A manufacturing sector supplies the domestic market, and an agricultural sector exports. Learning-by-doing externality influences growth through manufacturing sector, which is dependent on the imports. Implicitly, Rodrik assumes an import externality, therefore the overvaluation of the exchange rate increases the rate of growth in his model.

The import externality may be important, especially at the early industrialization stages. However, there are only limited opportunities to reap this externality through overvalued exchange rate because such an overvaluation would lead to the trade deficit and to the depletion of reserves.

Another argument against a policy of low exchange rates and against the accumulation of reserves in general is that this policy is inflationary in theory and was inflationary in practice for a number of countries including Latin American countries in the 1980s. (Calvo, Reinhart and Vegh (1995)). One has to mention, however, that Calvo-Reinhart-Vegh model does not take into account a possibility that the, new money issued against the increment of FER is used for investment, so that output increases and inflation does not rise. It appears also that countries that accumulated FER faster than others usually financed such accumulation with a government budget surplus and thus managed to escape high inflationary pressure. Data for all countries (see below) do not show any link between the accumulation of FER and inflation.

All related empirical papers we know of study the influence of the real exchange rate on economic growth; and all empirical and theoretical studies, except Rodric (1986), are based on the assumption that all output produced is utilized, so there is no permanent accumulation of FER. This methodology leads to substantial difficulties.

Under this approach the real exchange rate turns out to be an endogeneous variable dependent on many factors that may cause positive or negative correlation between dynamics of RER and economic growth (Kamin, Rogers (2000), Dynnikova (2001)). For example, real devaluation could be a result of an increase in the domestic sector productivity or a consequence of the capital flight due to investment climate deteroriations. One has to expect a growth acceleration in the first case and a contraction in the second. This may be a reason for the divergency of the research conclusions.

Our paper is probably the first empirical research where influence of the FER accumulation policy on the economic growth is systematically studied One may argue that FER are necessary to pay debt, to support a chosen exchange rate regime, to smoothen foreign exchange operations, and to prevent an attack against domestic currency. Another possible explanation refers to the portfolio argument: FER are a part of a country portfolio investment that earns world market interest rate. Our statistical analysis seems to reveal that these explanations are incomplete since the speed of FER accumulation is a policy variable that may be used to accelerate economic growth.

Overall, there were only five poor countries, all of them in East Asia, that succeeded in catching up with the "rich club" in the last half-century (Japan and the four Asian tigers – Hong Kong, Singapore, South Korea, and Taiwan) and all of them rapidly accumulated reserves. Only seven countries in the world increased their GDP per capita in 1960-99 at a rate higher than 4% a year (Table 2) and all these countries, except Japan, increased FER at a high pace, had relatively low domestic prices and prices for non-tradables due to the undervaluation of their currencies, and experienced rapid increases in export/GDP and investment/GDP ratios. Japan, where the FER to

GDP ratio after reaching 7% in 1971, declined for two decades (reaching 2% in 1992) and where the economy after that slowed down considerably and virtually stopped growing in the 1990s, may be an exception that proves the rule. Similarly, the ratio of domestic to US prices that was high in Japan, Hong Kong and Singapore in the last quarter of the 20th century, was much lower in the preceding 25 years.

Out of 17 countries that demonstrated growth rates of GDP per capita of 3% and higher (Table 2) there are more exceptions – in addition to Japan these are Ireland, Luxembourg, Portugal and Spain. These are developed countries, which obviously – due to a better investment climate and EU membership – had ways to increase capital productivity that were beyond the reach of poor countries. Mauritius and Indonesia also managed to achieve high growth rates with relatively low investment/GDP ratios, which requires explanation. Otherwise, however, the data are very meaningful.

Whatever the reasons for the equilibrium dynamics of the real exchange rate in poorer countries, and whatever are the equilibrium patterns of these dynamics, it is clear that the monetary authorities can influence these patterns through the accumulation of FER. If the Balassa-Samuelson effect really holds, countries accumulating reserves, other conditions being equal, will experience smaller increases in real exchange rates since the policy of the central bank in this case would be to prevent the appreciation of the national currency. It is important to realize that the accumulation of FER is an indicator of the deviation of the actual exchange rate from its equilibrium level (defined as a level which ensures the balance of payment equilibrium without change in reserves), although this equilibrium level itself for developing countries is lower than the PPP rate and also may change over time, approaching the PPP rate.

The imbalanced regime is associated with direct losses of resources.[2] Clearly, the waste of resources is not a first best solution.

2 The losses may be not so large if one takes into account that the reserves earn world market interest rate and may be used in the future.

Table 2. Some Macroeconomic Indicators for Rapidly Growing Countries in 1960-99

Countries	Annual average GDP per capita growth rate, %	Increase in FER/GDP ratio, p.p., 1960-99	Average FER/GDP ratio, %	Highest FER/GDP ratio in 1960-99, %	Average FER in months of import, 1975-99	Ratio of PPP to official exchange rate in 1975 -1999, %	Ratio of prices of health care and clothing, 1993, %	Average export/GDP ratio, %	Increase in export/GDP ratio, p.p.	Average investment/ GDP ratio, %
Countries with average annual growth rate of GDP per capita of over 4%										
Botswana	6.13	86.93 (1976-99)	68.89 (1976-99)	121.82 (1998)	13.64	53.86	66.9	41.83	3.88	27.61
China	4.94	13.72 (1977-99)	8.68 (1977-99)	16.31 (1999)	7.36	38.26		11.76	20.77 (1970-99)	31.31
Hong Kong, China	5.12	27.59 (1990-99)	42.74 (1990-99)	60.56 (1999)	3.61	83.03	80.8	103.37	48.8	27.33
Japan	4.18	2.37	3.42	6.76 (1999)	3.54	115.98	54	11.20	-0.34*	32.01
Korea, Rep.	5.82	14.17	5.89	18.21 (1999)	2.11	58.23	38.9	25.08	38.9	27.93
Singapore	5.87	72.76	60.55	90.52 (1998)	4.76	93.93	52.3	163.66	41.96 (1965-96)	34.57
Thailand	4.51	14.44	14.75	27.97 (1997)	4.47	41.69	25.3	41.63	26	27.98
Countries with average annual growth rate of GDP per capita of 3 to 4%										
Hungary	3.11	27.59 (1990-99)	14.18 (1983-99)	22.67 (1999)	3.52	36.05	57.5	38.06	22.44 (1970-99)	28.79
Greece	3.36	9.90	6.83	15.64 (1994)	3.86	69.99	49.69	14.42	10.76	27.02
Indonesia	3.43	19.09 (1967-99)	6.65 (1967-99)	23.89 (1998)	3.36	42.54	38.4	22.04	19.9	22.34
Ireland	3.89	-11.22	14.61	22.51 (1977)	2.46	93.99	94.3	49.20	57.9	18.71
Luxembourg	3.06	-3.61 (1984-99)	2.10 (1984-99)	4.29 (1985)	0.03	123.23	62.5	103.76	14.4	18.43
Malaysia	3.91	24.55	21.26	42.13 (1993)	4.19	59.12		58.80	71.1	27.83
Mauritius	3.30	6.94	14.53	32.32 (1991)	2.74	42.99	81.9	50.29	36.9	22.83
Norway	3.03	6.94	10.57	22.56 (1985)	3.91	125.96	89.8	38.19	2.22	22.83
Portugal	3.83	-9.31	26.77	51.40 (1979)	2.86	56.78	72.2	24.98	15.28 (1960-98)	24.66
Spain	3.31	1.80	8.18	13.06 (1997)	5.25	80.05	69.2	15.56	19.2	23.13

* In 1960-84 the ratio increased by 4.09 p.p.

If the government is strong enough it can tax consumers and subsidize exporters to extract the potential gain from the externality.However, subsidizing activity may be costly since it entails rent seeking. The costs are rather large for developing countries where rent seeking is particularly strong.

Therefore reserves accumulation may be considered as a second best policy. However, if a government is able to pursues a direct export promoting policy then the stimulating role of the FER accumulation turns out to be questionable.

2. A Closer Look at Stylized Facts – Cross-Country Regressions

All data are taken from the World Bank tables (WDI, 2001). We have observations for about 100 countries for the period of 1960-1999, but for some countries the values of particular indicators for particular years are missing. We kept a country on the list if the number of missing observations for the 40-year period was less than 20.

2-1. Explaining the Level and Change of FER

To begin with, foreign exchange reserves as a percentage of GDP (whether converted at official or PPP exchange rates) vary dramatically (Fig. 3.1). The average ratio of FER to GDP for 1960-99 ranged from several percent of GDP to several dozen percent (Hong Kong – over 40%, Singapore – over 60%; Botswana – 69%; by the end of 1999 Botswana had reserves over 100% of GDP). In East Asian countries the ratio of reserves to GDP in general increased over the course of the last four decades, whereas in African and Latin American countries foreign exchange reserves grew less rapidly than GDP.

If reserves are needed to ensure smooth foreign exchange operations, as the theory suggests,[3] it might be expected that smaller

3 The standard formula for explaining FER is $FER = Y^{\alpha} * O^{\beta} * \sigma O^{\gamma} * i^{\delta}$, where Y is income, O is the measure of openness of the economy (external trade to GDP ratio), σO is the volatility of openness, and i is the opportunity costs of holding foreign exchange reserves (difference between

countries with higher foreign trade would have relatively (as a % of GDP) higher reserves. In practice, however, this is not the case: there is practically no relationship between FER/GDP ratios and the GDP itself, no matter whether it is measured at PPP or official exchange rates. Similarly, the FER adjusted for the size of international trade of the country (measured in months of imports) differ considerably – from less than one month to over one year. Botswana, for instance, in the late 1990s kept enough reserves to support imports for 24 months, whereas Jamaica with a similar magnitude of international trade (40-50% of GDP) was unable to finance its imports even for two months.

Overall, the reserve to GDP ratio in the world fluctuated markedly in the last 40 years due to changes in gold prices and is currently at a level of 6-7% – slightly higher than in 1960 (Fig. 3.2). If gold is excluded (its share in total reserves dropped to about 10% today and only in the US is the share of gold at a level of about 50%), the upward trend is quite visible – from 2% in the 1960s, when the Bretton Woods system of fixed exchange rates was in place, to about 4% in the 1970-80s, when the world switched to floating exchange rates, to 6% in the 1990s, when capital flows increased dramatically.

Is there a rationale, except for the goal of ensuring the stability of external transactions, for the differing magnitude of foreign exchange reserves? FER are correlated with imports (with exports – as well, but the correlation is much weaker, adjusted R^2 is 26% and 13% respectively – Fig. 3.2a), but are not correlated with any other variables that are supposed to explain the level of reserves (Table 3). We tried the volatility of external trade, terms of trade, net fuel imports, the current account, private capital flows, total debt and short-term debt, debt service payments, international and domestic interest rates, per capita GDP – but none of the indicators was statistically significant (not shown in the ta-

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the interest rate earned on FER invested into short-term low risk securities and the interest rate on alternative investments and $\alpha, \beta, \gamma, \delta$ are respective elasticities. It is interesting to note that the collapse of the Bretton-Woods fixed exchange rates system in 1971 did not have a large impact on the demand for FER (Grennes, 1984, Ch. 22).

ble). The only way to improve the goodness of fit is to include the indicator of investment climate, which acquires the "wrong" sign – the better the investment climate, the higher are reserves. This suggests that the causation runs the other way: the accumulation of reserves improves the investment climate. It is also noteworthy that the goodness of fit improves significantly once the average GDP per capita growth indicator is included on the right hand side. It does not tell us which way the causation runs, but suggests that the variation of FER unexplained by the objective circumstances, *i.e.*, the variation that should be attributed to policy factors, is strongly correlated with growth. Later we use the policy induced change in FER in growth regressions.

It remains to be said that the accumulation of FER is financed in practice[4] through government budget surplus and domestic debt accumulation, but not through money printing, since inflation is not significant as an explanatory variable (Table 3). That is to say, most countries that accumulated reserves rapidly exhibited low inflation, and low budget deficit (or budget surplus), but growing government debt. Another possibility is that increases in money supply resulting from the accumulation of FER are accompanied by such a growth of output (due to mechanisms outlined above) that prices remain stable.

2-2. Accumulation of FER and Economic Growth

Overall there seems to be a positive relationship between the accumulation of foreign exchange reserves by the monetary authorities and the rates of long term economic growth. This is ob-

4 Formally, the following identities hold:
$\Delta M=\Delta FOREX+\Delta B_{CB}$
$BD = \Delta B_{CB} + \Delta B_P$
$\Delta FOREX = \Delta M + BS + \Delta B_P$,
where $\Delta FOREX$ – increase in foreign exchange reserves, ΔM – increase in money supply, BS – budget surplus (BD – budget deficit), ΔB_P – increase in bonds held by the public, ΔB_{CB} – increase in bonds held by the central bank. The last identity implies that the increase in foreign exchange reserves can be financed by the increase in money supply, i.e. seniorage (ΔM), budget surplus (BS), and accumulation of debt held by the public (ΔB_P).

served for different periods, and for different measures of FER – average for the period, as well as the increment for the period, as a proportion of GDP and in months of import (Fig. 3.3). It is not observed, however, for developed countries (Fig. 3.3a). But fast-growing developing countries more often than not appear to have high and rapidly growing reserves. Which way does the causation run?

It is difficult to argue that successful growth leads to rapid accumulation of reserves because the accumulation of reserves is a policy variable. Monetary authorities theoretically can accumulate as much reserves as they like over the long run through buying foreign currency with domestic currency. Sterilization of the increases in money supply resulting from the reserve accumulation may be a difficult task in the presence of an open capital account, but the facts are that countries with high reserves have a better record of macroeconomic stability than others. In any case, if successful growth is somehow accompanied by the rapid accumulation of FER, the appropriate question to ask is whether this reserve build up is a necessary pre-condition for growth, or whether this growth could continue without the reserve build up.

We used standard growth regressions to show that the accumulation of reserves and policy-induced accumulation of FER matters for economic growth even after other factors are taken into account. We control for initial level of development and for investment climate index (ranging from 0 to 100; the higher the index, the better the climate), for investment/GDP ratios and population growth rates.

Regression results (Table 4 for 1960-1999 and Table 4a for 1975-1999) clearly show the link between investment/GDP ratios and growth, but also suggest that the accumulation of reserves creates stimuli for growth through greater involvement in foreign trade. Even after controlling for investment/GDP ratios, investment climate and population growth, it turns out that the goodness of fit improves once the accumulation of reserves or increase in export/trade or the underpricing of the exchange rate or the interaction term is added on the right hand side. This suggests that the accumulation of FER is associated with greater involvement in

international trade that in turn produces externalities – higher capital productivity. With equal GDP per capita, investment/GDP ratios and population growth rates, countries that accumulate FER at a faster pace exhibit higher growth rates of international trade as compared to GDP and higher growth of GDP itself. The results for developing countries are very similar.

The effect of reserve accumulation is noticeable allowing for cross-country differences in investment/GDP ratios and it becomes even stronger if investment/GDP ratios are not included on the right hand side. This is to suggest, as we argue later, that the impact of reserve accumulation on growth is multidimensional – it raises investment/GDP ratios, and it also contributes to the increase in the productivity of this investment. Policy-determined level of reserves (calculated as the residual from the equation linking reserves to import) has higher impact on growth than the actual level of reserves (coefficients are 0.042 and 0.034 respectively). Overall the growth promoting effect of FER accumulation is quite powerful: a country that keeps the FER to GDP ratio at a level 20 p.p. higher than the required level of reserves gains about 1 p.p. extra average annual growth of GDP per capita over the 40 year period. Or else, a country that raises it's FER/GDP ratio by 1 p.p. a year over the course of 40 years may hope to increase the annual average growth rate of GDP per capita by 1.2 p.p.

The following stylized facts point in the direction of the existence of the mechanism which can transform the accumulation of FER into higher economic growth.

2-3. Accumulation of FER and Exchange Rate Undervaluation

The PPP exchange rate of the US$ in local currency, e_{PPP}, is defined as the ratio of domestic prices, P, to US prices, P^*:

$$e_{PPP} = \frac{P}{P^*},$$

so the ratio of the PPP exchange rate to official exchange rate, e_{of}, is equal to the ratio of domestic prices to the US prices converted into domestic currency at the official exchange rate:

$$\frac{e_{PPP}}{e_{of}} = \frac{P}{P^* * e_{of}}$$

As was previously argued, there are a number of reasons why the actual (official) exchange rates in less developed countries are usually below the PPP levels. One of the reasons is associated with the policy of monetary authorities in accumulating foreign exchange reserves. The faster the accumulation of reserves, the more undervalued is the exchange rate as compared to PPP and the lower are domestic prices as compared to prices of other countries (US prices in our case, since the exchange rate of the local currency is measured against $US). How important is this particular policy factor in comparison with other factors beyond the immediate control of the policymakers?

The data suggest that the impact of the policies of monetary authorities on the exchange rate is by no means negligible: there is a negative relationship between the increase in FER and the exchange rate undervaluation as measured by the ratio of PPP exchange rate of local currency in US$ to the official exchange rate (Fig. 3.4). On the other hand, the policy of reserve accumulation and undervaluation of domestic currency has its obvious costs – countries that pursue this kind of policy appear to experience some appreciation of real exchange rates, although even with this appreciation it remains lower than in countries with no reserve build up. Increase in the ratio of FER to GDP in 1975-1999 is statistically significant in regression equations explaining the average ratio of domestic to foreign prices in this period (Table 5). The goodness of fit improves if net external balance is taken into account – not every accumulation of reserves, but only the accumulation that occurs under the positive external balance (*i.e.*, is not financed by foreign borrowing) can lead to the undervaluation of the exchange rate.

In 1975-1999, the ratio of domestic to US prices (*i.e.*, the real exchange rate against the US$) for all developing countries, as a group, declined, whereas for rich countries it increased (Fig. 3.5). This has more to do with the terms of trade and the long cycle in resource prices (after peaking in 1980 the resource prices mostly

declined or were low) than with the Balassa-Samuelson effect, which is not observable because developing countries as a group were not catching up with rich countries in productivity levels in this period. It is noteworthy, however, that for the fastest-growing developing countries in which the Balassa-Samuelson effect should have been the strongest (Botsawna, Chile, China, Egypt, India, Indonesia, Malaysia, Mauritius, Sri Lanka, and Thailand), the decrease in real exchange rates versus the US$ was no less pronounced than for all developing countries. This probably means that the accumulation of FER in the fastest growing developing countries completely outweighed the productivity growth effect, so the real exchange rate was declining as fast as in slowly growing economies.

2-4. Relative Prices and Exchange Rate Undervaluation

It is usually assumed that prices for tradable goods do not differ much across countries and that the ratio of prices of non-tradables to tradables is one of the measures of the real exchange rate. Theoretically, the FER accumulation should affect relative prices for non-tradables, whereas prices for tradables should be more or less the same across countries (the difference is due to trade barriers and transportation costs). To put it differently, international differences in price levels should be mostly determined by differences in prices for non-tradables. We tried to verify that hypothesis by looking at relative prices of health care and education (non-tradables) as compared to prices of clothing and footwear (taken as a proxy for the tradable goods prices).

The problem is that health care and education are often non-tradables not only internationally, but within the country as well and are poor proxies for prices of all non-tradables, which include other important services such as transportation, communications, housing and public utilities, and trade and financial services for which comparable data are not available. Usually prices for health care and education are to a large extent controlled by the government and hence may not respond immediately to the change in relative prices caused by the accumulation of FER and undervaluation of the exchange rate. It is noteworthy neverthe-

less that countries with low relative prices for health care, education and energy exhibit higher investment/GDP ratios. Overall, it seems that some relative prices of intermediate goods may react to the accumulation of foreign exchange reserves (build up of reserves → devaluation → increase in prices for tradables → decline of relative prices of non-tradables) and that lower prices for some of these goods, even when not caused directly by the reserve accumulation, contribute to higher investment/GDP ratios and higher growth rates of output.

The correlation of prices for tradables with prices for non-tradables is very high and prices for these goods are strongly correlated with the level of development – GDP per capita (Table 6, Fig. 3.6), which creates the false impression that there is no difference in the levels of prices for tradables and non-tradables (the lower the GDP per capita, the lower are prices for tradables and non-tradables). In fact, it is easy to show that low price levels in developing countries are associated first and foremost with low prices for non-tradables (Table 6). The accumulation of FER suppresses relative prices for non-tradables more than it lowers prices for tradables; in Table 7 the coefficient of the FER increase variable in the equation explaining relative health care prices is not significant and the R^2 in this equation is less than in the equation explaining relative prices for clothing and footwear.

2-5. Accumulation of FER and Investment/GDP Ratios

If accumulation of reserves leads to devaluation and results in higher relative prices of tradables (as compared to wages and prices of non-tradables) and higher profits, it is reasonable to expect that this would result in higher savings and investment/GDP ratios. But, on the other hand, not every devaluation of national currency should be expected to produce higher investment, but only devaluation caused by the active policy of reserve accumulation: if the exchange rate of the national currency is low or falling due to the outflow of capital caused by, say, a poor investment climate as a result of political uncertainty (war), it would only cause the transformation of limited domestic savings into capital flight at the expense of investment. Hence, the link between in-

vestment and accumulation of FER should be stronger than the link between investment and the undervaluation of currency, which actually seems to be the case. The link between FER accumulation and the share of investment in GDP appears to be quite strong even without controlling for other factors (Fig. 3.7).

The results of regression of the average share of investment in GDP in 1960-99 on the ICRG index of investment climate for 2000, and the increase in foreign exchange reserves for the period 1960-99 are reported in Tables 8 and 8a. The investment climate index (ranging from 0 to 100: the higher the index, the better the climate) is strongly correlated with GDP per capita, so that they are regarded as substitutes, GDP per capita being just another proxy for investment climate. Both FER required level and FER policy-induced level have a significant impact on the ratio of investment to GDP. The first link can be explained by the fact that required reserves depend on imports, whereas investment/GDP ratios are strongly correlated with trade/GDP ratios (Fig. 3.8), and hence greater FER go hand in hand with larger international trade and higher investment (the causation probably runs both ways).

We control for foreign financing of investment – positive external balance means that the net foreign financing of domestic investment is negative and consequently investment/GDP ratios are lower. This effect of negative foreign financing on investment appears to be stronger than the effect of a positive current account leading to the accumulation of reserves and to the undervaluation of domestic currency. The impact of reserve accumulation on the ratio of domestic to foreign prices is the strongest when reserve accumulation is not financed by the inflow of foreign capital (Table 5). The latter effect, however, is captured by the interaction term in Table 6: the increase in reserves together with the current account surplus and higher ratio of foreign to domestic prices leads to higher investment/GDP ratios, although the T-statistics of this interaction term are low when its components are included into the regression equation as separate variables. The results for developing countries only (excluding 24 countries that were first members of OECD) are very similar and coefficients of FER accumulation variables are even somewhat

higher. The results for 1975-1999 are also very similar (Table 8a).

It is worth noting that savings rate also increases with the accumulation of reserves, but the correlation is weaker than that with investment. The interpretation could be as follows. FER build up leads to undervaluation of the exchange rate, an increase in the prices of tradables in local currency, and an increase in profits (business savings) because wages and prices for non-tradables lag behind the growth of prices of tradable goods. However, the increase in business savings may be offset by the drop in personal savings since real incomes fall (increases in personal income lag behind the increases in prices) and in difficult times households try to maintain their consumption at the expense of savings. If total private savings remain unchanged (the increase in business savings is exactly matched by the decline in personal savings), there may be an increase in investment due to the inflow of foreign capital (attracted by higher profitability) and due to the decline in the government budget deficit resulting from increased revenues due to price increases and lagging increases in expenditure for transfers, wages and salaries, and purchases of non-tradables.

2-6. Accumulation of FER, Undervaluation of Currency, Trade and Investment

Accumulation of reserves boosts not only investment/GDP ratios, but also the share of exports and trade in GDP. Trade/GDP ratios are positively related to the accumulation of reserves and negatively to the ratio of domestic to US prices. This relationship could be affected by differences in country size – it may be expected that smaller countries are more engaged in international trade and the share of trade in GDP of these countries grows faster. In fact, the correlation between the size of the country and the trade/GDP ratio is very weak and therefore it appears that countries with a rapid accumulation of reserves, irrespective of their size, have higher investment ratios and a higher and growing share of international trade in GDP.

To put it differently, increases in investment and output are linked to the growth of exports and output in the tradable goods

sector. Fig. 3.8 suggests that increases in investment and foreign trade go hand in hand. This is probably the major advantage of the strategy of reserve accumulation: it ensures not only rapid increases in investment, but also high returns to investment, and high capital productivity due to increasing involvement in international trade. During export-led growth, benefits emerge partly because investment projects are for the expansion of exports and hence their competitiveness is constantly tested by the world market, partly from greater specialization and externalities from international trade.

As Table 9 suggests, the ratio of trade to GDP and the increase in this ratio, after controlling for the size of the country (GDP), the level of development (GDP per capita) and the abundance of resources (share of net fuel imports in total imports or terms of trade change) is correlated with the increase in FER, with the undervaluation of the exchange rate (the ratio of domestic to foreign prices), and with lower levels of prices of non-tradables as compared to tradables.

2-7. Foreign Direct Investment and FER Accumulation

It appears that the inflow of foreign direct investment (FDI) depends on the accumulation of FER in the preceding period and in the current period. Fig. 3.9 tells the story – there is a surprisingly strong correlation between the increase in FER in 1960-99 and the net inflow of FDI in the 1980s and the 1990s. The FER build-up underprices the exchange rate and thus makes domestic assets look cheap in foreign currencies. Even more important is probably the demonstration effect – the ability of authorities to accumulate reserves for a considerable period of time is taken as a sign of government credibility and the consistency of its policy. China in the last 25 years may be a case in point: the inflow of FDI was miniscule for the whole of the 1980s, although the openness policy was enacted from the very start of reforms (1979) and although the growth rates in the 1980s were close to 10% a year. Only in the 1990s did foreign direct investment pour into China.

As the regressions reported in Table 10 show, the inflow of FDI in 1980-1999 is not correlated with the investment climate

index, but is strongly correlated with build-up of FER in the preceding period (1960-1980) and the current period (1980-1999). As a matter of fact, the impact of the preceding period is stronger than that of the current period – the coefficients are higher and the T-statistics are better.

2-8. FER Accumulation and Stages of Economic Growth

The analysis of the effect of FER accumulation on growth is complicated by the fact that that there are three (and possibly more) mechanisms that we identified so far, and that these mechanisms may operate in different countries at different periods, so cross-country regressions should be supplemented with the analysis of panel data and time series for particular, especially rapidly growing, countries. We were able to make only initials steps in distinguishing stages of growth and the mechanisms that operate at each stage. The results are very preliminary.

We identified all countries that were increasing GDP per capita by more than 3% annually in 1975-99 and the year of "take off" for each country defined as the year when these countries increased their long term growth rate (measured by the 5-year moving average of GDP per capita growth) by at least 2 p.p. After excluding Cyprus, Ireland and Luxembourg as developed countries and Hong Kong – because its take-off point was in the 1950s (no comparable statistics) – there remained 12 countries on the list: Botswana that "took off" in 1966, Chile (1976), China (1976), Egypt (1974), India (1982), Indonesia (1967), Korea (1965), Malaysia (1971), Mauritius (1968), Singapore (1964), Sri Lanka (1974) and Thailand (1986). The trajectories of FER/GDP ratios, growth rates of GDP per capita, and external balance and net FDI inflows as a percentage of GDP are presented in Fig. 3.10.

It appears that reserve accumulation preceded the period of take-off by at least five years and continued during the take-off stage. After ten years of rapid reserve accumulation, when the FER/GDP ratio increased from five to 15%, there was a pause of about ten years which probably resulted in the slow down of economic growth from year seven to year 15, whereas after that the FER accumulation accelerated again.

The real exchange rate for these countries depreciated slightly before the take off and more substantially after the take off, but after ten years showed signs of stabilization (Fig. 3.11). Trade balance improved around the take-off date, but deteriorated afterwards as the net inflow of FDI and other capital increased (Fig. 3.12). The external balance (exports minus imports of non-factor services) was strongly negative and did not show signs of improvement until ten years after the take-off. The inflow of FDI increased shortly after the take-off and continued to increase afterwards.

The crucial question is whether the net inflow of FDI was larger than the increase in FER. For the period of 1980-99 it actually was larger for Chile, Egypt, India, Malaysia, Mauritius, Singapore, and Sri Lanka, but was smaller than the FDI inflow for Botswana and Korea. If it is assumed that all FDI inflows were associated with the build up of FER (which is clearly an exaggeration), then it turns out that for the first group of countries the accumulation of FER resulted in a completely counterweighing inflow of FDI, which on balance pushed the exchange rate upwards, not down.

Whereas the story is different for various countries and various periods, it appears that in some countries, at least, in the second decade after the take off, the inflow of FDI outweighed totally the downward pressure on the exchange rate due to the FER accumulation. In this period the export externality mechanism associated with the undervaluation of the exchange rate was turned off completely and replaced by another – the investment inflow mechanism associated with the overvaluation of the exchange rate. A model developed in the full version of the paper examines these two mechanisms formally.

Conclusions

The accumulation of foreign exchange reserves is neither a necessary nor a sufficient condition of economic growth. It may well be that countries that do not accumulate reserves grow faster than others because of better investment climate, better institutions, and greater involvement in international trade achieved

through greater openness of their economies even though their exchange rate is at equilibrium level. It could also be the case that countries accumulating reserves are not able to increase their investment/GDP ratios since the export externality is not strong enough or due to poor investment climate. Inflation is a plausible consequence of FER accumulation in this case. Moreover, even if accumulation of FER yields increases in investment/GDP ratios, the growth of output may still be low due to poor marginal capital productivity. However, the accumulation of FER, as we have tried to show in this paper, is a powerful macroeconomic mechanism of raising long-term growth rates. It is simple, if not to say primitive, but this is exactly where its major strength lies. It is available to all countries in all periods, even when other measures to boost economic growth are not feasible due to reasons of political economy or the need for a long time for the first dividends to be reaped. If there is nothing else to do in a country with numerous government failures and poverty and institutional traps, there is at least a chance to provide an efficient "big push" to economic development via accumulation of reserves by a central bank. Even the most inefficient and corrupt governments can use reserve accumulation as the last resort device to promote growth.

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APPENDIX

Table 3. Factors Explaining the Level of FER in 1960-1999 and the Sources of FER Accumulation – Cross Country OLS Regression Results

Dependent variable	Average ratio of FER to GDP in 1960-1999, %	Average ratio of FER to GDP in 1960-1999, %	Average ratio of FER to GDP in 1960-1999, %	Increase in the ratio of FER to GDP from 1960-1999, p.p.	Increase in the ratio of FER to GDP from 1960-1999, p.p.	Increase in the ratio of FER to GDP from 1960-1999, p.p.
Number of observations	172	122	95	62	58	
Average budget surplus in 1960-1999, % of GDP				0.55*	1.0***	1.07***
Average government debt in 1960-1999, % of GDP					0.08*	0.09**
Average annual inflation (GDP deflator), 1960-1999, %				0.05		0.07
Average import of goods and services, % of GDP	0.29***	0.32***	0.21***			
Investment climate index, ICRG		0.18**				
Average growth rate of GDP per capita in 1960-1999			2.2***			
Constant	0.09	-13.1**	-1.0	7.1***	5.6**	4.5*
Adjusted R^2	26	32	41	2	8	7

*, **, *** - Significant at 10%, 5% and 1% levels respectively.

Table 4. Factors Explaining the Average Growth Rate of GDP Per Capita in 1960-1999 – Cross Country OLS Regression Results

Dependent variable	Average growth rate of GDP per capita in 1960-1999								
Number of observations	59	73	75	75	75	75	56	68	53 (dev. only)
Average investment/GDP ratio in 1960-1999		0.13***	0.14***	0.12***	0.13***		0.08 ***	0.11***	0.11***
Log PPP GDP per capita in 1975	1.25***	0.86**	-1.2***	-1.1***	-1.2***	-1.13**	-.0002***	-0.0001*	
2000 investment climate index, ICRG			0.08***	0.06***	0.06***	0.09***	0.06***	0.06***	0.05***
Average population growth rate in 1960-1999			-0.2,T-st=-1.2	-0.33*	-0.3*	-0.33*	-0.47**	-0.38**	
Increase in the ratio of FER to GDP from 1960-1999, p.p.	0.032**								
Average growth rates of FER in 1960-1999							0.08*		
Average level of FER to GDP in 1960-1999, %				0.034***					
Policy-determined average level of FER to GDP in 1960-1999, %					0.042***	0.05***			
Interaction term = (increase in reserves)x(foreign/domestic prices)x(external balance)								0.01***	0.015***
Increase in the ratio of export to GDP in 1960-1999		.023***							
Constant	-2.31	4.00***	-2.4	-1.2	-1.1	0.05	-3.29**	-1.93	-4.57***
Adjusted R^2	14	42	54	58	58	43	49	55	51

*, **, *** - Significant at 10%, 5% and 1% levels respectively.

Table 4a. Factors Explaining the Average Growth Rate of GDP Per Capita in 1975-1999 – Cross Country OLS Regression Results

Dependent variable	Average growth rate of GDP per capita in 1975-1999					
Number of observations	77	74	58 (dev. only)	89	79	75
Log PPP GDP per capita in 1975		-1.94***	-1.77***			-2.00***
2000 investment climate index, ICRG		0.08***	0.08***	0.09***	0.05***	0.09***
Average investment/GDP ratio in 1975-1999	0.11***	0.11***	0.12***	0.13***	0.15***	0.11***
Average population growth rate in 1975-1999	-0.53***	-0.79***	-0.89***			-0.68***
Increase in the ratio of FER to GDP from 1975-1999, p.p.	0.05***	0.04**	0.04***			
Average ratio of domestic to US prices in 1975-1999				-0.01**		
Increase in trade/PPPGDP ratio in 1980-1999					0.02***	
Interaction term = (increase in reserves) x (foreign/domestic prices) x (external balance)						0.01***
Constant	-2.91**	0.99	0.52	-7.32***	-5.7***	0.17***
Adjusted R^2	49	58	58	42	43	57

*, **, *** - Significant at 10%, 5% and 1% levels respectively.

Table 5. Factors explaining the average ratio of domestic to US prices in 1975-99 – cross country OLS regression results Dependent variable = average ratio of domestic to US prices in 1975-99

Number of observations	89	78	78	72(dev. only)
PPP GDP per capita in 1975	.006***			
Investment climate index, ICRG		1.00***	1.37***	
Increase in the ratio of FER to GDP from 1975 to 1999, p.p.	-0.53**	-.88***	-0.54*	-.57***
Average ratio of trade to PPP GDP in 1980-99	.35***	.39***		.41***
Average external balance in 1975-99, % of GDP			1.37***	
Net fuel imports, % of total imports				-.27***
Constant	33.8***	-17.3	162.7***	39.7
Adjusted R^2	64	53	45	62

*, **, *** - Significant at 10%, 5% and 1% level respectively.

Table 6. Correlation Coefficients between Prices of Tradables and Non-tradables (55 observations)

	All domestic to US prices, 1980-1999	Domestic prices of clothing to US prices	Domestic prices of healthcare to US prices	1975 PPP GDP per capita
All domestic to US prices, 1980-1999	1			
Domestic prices of clothing to US prices	0.6681	1		
Domestic prices of healthcare to US prices	0.7061	0.8392	1	
1975 PPP GDP per capita	0.7009	0.8365	0.8946	1

Table 7. Factors Explaining 1993 Price Levels of Health Care and Education, Clothing and Footwear

Dependent variable	Ratio of prices of health care to prices of clothing	Ratio of prices of education to prices of clothing	Ratio of domestic health care prices to US prices	Ratio of domestic clothing and footwear prices to the US prices
Number of observations	77	77	58	58
PPP GDP per capita in 1999	.000647*	.0008086*	0.0033***	0.0032***
Average ratio of domestic to US prices in 1975-1999	0.26**	0.28**		
Increase FER/GDP ratio in 1980-1999			-0.33**	0.32 (T stat=-1.47)
Constant	38.93***	34.57***	17.95***	41.52***
Adjusted R^2	23	23	78	64

*, **, *** - Significant at 10%, 5% and 1% levels respectively.

Table 8. Factors Explaining the Average Share of Investment in GDP in 1960-1999 – Cross Country OLS Regression Results

Dependent variable = average share of investment in GDP in 1960-1999

Number of observations	59	58	109	34	34	57	57	58	57	40 (dev. only)	39 (dev. only)
Log PPP GDP per capita in 1975	4.61***		3.71***	4.97**		5.24***	4.15***				
Increase in the ratio of FER to GDP from 1960-1999, p.p.	0.15***	0.13***		0.14***	0.10*			0.11**	0.09*	0.11*	0.10 (Tstat =1.6)
Required average level of FER in 1960-1999,%			0.33***								
Policy-determined average level of FER in 1960-1999, %			0.09*								
Investment climate index, ICRG		0.14***			0.19**			0.22***	0.22***	0.19**	0.18*
Ratio of prices for healthcare to prices for clothing in 1993				-0.03	-0.05***	-0.05**					
Ratio of prices for education to prices for clothing in 1993							-0.05				
Average external balance in 1960-99, % of GDP								-0.24*	-0.23*	-0.27*	-0.26*
Net fuel imports in 1960-1999, % of total imports								-0.09***	-0.09***	-0.10***	-0.11***
Interaction term = (increase in reserves) x (foreign/domestic prices) x (external balance)									0.01, Tst=0.6		0.02 (Tstat =0.9)
Constant	5.02	11.7***	6.7*	8.73	13.0***	9.2**	9.8**	29.4	5.6	7.2	7.8
Adjusted R^2	21	21	25	21	25	18	11	35	30	39	35

*, **, *** - Significant at 10%, 5% and 1% levels respectively.

Table 8a. Factors Explaining the Average Share of Investment in GDP in 1975-1999 – Cross Country OLS Regression Results

Dependent variable = average share of investment in GDP in 1975-1999

Number of observations	79	79	79	59 (dev. only)	85	46	46	48
Log PPP GDP per capita in 1975				-.0008**				
2000 investment climate index, ICRG	0.17***	0.17***	0.21***	0.27***	0.15***	0.23***	0.26***	0.24***
Increase in the ratio of FER to GDP from 1975-1999, p.p.	0.15***	0.24***	0.22***	0.23***		0.19***	0.26***	
Ratio of prices for healthcare to prices for clothing in 1993						-0.06***	-0.07***	-0.08***
Average external balance in 1960-1999, % of GDP			-0.21***					
Net fuel imports in 1960-1999, % of total imports		-0.09***	-0.12***	-0.12***	-0.06***		-0.15***	-0.13***
Interaction term = (increase in reserves) x (foreign/domestic prices) x (external balance)					0.03*			0.03*
Constant	10.3***	9.5***	6.3**	4.63	11.3***	10.7***	9.6***	11.5***
Adjusted R^2	17	34	39	42	16	37	63	44

*, **, *** - Significant at 10%, 5% and 1% levels respectively.

Table 9. Factors Explaining the Share of Export and Foreign Trade in GDP in 1960-99 – Cross Country OLS Regression Results

Dependent variable	Average ratio of export to GDP in 1960-99	Increase in the ratio of export to GDP in 1960-99	Increase in the ratio of export to GDP in 1960-99	**Average ratio of trade to PPP GDP in 1980-99**		Increase in the ratio of trade to PPP GDP in 1980-99, p.p.		
Number of observations	59	47	30	94	**62**	86	93	81
Log PPP GDP per capita in 1975	15.59***							26.7***
PPP GDP per capita in 1975				0.0085***			0.007***	
PPP GDP per capita in 1999					**.003***			
2000 investment climate index, ICRG			0.76*					
Average ratio of export to GDP in 1960-99		0.77***	0.71***					
Average ratio of trade to PPP GDP in 1960-99,%								-0.19***
Terms of trade improve-ment index, 1960-99		-0.23***						
Net fuel imports in 1960-99, % of total imports			0.39***		**-.31****	0.53***		0.40***
Increase in the ratio of FER to GDP from 1960 to 1999, p.p.	1.06***	0.37 (Tst=1.6)	0.56*					
Average ratio of domestic to US prices in 1980-99							-0.49***	-0.18**
Increase in the ratio of FER to GDP from 1960 to 1980, p.p.					**1.79***			
Increase in the ratio of FER to GDP from 1980 to 1999, p.p.				0.78***	**1.44***	0.58***		0.74***
PPP GDP in 1999, bill.$	-.004**			-0.009***	**-.009****			
Average annual FDI net inflow in 1980-99, % of GDP			4.9**					
Constant	-25.57	12.3	-67.9**	-15.40***	**.87**	8.9***	3.82	-80***
Adjusted R^2	41	38	61	21	**49**	29	19	57

*, **, *** - Significant at 10%, 5% and 1% level respectively.

Table 10. Factors Explaining the Net Inflow of Foreign Direct Investment (FDI) in 1980-1999 – Cross Country OLS Regression Results

Dependent variable	Average annual net inflow of FDI in 1980-1999, % of GDP						
Number of observations	59	40	47	40	39	37	36
PPP GDP per capita in 1975					-.0001*		-.0004***
2000 investment climate index, ICRG			-0.1			-0.02	0.05*
Average ratio of FER to GDP in 1960-1999, %	0.05***						
Increase in the ratio of FER to GDP from 1960-1999, p.p.		0.08***				0.08***	
Increase in the ratio of FER to GDP from 1960-1980, p.p.				0.1***	0.09***		0.09***
Increase in the ratio of FER to GDP from 1980-1999, p.p.				0.07***	0.06***		
Increase in the ratio of FER to import from 1980-1999, p.p.							0.1, Tst=1.6
Constant	0.4	0.4*	1.7	0.26	0.8**	1.7	
Adjusted R^2	18	50	-2	50	53	51	52

*, **, *** - Significant at 10%, 5% and 1% levels respectively.