APPROPRIATE ECONOMIC POLICIES AT DIFFERENT STAGES OF DEVELOPMENT

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ABSTRACT

This paper summarizes theoretical arguments and provides empirical evidence to support the statement that rational economic policies depend qualitatively on two factors – technology (GDP per capita) and institutional level of development of a country. We concentrate on the impact of three policies to promote the catch up development – import tariffs, increase and level of government revenues/spending, and the speed of foreign exchange reserves accumulation ("exchange rate protectionism"). It is shown that the impact of these policies may be positive or negative depending on a stage of development; in each case we find threshold levels or critical combinations of GDP per capita and/or an institutional quality indicator.

A theoretical model demonstrates how tariff protection and accumulation of reserves can boost long term growth in the presence of externalities.

РАЦИОНАЛЬНАЯ ЭКОНОМИЧЕСКАЯ ПОЛИТИКА НА РАЗНЫХ СТАДИЯХ РАЗВИТИЯ

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Аннотация

В статье суммируются теоретические аргументы и приводятся результаты эконометрических расчетов, показывающие как рациональная экономическая политика должна меняться с изменением технологического и институционального развития страны. Мы рассматриваем три инструмента политики стимулирования догоняющего развития: импортные тарифы, уровень и увеличение доли государственных доходов/расходов в ВВП и скорость накопления государственных валютных резервов («протекционизм валютного курса»). Показано, что одна и та же политика может ускорять или замедлять рост в зависимости от стадии развития. В каждом случае мы получаем критические уровни, либо критические комбинации душевого ВВП и индикаторов качества институтов.

Приведена модель, демонстрирующая, как благодаря экстерналиям тарифная защита и накопление резервов могут ускорять экономический рост.

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1. Introduction

Rational economic policy has to depend on the level of economic and social development of a country. This statement seems to be quite trivial. Up to the middle of epy 1990s, however, most of research devoted to institutional and policy reform implicitly assumed that a developing country has to move along a strict line connecting a current point and an ideal point in institutional space. In most cases the modern USA economy was set up as a model. Price liberalization, privatization, deregulation, elimination of tariff and non-tariff trade barriers were unconditionally recommended to all developing and transition economies. No distinctions were made between Latin America, Africa or East Europe. The discussion concentrated around the speed of these changes.

The outcome of these recipes has been disappointing. Per capita GDP for Latin America and Caribbean countries decreased by an average 0.8 percent per year in the 1980s, and grew by mere 1.5 percent per year in the 1990s. In the Middle East and North Africa we observed the average fall of 1.0 percent per year in the 1980s and the average growth of 1.0 percent per year in the1990s. For 28 countries of East Europe and former USSR, the total loss of GDP amounted to 30% in the 1990s. In Sub-Sahara Africa there was a reduction if the GDP per capita.

It is now widely accepted that the most important causes of the recession were the weakness of the new market institutions and the low quality of governance and that the role of government was underestimated (World Bank, 1997; Stiglitz, 1997; Popov, 2000). A number of recent empirical studies have shown that the recommendations mentioned above could not be considered as universal recipes. Privatization does not necessary entail restructuring and increase in efficiency. Deregulation may cause financial crises. A thorough analysis of statistical data does not reveal any positive connection between trade liberalization openness and growth (Rodrik, 2003a). A possible conclusion is an agnostic view: only general principles like a necessity of market oriented incentives, economic stability, and property right enforcement merit to be beliefs; each country is unique, therefore concrete policy recommendations can not be extracted from theoretical considerations or data analysis (Rodrik, 2003b).

A different approach is based on the presumption that there exists a link between a set of technological, institutional and cultural indicators and rational economic policy. The absence of general universal recipes means that what may be good for developed countries is not necessarily good for developing ones. Elimination of tariff or subsidies to producers, liberalization of capital flows and deregulation of domestic financial markets, strengthening government control and promotion of competition may be good or bad for an economy depending on its stage of development.

In the last two decades, developing countries experienced strong pressure of IMF, World bank, WTO and other international organization to accelerate the creation of modern institutions and to follow Western-type economic policies. The fairness of these demands was challenged by anti-globalization literature on two grounds. First, as was just mentioned, for developing countries with

low GDP per capita and poor institutions, standard set of policies for promoting growth may be different than the policy package that works in developed countries. Second, the rationale for applying the Western pattern of tradeoffs between different development goals (wealth, education, life expectancy, equality, environmental standards, human rights, etc.) to less developed countries could be also questioned. Policies that prohibit child labor, for instance, may be an unaffordable luxury for developing countries, where the choice is not between putting a child to school or into a factory shop, but between allowing the child to work or to die from hunger. The marginal cost of adopting stricter regulations in such areas as environment and human rights (reproductive rights, work conditions and safety standards, children's and prisoners' rights) in developing countries in terms of deterioration of other developmental indicators (life expectancy, consumption) may be prohibitively high.

The argument in both cases is that most Western countries 100 years ago did not have either *laissez faire* markets, or today's strict standards of protection of environmental and human rights. Advocating the acceptance of these standards in less wealthy parts of the world, and even threatening developing countries with economic sanctions in case they refuse to accept such standards, the West, whatever the good intentions may be, *de facto* undermines the competitiveness of poorer countries and preserves their backwardness. There are even accusations of double standard (when the West was industrializing, it was not maintaining these standards) and "kicking away the ladder" (after the West got rich through exploitation of colonies and child labor, it does everything to slow down the growth of "the other world"; Chang, 2002).

Two recent papers by Acemoglu, Aghion, Zilibotti (2002a,b) offer a model to demonstrate the dependence of economic policies on the distance to the technological frontier. The authors assume that a change of a country technological level is equal to the weighted sum of technological change due to imitations and innovations. The speed of imitation is fixed whereas the speed of innovation is larger for more advanced economies. The experience of new managers is most important for imitations, whereas their talents are crucial for innovation. If the distance to the technological frontier is large, the economy would be better off giving managers long-term contracts that would lead to imitation and investment based growth. But once the economy approaches the technological frontier and innovation yields greater returns than imitation, the life-time employment system should be replaced by the competitive selection. It is argued also that the optimal size of firms is an increasing function of the distance to frontier.

Overall, the necessity of different economic policies for developed and developing countries is recognized now by many specialists. Their general conclusion is that developing countries should not embark blindly on market friendly policies/reforms, even if the latter proved to be beneficial in more advanced countries.

Empirical evidence are sporadic, however, and theoretical argumentation is not systematically described. This paper is aimed at summarizing theoretical arguments and empirical evidence to support the statement that rational economic policies have to depend qualitatively on technological and institutional indicators of a country. We study the impact of import tariffs, of level and increase of government revenue, and of the speed of foreign exchange reserves accumulation on the rate of economic growth. It is demonstrated that the impact may be positive or negative; in

each case we find a threshold level of GDP per capita and a threshold institutional quality indicators.

It is shown as well that import tariff policy, foreign exchange reserves accumulation policy and the increase in the financial size of the government are to an extent substitutable, so that a GDP per capita threshold for one of these indicators depends on another one. These results, the experience of successful countries and theoretical arguments imply that there exist different stages of economic development that require different sets of economic policies.

2. Trade protectionism as industrial policy

Fast growing countries are usually more involved into international trade – have higher and faster growing trade/GDP ratios (fig.1). In addition, there is a correlation between the share of investment in GDP and the share of export in GDP – countries which export more, invest more as well (fig. 2). However, fast growing and more intensively trading nations are not always and were not always more open to trade (had low tariff and non-tariff barriers) than their less globalized competitors: among countries with rapid growth of export/GDP ratios there are quite a few that maintained high import duties (fig. 3).

As table 1 suggests, import and export taxes[1] are used mostly by poor countries (with low GDP per capita) and countries with authoritarian political regimes: the higher was the level of democracy in 1972-75 and the greater was democratization in the 1970-90s, the lower were import duties[2]. Do these countries make a mistake, is there evidence that more free trade policies would boost international trade and economic growth in these more protectionist countries?

The debates on whether free trade or protectionism are more conducive to growth are as old as economic research itself. For the XIX century, although detailed statistics does not exist, there are some powerful examples, suggesting that the growth-promoting nature of free trade is not obvious: China after the Opium Wars had to open its economy to international trade completely, but GDP per capita in 1949, when the communists took power, was at the same level as in 1850; 100 years was lost for growth despite pervasive openness. Recent empirical studies (Rodriguez and Rodrik, 1999; O'Roerke and Williamson, 2002; O'Roerke and Sinnoit, 2002; see for a survey: Williamson, 2002) found that there is no conclusive evidence that free trade is always good for growth: whereas protectionist countries grew more rapidly before the WWI (see fig. 4), they exhibited lower than average growth after the WWII. Rose (2002) estimated the effect on international trade of multilateral trade agreements, such as the World Trade Organization (WTO), its predecessor the Generalized Agreement on Tariffs and Trade (GATT), and the Generalized System of Preferences (GSP) extended from rich countries to developing countries, using standard "gravity" model of bilateral merchandise trade. He found little evidence that countries joining or belonging to the GATT/WTO have different trade patterns than outsiders,

[1] Here and elsewhere average ratios for the period of time (like import dutities, as a % of import) are computed as unweighted average of ratios for particular years.

[2] Export duties were are generally much lower than import duties. They were used also mostly by poor countries, but with low level and low increase in government revenues, i.e. they were probably used mostly for fiscal purposes. On the contrary, the correlation between import duties and the level of government revenues was non significant (table 1).

whereas the GSP giving poor countries better access to markets in developed countries, had a very strong effect (an approximate doubling of trade).

Table 1. Factors explaining the level of import and export duties – cross-country OLS regression results (T-statistics in brackets)

Dependent variable/ Explanatory variables	Import duties as a % of Import, average for 1975-99		Export duties as a % of export, average for 1975-99	
Number of observations	N = 104	N = 89	N = 89	N = 65
Log PPP GDP per capita in 1975, $	-.8. 6*** (-3.70)	-11.9*** (-7.69)	-2.88*** (-3.27)	-2.3 (-3.51)
Level of democracy in 1972-75 (lower values mean more democracy)	9.8* (1.64)			
Increase in democracy index in 1970-2000 (positive values mean democratization)	-1.26** (-2.59)			
Government revenues as a % of GDP in 1975		0.22 (033)	-0.07* (-1.82)	-0.06* (-1.90)
Ratio of government revenues to GDP in 1999 as a % of 1975				-0.012 (-1.42)
Constant	36.2*** (3.95)	49.0*** (10.84)	12.8*** (4.97)	11.7*** (5.28)
Adjusted R^2	44	44	21	28

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

The absence of the conclusive evidence on whether free trade is good for growth (see Rodriguez and Rodrik, 1999, for a survey) may be associated with the fact that the impact of lower trade barriers on growth depends upon the level of development and quality of institutions. We try to identify these two thresholds, using the PPP GDP per capita as a characteristic of the level of development and several institutional variables as a measure of the quality of institutions. The brief description of the indicators of the institutional development follows.

We define the quality of (state) institutions as the ability of the government to enforce its own rules and regulations, no matter whether these regulations are established by democratic or authoritarian regime. Good measures of the quality of institutions would be investment risk index (The International Country Risk Guide – World Bank, 2001) and indices of government effectiveness, political stability, rule of law, control of corruption, and quality of regulations (Kaufmann, Kraay, and Zoido-Lobatón, 1999), measures of unofficial economy (Friedman, Johnson, Kaufmann, and P. Zoido-Lobatón, 2000). These measures, however, are available only for recent years (except the investment risk index, which is available from 1984), whereas we are interested in the quality of institutions in the beginning (or at least in the middle) of the period of economic growth.

The Freedom House computes indices of civil liberties available from early 1970s, but they are very correlated with political rights indices (and hence measure mostly political/democratic liberties), whereas we are mostly interested in non-political rights (security of life, contracts, property, etc.). POLITY database has the same shortcomings. The case in point is Hong Kong, where there was no democracy/political rights neither under the British rule, no after the hand over to China in 1997, but where contracts and property rights were and are strictly enforced and where there is more order than in most other countries. That is why we use mostly Corruption perception index (CPI) for 1980-85 – these estimates are available from Transparency International for over 50 countries and make a lot of sense for our analysis. For instance, they show that in 1980-85 the Soviet corruption was in between developed and developing countries, whereas today Russia is at the bottom of the list of developing countries. CPI is measured on a 0 to 10 points scale (the higher the index, the lower is corruption, so actually it is the index of cleanness, not of corruption).

We also construct our own measure of corruption using the CPI. First, we regress the actual CPI on PPP GDP per capita[3] and take the residual; second, we subtract this residual from 10, so we have a residual positive corruption index (the higher the index, the greater the corruption):

$$CORRres = 10 - [CPI - (2.3 + 0.07Ycap75us)] = 12.3 - CPI + 0.07*Ycap75us, \quad (1)$$

where CORRres is residual positive corruption index, CPI – actual average corruption perception index in 1980-85 from Transparency International, Ycap75us – PPP GDP per capita in 1975 as a % of the US level.

Using the index of residual positive corruption, we try to test how tariffs affect growth. The best equation is the following:

$$GROWTH=CONST.+CONTR.VAR.+Tincr.(0.06–0.0004Ycap75us–0.004CORRres–0.0005T), \quad (2)$$

where the dependent variable,
GROWTH, is the annual average growth rate of GDP per capita in 1975-99,
the control variables are population growth rates during the period and net fuel imports (to control for "resource curse"),
T – average import tariff as a % of import in 1975-99,
Tincr. – increase in the level of this tariff (average tariff in 1980-99 as a % of average tariff in 1971-80),
Ycap75us – PPP GDP per capita in 1975 as a % of the US level,
CORRres – positive residual corruption in 1975, calculated as explained earlier.
R^2=40%, N=39, all coefficients are significant at 5% level, except the last one (33%), but exclusion of the last variable (a multiple of T by Tincr.) does not ruin the regression and the coefficients do not change much.

[3] The robust estimate is: CPI = 2.3 + 0.07*Ycap75, N=45, R^2 =59%, T-statistics for Ycap75us coefficient is 9.68.

This equation allows to test the hypothesis that there is a threshold level of GDP per capita and corruption: at lower than threshold levels of GDP per capita and low levels of corruption the impact of the increase in tariff protection on economic growth is positive, whereas at higher than threshold levels the impact of protectionist policies is negative. The threshold levels are such that for poor countries (GDP per capita at below 50% of the US level), but with relatively low corruption (below 10, whereas CORRres varies from 6 to 13) and low initial levels of tariff protection, growth can be stimulated by the increase in import tariffs. For wealthier and/or more corrupt countries the impact of tariffs on growth is negative[4].

It is noteworthy that if import duties are included into growth regressions without the interaction terms with GDP per capita and/or a measure of institutional strength (corruption), the coefficient on import duties is not significant:

GROWTH = CONST + CONTR. VAR. – 0.05T – 0.04Ycap75us–0.05CORRres,
where, N=44, R^2 = 51, all coefficient significant at 1% except for import duties (T) coefficient, control variable – annual average population growth rates in 1975-99.

However, if we replace the linear term Ycap75us with the interaction terms (a multiple of Ycap75us and T, and a multiple of T and ΔR pol), then we get the regression below, where all coefficients become statistically significant:

GROWTH = CONST + CONTR. VAR. + T(0.05 – 0.005Ycap75us— 0.007 ΔR pol),
where ΔR pol is the indicator of the accumulation of foreign exchange reserves computed as explained later, in the third section, N=40, R^2=40, all coefficients significant at 8% level or less, control variables – positive residual corruption and population growth rates, ΔR pol – policy induced change in reserves (this another indicator of policy explained later in the text) .

According to this last equation, for very poor countries (with GDP per capita of less than 10% of the US level), tariff protection is good for growth, especially if these countries do not accumulate foreign exchange reserves (reserve accumulation, i.e. exchange rate protectionism, and conventional tariff protectionism turn out to be substitutes).

To test the robustness, we also used another measure of institutional capacity – average investment risk index for 1984-90, varies from 0 to 100, the higher, the better investment climate. This

[4] We tried to find a GDP per capita threshold for the 19th century using data from (Irwin, 2002), but failed. The best equation linking growth rates in 1870-1913 to GDP per capita and tariff rates (27 countries, two periods – 1870-90 and 1890-1913 – 54 observations overall) is:

GROWTH = 0.24 + 0.04*Y – 0.0004*Y^2 – 0.05*T + 0.001*T^2 + 0.0006*Y*T,
Where Y – GDP per capita in 1870 nor 1890 respectively, T – average tariff rates
(R^2adj. = 33%, all coefficients significant at 11% level or less).

Introducing squared variables to capture non-linearity, we get better results than in (Irwin, 2002) – the R^2 is twice as high, but the basic relationship between growth and tariffs is monotonously positive without a threshold: higher tariffs – faster growth. It may well be that the sample of 27 countries only is not that representative.

indicator is available for all years from 1984 and is taken from the International Country Risk Guide.

The best equation that we obtained with residual investment risk index as a measure of institutional strength (instead of residual corruption index) is the following:

GROWTH = CONS + CONTR. VAR. +T(0.005RISK– 0.0016Ycap75us – 0.27)
(N=87, R^2 =42, all coefficients significant at 10% level or less, control variables are population growth rates, population density and total population).

The equation implies that for a poor country (say, with the PPP GDP per capita of 20% of the US level or less) import duties stimulate growth only when investment climate is not very bad (RISK>61%) – the expression in brackets in this case becomes positive.

Two recent papers (Acemoglu, Aghion, Zilibotti, 2002a, 2002b) suggested some theoretical explanations for these stylized facts, although not with respect to tariff protection, but with regard to promotion of vertical integration and imitation of technology versus indigenous R&D – the larger the distance to the frontier, the greater the returns from vertically integrated companies and from reliance on imported technology. In a similar way, it may be argued that the impact of trade protection on economic performance depends upon the distance to the technological frontier – the larger the productivity gap between the country in question and the most advanced (Western) economies, the more likely that protectionist policy, encouraging investment into "catch-up" pattern of development would be beneficial. Besides, greater corruption undermines the positive impact of tariffs on growth – this conclusion is very much in line with intuition.

The debate, in fact, is even more general – it is about the impact of industrial policy in a developing economy, not only about trade protectionism, which is nothing more but just one tool of industrial policy. Whereas for developed countries industrial policy may be of little use, for countries that are catching up appropriate (export-oriented) industrial policy promises high returns. "In his famous essay, Economic Backwardness in Historical Perspective, Gerschenkron argued that relatively backward economies, such as Germany, France, Belgium and Russia during the nineteenth century, could rapidly catch up to more advanced economies by introducing "appropriate" economic institutions to encourage investment and technology adoption. He emphasized the role of long-term relationships between firms and banks, of large firms and of state intervention. Underlying this view is the notion that relatively backward economies can grow rapidly by investing in, and adopting, already existing technologies, or by pursuing what we call an investment-based growth strategy. If this assessment is correct, the institutions that are appropriate to such nations should encourage investment and technology adoption, even if this comes at the expense of various market rigidities and a relatively less competitive environment" (Acemoglu, Aghion Zilibotti, 2002a).

With respect to rapidly growing countries of East Asia this argument was made in the World Bank Development Report "East Asian Miracle" (WDR, 1993), but the issue is by no means settled and the controversies continue. So far there has been only 5 countries that managed to transform themselves in the second half of the XX century from developing into developed (Japan and 4 Asian tigers – Hong Kong, Singapore, South Korea, Taiwan); all these countries relied heavily on various industrial policy instruments, including protectionism.

WTO rules prohibiting increases in protection of domestic markets, except for special circumstances, may thus actually be destructive for developing countries. Not to speak about most appalling cases, such as subsidies to agricultural producers in Western countries, blocking the access of developing countries to Western markets.

3. The size of the government

Related to industrial policy, albeit a different issue, is the one about the size of the state (government revenues and expenditure as a % of GDP), which may be good or bad for economic growth. There is extensive literature on the issue (see: Gordon and Wang, 2004, for a survey). Unlike most other scholars, we look not at the level of the ratio of government revenues to GDP, but at the growth of this ratio (revenues are very much correlated with government expenditure, but we take revenues in order to avoid the influence of government budget deficits). On average, over the period of 1975-99, the ratio of central government revenues to GDP increased by some 20% (from mean of 22.1% in 1975 for 70 countries to 25.8% in 1999 for 100 countries – see fig.5). We look at the ratio of government revenues (rather than government expenditure) to GDP to exclude the impact of budget deficits: one can think that this indicator shows the ratio of government expenditure fully backed by revenues to GDP. Finally, we have to compare only revenues of central governments because the comparable data for consolidated government budgets are missing.

We do not pretend to test the causation (whether the growth of the government causes economic growth or vice versa), it is necessary to use the panel data for that and there are limitations for time series. However, the fact is that faster growth was associated with the larger increases in the size of the government, even controlling for the level of development and for the size of the country (table 2 and 3).

The logical argument about causation would be the following. Government revenue as a % of GDP is at least partially a policy variable: whereas it may be difficult to increase the share of revenues in GDP, governments always retain an option of decreasing it via lowering the tax rates. But it does not appear that countries that were reducing or limiting the growth of government revenues were doing better than the others, in fact they were doing worse. There is an optimal rate of the increase in the ratio of government revenues/GDP ratio as the GDP per capita increases (determined by the need to provide more and more public goods), so countries that under-spend or overspend on the central government may have lower growth rates.

Cuts in government spending and lower efficiency in enforcement of government regulations, as measured by the index from (Kaufmann, Daniel, Kraay, Aart, and Zoido-Lobatón Pablo, 1999) or by the increase in the share of shadow economy negatively affect growth. As regressions presented in table 2 and 3 suggest, controlling for the level of development, investment climate and inflation, investment tend out to be higher in countries with high and growing level of government revenues. Similarly, controlling for the level of development, investment climate and population change, growth rates of GDP per capita are lower in countries with smaller and shrinking governments and larger shadow economy. Even when such control variables as effectiveness of the government, inflation, population growth rates and the size of the country (since bigger countries have smaller governments) are introduced, the impact of the *increase* in the share of government revenues in

GDP is positive and significant, whereas the impact of the *level* of the share of government revenues in GDP is also positive, though less statistically significant (see table 3).

This is not to argue that bigger governments are always better. The point here is that the ability of the government to provide public services may be limited by two factors – the scarcity of financial resources and the low efficiency of the government apparatus, and as a result this ability may be weaker than it should be to maintain reasonable economic growth.

Table 4 reports regressions to determine the threshold level of GDP per capita and the optimal increase in the ratio of government revenues to GDP over a prolonged period of time (1975-99). The best equation[5] explaining growth is the following:

Table 2. Impact on investment and growth of government revenues in 1975-99 and the share of shadow economy in GDP in the 1990s – cross country OLS regression results

Dependent variable	Average investment/ GDP ratio in 1975-99		Average growth rate of GDP per capita in 1975-99			
Number of observations	56	51	62	62	47	47
PPP GDP per capita in 1975, $	-.001***	-.001***	-.0002*	-.0003**		
Log PPP GDP per capita in 1975					-4.97***	-4.99***
2000 investment climate index, ICRG (ranges from 0 to 100%)	.32***	.21***			.15***	.16***
Average population growth rate in 1975-99, %			-.93***	-1.08***		
Share of central gov. rev. in GDP in 1971-75, %	.15**	.14*		.05(Tst= 1.62)		
Share of central gov. rev. in GDP in 1995-99 as a % of 1971-75	**.011*** **	**.05** **	**.011***	**.014***		
Share of the shadow economy in GDP in the 1990s, %, 1st estimate					**-.044*** **	
Share of the shadow economy in GDP in the 1990s, %, 2nd estimate						**-.044*** **
Log of annual average inflation in 1975-99, %		-1.51**				
Transit. Economies dummy				-3.82*		
Constant	-.21	5.62	2.61**	1.88	9.31***	8.49***
Adjusted R^2	32	34	12	16	61	59

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

[5] This is the 6th equation. The last, 7th equation is for checking the robustness – we introduce the rule of law index instead of the investment climate index and get the improvement of the goodness of fit with a larger sample of counties.

GROWTH = CONST. + CONTR. VAR.+ 0.08* ΔG - 0.0003* ΔG^2 – 0.0003*G*Ycap75us =
= CONST. + CONTR. VAR. + ΔG *(0.08 - 0.0003* ΔG – 0.0003 * Ycap75us), (3)
where ΔG – the share of government revenues in GDP in 1999 as a % of 1975,
Ycap75us – PPP GDP per capita in 1975 as a % of the US level.

Other regressions presented in table 4 prove the point: whether different control variables (investment climate, investment, population growth rates, size of GDP) are included or excluded, the result is that the growth of the share of government revenues in GDP is good for growth, especially for less developed countries, but until a certain level only.

Differentiating (3), we get the expression for the increase in growth due to marginal increase in government revenues to GDP ratio:

dGR/dG = 0.08 – 0.0006 ΔG – 0.0003Ycap75us

Table 3. Growth of GDP per capita – impact of government effectiveness and change in government revenues in 1975-99 – cross-country OLS regression results

Dependent variable	Average growth rate of GDP per capita in 1975-99			
Number of observations	59	58	59	57
PPP GDP per capita in 1975	-.0003**	-.0004***	-.0006***	-.0008***
Average population growth rate in 1975-99	-.87***	-.96***		-.50*
Share of central gov. rev. in GDP in 1971-75, %	.04 (Tst = =1.4)	.06**		.03 (Tst= = 1.3)
Share of central gov. rev. in GDP in 1995-99 as a % of 1971-75	**.015*** **	**.017** **	**.01** **	**.013** **
Government effectiveness in 2001			**1.95*** **	**1.80*** **
PPP GDP in 1999, bill. $		.0003(Tst =1.3)		.0003**
Annual average inflation in 1975-99, %	-.029***	-.027***	-.021***	-.018***
Constant	1.86(Tst= 1.2)	1.55(Tst= 1.0)	1.84***	2.04 (Tst=1.6)
Adjusted R^2	29	30	58	62

*, **, *** - Significant at 10%, 5% and 1% level respectively.
Note: It is known that the size of the government (budget revenues and expenditure as a % of GDP) depends on the level of development (GDP per capita) and the size of the country (GDP) – see Rodrik (1996a). Controlling for GDP and GDP per capita in the regression explaining growth rates, we de facto consider only policy-induced level of government revenues, i.e. only the level that is higher or lower than "objectively determined" by the size of a country and its level of development.

It implies that the optimal (maximizing growth) change in the share of government revenues in GDP in 1975-99 for very rich countries (Ycap75us = 100%) was about -27% (ΔG=83%); for medium income countries (Ycap75us = 50%) the optimal increase was 8% (ΔG=108%); for poor countries (Ycap75us = 10%) optimal increase was 28% (ΔG= 128%).

In addition to the threshold level of GDP per capita, there exists a threshold level of corruption as well. The following equation identifies both:

GROWTH = CONST. + CONTR. VAR. + ΔG (0.02 - 0.000037Ycap75us*CORRpos), (4)
R^2 = 53%, N=35, all coefficients significant at 6% level or less, the control variables are population growth rates and government effectiveness index in 2001.

It implies that the increase in the ratio of government revenues to GDP is good for poor and relatively clean countries, for instance for a country with GDP per capita of less than 50% of the US level and with residual corruption of no more than 10 (in reality CORRres varies from 6 to 13). For the US (Ycap75us=100%, CORRres = 10.6) the increase in the ratio of government revenues to GDP by 10% over the period lead to the decrease in annual average growth by 0.2 p.p.

Table 4. Factors explaining growth of GDP per capita in 1975-99 (level and growth of government revenues) – cross country OLS regression results (T-statistics in brackets)

Dependent variable	Average growth rate of GDP per capita in 1975-99						
Number of observations	53	53	65	53	53	53	60
2000 investment climate index, ICRG (ranges from 0 to 100%)	0.13*** (5.69)	0.10*** (4.06)		0.12*** (5.08)	0.09*** (3.55	0.09*** (3.69)	
Rule of law index (ranges from –2.5 to +2.5; higher values – stronger rule of law)							1.88*** (6.97)
Investment as a % of GDP, average in 1975-99		0.12*** (3.01)			0.12*** (3.12)	0.12*** (3.27)	
Average population growth rate in 1975-99, %	-0.79*** (-2.87)	-0.81*** (-3.15)		-0.72*** (-2.68)	-0.74*** (-2.97)	-0.77*** (-3.15)	-0.46** (-2.05)
Share of central gov. rev. in GDP in 1995-99 as a % of 1971-75	**0.02*** (2.62)**	**0.01** (2.14)**	**0.08*** (2.61)**	**0.09*** (2.57)**	**0.08*** (2.64)**	**0.08** (2.56)**	**0.11*** (3.15)**
Share of central gov. rev. in GDP in 1995-99 as a % of 1971-75, squared			**-.0002** (-2.26)**	**-.0003** (-2.08)**	**-.0003** (-2.24)**	**-.0003** (-2.11)**	**-.0004** (-2.50)**
Interaction term = (share of central gov. rev. in GDP in 1995-99 as a % of 1971-75) x (PPP GDP per capita in 1975 as a % of the US level)	**-0.0004 *** (-5.14)**	**-0.0003 *** (-4.17)**		**-0.0003 *** (-5.00)**	**--0.0003 *** (-4.04)**	**-0.0003 *** (-4.40)**	**-0.0005 *** (-6.08)**
PPP GDP in 1975, bln.$						1.2 $*10^{-12}$ (1.61)	$6.7*10^{-13}$ ** (2.24)
Constant	-6.75*** (-3.79)	-6.98*** (-4.24)	-3.36* (-1.81)	-9.71*** (-4.35)	-9.91*** (-4.83)	-9.83*** (-4.92)	-3.60* (-1.89)

Adjusted R^2	47	59	9	50	58	60	67

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

To test the robustness of results, we ran regressions with another indicator of the size of the government – the policy determined level of government revenues to GDP ratio in 1995-99. This latter variable was computed as a residual from regression of the actual share of the government revenues to GDP in 1995-99 (GR_Y95_99) on the size of the PPP GDP of a country in 1999 in billion $ (Yppp99) and the level of PPP GDP per capita in 1999 as a % of the US level (Ycap99us):

GR_Y95_99 = 20.3 – 0.003Yppp99 + 20.6Ycap99us
(N=99, R^2=40%, all coefficients significant at less than 1% level).

We call this residual "policy determined level of government revenues to GDP ratio", Gpol, because it is in excess of the level determined by objective circumstances – level of development and size of the country. One of the best equations with this policy determined level of government revenues to GDP ratio is the following:

GROWTH = CONST. + CONTR. VAR.+ Gpol (8.0 – 0.06Ycap75us – 0.6CORRres), where all notations are same as above, control variables are the size of the country (PPP GDP in 1975) and growth rate of population in 1975-99, N=40, R2=52%, all coefficients significant at less than 1% level.

The equation implies that relatively poor and clean countries, say with level of GDP per capita of below 50% of the US level and positive residual corruption index of less than 8 (level of Cameroon and Jordan) can benefit from larger financial size of the government.

Another robustness test is to use a different indicator of the institutional quality – the investment climate index (RISK), average for 1984-90, the indicator that we used previously, when discussing the impact of tariffs on growth (it also allows to use more observations). The best equation is below:

GROWTH = CONST. + CONTR. VAR.+ Gpol (0.086RISK – 0.06Ycap75us – 3.12), where N=65, R^2 = 44, all coefficients significant at less than 10% level, control variables are total PPPGDP in 1975, population density and population growth rate.

The equation basically implies that for developing countries (say, PPP GDP per capita is lower than 50% of the US level) the increase in government revenues to GDP ratio was beneficial for growth only if they were relatively clean (RISK indicator should be higher than 71%), whereas for most developed countries this increase was detrimental.

4. Foreign exchange reserve accumulation

Fast growing countries usually have undervalued exchange rate (*ceteris paribus* lower ratio of domestic to US prices), which is achieved due to rapid accumulation of foreign exchange reserves – FER (appendix table, fig. 6). As a result, there is a positive correlation between the accumulation of reserves, the share of investment in GDP and economic growth (appendix table, fig. 7). It was

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 (1986) developed a model demonstrating how disequilibrium exchange rate in the presence of foreign trade externalities could lead to the acceleration of growth[6]. 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.

Empirical evidence seems to suggest that the accumulation of foreign exchange reserves (FER) contributes to economic growth of a developing economy by increasing both the investment/GDP ratio and capital productivity. The discussion and interpretation of these stylized facts is offered in (Polterovich, Popov, 2002). First, FER accumulation causes real exchange rate undervaluation that is expansionary in the short run and may have long term effects, if such devaluations are carried out periodically and unexpectedly. Second, real exchange rate undervaluation allows to take full advantages of export externality and triggers export-led growth. This is sometimes called the "exchange rate protectionism" and quantitatively is considerably more important than conventional trade barriers[7]. Third, 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. This third mechanism can operate even with the exchange rate overvaluation, if benefits from FDI inflows exceed costs of not utilizing fully the export externality.

It appears that this policy works primarily for developing countries (like with trade protectionism there is a threshold level of GDP per capita) and that trade protectionism and "exchange rate protectionism" are sometimes substitutes, but sometimes complementary, so that both policies at a certain stage of development can achieve growth promoting results. There are important differences between import duties and devaluation of the exchange rate. As Larry Summers once observed: "A ten percent decline in the dollar exchange rate is equivalent to a ten percent tariff on all imported goods and a ten percent subsidy for all exported goods (The New Republic, 25 January, 1988, p. 14). But the import duties and export subsidies raise the real exchange rate (level of prices in the country as compared to the world), whereas real devaluation lowers the real exchange rate[8]. The issue is discussed in greater detail in the theoretical model (last section).

We tried to determine the threshold level of GDP per capita for both policies – accumulation of reserves and trade protectionism. We use the indicator of the policy-induced changes in reserves

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[6] In this early paper Rodrik (1986) assumes an import externality, which is used via the overvaluation of the exchange rate that stimulates imports of machinery and equipment. This import externality probably exists at early industrialization stages. Later, at the next stage, when export externality has a greater impact on growth than import externality, the appropriate policy is to undervalue exchange rate via reserve accumulation. See section 7 for details.

[7] Real devaluation of 20-30% during the short period of time (1-2 years) is not that uncommon, whereas import duties as a % of import rarely change more than by several p.p. One of the most protectionist legislation ever – Smooth-Hawley tariff of 1930 in the US – raised duties an average of only 6 percent on the prices of imported products (Faux, 1988).

[8] The ratio of domestic prices for non-tradables (education and health care) to prices of tradables (clothing and footwear) depends significantly on the GDP per capita and somewhat less significantly (16% and 23% respectively) on the level import duties – the higher import duties, the higher are prices for non-tradables (N= 56 in both cases), R^2 is 18% and 14% respectively.

(Polterovich, Popov, 2002), where the impact of the objective factors (GDP per capita and trade to GDP ratio) on the reserves to GDP ratio is netted out. First, we computed the regression linking the increase in the reserves/GDP ratio in 1975-99 to initial (1975) GDP per capita, average ratio of foreign trade to GDP over the period (T/Y) and the increase in the same ratio over the period ($\Delta[T/Y]$): ($\Delta R = 38 - 11.4 \lg Y + 0.1(T/Y) + 0.24(\Delta[T/Y])$, R^2=34%, N=82, all coefficients significant at 0.1% level). Then we considered the residual as the policy-induced change in reserves (ΔR pol). The logic behind such an approach was to net out changes in reserve/GDP ratio caused by objective circumstances, such as the level of development and the level and dynamics of foreign trade. Afterwards we used the *policy induced change in foreign exchange reserves* as one of the explanatory variables in growth regressions together with import taxes and change in government revenues/GDP ratio. In this way we deal with the possible endogeneity problem: policy-induced change in reserve to GDP ratio in 1975-99 could be regarded as a exogenous policy variable.

The results are in table 5. The first three equations imply that accumulation of reserves stimulates growth in relatively poor countries, but the impact of this policy is getting smaller and smaller as countries approach the threshold level. In the second and third equation that contains a number of control variables, the threshold GDP per capita is 66-75% of the US level: accumulation of reserves in relatively rich countries is detrimental to economic growth.

The interpretation of this result could be the following: developed countries have already achieved the optimal share of foreign trade in GDP, whereas in developing countries the share of foreign trade stays at sub-optimal level due to externalities from international trade (returns to the economy are greater than the returns to particular firms). One way to reach the optimal level of international trade and to reap the benefits of trade externalities is to accumulate foreign exchange reserves, which would lead to the underpricing of the exchange rate and greater exports and later – imports. There is evidence that countries with high reserve accumulation have lower real exchange rate, and that the latter is correlated with the increase in the share of external trade in GDP (Polterovich, Popov, 2002).

We tried to find the threshold level of the quality of institutions (corruption variable), but it turned out that corruption level and change do not affect the impact of reserve accumulation on growth. This is consistent with intuition – whereas corruption should matter for the impact of government spending and tariffs (because these selective policies could be captured by lobbyists), it should not affect negatively the impact of reserve accumulation, because exchange rate protectionism is not a selective policy, it creates stimuli for all producers of tradables.

Consider now the 4th equation in table 5:

GROWTH= CONST.+CONTR.VAR.+ T(0.06–0.0027Ycap75us)+ ΔR pol (0.07-0.006T), (5)

The control variables are the rule of law index for 2001, the size of the economy in 1975, and the population growth rate in 1975-99. N=74, R^2=44%, all coefficients are significant at less than 10% level, except for coefficients of Rpol (11%) and the PPP GDP in 1975 (16%).

Table 5. Factors explaining the average growth rate of GDP per capita in 1975-99 (trade protectionism and reserve accumulation)– cross country OLS regression results

Dependent variable	Average growth rate of GDP per capita in 1975-99				
Number of observations	40	40	40	74	34
Rule of law index in 2001				1.0*** (3.94)	
Positive residual corruption (controlling for the GDP per capita) in 1980-85	-0.27** (-1.99)	-0.37*** (-3.23)	-0.40*** (-3.43)		
PPP GDP per capita in 1975, % of the US level		-.034*** (3.52)	-.039*** (-3.97)		
Net fuel imports, % of total imports, in 1960-99	0.018* (1.96)				
Size of the economy (PPP GDP in 1975, $)			$1.1*10^{-12}$ ***(2.79)		$9.6*10^{-13}$ ***(2.74)
Average population growth rate in 1975-99, %		-1.12*** (-3.67)	-1.14*** (-3.70)	-0.57* (-1.93)	-1.12*** (-3.62)
Policy determined increase in the ratio of FER to GDP from 1975 to 1999, p.p.	0.11** (2.05)	0.09** (2.30)	0.1** (2.43)	0.07 (1.56)	0.12*** (3.00)
Interaction term = (GDP per capita in 1975) x (increase in the ratio of FER to GDP from 1975 to 1999, p.p.)	-.00002* (-1.73)	-.0012** (-2.04)	-.0015** (-2.37)		-.002*** (-2.78)
Share of central gov. rev. in GDP in 1995-99 as a % of 1971-75					0.05*** (3.00)
Interaction term = (share of central gov. rev. in GDP in 1995-99 as a % of 1971-75) x (PPP GDP per capita in 1975 as a % of the US level)					-.0003*** (-4.22)
Interaction term = (share of central gov. rev. in GDP in 1995-99 as a % of 1971-75) x (positive residual corruption in 1980-85)					-.003*** (-2.94)
Average import duties as a % of import in 1975-99				0.06** (2.28)	
Interaction term = (GDP per capita in 1975) x (average import duties as a % of import in 1975-99)				-.003*** (-4.70)	
Interaction term = (increase in the ratio of FER to GDP from 1975 to 1999, p.p.) x (average import duties as a % of import in 1975-99)				-0.006* (-1.70)	
Constant	4.8*** (3.38)	9.0*** (6.12)	9.6*** (6.36)	2.2*** (3.76)	3.0** (2.10)

Adjusted R^2	29	49	52	43	57

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

The equation implies that tariff protection is good for relatively poor countries (with GDP per capita below 22% of the US level) and that reserve accumulation (exchange rate protectionism) are substitutes, so that accumulation of reserves is good for growth in countries with average tariff of less than 12%. Later, in subsequent section, where we consider the impact of all three types of policies, we cannot find this tariff–reserves substitution effect. It may well be that the effect of tariffs on growth depends on what particular industries are being protected and whether tariff protection is accompanied by export subsidies (see theoretical model in the last section for details).

The 5th equation in table 5 is:

GROWTH=CONST.+CONTR.VAR.+ ΔG (0.05–0.0003Ycap75us–0.003CORRpos)+ ΔR pol(0.12 – 0.002Ycap75us), (6)

This equation implies that the growth of government revenues/GDP ratio is good for most countries, excluding the richest ones and the most corrupt ones (if Ycap75us is higher than 100%, whereas CORRpos >7, the impact of the increase of government revenues/spending on growth becomes negative). It also allows to determine the threshold level of GDP per capita for the impact on growth of reserve accumulation: for countries with GDP per capita higher than 60% of the US level, the accumulation of reserves has a positive impact on growth; for richer countries the impact is negative.

We also experimented with another definition of *policy induced change in foreign exchange reserves,* as a residual from regression linking the increase in reserves to GDP ratio to the following ratios: trade/GDP, increase in trade/GDP, external debt/GDP(ED/Y) and debt service/GDP(DS/Y):

$\Delta R = 3.3 - 0.6(DS/Y) + 0.06(ED/Y) + 0.2(T/Y) + 0.28(\Delta T/Y)$, R^2=36%, N=59, all coefficients significant at less than 7%.

When this variable of policy determined change in reserves is used, the results are similar for tariffs and reserves and for government revenues and reserves, but not for 3 policy variables all together (reserves, tariffs, government revenues). With 3 policy variables, the number of observations (using the corruption index as a measure of institutional quality) decreases to only 18 and the results do not hold. Hence, we had to use RISK indicator allowing us to preserve larger sample. Here are the best equations for the Gpol and R, T and R with the RISK indicator for 1984-90 as a measure of the quality of institutions:

GROWTH=CONST.+CONTR.VAR.+T(0.001RISK–0.0038Ycap75us)+ ΔR pol(0.23-0.014T), N=48, R^2 = 46, all coefficients significant at 7% or less, control variables – PPP GDP in 1975 and population growth rate.

GROWTH=CONST.+CONTR.VAR.+Gpol(0.096RISK–6.3)+ ΔR pol(0.31 – 0.017T),

N=28, R2 = 61, all coefficients significant at 10% or less, control variables – PPP GDP in 1975, average ratio of government revenues to GDP in 1973-75.

The results suggest that only relatively clean and poor countries can benefit from the increase in government spending and tariff protection, but virtually all countries can spur growth via reserve accumulation, if the level of tariff protection as a % of total import is below 16-18%.We tried to find the GDP per capita threshold for the policy of reserve accumulation, but failed.

Overall, so far it appears that the underpricing of the exchange rate via reserve accumulation is the most promising policy for developing countries: first, unlike tariffs that are good only for poorest countries, reserve accumulation works for middle income countries as well; second, "exchange rate protectionism" is more efficient policy to stimulate growth because decisions on import duties and government taxes/spending are affected by poor quality of institutions (corruption and low efficiency of implementation), whereas low exchange rate policy is indiscriminate and non-selective by nature: it cannot be captured and "privatized" by particular interest groups, which makes it especially efficient growth promoting instrument in poor and middle income countries that generally suffer from corruption.

In practical terms, there are no formal limits for the accumulation of reserves by developing countries, but "exchange rate protectionism" can result in "beggar-thy-neighbor policies" – obviously all countries cannot exercise these policies at the same time to achieve undervaluation of their exchange rates. The Plaza Accord of 1985 involved the coordinated efforts of major Western countries to appreciate their currencies against the dollar in order to reduce the US trade deficit; as a result, the Japanese currency appreciated from 239 yens to the dollar in 1985 to 128 yens in 1988. Export/GDP ratio in Japan that increased from 10 to 15% in 1960-84, fell to 10% by 1986 and stayed at this level until today. Economic growth in Japan slowed down dramatically in the 1990s, although there is still no persuasive evidence of the causal link between these two events.

China did not devalue yuan versus the dollar after the 1997 Southeast Asian currency crises mostly on political reason – it took an economic hit since its exports was competing with ASEAN exports in Western markets for the sake of providing assistance to its neighbors and promoting East Asian solidarity. Revaluation of the yuan versus East Asian currencies after the Asian crisis caused a deflation in China (prices decreased or virtually did not grow in 1998-2002) and a slowdown of economic growth (from 10% in 1996 to 7% in 1999). More recently, in 2003-05, the US pressed China to revalue, but without much success.

The US-IMF policy to force countries to appreciate their exchange rates (via selling their reserves) is in fact depriving these countries of a powerful tool of growth promoting policy. It is possible that exchange rate protectionism of developing countries would provoke conventional protectionism in the West. According to IMF, "reserves in emerging economies in Asia are now at the point where some slowdown in the rate of accumulation is desirable from both domestic and multilateral perspective… An eventual narrowing of the US current account deficit from its present unsustainable level will likely require emerging economies in Asia to share in the adjustment, to prevent an undue burden of the adjustment on other economies… not least to keep protectionist pressures at bay" (IMF, 2003).

5. Putting the pieces together: joint impact of three policies (trade protectionism, accumulation of reserve, increase in government revenues/GDP ratio)

Examining the joint impact of three policies on growth, we get the following equation:

GROWTH = CONST. + CONTR.VAR. + ΔG *(0.034 – 0.00059*Ycap75us –0.0027*T) +
+ T*(0.28– 0.010* ΔR pol) + ΔR pol*(0.15 – 0.002*Ycap75us), (10)

where:

T – import tariffs as a % of imports, average for 1975-99,

ΔG - share of central gov. rev. in GDP in 1995-99 as a % of 1971-75,

ΔR pol – policy-induced increase in the ratio of FER to GDP from 1975 to 1999, p.p.,

Ycap75us – PPP GDP per capita in 1975 as a % of the US level.

Among the control variables are population growth rate in 1975-99, rule of law index for 2000 (to control for the quality of the institutions), and PPP GDP in 1975 (to control for the size of the country – larger countries grow faster on average than the smaller ones, probably due to advantages of single market with one currency). All coefficients are significant at 5% level (most – at 1% level), N= 50, R^2= 73%.

We experimented with this equation substituting the rule of law index for the risk index and corruption perception index (see below) – the results do not change. We also tried to find the threshold level of GDP per capita for tariff protection policy by introducing the interaction term (Ycap75us*T), but it was not significant. The *increase* in tariffs over the 1975-99 period was significant in some specification, however: we got the negative coefficient for the multiple of the increase in tariffs over the period by the tariffs levels, i.e. T*(constant – Tincr), suggesting that the increase in tariffs may be excessive and affect growth negatively.

Equation (10) suggests that the increase in government revenues/GDP ratio is good for growth only for countries with per capita of less than 58% of the US level and that the higher the import duties the lower this threshold level of per capita GDP (so that government spending and import duties are interchangeable). It also follows from the equation that import tariffs are good for growth in countries with low increase in government revenues/GDP ratios and low accumulation of reserves. Finally, reserve accumulation is good for growth in countries with GDP per capita below 75% of the US level and low import tariffs.

Consider now a hypothetical country with no increase in government revenues/GDP ratio in 1975-99 (ΔG=100%), no increase in policy determined level reserve/GDP ratio over 1975-99 period (ΔR pol = 0), and zero import tariffs in 1980-99 (T = 0). To see the impact of various policies on growth, we differentiate the equation (10), and get a convenient expression for the marginal impact of three types of policies on growth rates:

dGROWTH=d ΔG *(0.034–0.00059*Ycap75us)+0.28*dT+d ΔR pol*(0.15–0.002*Ycap75us). (11)

Assuming that two policies out of three under examination are absent (either ΔG=100% and ΔR pol = 0, or ΔG=100% and T = 0, or ΔR pol = 0 and T = 0), we can compute the marginal impact on growth of 10 % tariff, of reserve accumulation (+10 p.p. of GDP over the period) and of

the increase in government revenues/GDP ratio by 10 p.p. over the period respectively. The results are presented graphically at fig. 8.

For very poor countries (less that 10% of the US PPP GDP per capita in 1975) with no tariffs, no accumulation of reserves in excess of objective needs, the increase in the ratio of government revenues to GDP by 10 p.p. would have resulted in a pretty modest increase in the average annual growth of GDP per capita of 0.2 p.p. a year. Accumulation of foreign exchange reserves – increase in reserves/GDP ratio by 10 p.p. from 1975 to 1999 could have increased growth by over 1 p.p. annually. The introduction of tariffs equivalent to 10% of imports was most promising: it could have boosted average annual growth by 2.8 p.p. a year. The positive impact of tariffs on growth was constant for poor and rich countries, whereas the impact of the increase in the share of government revenues in GDP was positive for countries with GDP per capita of less than 58% of the US level. The most lasting effect for catch up development was that of the accumulation of reserves, which was good for growth in countries with GDP per capita of less than 75% of the US level.

Such was the magnitude of the growth effects in 1975-99 of three different policies for a hypothetical country – that was just starting to increase tariffs from zero level and to increase government revenues/GDP and reserves/GDP ratios from the level of 1975. But in reality, of course, countries were not starting from scratch and pursued various combination of policies in the period in question. The simple way to evaluate the potential of a particular policy in the presence of other two types of policies (that imposed constraints on the first policy, because they were interchangeable) and to see to what extent in each particular case three types of policies were growth promoting is to compute partial derivatives from the growth equation (10) on government revenues/GDP ratios, on tariffs and on reserves/GDP ratios respectively:

$$\text{GROWTH} = \text{CONST.} + \text{CONTR.VAR.} + \Delta G*(0.034 - 0.00059*\text{Ycap75us} - 0.0027*T) + \\ + T*(0.28 - 0.010*\Delta R\,\text{pol}) + \Delta R\,\text{pol}*(0.15 - 0.002*\text{Ycap75us}), \qquad (10)$$

$$d\text{GROWTH}/d\Delta G = 0.034 - 0.00059*\text{Ycap75us} - 0.0027T,$$
$$d\text{GROWTH}/dT = 0.28 - 0.010*\Delta R\,\text{pol} - 0.0027*\Delta G,$$
$$d\text{GROWTH}/d\Delta R\,\text{pol} = 0.15 - 0.002*\text{Ycap75us} - 0.010*T$$

These partial derivatives are presented graphically at fig. 9, assuming that ΔG (for computing dGROWTH/dT) and T (for computing $d\text{GROWTH}/d\Delta G$ and $d\text{GROWTH}/d\Delta R\,\text{pol}$) were at the actual levels. The chart seems messy at a first glance, but in fact is very telling. Most developed countries had little to gain from reserve accumulation (square points on the chart) and increase of government revenues/GDP ratios (diamonds on the chart) even controlling for the existing degree of tariff protection: the partial derivatives of growth on ΔG and $\Delta R\,\text{pol}$ were close to zero. The marginal effect of tariff protection (T, triangles on the chart) after controlling for the increase in government revenues/GDP ratio was sometimes substantial, but the magnitude of the impact for most of the developed countries was much less pronounced than for developing countries.

For developing countries the picture is much more diverse: it seems like for most rich countries the similar and uniform no-intervention policies were most promising, while for poor countries the impact of three types of growth promoting policies was substantial and dissimilar – for each

country the combination of most beneficial policies was different. Most of developing countries had negative dGROWTH/dΔG and dGROWTH/dT, but positive dGROWTH/dΔR pol, suggesting they could have boosted annual average growth rates of GDP per capita in 1975-99 by several percentage points annually via decreasing import tariffs and government revenues/GDP ratios and increasing the pace of the accumulation of reserves. On the other hand, there was quite a number of countries that had to decrease the reserves (given their actual levels of tariff protection) and a few countries with too low tariffs (given their actual rates of increase in the ratios of government revenues to GDP).

Table 6 presents the breakdown of countries in 3 income groups (PPP GDP per capita in 1975 in the range of 0-25%, 25-60% and 60-120% of the US level) that could have benefited from particular combination of policies in 1975-99, given their GDP per capita, actual level of the increase in government revenues/GDP (for computing the impact of tariff protection) and actual level of tariff protection (for computing the impact of the increase in the government revenues/GDP ratio and the impact of reserve accumulation). In a sense, this is a typology of "good policy sets" for countries at various stages of development.

The most typical "good policy" for rich countries was to decrease tariffs, cut reserves slow down the increase in government revenues. Among low and middle income countries more than half could have benefited from accumulation of reserves, and nearly a quarter – from high tariffs, faster reserve accumulation and more rapid increase in government revenues. For other developing countries the appropriate policy would have been cuts in size the government, decrease in reserves and tariff protection.

Table 6. Policy potential of countries with different GDP per capita

Number of countries with Different policy potential / PPP GDP per capita in 1975 as a % of the US level	Countries that would have benefited from		
	Increase/ Decrease in tariffs	increase/ decrease in reserves	Increase/ Decrease in revenues/GDP ratio
0 – 25% (25 countries)	4/20	12/12	5/19
25 – 60% (12 countries)	4/8	7/5	3/9
60 – 120% (13 countries)	3/10	1/12	0/13
ALL COUNTRIES	11/38	20/29	8/41

To put it differently, prescriptions for speeding up growth in rich and poor countries are different. Whereas for many poorest and middle income countries tariff protectionism, accumulation of reserves (exchange rate protectionism) and expansion of the fiscal capacity of the government were conducive to growth, appropriate policy for the majority of rich countries was to decrease tariffs, cut reserves and the growth of government revenues.

6. Complicating the problem: joint impact of three policies (trade protectionism, accumulation of reserves, increase in government revenues) depending on the level of development and quality of institutions

Running regressions with all our previous policy variables, but also including positive residual corruption index in 1980-85 and PPP GDP per capita in 1975 (CORRpos and Ycap75us), we get the following best equation:

GROWTH = CONST. + CONTR.VAR. + ΔG*(0.074–0.00027*Ycap75us–0.005*CORres) + T*(0.00061*CPIincr – 0.077) + ΔR pol*(0.090 – 0.0014*Ycap75us), (12)

where CPIincr – corruption perception index in 1999-2003 as a % of 1980-85 level, characterizing the increase in the "cleanness" of a country,
CORRres – residual positive corruption computed as explained earlier.

All coefficients in this equation are significant at 1% level (except for ΔR pol*Ycap75us, which is significant at 5% level), N= 34, R^2 = 67%. The control variables are population growth rate and size of the country (PPP GDP in 1975). We experimented with this equation trying to find for tariffs and reserves increase variables the same threshold levels of GDP per capita and corruption, as the one found for the increases in government revenues, but the results were worse. We also tried to include the interaction terms for policy variables (reserve accumulation, increase in government revenues, tariffs) – mostly these interaction terms had predictable signs and were close to being significant, but at the expense of the decrease in significance of other variables[9].

The equation suggests that there is a certain critical level of positive residual corruption index and PPP GDP per capita in 1975: before this level is reached increase in government revenues/GDP ratio is good for growth, afterwards these increases are only detrimental to growth. The economic interpretation of these threshold levels is rather transparent: increases in the fiscal size of the government are good for poor and "clean" (low corruption) countries, but bad for rich and "dirty" countries, whereas for "dirty"-poor and "clean"-rich countries the final impact depends on what effect predominates.

The impact of reserve accumulation on growth does not depend on corruption (we tried to introduce "GDP per capita–corruption" interaction term, but it turned out to be insignificant). Such a result is also in line with economic intuition: corruption hurts growth because it lowers the efficiency of government spending and protectionism (corrupted government makes wrong

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[9] Other reasonable equations are the following:

GROWTH=CONST.+CONTR.VAR.+Gpol(3.1–0.39CORRres)+T(0.06–0.0057Ycap75us)+ ΔR pol(0.11–0.0013Ycap75us),

N=37, R^2= 46%, control variables are land area and population growth rate, Gpol – is the policy determined level of government revenues to GDP computed as explained earlier, CORRres – positive residual corruption discussed earlier, all coefficient significant at a level of 9% or less.

GROWTH=CONST.+CONTR.VAR.+Gpol(0.043RISK–5.0)+T(0.08–0.0025Ycap75us)+ ΔR pol(0.29–0.002 ΔG),

N=48, R^2=39, control variables are population density and the ratio of government revenues to GDP in 1973-75, RISK – is the investment climate index in 1984-90 used in previous regressions, all coefficient significant at 5% level or less.

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spending decisions and protects wrong industries), whereas exchange rate protectionism (reserve accumulation) is not a selective policy and hence cannot be "privatized".

Tariff protection was good for growth only in countries that managed to decrease corruption considerably in the 1980s – 90s, whereas neither the level of corruption in 1980-85, nor the initial level of GDP per capita had an impact on the efficiency of tariff protection. To put it differently, import tariffs were bad for growth, unless countries that introduced them made a considerable progress (over 26% increase in the "cleanness" – actual CPI index – in 1980-85–2002-03.

The interpretation could be that the impact of tariffs on growth is more immediate than the impact of government revenues-spending: whereas the increase in the fiscal size of the government affects growth positively only if the certain level of "cleanness" is reached, tariffs have a positive impact on growth in all countries, even the corrupt ones, provided they make a considerable progress in the reduction of corruption during the period in question. Allegedly tariffs were changed quite often during the 25 years (1975-99), so for import duties to have a positive impact on growth, each new round of tariff change had to be better that the previous one, which was possible only in countries that made considerable progress in fighting corruption, i.e. where tariff structure changed not under the pressure of lobbying groups, but to stimulate industries with largest potential externalities for the growth of national economy.

Consider now a hypothetical country with no increase in government revenues/GDP ratio in 1975-99 (ΔG=100%), no increase in policy determined level reserve/GDP ratio over 1975-99 period (ΔR pol = 0), and zero import tariffs in 1980-99 (T = 0). To see the impact of various policies on growth, we differentiate the equation (12) to get a convenient expression for the marginal impact of three types of policies on growth rates:

$$dGROWTH = d\Delta G(0.074 - 0.00027*Ycap75us - 0.005*CORRres) + dT(0.00061*CPIincr - 0.077) + d\Delta R\,pol(0.090 - 0.0014*Ycap75us) \quad (13)$$

This equation is presented graphically at fig. 10. It is similar to the fig. 8 in the previous section – after a certain critical level of GDP per capita the impact of three types of policies considered here on economic growth becomes negative. The impact of reserve accumulation on growth is similar – it is described by the same linear function of GDP per capita (because the impact of reserve accumulation does not depend on corruption), but has more modest quantitative characteristics (a 10 p.p. increase in reserves/GDP ratio over the 1975-99 period could yield a 0.7 p.p. increase in annual average growth rate for countries with GDP per capita of 10% of the US level; it diminishes for richer countries and disappears completely for countries with GDP per capita of 65% of the US level). But the impact of tariff protectionism and increase in government revenues is different.

First, these impacts are not represented by straight lines, like in the chart in the previous section, because now these impacts are not linear functions of GDP per capita, but also of corruption levels (for government revenues/GDP ratio) and corruption change (tariff protectionism). Second, and more importantly, the impact of the increase in government revenues now is positive for virtually all countries (although for developed countries it is negligible), whereas the impact of tariff protectionism is negative for all developed countries, but positive and substantial for some developing countries (namely those that managed to decrease corruption noticeably).

Fig. 10 suggests that three major stages of development depending on the level of income and the quality of institutions can be tentatively identified. At the first stage (when GDP per capita is below 25% of the US level) all countries – with good and bad institutions – can benefit from the accumulation of reserves and increase in the fiscal capacity of the state. Countries that manage to improve institutions (cut corruption) at this low stage of development can also benefit from tariff protection. The positive effect of the increase in government revenues to GDP ratio is greater, when corruption is lower, but the actual relationship between corruption and GDP per capita is such, that the negative effect of corruption (poor institutions) pales in comparison with the positive impact from increasing government revenues to GDP ratio. Besides, the accumulation of reserves yields growth dividends irrespective of the corruption levels.

At the second stage (when GDP per capita is within 25% to 65% of the US level) all countries can benefit from then accumulation of reserves and the increase of the fiscal capacity of the state, but the impact of tariff protection for most countries is negative. That is to say, middle income countries should continue to build up reserves/GDP and government revenues/GDP ratios, but should generally phase out import tariffs because their impact becomes very small and even negative (remaining positive only for the least corrupted countries). Finally, at the third stage (when GDP per capita is above 65% of the US level) countries should slow down the increase in government revenues/GDP ratio because its impact on growth becomes very small, and should phase out growth promotion policies in the form of tariff protection and accumulation of reserves because their impact becomes outright negative.

Given the actual relationship between the level of development (GDP per capita) and the quality of institutions (corruption), it turns out that out of three policies under consideration, the policy of tariff protectionism is most sensitive to the quality of institutions. It is unconditionally good only for the "cleanest" developing countries, whereas other policies are good for corrupted countries as well. The art of the policymakers in developing countries is to switch from one set of policies to another as the technological level and the quality of institutions improve.

Countries with smallest effects of best policies – with less than 0.2 p.p. of growth impact of each policy (i.e. with smaller deviation of all three points from the zero horizontal line) – that could not have gained much from altering the rates of tariff protection, reserve accumulation and government revenues/GDP ratio, are mostly developed countries, such as Finland, Japan, Italy, Netherlands, Norway, and countries that became developed during the period in question, such as Greece, Spain and Israel. Generally these countries had low rate of tariff protection and reserve accumulation and low rate of increase of government revenues/GDP ratio. Among countries that could have benefited most from using the three growth promotion policies in question (combined effect of three policies increasing the potential annual average growth rate by 1 p.p. and more) are Bangladesh, Bolivia, Egypt, Hungary, India, Indonesia, Nigeria, Pakistan, Philippines. Some of these countries (Egypt, India, Indonesia) managed to pursue good policies and to increase GDP per capita by over 3% a year in 1975-99, but others (Bolivia, Nigeria, Philippines) failed to utilize fully their potential advantages via tariff protection, accumulation of reserves, increase in government revenues/GDP ratio.

It is noteworthy that in the current regression (with corruption), the impact of the increase in government revenues to GDP ratio is positive for virtually all countries, whereas in the previous regression (without corruption) the impact was positive only for countries with GDP per capita of less than 58% of the US level. The economic interpretation is the following: if we account for corruption (institutional quality) in the regression equation and the fact that the "cleanness" increases with the growth of GDP per capita), it turns out the positive impact of the expansion of the government becomes stronger. Most countries were able to gain from the increase in government revenues/spending (unlike in the equation with only GDP per capita and no corruption) because the growth of "cleanness" with the increase in GDP per capita was pretty fast. Had it been slower, many medium income and rich countries would have found themselves in the situation, when the positive effect of corruption-free environment is not enough to counterweigh the negative effect of "richness".

To put it differently, the process of economic development is characterized by the technological advancement (increase in GDP per capita) and improvement in quality of institutions (increase in corruption perception index). As GDP per capita increases, the policy of boosting government revenues/expenditure yields less and less dividends (because externalities from enlarging the state are being depleted); however, as corruption falls (CPI increases), boosting government revenues/expenditure yields more dividends (because government efficiency increases). What the chart above tells, is that the combined effect of these two processes is such that for most countries increases in government revenues/spending have positive, although diminishing, effect on growth[10].

Consider now the impact of three policies on particular countries – given their actual GDP per capita, corruption level and change in this level. Partial derivatives of growth on government revenues, tariffs, and reserve accumulation from equation (12) are now equal to:

$dGROWTH/d\Delta G = 0.074 - 0.0027*Ycap75us - 0.005*CORres,$
$dGROWTH/dT = 0.00061*CPIincr - 0.077,$
$dGROWTH/d\Delta R\,pol = 0.090 - 0.0014*Ycap75us.$

Fig. 11 shows the 3 policy impacts for 43 countries depending on their actual GDP per capita and changes in the level of corruption. This time there are only 43 points on the chart mostly due to constraint with data on corruption in 1980-85. There are obviously four groups of countries that are shown in table 7:

1. Poor, but successfully fighting corruption – left upper quadrant (that could have benefited from all three types of growth promotion policies – expansion of the state, accumulation of reserves, tariff protectionism: G+, R+, T+);
2. Poor and not being able to fight corruption (left lower quadrant: G+, T-, R+);
3. Developed countries – rich and making small progress in fighting corruption (lower middle quadrant: G+, T-, R-);

[10] The same line of reasoning with the same conclusions could be presented for the policy of tariff protectionism. We do not do it here to save space.

4. Developed countries – very rich and making small progress in fighting corruption (lower right quadrant with only two countries – US and Switzerland: G-, T-, R-).

Table 7. Policy potential of countries with different income and different corruption

Groups of countries	PPP GDP per capita as a % of the US level	CPI in 2002-03 as a % of 1980-85 level	Appropriate Policies
Poor-clean (10 countries)	Less than 65%	Over 126%	G+, R+, T+
Poor – corrupted (20 countries)	Less than 65%	Less than 126%	G+, R+, T-
Rich – clean (12 countries)	65-100%	Less than 126%	G+, R-, T-
Very rich – clean (2 countries)	Over 100%	Less than 126%	G-, R-, T-

The appropriate question to ask at this point is how various countries used their potential advantages in growth promotion, i.e. to what extent actual policies were in line or out of line with the best possible policies. For instance, Indonesia as a poor country (5% of the US GDP per capita in 1975) and as a country that reduced corruption dramatically in the 1980s-90s (CPI increased from 0.2 to 1.9) could have benefited in 1975-99 from the 10% import tariff by gaining 5 p.p. of annual average growth rate of GDP per capita; from increasing the reserve/GDP ratio over the period by 10 p.p. – another 1 p.p. of growth; from increasing the ratio of government revenues to GDP by 10 p.p. – another 0.1 p.p. of growth. The question is: did Indonesia use these policy potential, did she exercise tariff protection, accumulate the reserves, increased the fiscal size of the government?

Next three charts (figs. 12-14) compare partial derivatives of growth on each of three type of policies (dGR/dT-potential, dGR/dG-potential, dGR/dR-potential – diamond points on the charts) with actual contribution of these policies to growth calculated from equation (12) by introducing actual values of policy variables ΔG, T, ΔR pol (so we get dGR/dT-actual, dGR/dG-actual, dGR/dR-actual – square points at the charts).

The results for Indonesia is that in reality she gained 2 p.p. of growth via relatively low tariff protection of 4% (in 1975-99 the average unweighted tariff for all countries was 13%); another 1 p.p. of growth via rapid accumulation of reserves – the ratio of policy determined reserves to GDP increased over the period by 11 p.p. (for all countries the average was 0 p.p.); and another 1 p.p. via increasing the ratio of government revenues to GDP in 1975-99 by modest 15 p.p.(on average for all countries – 19 p.p.). The actual growth rates of GDP per capita in Indonesia in 1975-99 were nearly 4% a year (the small difference is due to the negative impact of population growth rate and positive impact of the size of the country, plus error term). So, in fact Indonesian record is pretty impressive – all three types of policies operated in a right direction, even though Indonesia could have been even more successful with higher tariff protection and faster growth of the fiscal capacity of the state.

From the three charts below it is easy to identify the typical policy mistakes for countries at different stages of development. Rich countries had nothing to gain and little to loose from increasing tariff protection: because in reality their tariff protection was low, they did not loose much in terms of economic growth. All rich countries increased the government revenues/GDP ratio, but most of them had little to gain from such policy in terms of economic growth, so in

reality they did not get much. For three rich countries (Italy, Switzerland, US) the impact of the increase in the government size was negative, so by increasing the ratio of government revenues to GDP (by 64, 56 and 13% respectively) these three countries actually slowed down economic growth. Finally, whereas for all rich countries the impact of reserve accumulation was negative, part of them decreased reserves (and gained in terms of growth – the biggest winner was Switzerland), while another part increased reserves and slowed down growth (but not that much).

For developing countries gains and losses from good/bad policies were more sizable. Some of them (with rapidly decreasing corruption) had a lot to gain from import tariffs and actually did gain (Indonesia, Egypt). Others (less successful in fighting corruption), on the contrary, had to loose from import tariffs and actually lost (Cameroon maintained 22% import tariff and lost over 1 p.p. of annual average growth). For all developing countries the impact on growth of the increase in government revenues to GDP ratio was positive, most of developing countries in reality increased this ratio and some of them got substantial growth gains (Ireland, Jordan, Kenya, Malaysia – up to 3 to 5 p.p. of annual average growth). Other countries, however, gained very little, i.e. failed to use their potential advantages to the full extent. Finally, for all developing countries accumulation of reserves was a promising way to increase long term growth. Some, like Chile and Indonesia, did exactly that, but others, like Jordan and Ireland decreased reserves and slowed down their potential growth.

These kind of calculations, of course, should not be taken at face value. The magnitude of the effects, calculated from simple linear regressions using its partial derivatives, is not a statistically accurate procedure. The last equation (12) that we analyzed has 34 observations and 8 variable, so it cannot really be estimated with sufficient precision. And the equations with all three policy variables (unlike the equations with two policy variables) are not very robust to the inclusion of various control variables characterizing initial conditions and external environment (population and GDP of the country, land area, density of population, initial level of institutional quality, GDP per capita and the level of government revenues to GDP, population growth rate, net fuel imports, change in terms of trade): the signs of coefficients usually remain intact, but the significance often changes to worse.

What we try to demonstrate here, is a general principle – developing countries have much to gain from growth promoting industrial policies – rapid accumulation of reserves, increase in government revenues/GDP ratio, and (those developing countries making rapid progress in fighting corruption) tariff protection. Many countries did exactly that and enjoyed high growth. But other countries pursued wrong policies and their growth record is much less impressive.

7. Accumulation of foreign exchange reserves and tariff policies: a theoretical consideration

7.1. Introduction

It is quite standard to consider import substitution and export oriented policies as two incompatible alternatives. Outward orientation only is considered as "a necessary condition for rapid economic growth" (Krueger (1995)). However, some students of the history of the economic policies challenge this view. They point out that the most successful economies implemented both kinds of policies the same time. Hayami writes: "At least until the 1960s

in Japan and until the 1980s in Korea and Taiwan, export-promotion policies were superimposed on the import-substitution policies rather than replacing them" (Hayami (1995, p.21)). With respect to Japan, a similar observation is made by Nam (1995, p. 168). In many countries, trade liberalization reforms were accompanied by the domestic currency devaluation to damp down consequences of the liberalization shock (Edwards (1995)). This means that policy makers consider tariff and real exchange rate policies as substitutes.

Our statistical data support this observation. They show that tariff policy often coexists with an active FER accumulation.

A question arises why this is a case. To see the problem, consider an economy where capital goods are imported. One may expect that the domestic capital production gains from tariffs due to capital price increase. However, export sector may suffer if an imported good is used for the export production. If real exchange rate increases due to tariff introduction then the tariff policy and the FER accumulation policy may hamper each other.

In this section we demonstrate, however, that, due to presence of externalities, both policies may change real exchange rate in the same direction and accelerate growth. This explains not only real experience but also our empirical finding: in the regressions (see previous section) the speed of FER accumulation and the tariff levels have the same signs of their impact on economic growth.

To fulfill this task we use a modification of a model suggested in Polterovich, Popov (2002). Below this model is described in detail, and a number of results that were got in the earlier paper are adduced. Propositions 5,6,8 as well as Sections 7.5 and 7.6 are new. Section 6 shows that the influences of both instruments depend qualitatively on the structure of externalities. We suppose that the structure is changing in the process of economic development, and this is a plausible reason why economic policy has to be changed as well. At an early industrialization stage, domestic production of consumption creates the strongest external impact on the whole economy. A tariff policy has to use this externality. At this stage, tariffs increase real exchange rate, and selling of foreign exchange reserves affects the economy in the same direction. At the next stage of industrialization the capital production externality dominates. In this case, tariffs decrease the real exchange rate, and the tariff policy is compatible with FER accumulation. When, in the process of economic development, the export externality turns out to be the strongest one, tariffs may be abandoned, but the FER accumulation continues to serve for the acceleration of economic growth.

In Section 7.5 we discuss a policy of the budget surplus accumulation ("stabilization fund") and compare it with the accumulation of FER.

7.2. A model

Why do countries accumulate foreign exchange reserves (FER)? It is a surprise that only a few researches are devoted to this question, and that a related theory does not seem to be well developed. One may argue that FER are necessary to pay debt, to support a chosen exchange rate regime, to smooth foreign exchange operation, 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.

To some extent, this point of view is close to an idea developed in Rodrik (1986). Rodrik suggested a two- period model demonstrating how overvalued exchange rate could lead to a welfare improvement. He assumed learning-by-doing externality that influences domestic production and show how the government may correct non-optimal market equilibrium. It is reached by an increase in government spending in the first period followed by a decrease in the second period to keep the two-period budget balance. The first shift in the government spending is financed by a first period fall in central bank reserves. Rodrik shows that this policy results in a total welfare increase through overvaluation of the real exchange rate in the first period and undervaluation in the second. Due to externality, the overvaluation gives an incentive to increase the efficiency of production.

Rodrik's model explains why a number of countries kept their real exchange rate overvalued at a very early stage of industrialization. However, at the next stage of development many fast growing economies preferred undervaluation to develop their export trade. It was shown above that this tendency dominates in our statistical data. In a recent paper Rodrik makes a point that a large real exchange rate devaluation has played a big role in the success of some economies, notably in Chile and Botswana (Rodrik, 2003).
In this section we suggest a combination of a Sidrauski-type model and an AK-type model of endogenous economic growth to study FER accumulation policies. It will be shown that, under reasonable conditions, FER accumulation may influence real exchange rate. Two hypotheses on mechanisms of this influence are considered. The first one assumes that the accumulation policy forces a country to follow an imbalanced regime keeping positive current account at a steady state.

At the first glance, there is no any sense to choose this regime since it results in pure losses. Why do not spend the reserves to increase consumption? We show, however, that the FER accumulation brings real exchange rate down. Therefore, this policy facilitates export development and helps to defend domestic producers. If the export sector dominates in the knowledge accumulation, then, in accordance to the logic of AK-models, the FER accumulation accelerates growth. Moreover, under some more restrictive conditions, it may also increase discounted utility value even if the accumulated reserves do not earn any interest and can not be used in the future. The essence of this effect is, of course, strong positive export externality.

There are several objections against this hypothesis. One can think that reserve accumulation leads to inflation. This is not necessarily the case, however, if the rate of reserve accumulation does not exceed the rate of economic growth. Moreover, small inflation is not

necessarily harmful, particularly for a developing economy.[11] In what follows we disregard its influence assuming money superneutrality.

The imbalanced regime is associated with direct losses of resources[12]. Clearly, waste of resources is not a first best solution. 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 country where inclination to rent seeking is particularly strong.

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

Another objection might stress the fact that import may have strong externality as well. In this case exchange rate undervaluation would not be reasonable. Some studies seem to show that export oriented policy is growth promoting. This may be interpreted as evidence that export externalities is stronger in the most developing countries than import ones. It is quite plausible however that the undervaluation policy is not efficient for import dependent countries.

If domestic production substantially influences knowledge accumulation then the mechanism described above does not work. For this case FER accumulation can play a different role: it serves as a signal for foreign investors that the economy is in a good state.

In accordance to our second hypothesis, the speed of foreign investment is proportional to the speed of the FER accumulation. We assume also that the foreigners use domestic intermediates and earn world market interest rate that is smaller than domestic one. Under these conditions, FER accumulation results in pure capital inflow and brings real exchange rate up. This accelerates growth if domestic production externality is strong enough so that export sector has no knowledge accumulation advantage.

The first hypothesis seems to be more plausible for earlier stages of fast development, and the second one fits better the later stages when a country is better integrated into the world market. Note that for the third stage, when an economy is open, and domestic capital market is well developed, FER loose their role as an instrument of the economic growth acceleration.

The model has some specific features that seem to be reasonable to postulate for a developing economy. The economy is small and is open for good flows. Concerning capital flows, we consider two versions of the model. In the first one foreign capital is not permitted at all. In the second version, foreigners may purchase assets through domestic intermediates. The intermediates pay them world market interest rate that is less than domestic one. These

[11] This is a conclusion of a number of empirical works (see Bruno and Esterly (1995)). It is also a conclusion of the authors who considers the optimal taxation problem including inflation tax (Felps (1993), Braun (1994), Movshovich (1998)).

[12] 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.

are foreigners who take the decisions on the investment volumes dependently on the speed of reserve accumulation. Indebtedness issues are ignored, and, in both versions, the domestic forces form the domestic interest rate. Under such conditions the learning-by-doing capital externality can influence economic growth as it does in Romer-type models (Romer(1996)).

We assume also that export sale requires much greater capital expenditure than import purchase. This asymmetry seems to be plausible for a developing country where producers and traders have so much to learn about how to sell the domestic product. Thus export trade sector is introduced. This sector uses capital to convert a quantity of "nontradable" consumption good into the same quantity of the good marketed abroad.[13] There are two interpretations of the trade sector activity. First, it may be considered as building marketing infrastructure: creating brands, making connections, and building capacities for selling goods abroad. Under this interpretation, one could count the consumption good as tradable one; the model reflects the fact that domestic and world prices of tradables are very different for many developing countries. Second, the activity may be considered as re-shaping of nontradables into tradables. Additional quantities require increasing increments of capital so that one could talk about a spectrum of goods with different degrees of tradability.

The import trade is costless, so that the price of the imported good coincides with the world price.

The model includes also a representative consumer and two production sectors (Fig. 15). The first sector produces a consumption good, and the second one produces an investment good that can be also imported. Its dollar price is taken for 1.

The representative consumer maximizes overall utility function

$$\Phi = \max \int_o^\infty (u(c) + v(m))e^{-\rho t} dt \qquad (1)$$

subject to the budget constraint

$$da/dt + pdm/dt + \pi pm = ra - pc + \Pi + (r - r_1)b + pT, \qquad (2)$$

where $u(c) + v(m)$ is an additive momentary utility function, c is consumption, m is real money holding, $\rho > 0$ is a constant rate of time preference, a is the quantity of real assets, Π is the production profit, p is a price of the consumption good, π is inflation rate, b is a volume of assets held by foreigners, T is a money transfer, r, r_1 are, relatively, domestic and world market interest rates. We assume that foreign investor needs in resident intermediaries who appropriate the difference $(r - r_1)b$. This assumption reflects the fact that operations at a domestic financial market are more costly for foreigners than for residents.

[13] Probably one can use a more standard model with composition of tradable and non-tradable goods (see , for example, Obstfeld and Rogoff (1996)). The model should be modified properly to allow for endogenous growth. This approach does not seem to be simpler. Our model contains three sectors instead of two and one consumption good instead of two in the standard models with nontradables.

It is postulated also that foreign investors spend abroad their interest payments $r_1(B/\xi)$. All prices and real money are calculated in dollars. Real money and money transfers are measured in units of consumption. Appendix 1 explains in detail how equality (2) is derived from a nominal budget constraint.

Note that the choice of p is equivalent to the choice of real exchange rate. For simplicity and following a tradition, we take labor force in each sector as a constant[14], and assume that the "consumption part" of the momentary utility function is given by

$$u(c) = c^{1-\theta}/(1-\theta), \qquad (3)$$

where $\theta>0$, $\theta \neq 1$. As usual, the No-Ponzi-Game –Condition is supposed to be valid.

The profit Π is a sum of three terms

$$\Pi = \Pi_1 + \Pi_2 + \Pi_3, \qquad (4)$$

where Π_i - is the profit of the Sector i. For simplicity we assume that all sectors have Cobb-Douglas production functions that differs only by productivity multipliers,

$$Y_i = A_i F(k_i, K), \quad F(k,K) = k^{\alpha} K^{1-\alpha}. \quad (5)$$

Here k_i is capital accumulated in the sector i, and K is the knowledge accumulated in the process of learning by doing. It is assumed that

$$K = \Sigma \beta_i k_i . \quad (6)$$

The profit of Producer i is derived from maximization of the profit

$$\Pi_i = \max\ (b_i F(k_i, K) - r k_i), \quad (7)$$

where $b_1 = A_1, b_2 = pA_2, b_3 = (q-p)A_3$, q is a fixed price of the exported good.

The following balance conditions are supposed to be valid.

$$I = \sum_{i=1}^{3} dk_i / dt - Y_1. \qquad (8)$$

$$c = Y_2 - Y_3. \qquad (9)$$

$$I = qY_3 + db/dt - r_1 b - dR/dt + r_1 R. \qquad (10)$$

Here R are accumulated reserves. The quantities b, db/dt, and R, dR/dt are supposed to be chosen by foreigners and the Central Bank, respectively.

Asset market has to be balanced as well:

$$a + b = k = \sum_{i=1}^{3} k_i, \qquad (11)$$

[14] The model may be developed to include labor allocation among sectors. It does not change our conclusions.

where k denotes total capital in the economy. Let k_0 be total initial capital. The following initial condition is postulated.

$$k_0 = k(0). \qquad (12)$$

It seems to be more natural to suppose that initial capital is fixed for each sector. In this setting, however, the study of the model would be much more complicated.

An equilibrium trajectory is defined as a set of functions, $c, a, Y_i, k_i, k, K, I, p, r, \lambda, m, \pi$, that meets maximization and balance requirements (1)-(11) as well as initial condition (12).

It follows from the equilibrium conditions above and the budget constraint (2) that the money inflow in real terms is determined by the equation

$$pdm/dt + \pi pm = dR/dt - r_1 R + pT. \qquad (13)$$

Since the momentary utility is additive, the first order conditions for the real part of our economy and, therefore, the real trajectory itself are independent on the monetary variables, m and π [15]. This fact drastically simplifies our analysis.

Recall that, in the described setting, the price of consumption p represents real exchange rate.

The described three-sector model inherits a very useful property of a standard one sector AK model: it has no transitional dynamics.

To show this, suppose that the price of consumption p is constant over time. Then maximum principle for the consumer problem (1)- (3) leads to a well known expression for the rate of economic growth, λ,

$$\theta\lambda = r - \rho. \qquad (14)$$

It is convenient to introduce the notations

$$d_1 = A_1^{\sigma}, d_2 = p^{\sigma} A_2^{\sigma}, \sigma = 1/1-\alpha. \quad (15)$$

$$d_3 = (q-p)^{\sigma} A_3^{\sigma} \text{ if } p \le q, \; d_3 = 0 \text{ if } p > q. \quad (15a)$$

$$h = h(p) = \Sigma \beta_i d_i \qquad D = D(p) = (\Sigma d_i)^{-1}. \qquad (16)$$

The following equalities are straightforward consequences of the relations (6), (16), and first order conditions.

$$K = h(p)D(p)k \quad , \qquad (17)$$

[15] This is well known property of superneutrality. It looks not very restrictive for the long term analysis.

$$r = r(p) = \alpha h^{1-\alpha}, \qquad (18)$$

$$k_i = d_i K h^{-1}, \qquad (19)$$

$$Y_i = A_i d_i^{\alpha} h^{1-\alpha} Dk. \qquad (20)$$

If p is constant then rate of return, r, is constant as well. In view of (14), the economy develops with a constant rate of growth. From the balance equality (8) one gets

$$I = \lambda k - Y_1. \qquad (21)$$

Using (10) one has an equation

$$\lambda k - Y_1 = qY_3 + db/dt - r_1 b - dR/dt + r_1 R. \qquad (22)$$

Assume that b, R grow with the rate λ. Since $k = k_0 e^{\lambda t}$, one has from (20) and (22):

$$\lambda k_0 - A_1 d_1^{\alpha} h^{1-\alpha} Dk_0 = qA_3 d_3^{\alpha} h^{1-\alpha} Dk_0 + (b_0 - R_0)(\lambda - r_1). \qquad (23)$$

This is an equation with respect to p. We assume that it has an appropriate solution, and will demonstrate that under some conditions, this is really the case.[16] If p is a root of (23), then all real variables are defined by formulas (14)-(21), (9). Rate of return, r, and rate of growth, λ, are constants, initial values of capital variables, K, k_i, and outputs, Y_i, are calculated from (17), (19), and (20). Initial values of import, I, and consumption, c, are defined by (21) and (9). All the quantities grow with the same rate, λ.

Assume now that the monetary part of our instant utility function is $\nu(m) = Nm^{1-\theta}/(1-\theta)$ where N is a positive constant. Then due to an optimality condition $m = m(0)e^{\lambda t}$, and $c(0)^{-\theta}(r+\pi) = Nm(0)^{-\theta}$. It is easy to check that if $R(0)$ is small enough then money transfer $T(0) \geq 0$ may be chosen by such a way that $T = T(0)e^{\lambda t}$ and inflation rate, π, is equal to zero. Indeed, since m and R grow with equilibrium rate of growth, λ, one has from (13)

$$p\lambda m(0) + \pi p m(0) = \lambda R(0) - r_1 R(0) + pT(0).$$

Thus if $p\lambda m(0) \geq \lambda R(0) - r_1 R(0)$, and $T(0)$ are chosen to meet equality

$$p\lambda m(0) = \lambda R(0) - r_1 R(0) + pT(0), \qquad (13a)$$

then inflation is not arisen since sterilization serves to finance growth. Experience of many fast growing economies including Russia in 1999-2004 seems to support this conclusion. [17]

[16] We postulate that the investment good is imported and the consumption good is exported. This can not be the case under arbitrary parameters of the model.

[17] It is probably valid for non-separable utility functions as well. In this case, however, the rule of money supply has to be more sophisticated.

We say that the economy follows a FER accumulation or imbalanced trajectory if $dR/dt \neq 0$. In this case trade balance $qY_3 - I$ may be positive or negative. If $qY_3 = I$, the trajectory is called a balanced one.

The integral (1) exists iff the inequality

$$\lambda < r \quad (24)$$

holds, or equivalently,

$$\rho > (1-\theta)r\,. \quad (25)$$

In what follows we compare balanced and imbalanced trajectories by the value

$$\Phi = \int_o^\infty u(c)e^{-\rho t}dt$$

along the trajectory considered.

Denote by c_0 an initial consumption that is defined by (9). Then the integral utility (24) is equal to

$$\Phi = {c_0}^{1-\theta}/(1-\theta)(r-\lambda) \quad (26)$$

for both FER accumulation and balanced trajectories. It is simple to check that

$$c_0 = Y_2 - Y_3 = Dh^{1-\alpha}[A_2{d_2}^{\alpha} - A_3{d_3}^{\alpha}]k_0\,. \quad (27)$$

Obviously, c_0 has to be positive, and, in view of our assumptions, import, I, has to be positive as well. Thus a solution, p, of the equation (23) defines an equilibrium trajectory if and only if it meets (25) and the following additional requirement

$$A_2{d_2}^{\alpha} \geq A_3{d_3}^{\alpha}. \quad (28)$$

It is equivalent to the inequality

$$q\zeta < p\,, \quad (29)$$

where $1/\zeta = 1 + (A_2/A_3)^{1/\alpha}$.

Let introduce a concept of an autarkic trajectory. It is an equilibrium trajectory of the economic system where foreign trade does not exist. Formally, one has to substitute zero for Y_3, I, b, R in the formulas above to have an autarkic trajectory. An equilibrium trajectory may be autarkic if the term of trade, q, is not favorable enough so that foreign trade does not occur.

It follows from the above consideration that reserve accumulation may influence real exchange rate and, therefore, long run growth. Below, we consider two hypotheses on the influence mechanism. The consideration uses the fact that, if real exchange rate, r, increases then the rate of growth, λ, may go up or down dependently on the knowledge accumulation coefficients β_i. Indeed, from (14) one has

$$h'(p) = \sigma[\beta_2 A_2{d_2}^{\alpha} - \beta_3 A_3{d_3}^{\alpha}]\,. \quad (30)$$

Therefore the following statement is a straightforward consequence of (16), (18), and (29).

Proposition 1. The function $h(p)$ as well as $r(p)$ and $\lambda(p)$ reach their minima at

$$p = q\zeta^*, \text{ where } 1/\zeta^* = 1+(\beta_2/\beta_3)^{-1+1/\alpha}(A_2/A_3)^{1/\alpha}. \quad (31)$$

If $\beta_2 = 0$ then $p \le q\zeta^* = q$, therefore rate of growth and rate of return both are decreasing functions of the real exchange rate. If $\beta_2 \ge \beta_3$ then $p > q\zeta \ge q\zeta^*$, hence $r(p)$ and $\lambda(p)$ increase with respect to p in the feasible aria.

Since $\theta\lambda = r - \rho = \alpha h^{1-\alpha} - \rho$, the basic equation (23) may be written as

$$h^{1-\alpha}[\alpha - \theta q A_3 d_3^{\alpha} D - \theta A_1 d_1^{\alpha} D] = \rho + \Delta \ , \qquad (32)$$

where $\Delta = (b_0 - R_0)(\lambda - r_1)k_0^{-1}\theta$. An equilibrium trajectory is balanced if $\Delta = 0$. A balanced trajectory is autarkic if $d_3 = 0$. Denote by $\Psi(p)$ the left-hand side of (32). The function $D(p)$ is decreasing since

$$D'(p) = -D^2\sigma(A_2 d_2^{\alpha} - A_3 d_3^{\alpha}) \ (33)$$

and in view of (28).

7. 3. Positive trade balance hypothesis

Let foreign investments be absent. For simplicity, we assume $r_1 = 0$. Then $\Delta = -k_0^{-1}\theta dR/dt = -R_0\lambda k_0^{-1}\theta$. For a balanced trajectory $\Delta = 0$ and trade balance is zero. At a FER accumulation trajectory, positive trade balance $qY_3 - I$ are accumulated by the Central Bank and never used. The model generates an imbalanced trajectory if a real exchange rate, p, meets the inequality

$$qY_3 > \lambda k - Y_1 .$$

Usually a continuum of imbalanced trajectories exists. It was shown above that the real exchange rate is directly connected with the speed of FER accumulation $dR/dt = qY_3 - I$. In framework of our model, FER grow with the rate λ, and the speed dR/dt is defined by initial value R_0.

Assume also that $\beta_2 = 0$ so that the production of the consumption good, Sector 2, does not contribute to the exchange rate. Then for an autarkic trajectory, one has $h(p) = \beta_1 A_1^{\sigma}$, and rate of growth does not depend on p. An autarkic real exchange rate, p_a, is defined by the equation

$$\beta_1^{1-\alpha} A_1[\alpha - \theta A_1^{\sigma}(A_1^{\sigma} + p^{\sigma} A_2^{\sigma})^{-1}] = \rho \ , \qquad (34)$$

(see(32)) .The following proposition immediately follows from (34) and (25).

Proposition 2. Let $\beta_2 = 0$. An autarkic trajectory exists (under some q small enough) if and only if the following inequalities are valid:

$$\alpha\theta > \alpha - \rho \ \Big/ \ \beta_1^{1-\alpha} A_1 > 0 . \quad (35)$$

Indeed, under these conditions the left hand side of (34), $\Psi(p)$, increases with respect to p and $\Psi(0) < \rho$, $\Psi(\infty) > \rho$.

Obviously, to prevent foreign trade the price q should meet the inequality $\Psi(q) \le \rho$.

Assume now that q is a little bit larger than an autarkic price, p_a, and consider equilibrium trajectories in a vicinity of the autarkic one.

If $\beta_2 = 0$, then $h(p)$ decreases with respect to p, and therefore r, λ are decreasing functions of p (see ((18),(14)). Thus, one gets the following important conclusion.

Proposition 3. Let p_a be an autarkic price, and the influence of consumption good sector, β_2, on the knowledge stock, K, be small enough. There exists $\bar{q}$ such that for each q from the interval $p_a < q < \bar{q}$ a small FER accumulation increases rate of economic growth. This is reached by a small real exchange rate undervaluation.

To prove the proposition, consider $\Psi(p)$, the left hand side of the basic equation (32), under β_2=0 and $q = p_a$. In view of (15a), (30), and (33), the derivative $\Psi'(p_a)$ is strictly positive. Let β_2 be small enough. If $\bar{q}$ is close enough to p_a, then a balance equilibrium exists for each q from an interval $p_a < q < \bar{q}$, and $\Psi'(p_q) > 0$ for equilibrium price p_q, $\Psi(p_q) = \rho$.

Let $p_a < q < \bar{q}$, and consider an equation (32), $\Psi(p) = \rho + \Delta$, where Δ is small. Since $\Psi(p)$ is increasing, the solution, $p(\Delta)$, is an increasing function of Δ. FER accumulation means that $\Delta < 0$. Hence, FER accumulation decreases $p(\Delta)$ in comparison to the balanced trajectory, and, in view of Proposition 1, increases rate of growth.

An increase of the growth rate may be accompanied by a decrease of initial consumption, c_0, so that the effect of undervaluation on the overall utility, Φ, is not clear a priory. The following proposition points out some conditions that guarantee a positive affect of the undervaluation policy.

Proposition 4. Let p_a be an autarkic price, and the following inequalities hold:

$$\alpha > 1/2, \qquad (36)$$

$$\alpha < p_a{}^{\sigma} A_2{}^{\sigma} / (A_1{}^{\sigma} + p_a{}^{\sigma} A_2{}^{\sigma}), \qquad (37)$$

where $\sigma = 1/(1-\alpha)$. If β_2 is small, and $p_a < q < \bar{q}$ then a small undervaluation brings initial consumption up as well as overall utility, Φ.

Proof. Taking into account that $\theta(r-\lambda) = \rho - r(1-\theta)$, one has from (26)

$\Phi'(p) = c_0{}^{-\theta}\theta[c_0{}'(r-\lambda) + c_0 r']/(r-\lambda)^2$.

Thus the sign of Φ' coincides with the sign of the function

$F(p) = c_0{}'(r-\lambda) + c_0 r'$.

In view of (30) and (33), one has from (27)

$$c_0' = -\sigma D^2 h^{1-\alpha}[A_2 d_2{}^{\alpha} - A_3 d_3{}^{\alpha}]^2 + Dh^{-\alpha}[\beta_2 A_2 d_2{}^{\alpha} - \beta_3 A_3 d_3{}^{\alpha}][A_2 d_2{}^{\alpha} - A_3 d_3{}^{\alpha}] +$$

$$+ \alpha\sigma D h^{1-\alpha}[A_2{}^2 d_2{}^{2\alpha-1} + A_3{}^2 d_3{}^{2\alpha-1}] \ . \qquad (38)$$

We take $k_0 = 1$. Assume now $p = p_a, d_3 = 0$. Since $\alpha > 1/2$, one has

$$c_0' = D\sigma A_2{}^2 h^{\alpha-1} d_2{}^{2\alpha-1}(\alpha - Dd_2),$$

where $d_2 = A_2{}^{\sigma} p_a{}^{\sigma}, D^{-1} = A_1{}^{\sigma} + p_a{}^{\sigma} A_2{}^{\sigma}$. Therefore $c_0' = D\sigma A_2{}^2 h^{\alpha-1} d_2{}^{2\alpha-1}(\alpha - Dd_2) < 0$ in view of (37).
This proves Proposition 4.

Note that the condition (36), (37) seem to be very restrictive. Moreover, the condition (36) is necessary for validity of the statement of Proposition 4. One may assume that the difference $q - p$ has to be big enough to guarantee welfare improvement due to FER accumulation.

To formulate an existence theorem for a balance trajectory, let us introduce the following assumptions.

$$\rho > \max(1-\theta)\alpha h^{1-\alpha}(p), \qquad (39)$$

$$\rho < h^{1-\alpha}(q)[\alpha - \theta A_1{}^{\sigma} D(q)], \qquad (40)$$

$$\alpha < q^{\sigma} A_3{}^{\sigma}(1-\zeta)^{\alpha\sigma} D(q\zeta) + A_1{}^{\sigma} D(q\zeta). \qquad (41)$$

The condition (39) means that $r(p) - \lambda(p) > 0$ for all p. The inequality (40) is equivalent to $I(q) > 0$. Both conditions look as restrictive ones. In fact, however, they are implied by the architecture of the AK- model and our assumption that capital is imported. The AK-model also requires $c > 0$ which implies $p > q\zeta$. For existence such an equilibrium, one needs in an additional technical restrictions of the model parameters. Condition (41) is an appropriate restriction. One may check that (41) is fulfilled if $\alpha^{1-\alpha} < A_3/(A_2 + A_3)$. The last condition is much stronger than (41), however. Note also that inequality (39) implies (35).

Proposition 5. If conditions (39)-(41) hold then a balance equilibrium trajectory exists, and $q\zeta < p^* < q$.

Proof. Let us prove that the right-hand side of equation (32), $\Psi(p)$, satisfies inequalities

$$\Psi(q\zeta) < \rho < \Psi(q) \ . (42)$$

In view of (39) one has

$$\alpha h^{1-\alpha}(p) < \rho + \theta\alpha h^{1-\alpha}(p) \text{ for all } p \ .$$

Therefore

$$\Psi(q\zeta) < \rho + \theta h^{1-\alpha}(q\zeta)[\alpha - qA_3 d_3{}^{\alpha}(q\zeta) D(q\zeta) - A_1 d_1{}^{\alpha} D(q\zeta)] < \rho,$$

where the second inequality follows from (41).
Conditions (40) implies

$$\Psi(q) = h^{1-\alpha}(q)[\alpha - \theta A_1 d_1{}^{\alpha} D(q)] > \rho \ .$$

Hence (42) is valid, and Proposition 5 follows.

Remark. It is useful to note that we proved an important statement on $\Psi(p)$: it is increasing in a vicinity of an equilibrium.

Denote $\delta = b_0 - R_0$. The inequality $\delta > 0$ means capital inflow into the economy due to foreign investments. If $\delta < 0$ then the capital flows out of the system due to reserves accumulation.

Let p^* denote an equilibrium value of the consumption good. In our model, p^* is equal to real exchange rate. It has to satisfy the following constraints

$$q\zeta < p^* \le q .$$

Proposition 6. Let (39)-(41) be valid, $\beta_2 = 0$, $\beta_3 > 0$, and $\delta = b_0 - R_0$ is small enough by its absolute value. Then an equilibrium trajectory exists, and $q\zeta < p^* < q$. If the balance equilibrium is unique, then for small δ

a) rate of economic growth increases with respect to R_0 and decreases with respect to b_0;

b) real exchange rate p^* decreases with respect to R_0 and increases with respect to b_0.

It was assumed that $dR/dt = \lambda R_0$. Hence, Proposition 6 implies that small increase of FER accumulation accelerate economic growth through real exchange rate depreciation.

The statement that foreign investments hamper economic growth seems to be paradoxical.

However, this phenomenon is totally similar to the accumulation reserve paradox. Foreign capital inflow causes depreciation of domestic currency and, therefore, create an obstacle to development of the export trade sector. In view of our assumption on the structure of externalities ($\beta_2 = 0, \beta_3 > 0, \beta_1 > 0$[18]), this sector turns out to be vehicle of economic growth, so that the negative influence of foreign investments surpasses their positive contribution.

These conclusions illustrate an important general idea: a policy may be good or bad for growth dependently on the structure of externalities. We suppose that the structure changes in the process of economic development, and these changes dictate a necessity to alter economic policy as well.

Proof of Proposition 6.

Since (42) is valid, one has

$$\Psi(q\zeta) - \Delta(q\zeta, \delta) < \rho < \Psi(q) - \Delta(q, \delta), \quad (43)$$

where $\Delta = \Delta(p, \delta) = \delta(\lambda(p) - r_1)k_0\theta$, and δ is small enough. This means that there exists a root, $p^* = p^*(\delta)$, of equation (32), and $q\zeta < p^*(\delta) < q$. Let the root be unique under $\delta = 0$. Then, for a small δ, the function $\Psi_1(p, \delta) = \Psi(p) - \Delta(p, \delta) - \rho$ is increasing with respect to p in a neighborhood of its zero, and decreasing with respect to δ. Therefore $p^*(\delta)$ is an increasing function of δ, it increases with respect to b_0 and decreases with respect to R_0. Now, the statement a) of Proposition 6 follows from the fact that $\lambda(p) = (\alpha h^{1-\alpha}(p) - \rho)\theta^{-1}$ is a decreasing function of p.

[18] This follows from (40).

Note that in a multiple equilibrium case the statements of Proposition 6 are valid for a minimal root of (32) if this root is locally unique under $\delta = 0$.

In our model accumulated reserves are considered as completely useless. Under this condition, the detected possibility of a gain is a paradoxical result. Allowing to use the reserves in the distant future would make advantages of the reserve accumulation policy much more evident. Net gains of FER accumulation could then be demonstrated under much less restrictive conditions.

The undervaluation policy may be beneficial even if the conditions formulated above are not fulfilled. Our numerical calculations reveal that there is a significant set of parameters under which small undervaluation raises overall utility. Fig. 16-18 demonstrate an example.

7. 4. Negative trade balance hypothesis

Above we consider the initial stage of building an export trade sector when export externality is comparatively strong. Assume now that $\beta_2 \geq \beta_3$, and that $\Delta = (b_0 - R_0)(\lambda - r_1)k_0^{-1}\theta > 0$ since foreign investment are effectively attracted due to FER accumulation:

$\boldsymbol{b_0 = \gamma R_0, \gamma > 1}$. Thus the trade balance turns out to be positive.

In view of the Proposition 1, the function h and the growth rate, λ, are increasing with respect to the real exchange rate. Consider again the basic equation (32)

$$h^{1-\alpha}[\alpha - \theta q A_3 d_3^{\alpha} D - \theta A_1 d_1^{\alpha} D] = \rho + \Delta .$$

It's left hand side, $\Psi(p)$, is an increasing functions in the feasible area.

A balanced solution exists and is unique if the following sufficient conditions are fulfilled

$$\psi(\zeta q) < \rho < \psi(q), \alpha > (q^{\sigma} A_3^{\sigma}(1-\varsigma)^{\sigma-1} + A_1^{\sigma})D(\zeta q)$$

The last inequality ensures $\rho > (1-\theta)r$ (or, equivalently, $\lambda > r$).

Indeed, for a balanced trajectory the equation (32) entails

$$r - \rho = h^{1-\alpha}(\theta q A_3 d_3^{\alpha} D + \theta A_1 d_1^{\alpha} D) < r\theta$$

if $q A_3 d_3^{\alpha} D + A_1 d_1^{\alpha} D < \alpha$. The left hand side is decreasing and has to be taken at $p = \xi q$.

Proposition 7. Assume $\beta_2 \geq \beta_3, \beta_2 \geq \beta_1$. Then a small FER accumulation increases rate of economic growth as well as initial consumption and, therefore, overall utility. This is reached by a small real exchange rate overvaluation.

Proof. Using relation (38) and the theorem condition, one gets

$$c_0' \geq Dh^{-\alpha}(\beta_2 - \sigma Dh)[A_2 d_2^{\alpha} - A_3 d_3^{\alpha}]^2 + \alpha\sigma Dh^{1-\alpha} A_2^2 d_2^{2\alpha-1}$$

If $\beta_2 \geq \sigma Dh$ then $c_0' > 0$. Let $\beta_2 < \sigma Dh$, then

$$c_0' \geq Dh^{-\alpha} A_2^2 d_2^{2\alpha}[\beta_2 - \sigma Dh + \alpha\sigma h d_2^{-1}].$$

The sign of the right hand side coincides with the sign of the following expression

$$\alpha + \frac{\beta_2 d_2 (1-\alpha)}{\Sigma \beta_i d_i} - \frac{d_2}{\Sigma d_i}.$$

Since $\beta_2 \geq \beta_1, \beta_3$, the following inequalities are valid

$$\alpha + \frac{\beta_2 d_2 (1-\alpha)}{\Sigma \beta_i d_i} - \frac{d_2}{\Sigma d_i} \geq \alpha + \frac{d_2 (1-\alpha) - d_2}{\Sigma d_i} > 0$$

Thus, $c_0' > 0$. Since $\Psi(p)$ is increasing, an increase in the right hand side of (32) brings the real exchange rate up and accelerates growth.

7.5. State Budget Surplus Accumulation

Accumulation of State Budget Surplus (BSA) is another instrument to devaluate real exchange rate and accelerate economic growth. This instrument is used much more rarely than FER, however. Contemporary Russia gives an interesting example: in 2002, Russian government established Stabilization Fund that was growing and reached about 10% of the yearly state budget revenue.

The influence of BSA is partly similar to that of FER. To the similarity consider a modification of the model above. However, instead of FER, we assume that the government accumulates revenue of profit taxation. This budget surplus is invested abroad into dollar assets.

Assume also that the interest income earned comes back to the budget to be added to the consumer's income. Then the consumer budget constraint (2) and foreign trade balance condition (10) have to be modified

$$da/dt + pdm/dt + \pi pm = ra - pc + (1-\tau)\Pi + r_1 S + pT, \qquad (43)$$

$$I = qY_3 - \tau\Pi + r_1 S, \qquad (44)$$

where τ - profit tax rate, S - accumulated stabilization fund, $dS/dt = \tau\Pi$. All other equilibrium requirements (1), (3)-(9), (11), (12) do not changed. The basic equation (32) also keeps its form

$$h^{1-\alpha}[\alpha - \theta q A_3 d_3^{\alpha} D - \theta A_1 d_1^{\alpha} D] = \rho + \Delta_1, \qquad (45)$$

where $\Delta_1 = (r_1 S - \tau\Pi) k_0^{-1} \theta = -\tau\Pi(\lambda - r_1) k_0^{-1} \theta \lambda^{-1}$. If rate of growth, λ, is large enough so that $\lambda > r_1$, then $\Delta_1 < 0$. Therefore, if τ is small an analogue of Proposition 6 is valid, and BSA accumulation accelerates growth.

We assumed that the source of BSA is non– distortionary profit taxation. In practice , however, one may turn down BSA to decrease distortionary taxes. This is a shortcoming of BSA in comparison with FER accumulation. At other hand, BSA does not create inflationary pressure as FER accumulation does. FER accumulation is less sensitive to rent seeking. However, taxation is much more flexible instrument. More efforts are needed to compare these two instruments.

BSA and FER accumulation both are costly since they mean that a part of resources is underutilized. Other possibilities are connected with industrial policy.

7.6 Tariffs and the real exchange rate

It was mentioned above that tariff policy sometimes coexists with active FER accumulation. This seems to be a puzzle. One has to expect that FER accumulation stimulates export trade whereas tariffs hamper it if an import good is used for the export production. In this section we show, however, that both policies may move real exchange rate in the same direction to accelerate economic growth if one takes into account learning by doing externalities.

Consider an economy depicted on Fig.15, and assume that import tariff is introduced. Assume also that the producer of investment goods does not use domestic capital ($I > k_1$ in a balanced equilibrium) and is released from import duties[19].

This new setting is equivalent to the following modification of our model. Consider production problems (7) where parameters b_i are modified:

$b_1 = sA_1, b_2 = (p/s)A_2, b_3 = (q-p)A_3/s$, where s is a domestic price of the capital good, s-1 is a tariff rate. Then (see (15a), (15))

$d_1 = s^\sigma A_1^\sigma, d_2 = (p/s)^\sigma A_2^\sigma, \sigma = 1/1-\alpha$, $d_3 = (q/s - p/s)^\sigma A_3^\sigma$ if $p \le q$, $d_3 = 0$ if $p > q$.

All other formulas that define equilibrium remain valid including basic equation (32). Let FER accumulation is absent so that Δ=0. Denote a ratio of domestic prices of exportable and importable goods by $z = p/s$. Since world market prices suppose to be constant this ratio plays the role of the real exchange rate. Thus

$d_1 = s^\sigma A_1^\sigma, d_2 = z^\sigma A_2^\sigma$, $d_3 = (q/s - z)^\sigma A_3^\sigma$ if $p \le q$, $d_3 = 0$ if $p > q$. (46)

Then the basic equation (32) may be written as

$$\Psi(z,s) = h^{1-\alpha}(z,s)[\alpha - \theta Q(z,s)]\,] = \rho, \qquad (47)$$

where

$$Q(z,s) = qA_3 d_3^{\alpha} D + A_1 d_1^{\alpha} D, \qquad (48)$$

$$h(z,s) = \Sigma \beta_i d_i, \qquad (49)$$

$$D = D(z,s) = (\Sigma d_i)^{-1}. \qquad (50)$$

Let p^* be an equilibrium price in the economy without tariffs when s=1.

The following proposition solves, at least partially, the puzzle of the simultaneous increase of tariffs and the FER accumulation.

Proposition 8. Let (39)-(41) be valid. Assume that the equilibrium is unique, and $I > k_1$. Then the following statements are valid.

a) If $\beta_1 >> \beta_3 >> \beta_2$ (β_1 is much larger than β_3 which is much larger than β_2), and $\alpha < 1/2$, $qA_3 > A_1$ then a small tariff and/or a small FER accumulation both decrease real exchange rate and accelerate growth.

b) If $\beta_3 >> \beta_2$, $\alpha < 1/2$, and $q - p^*$ is small enough then a small tariff and/or a small FER accumulation both decrease real exchange rate and accelerate growth.

[19] Without this somewhat artificial assumption, the introduction of tariff would not make any sense in our simplify model where the only input of the capital production is the capital itself.

c) If $\beta_1 > 0$, $\beta_2 \geq \beta_3$, and $\alpha > 1/2$, $q - p^*$ is small enough then a small tariff increases real exchange rate and accelerate growth, and a small FER accumulation has the opposite impacts.

The statement c) means that a small FER selling (or debt accumulation), if it is feasible, would be rational.. To some extent this result is similar to that received by Rodrik (1987).

Proof. One has

$$D_s = -D^2(d_{1s} + d_{3s}),$$

where a subscript s means partial differentiation with respect to s. We consider a response of the economy on the introduction of a small tariff or FER accumulation. Thus all derivatives are taken at a balance equilibrium without tariffs, at s=1, $z = p^*$. Our nearest task is to determine the sign of Q_s.

It is simple to check that

$$D^{-1}Q_s = d_{1s}[\alpha A_1 d_1^{\alpha-1} - Q] + d_{3s}[\alpha q A_3 d_3^{\alpha-1} - Q] =$$

$$\sigma A_1^{\sigma}[\alpha - Q] - \sigma q(q - p^*)^{\sigma-1} A_3^{\sigma}[\alpha q(q - p^*)^{-1} - Q], \quad (51)$$

where $Q = Q(p^*,1)$.

Using (39) and (47), it is easy to check also that $\alpha > Q(p^*,1)$. Therefore $\alpha q(q - p^*)^{-1} - Q > 0$ as well. If

$$q^2(q - p^*)^{\sigma-2} A_3^{\sigma} > A_1^{\sigma}, \quad (52)$$

then

$$Q_s < 0. \quad (53)$$

Indeed if $q(q - p^*)^{\sigma-1} A_3^{\sigma} > A_1^{\sigma}$ then (53) holds. I view of (52) the same is true if $q(q - p^*)^{\sigma-1} A_3^{\sigma} \leq A_1^{\sigma}$.

If the difference $q - p^*$ is small enough and $\alpha < 1/2$ ($\sigma < 2$) then (52) is valid, and $Q_s < 0$. Obviously, (52) holds if $\alpha < 1/2$ and $qA_3 > A_1$.

Let us consider now

$$h_s(p^*,1) = \beta_1 \sigma A_1^{\sigma} - \beta_3 \sigma A_3^{\sigma} q(q - p^*)^{\sigma-1}.$$

Assume that $\beta_1 >> \beta_3$ or $q - p^*$ is small enough. Then $h_s(p^*,1) > 0$, therefore also $\Psi_s(p^*,1)>0$. Remind that $\Psi(z,s)$ is an increasing function of the real exchange rate, z (see Remark to Proposition 5). Therefore a small tariff causes an up-shift of $\Psi(z,s)$ and decreases an equilibrium real exchange rate. A small RES accumulation causes an up-shift of $\Psi(z,s) - \Delta$ and also decreases z (one has to consider equation $\Psi(z,s) = \rho + \Delta, \Delta < 0$). Now recall that $h(z,s)$ is a decreasing function of z if $\beta_3 >> \beta_2$, therefore a small tariff or/and a small RES accumulation increases rate of growth.

Thus the first two statements of the Proposition 8 is proved.

The proof of the third statement uses somewhat similar considerations, and we omit them.

Let us summarize the results. We introduce a tariff by such a way to stimulate domestic production of capital goods. At the earlier stages of development foreign trade sector externality, β_3, is weak, and a domestic consumption sector externality, β_2, prevails. In this case tariffs increase real exchange rate, and the tariff policy is compatible with selling of FER (statement c)). As soon as the foreign trade sector externality becomes stronger than domestic one a FER accumulation policy turns out to be rational.

There is an obstacle to consider this interpretation of Proposition 8 as completely adequate. Its statements a), b) and c) are related to technologies with different shares of capital, α. For developed countries, this share is usually about 0.4. However, it is larger than one half for most Latin American Countries and Singapore (Barro, Sala-I-Martin (1995), p. 380-381)[20]. One may suppose that the capital share is typically decreasing when an economy is developing. If this is the case then the picture described above become more plausible.

If one believes in this explanation then the most difficult question arises: which forces and mechanisms are driving the evolution of externalities? This is an important problem for future research.

Appendix 1

In this Appendix we formulate the model of Section 4 in nominal ruble terms and show how to get the formulation in the text. One has

$$dA/dt + dM/dt = \nu A - Pc + \tilde{\Pi} + (\nu - r_1 - \pi_\xi)B + PT, \qquad (2A)$$

where M is nominal money holding, A is the nominal value of assets, $\tilde{\Pi}$ is nominal production profit, P is a nominal ruble price of the consumption good, π_ξ is rate of ruble devaluation, $\pi_\xi = (d\xi/dt)/\xi$, where ξ is nominal exchange rate in ruble/dollar term, B is ruble value of assets held by foreigners, T is money transfer in consumption term, ν, r_1 are, respectively, nominal domestic and world market interest rates. We assume that world market prices and interest rate are stable.

Let ν_1 be a rate of return paid to foreign investors in ruble terms. In view of no arbitrage condition, world market interest rate is equal to rate of asset revaluation plus rate of return. This means

$$r_1(B/\xi) = Bd(1/\xi)/dt + \nu_1(B/\xi),$$

thus $\nu_1 = r_1 + \pi_\xi$. There are empirical evidences that rate of return, ν_1, may be not equal to domestic interest rate, ν. For developing economies, one has to expect $\nu > \nu_1$. Probably, this difference may be explained, at least partially, by risk considerations. However, in our deterministic framework, we prefer to assume that foreign investor needs in resident intermediaries who appropriate the difference $(\nu - \nu_1)B = (\nu - r_1 - \pi_\xi)B$. This assumption reflects the fact that operations at a domestic financial market are more costly for foreigners than for residents.

We postulate also that foreign investors spend abroad their interest payments $r_1(B/\xi)$.

[20] In Barro, Sala-I-Martin (1995), the data on advanced countries are given for 1947-1973, and for 1960-1990.

The profit Π is a sum of three terms

$$\tilde{\Pi} = \tilde{\Pi}_1 + \tilde{\Pi}_2 + \tilde{\Pi}_3,$$

where $\tilde{\Pi}_i$ - is the profit of the Sector i.

The profit of Producer i is derived from maximization of the profit

$$\tilde{\Pi}_i = \max\ (B_i F(k_i, K) - r\xi k_i)\ , \text{(7A)}$$

where $B_1 = \xi A_1$, $B_2 = PA_2$, $B_3 = (q\xi - P)A_3$, q is a fixed price of the exported good. Since capital, k, is measured in dollars, the firm goal function has to take into account not only negative interest rate term, νk, paid to asset holders in rubles, but also a positive capital revaluation term, $\pi_\xi k$. We denote $r = \nu - \pi_\xi$, where r is domestic interest rate in dollar term. We prove that $\pi_\xi = 0$ for equilibrium trajectories, therefore $r = \nu$, and our assumption about capital measurement does not influence any conclusion.

Denote $b = B/\xi$, $b_i = B_i/\xi$, $a = A/\xi$, $p = P/\xi$, $m = M/P$, $\pi = dP/Pdt$. Then it is simple to check that (1A) and (2A) imply budget constraint (2) in the text.

Evidently,

$$dM/dt = (dR/dt - r_1 R)\xi + PT\ .$$

Since $dM/dt = Pdm/dt + mdP/dt = (pdm/dt + \pi mp)\xi$, equation (13) is valid.

Conclusions

Cross-country regressions were used to estimate the impact on growth of such policies as import protection, accumulation of foreign exchange reserves, increases of the size of the government. It turned out that the impact of these policies depends on the level of development and on the strength of institutions –f or poorer countries with weak institutions and for rich countries with strong institutions policies that are conducive to growth are exactly the opposite. We were able to identify three major groups of countries: (1) for relatively poor countries (with GDP per capita below 65% of the US level) with rapidly improving institutions (decrease in corruption by over 26% in the 1980s-90s) all three policies have positive impact; (2) for poor countries with slowly improving or deteriorating institutions increases in reserve/GDP and government revenues/GDP ratios are beneficial, but increases in import duties yield negative results; (3) for all rich countries (with GDP per capita above 65% of the US level; among these countries there is none that managed to cut corruption by over 26%) accumulation of reserves and tariff protection are detrimental to growth, whereas increases in the fiscal capacity of the government provide very little returns.

The art of the policymakers in developing countries is to enact appropriate set of policies depending on the level of development and the quality of institutions. Increases in the ratio of reserves to GDP were always good for developing countries, irrespective of the quality of institutions: the poorer was the country, the stronger was this effect. The increase in government revenues to GDP ratio was also good for growth in developing countries: the better were the institutions and the lower the GDP per capita, the stronger was this effect. Tariff protectionism was good for poor countries, but depended crucially on the quality of institutions – for countries that did not manage to decrease corruption by more than 26% over the period of 1980s-90s the impact of import duties on growth was negative. Finally, for countries approaching income levels of developed states increases in reserve/GDP ratios and

tariff protection yielded negative results, whereas positive impacts of expansion of state revenues was not sizable and diminishing with the increase in the level of development.

If one compares these policy prescriptions with the actual policies pursued by various countries in 1975-1999, it turns out that low income developing countries suffered from very diverse policy mistakes: under-accumulation of reserves, excess and insufficient protectionism, too slow growth of government revenues. Typical policy mistakes for developed countries were excess tariff protectionism, over-accumulation of reserves and too slow (in three cases – too fast) increase of the fiscal capacity of the state.

There is certainly a simultaneity problem in our regressions and more research is needed to prove that the causation runs the way we described. Using the panel data would allow to run Granger causation test, but studying growth with panel annual or even with 5-10 years interval data always poses a problem of not being able to control for too many specific historical events, like currency crises, natural disasters, wars, etc. The longer is the period for comparison, the more reasons to believe that the impact of these events on cross-country differences in growth cancels out. More promising avenue is to search for instrumental variables in each case, which is not an easy task. We believe, however, that the logical argument about causation is the strongest: we considered mostly the impact on growth of policy factors, while controlling for objective circumstances that are beyond the control of policymakers. A country can accumulate more or less foreign exchange reserves, it can impose import duties or liberalize trade, it can cut (if not increase) government revenue, but it cannot change rapidly its level of development and its quality of institutions.

There are of course political economy factors for carrying out bad or good policies, but it is of interest to find out which particular policies pay off for promoting growth before asking another reasonable question: why many countries do not follow good policies. Additional complication is that in our interdependent world "good policies" for developing countries, whether its trade protectionism or exchange rate protectionism, in most instances cannot be pursued unilaterally, without the co-operation of the West or at least without some kind of understanding on the part of the rich countries.

The recognition that potential benefits of good policies are contingent on the level of technological and institutional development should be supplemented with the understanding that developing countries are supposed to have a right to proceed with "different" set of policies in establishing tariff protection, accumulating reserves and increasing the ratio of government revenues to GDP. The evaluation of reforms in developing countries should be carried out accordingly. There is no need to add three mistakes (sub-optimal rates of tariff protection, increase in government revenues/GDP and reserves/GDP ratios) to two misfortunes (low level of technological development and poor quality of institutions).

Finally, it is important to recognize, that each of three growth promoting industrial policies has its costs – it affects negatively current consumption, even though integral consumption can increase. Different countries have most probably different preferences with regards to current versus future consumption – developing countries, especially authoritarian regimes can prioritize growth at the expense of current consumption, whereas developed countries are

less likely to sacrifice current consumption for achieving higher future consumption, and even less so – for achieving higher future GDP growth rates. This could provide another explanation, why rich countries embark less on growth promoting policies than the poor countries.

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APPENDIX

Table . 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 1975-99, %	An. av. net in-flow of FDI in 1980-99, % of GDP	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	2,20	41,83	3,88	27,61
China	4,94	13,72 (1977-99)	8,68 (1977-99)	16,31 (1999)	7,36	38,26	2,26	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	-1,10	103,37	48,8	27,33
Japan	4,18	2,37	3,42	6,76 (1999)	3,54	115,98	-0,62	11,20	-0,34*	32,01
Korea, Rep.	5,82	14,17	5,89	18,21 (1999)	2,11	58,23	-0,07	25,08	38,9	27,93
Singapore	5,87	72,76	60,55	90,52 (1998)	4,76	93,93	6,80	163,66	41,96 (1965-96)	34,57
Thailand	4,51	14,44	14,75	27,97 (1997)	4,47	41,69	1,61	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	4,27 (1990-99)	38,06	22,44 (1970-99)	28,79
Greece	3,36	9,90	6,83	15,64 (1994)	3,86	69,99	1,08	14,42	10,76	27,02
Indonesia	3,43	19,09 (1967-99)	6,65 (1967-99)	23,89 (1998)	3,36	42,54	0,93 (1990-99)	22,04	19,9	22,34
Ireland	3,89	-11,22	14,61	22,51 (1977)	2,46	93,99	2,08	49,20	57,9	18,71
Luxembourg	3,06	-3,61 (1984-99)	2,10 (1984-99)	4,29 (1985)	0,03	123,23		103,76	14,4	18,43
Malaysia	3,91	24,55	21,26	42,13 (1993)	4,19	59,12	4,36	58,80	71,1	27,83
Mauritius	3,30	6,94	14,53	32,32 (1991)	2,74	42,99	0,50	50,29	36,9	22,83
Norway	3,03	6,94	10,57	22,56 (1985)	3,91	125,96	-0,51	38,19	2,22	22,83
Portugal	3,83	-9,31	26,77	51,40 (1979)	2,86	56,78	0,98	24,98	15,28 (1960-98)	24,66
Spain	3,31	1,80	8,18	13,06 (1997)	5,25	80,05	0,61	15,56	19,2	23,13

* In 1960-84 the ratio increased by 4,09 p.p. Source: WDI.

BOX. The story of two countries: Algeria and Malaysia

Country/indicator	Algeria	Malaysia
PPP GDP per capita in 1975, $	1953	1277
Population in 1975, mln.	16	12
PPP GDP per capita in 1999, $	**5063**	**8209**
Growth rate of GDP per capita, annual average for 1975-99, %	**0.3**	**4.1**
Life expectancy in 1970-75, years	**55**	**63**
Life expectancy in 1995-2000, years	**69**	**72**
Population growth, annual average for 1975-99, %	2.6	2.6
Investment/GDP ratio, average for 1975-99, %	34	32
Budget deficit, annual average for 1975-99, % of GDP	**-1.3**	**-4.2**
Inflation, annual average for 1975-99, %	**14.1**	**3.7**
Government revenues as a % of GDP in 1995-99	29	25
Government revenues to GDP ratio in 1995-99 as a % of 1970-75	124.4	No data
Import taxes as a % of GDP, 1996-99	**4.3**	**2.4**
Increase in FOREX to GDP ratio in 1975-99, p.p.	**1**	**22**
Policy-induced increase in FOREX to GDP ratio in 1975-99, p.p.	**3.9**	**9.2**
External trade to PPP GDP ratio, average for 1980-99, %	**21**	**69**
Increase in trade/GDP ratio in 1975-99, p.p.	**-26**	**9**
Rule of law index in 2001 (ranges from –2.5 to +2.5)	**-0.97**	**0.34**
Government effectiveness index in 2001 (ranges from –2.5 to +2.5)	**-0.81**	**0.53**
Investment climate index in 2000 (ranges from 0 to 100)	**59**	**76**

Initial conditions in two countries are similar, but the quality of institutions and policy variables are different :

Algeria relied on import taxes (import substitution), whereas Malaysia underpriced its exchange rate via accumulation of reserves (export orientation). Hence the share of foreign trade in GDP increased in Malaysia, but decreased in Algeria;

Although budget deficit was higher in Malaysia, inflation was higher in Algeria;

Institutions were much stronger in Malaysia – at least by the end of the period.

Fig. 1. Increase in the ratio of exports to GDP and average annual growth rates of GDP per capita in 1960-99, %

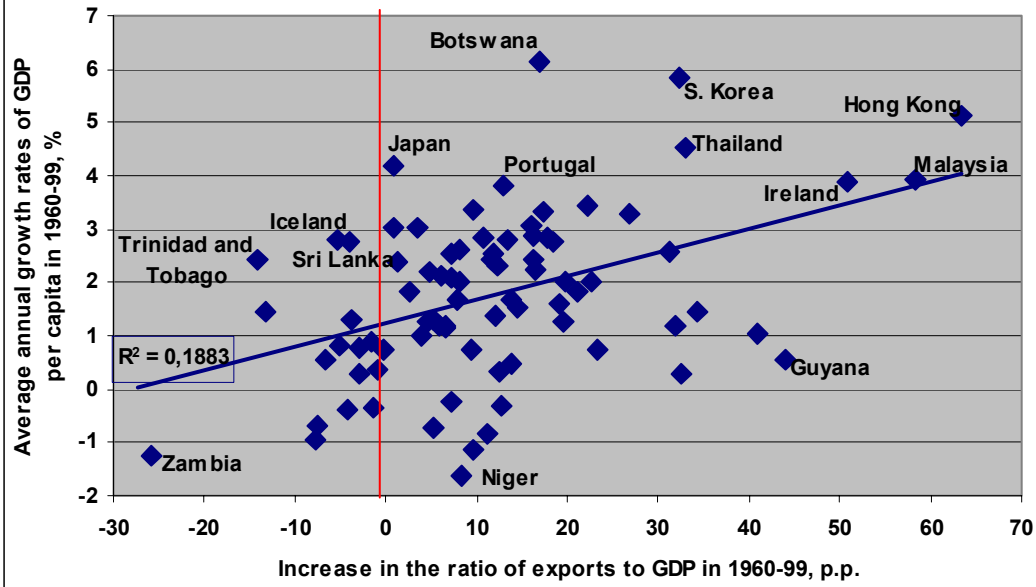


Fig. 2. Average share of exports and investment in GDP in 1960-99, %

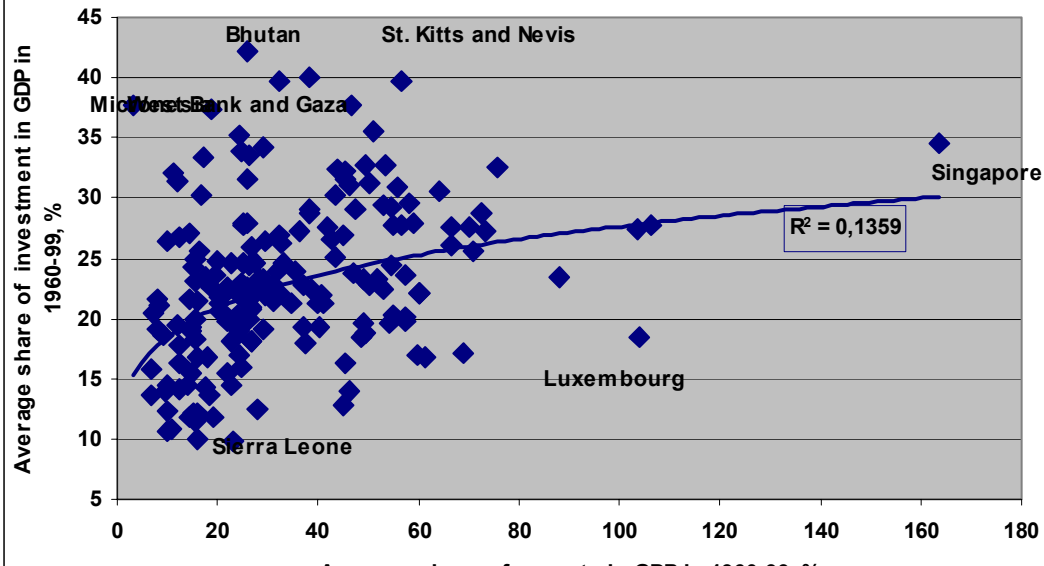


Fig. 3. Import duties as a % of import in 1975-99 and the increase in export as a % of GDP in 1980-99, p.p.

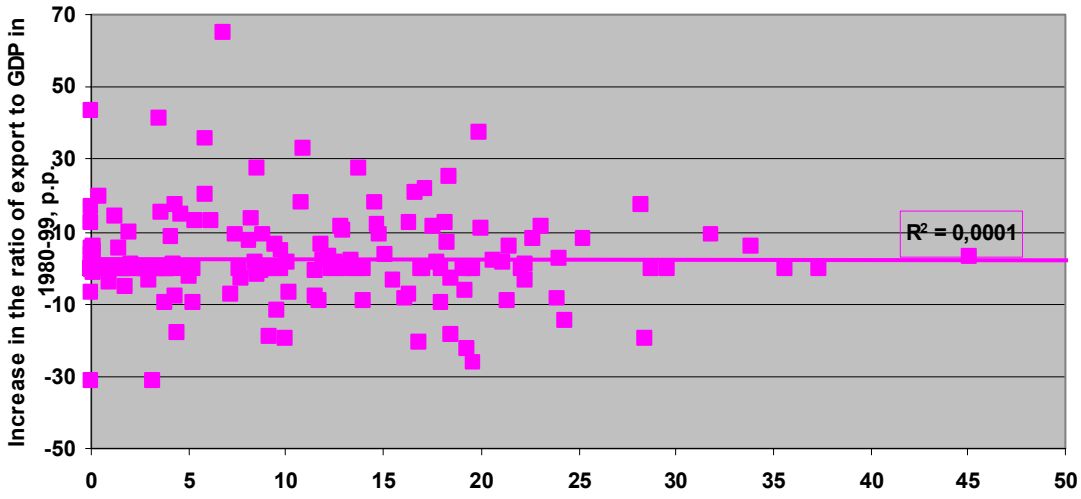


Fig.4. Average tariff rate (% of import) and growth rate of per capita GDP (%) in 1870-90 and 1890-1913

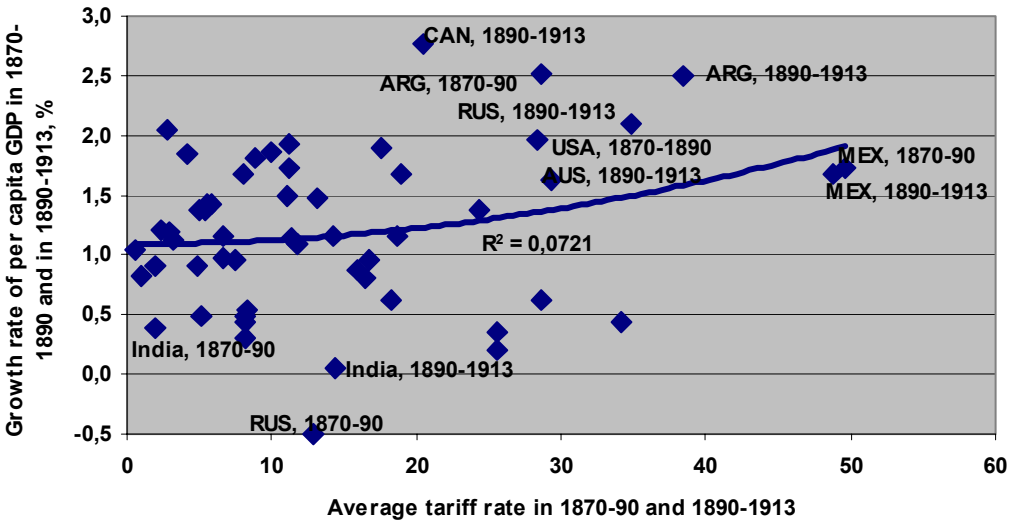


Fig. 5. Government revenues to GDP ratio in 1971-75 and in 1995-99, %, and PPP GDP per capita in 1975 as a % of the US level

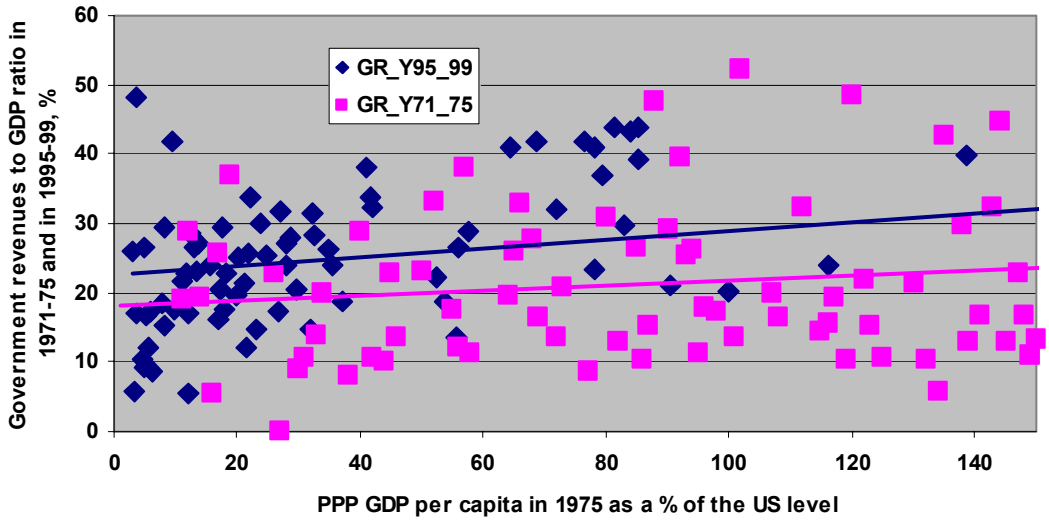


Fig. 6. Average real exchange rate versus the US $ (Year 12 = 100%) in fast growing developing economies, year "0" denotes the point of take-off

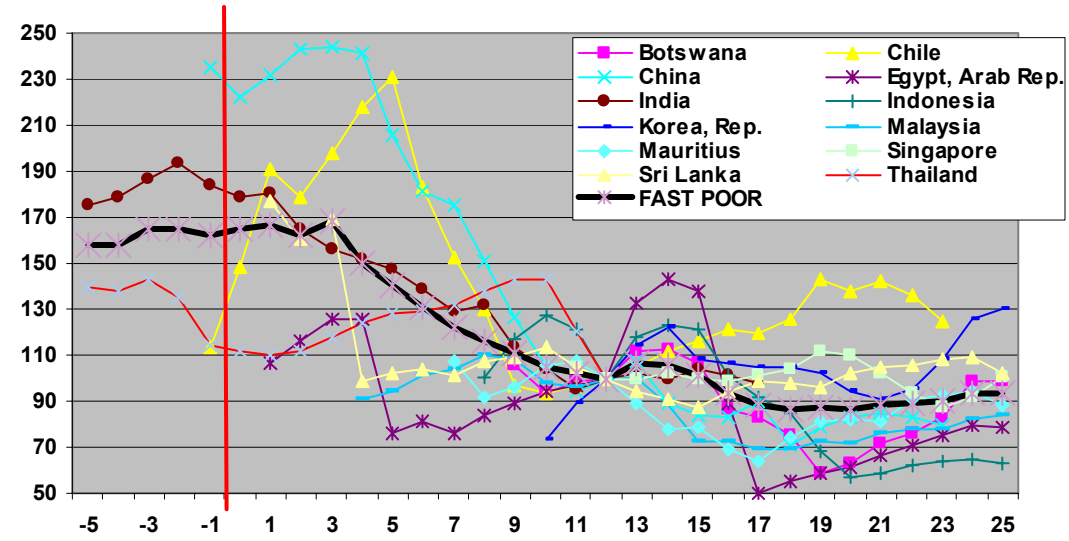


Fig. 7. Average ratio of gross international reserves to GDP and average annual growth rates of GDP per capita in 1960-99, %,

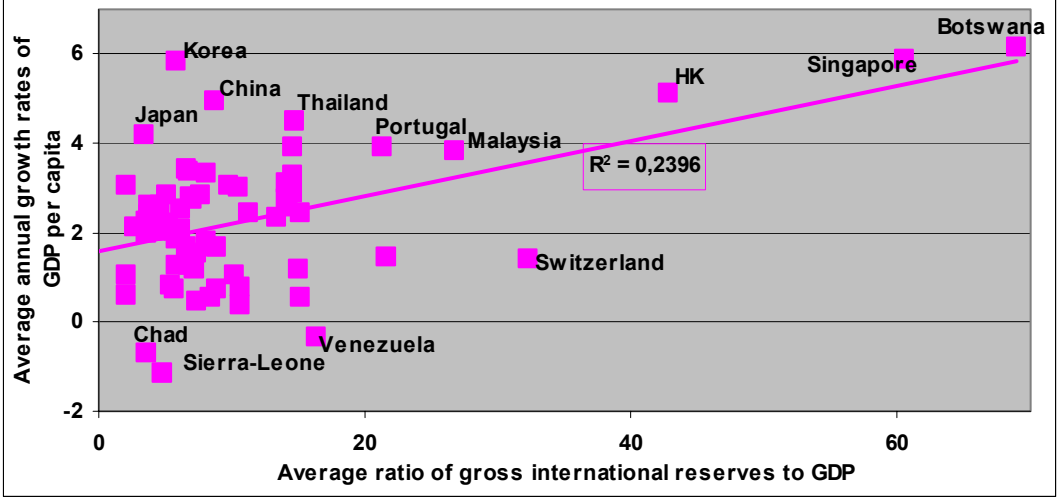
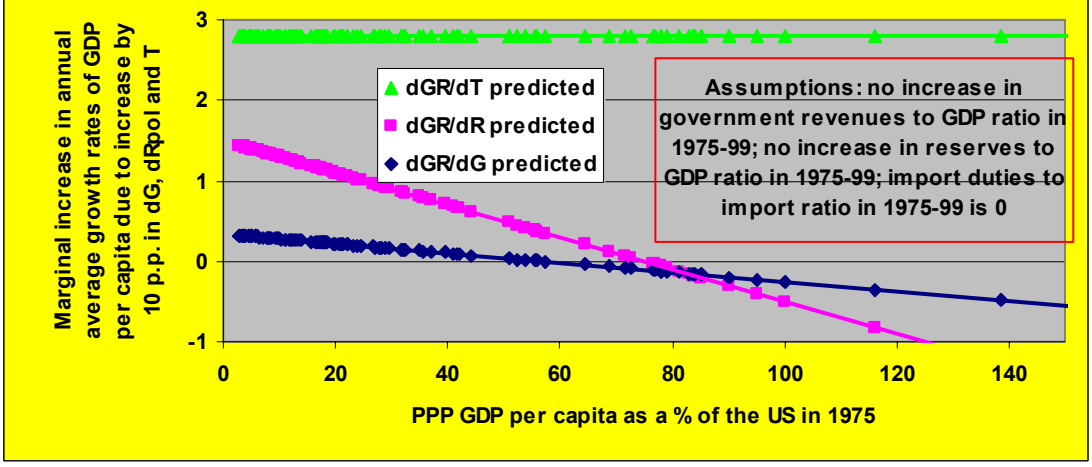


Fig. 8. Simulation: marginal impact on growth of the increase by 10 p.p. of (1) government revenues to GDP ratio, (2) reserves to GDP ratio, (3) import duties to import ratio for countries with different level of development



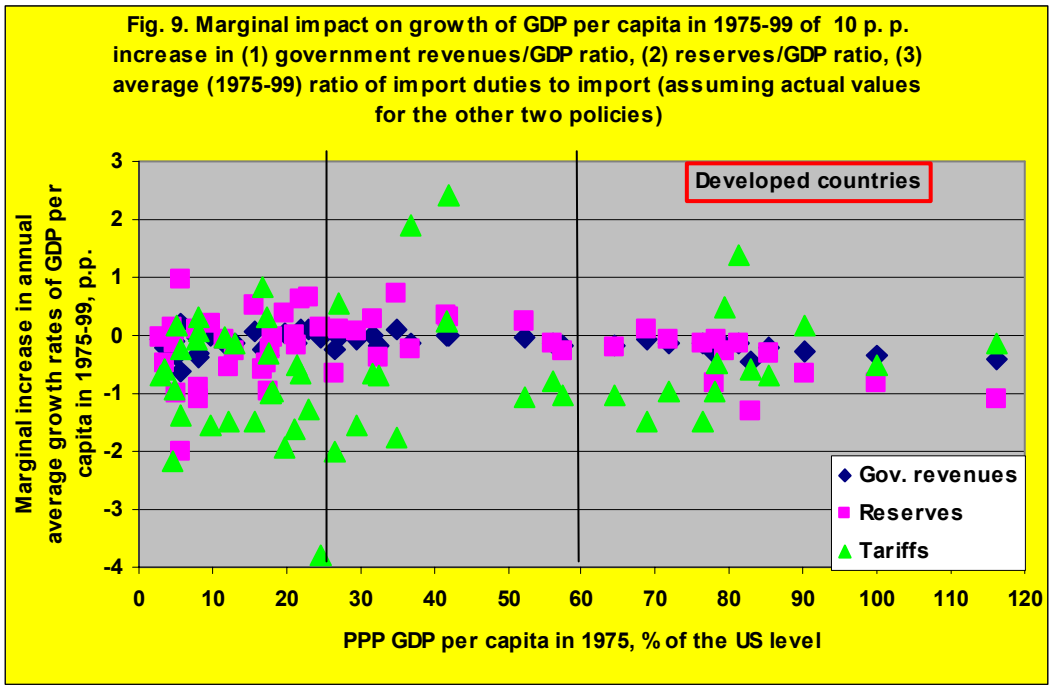


Fig. 9. Marginal impact on growth of GDP per capita in 1975-99 of 10 p. p. increase in (1) government revenues/GDP ratio, (2) reserves/GDP ratio, (3) average (1975-99) ratio of import duties to import (assuming actual values for the other two policies)
Developed countries
Marginal increase in annual average growth rates of GDP per capita in 1975-99, p.p.
3
2
1
0
-1
-2
-3
-4
0
10
20
30
40
50
60
70
80
90
100
110
120
PPP GDP per capita in 1975, % of the US level
Gov. revenues
Reserves
Tariffs

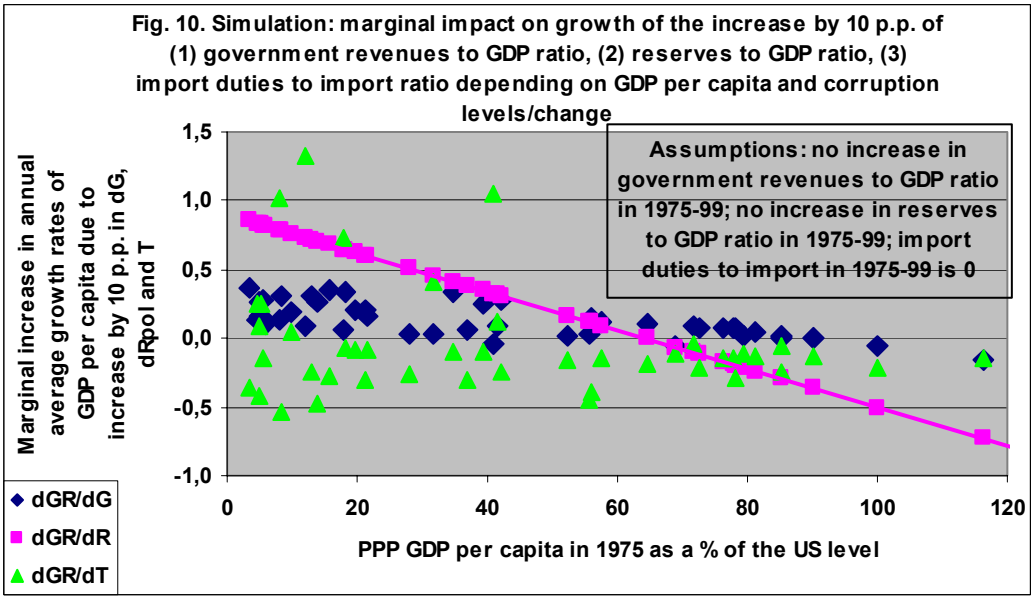


Fig. 10. Simulation: marginal impact on growth of the increase by 10 p.p. of (1) government revenues to GDP ratio, (2) reserves to GDP ratio, (3) import duties to import ratio depending on GDP per capita and corruption levels/change
Assumptions: no increase in government revenues to GDP ratio in 1975-99; no increase in reserves to GDP ratio in 1975-99; import duties to import in 1975-99 is 0
Marginal increase in annual average growth rates of GDP per capita due to increase by 10 p.p. in dG, dRpol and T
1,5
1,0
0,5
0,0
-0,5
-1,0
0
20
40
60
80
100
120
PPP GDP per capita in 1975 as a % of the US level
dGR/dG
dGR/dR
dGR/dT

Fig.11. Increase in corruption perception index in the 1980s-90s and PPP GDP per capita in 1975 in countries with different policy potential (G - gov. revenues to GDP ratio, R- reserves to GDP ratio, T- import duties to foreign trade turnover ratio, %)

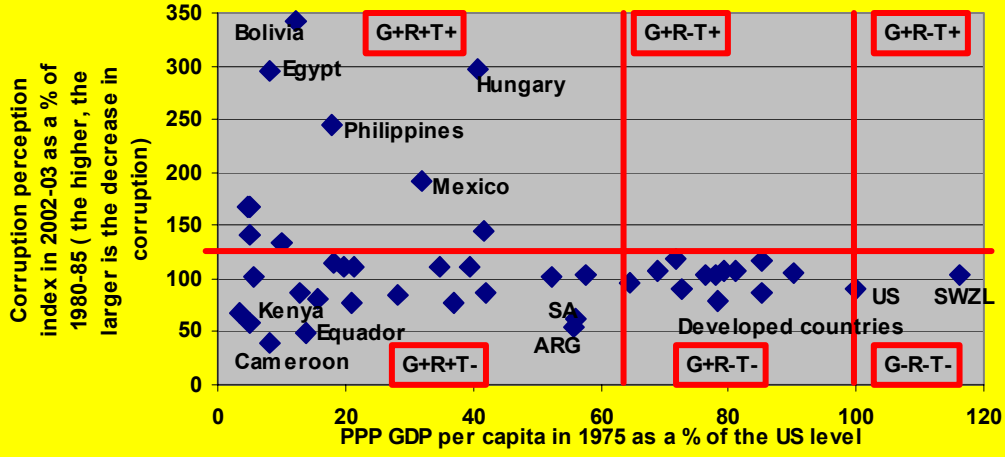


Fig. 12. Marginal impact on growth of the increase by 10 p.p. of import duties to import ratio and actual impact on growth of tariff protection

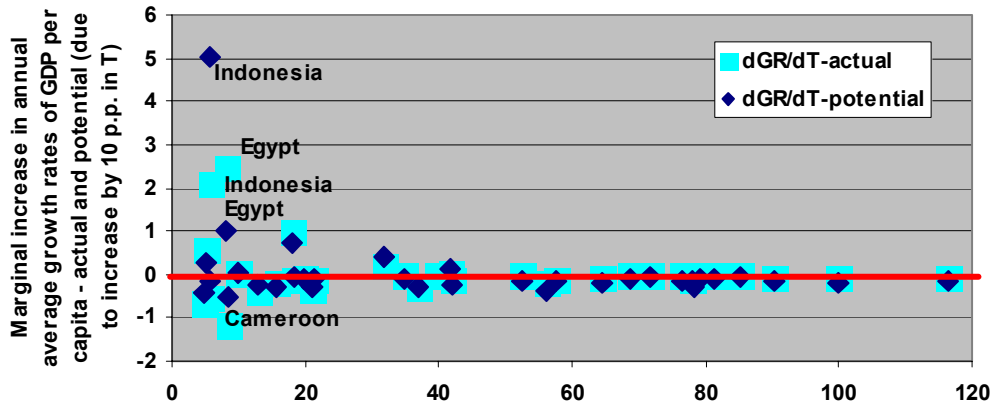


Fig. 13. Marginal impact on growth of the increase by 10 p.p. of government revenues to GDP ratio and actual impact on growth of the increase in government revenues/GDP ratio

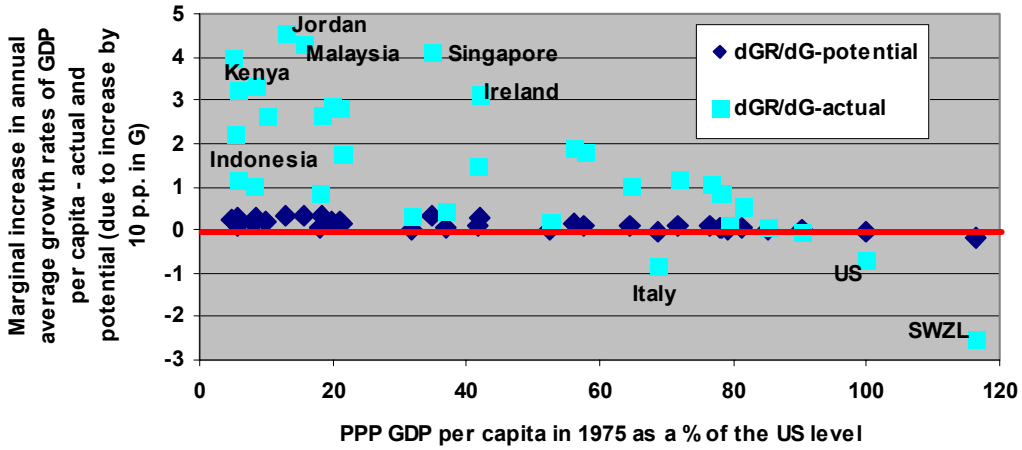


Fig. 14. Marginal impact on growth of the increase by 10 p.p. of reserves to GDP ratio in excess of objective needs and actual impact or reserve accumulation on growth

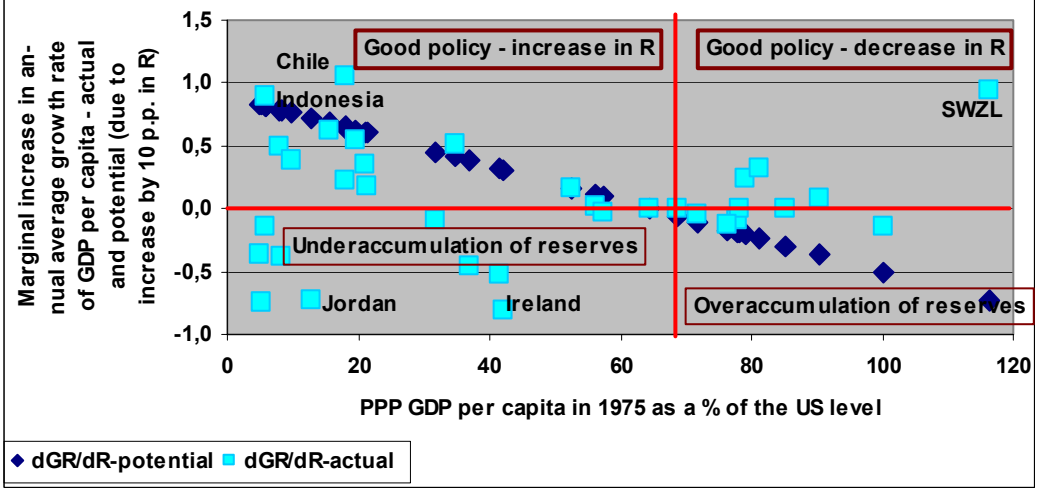


Fig 15. THE ECONOMY

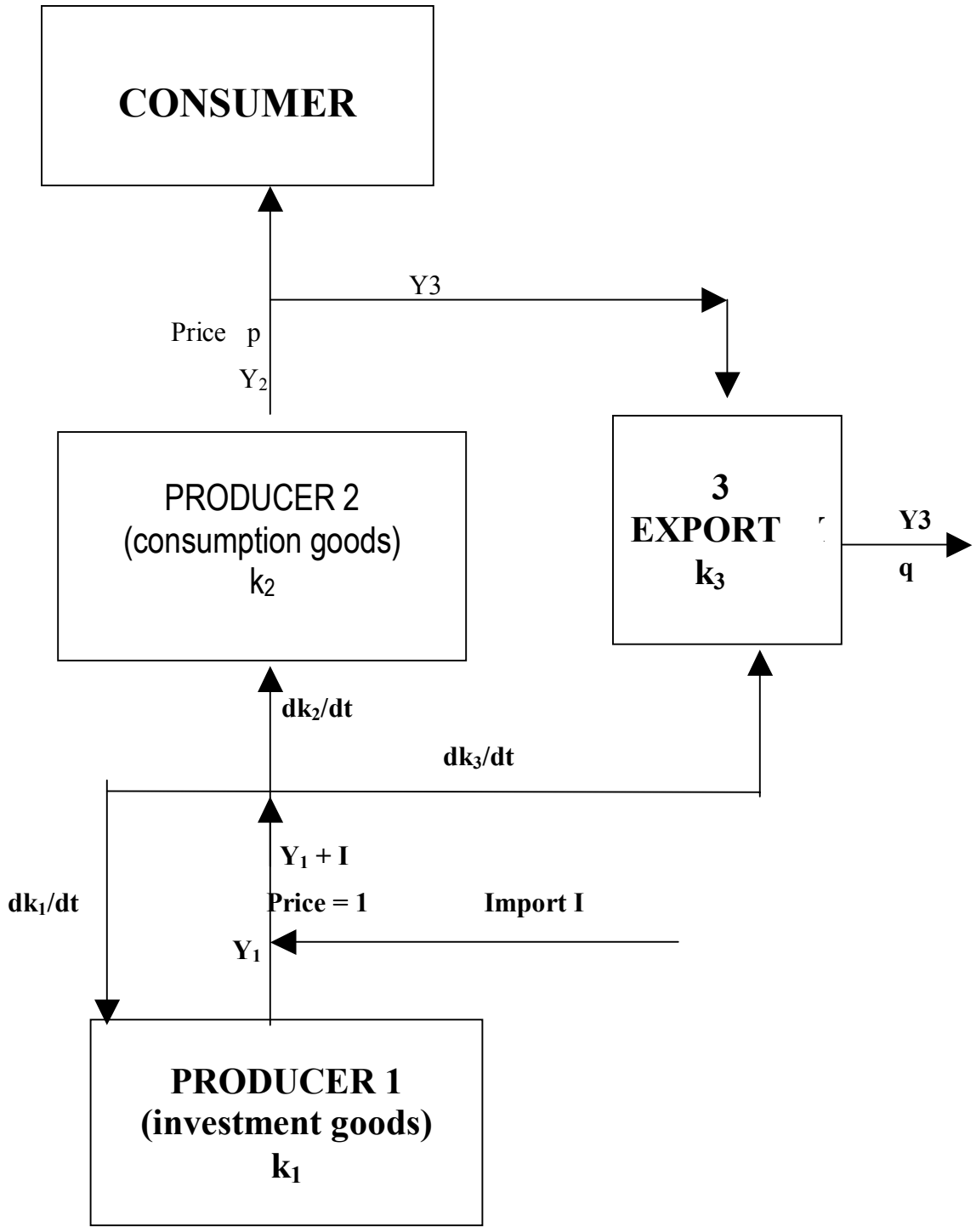


Fig. 16 . Fig. 4.2. Imbalance is better: an example

Parameters:

$A_1 = 0.3$ $\beta_1 = 1.0$ $\alpha = 0.36$ $\sigma = \frac{1}{1-\alpha}$ $\sigma = 1.5625$

$A_2 = 0.45$ $\beta_2 = 0.15$ $\theta = 0.7$ $k0 = 1$

$A_3 = 0.5$ $\beta_3 = 1.1$ $\rho = 0.055$ $q = 2$

BALANCED TRAJECTORY VERIABLES

Price : $p^* = 1.8774$

$h(p^*) = 0.2817$ $r(p^*) = 0.16$ $\lambda(p^*) = 0.15$ $Y(p^*) = \begin{bmatrix} 0.0632 \\ 0.1698 \\ 0.0431 \end{bmatrix}$ $k(p^*) = \begin{bmatrix} 0.0113 \\ 0.0569 \\ 9.4465 \cdot 10^{-4} \end{bmatrix}$

$c(p^*) = 0.1267$ $\Phi(p^*) = 179.4394$

IMBALANCE IS BETTER:

$\Phi(p^*) = 179.4394 < \Phi(0.99 \bullet p^*) = 182.0007$

Fig. 17. IMPORT (red line) AND EXPORT (blue line)

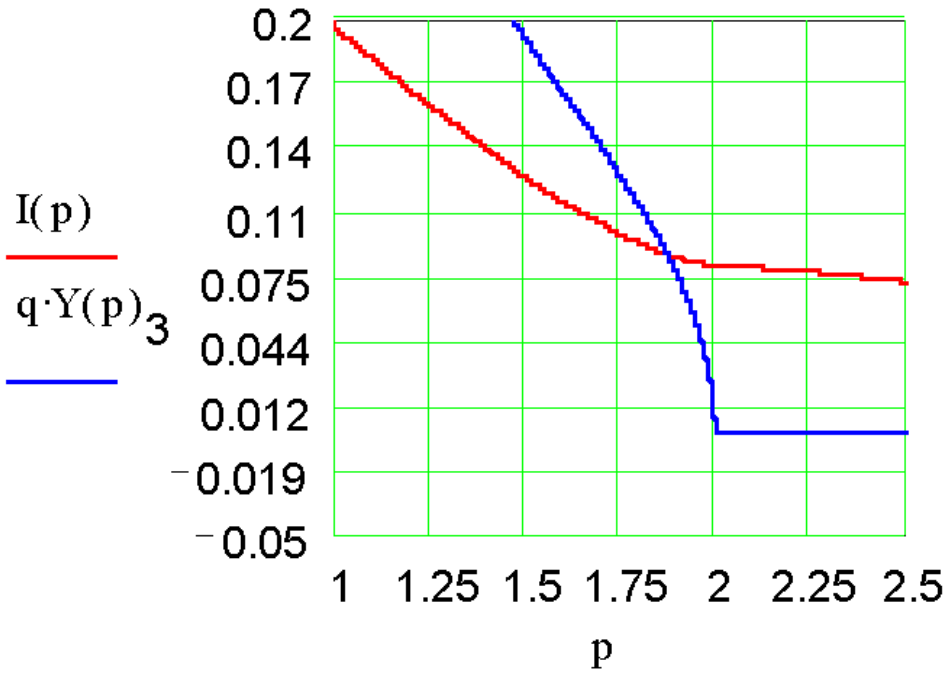


Fig. 18. UNDERVALUATION INCREASES THE UTILTY FUNCTION $\Phi(p)$

(p* = 1.8774)