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Application of the Harrod-Domar model in planning the economic growth of less developed countries

***Abstract**: In this paper, special attention will be paid to the theoretical and practical application of the Harrod-Domar model of economic growth, the mainstream of economic development analysis. The reason for this is in the fact that this model is still relevant to this day, since it promotes investments as primary component of economic growth. Harrod Domar's model is often used for planning economic development, as well as understanding development difficulties, especially in underdeveloped countries.The use of this model is explained by economists from leading international financial institutions. Even today they often use this model in order to calculate the projected GDP level of a country in the fastest manner, based on projected investments, and on that basis to determine its possibilities for external borrowing. Most of underdeveloped countries, due to a lack of domestic resources for investments, opt for borrowing. This paper analyzes the practical application of the Harrod-Domar model in planning economic growth in certain countries. Positive and negative experiences of certain countries in the application of the model are reviewed, what should help the Republic of Srpska to establish its own development model. The intention is to determine how to use the Harrod-Domar model to calculate the required investments and achieve a certain rate of economic growth in the Republic of Srpska.*

Key words: economic growth and development, investments, gross domestic product, standard of living, productivity, employment

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INTRODUCTION

The economic problems of poor countries attracted the attention of economists for the first time after the end of the Second World War. They began to deal more seriously with these issues in order to support the governments of developing countries. Their advices were based on two events that marked this period:

a) The Great Depression, that caused high unemployment and the expectation that this would happen again unless governments take some new actions, and

b) the industrialization of the USSR through savings and investments.

The Harrod-Domar model was created exactly in the post-war period based on the views of John Maynard Keynes about the importance of the role of savings and investments, as well as the claims that investments are one of the main factors of economic growth and development. In the Harrod-Domar model, labor does not play a major role in production. Under the influence of the Great Depression, it was believed that many people lost their jobs due to machines, and then in conditions of high unemployment, it was necessarry to look for a solution for economic growth that respects these circumstances. In other words, the model promises the poor countries growth in the short term through aid and investments, that has become widely popular.

The Harrod-Domar model simply indicates that the GDP growth rate ($\Delta Y/Y$ or g) depends directly on the ratio of national savings s and inversely proportional to the capital - output, k, i.e. $g = s / k$. With the target growth rate, the required savings rate is known. If the country is unable to provide that level of savings, it requires borrowing from international organizations. Economic growth requires policies that will encourage savings and induce technological progress, leading to higher investment productivity, lower capital - output.

The problems with the Harrod-Domar model are reflected in the fact that it is difficult to ensure an increase in savings, as most of less developed countries have a little tendency to save, since the population allocates a larger part of their income to consumption. Even if they have enough money to save, due to the current instability of banking institutions, saving is not a good decision. Many less developed countries are also faced with an outflow of capital and brains. Increasing efficiency is difficult. Shortages in education and trained workers suggest that institutions and research and development may be weak or underfunded, which will reduce the likelihood of increased efficiency.[2]

[2] http://prezi.com/cjtlltufza-l/growth-and-development-strategies/ (02. 04. 2012, 21.49 h).

Domar's intention was to comment on business cycles, not to derive an empirically significant growth rate. Criticisms of the model refer to claims that it is very difficult to stimulate the desired level of savings in the local economy. Overcoming the problem of lack of savings by borrowing from abroad will cause problems with debt repayment later.The reduction of marginal revenue on investment equipment exists in a way that each successive unit of investment is less productive, which means that capital output grows. The amount of investments is only one factor that affects development, there are also for example, human resources, free markets. Economic growth is a necessary but not sufficient reason for economic development. The sectoral structure of the economy (agriculture, industry, services) is also important.[3]

In application of predicting the effects of foreign aid on economic growth, the Harrod-Domar model did not achieve the expected results. There are two main reasons. The first, the impact of aid on investment in many countries has been small - much aid has been spent in one way or another, rather than invested in economic growth. The assumption that aid will simply be added to domestic savings to increase investment ignores initiatives and institutional factors, which may be important. The second, the statistical relationship between investments and growth, especially in shorter periods, is far from proportional and quite unstable in general. This largely reflects the fact that, contrary to the assumptions of the model, investments are only one of several sources of domestic product growth. Equally important are changes in work activities and education, improvements in management efficiency, industrial policy and technological changes.[4]

In an artical *Capital Expansion, Rate of Growth and Employment* from April 1946, Evsey Domar wrote about the relationship between short-term recession and investing in the US, pointing out that his model does not have a view on long-term economic growth. Easterly[5] pointed out that Domar's model was not created as a growth model, and that it was not created in terms of a growth model, so it was rejected by its creator as a growth model 40 years ago. Therefore, it is more than ironic that Domar's model became and continues to be the most widely applied growth model in history.

It has been more than half a century since the establishment of the Harrod–Domar model. Despite all the criticisms, this growth model is still "liked, current and usable" primarily by the economists of the leading international financial institution, the World Bank. They often use it in planning and interpreting the economic growth of less developed countries, when they want to determine the required investments to reach the desired growth rate. It is often used by IMF

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[3] http://www.economics4development.com/harrod_domar_model.htm (02. 04. 2012, 22.18 h).

[4] http://qed.econ.queensu.ca/pub/faculty/lloyd-ellis/econ239/readings/lloydellis3_1.pdf (03. 04. 2011, 22.52 h). (note: modified text).

[5] William, Easterly. 1997. The Ghost of Financing Gap. How the Harrod-Domar Growth Model Still Haunts Development Economics. Washington: The World bank, Development Research Group. Policy Research Working Paper World Bank. 1807, page 2. Document is available on web page: http://wwwwds.worldbank.org/servlet/WDSContentServer/ WDSP/IB/2000/02/24/ 000009265_39 71110141350/Rendered/PDF/multi_page.pdf (13. 04. 2012, 23.43h). (note: modified text).

economists, who also believe in short-term relationships between investment and economic growth.European Bank for Reconstruction and Development (EBRD) admitted in 1995 the use of the Harrod-Domar equation to project required investments. This equation warns former communist countries "that investment financing of 20 percent and more of GDP is required" to maintain "an economic growth rate of 5 percent" (in which case the ICOR is 4).[6]

Before setting up and proposing a model of the long-term economic growth of the Republic of Srpska, based on the Harrod-Domar model, it is necessary to focus a little more on the actual application of this model. In the following section will be explained the calculation of the basic variable, ICOR, and the Revised Minimum Standard Model (RMSM). An explanation is provided as to how certain less developed economies used this model in planning their own economic growth.

1. Concept and comparative analysis of icor (incremental capital output ratio) in different countries

Previous analyses have proved that the basic variable in the Harrod-Domar model is the incremental capital - output ratio - ICOR. This variable is explained by Veselinović[7], pointing out that ICOR makes it possible to determine what rate of economic growth can be achieved with a given rate of investment, and conversely, what rate of investment is required to reach a certain rate of economic growth. Writing about ICOR, in the context of investments, Lovrinčević, Mikulić and Marić state that a higher value of ICOR means a lower investment efficiency because for the same growth rate of real GDP, it is necessary to have a higher share of investments in GDP. The reverse is also true, a lower ICOR value means higher investment efficiency.

This paper will present the data and method of calculation of the ICOR variable taken from USAID, *The CountryCompass website*, since it was determined that this international organization has a database and a methodology for creating this variable for almost all countries of the world, which is based on relevant source, data from the *World Development Indicator*.

The explanation and the method of calculation of ICOR provided in the dictionary of *The CountryCompass website* says: "ICOR shows the amount of capital investment incurred per additional unit of production. A higher value represents a lower investment efficiency. ICOR is calculated as the ratio of the investment share in GDP to the GDP growth rate, using five-year

[6] William, Easterly. 1997. The Ghost of Financing Gap. How the Harrod-Domar Growth Model Still Haunts Development Economics. Washington: The World bank, Development Research Group. Policy Research Working Paper World Bank. 1807, page 15. Document is available on web page: http://wwwwds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2000/02/24/ 000009265_3971110141350/ Rendered/PDF/multi_page.pdf (13. 04. 2012, 23.43h). (note: modified text).

[7] Veselinović, Petar. 2010. Economics, second revised edition. Belgrade: Singidunum University, Faculty of Tourism and Hotel Management. page 285. (note: modified text).

averages for the numerator and denominator. International reference data points computerized in the World Development Indicator, the latest annual publication, are based on five-year averages of the share of fixed investments (NE.GDI.FTOT.ZS) and five-year averages of GDP growth (NY.GDP.MKTP.KD.ZG).”[8]

Most of the time economists agree that desirable ICOR values range from 2 to 5. ICOR is used today mainly in analyses and forecasts of growth trends in the group of middle-income countries, which also include transitional countries, since in these countries the impact of economic growth rates on ICOR is more significant than in low-income countries. Countries that use technology more efficiently and use capital-saving technology, have a lower ICOR than countries that invest in capital-intensive industries. This means that a higher ICOR leads to a lower growth rate. Highly developed countries have recorded low growth rates in recent years, leading to higher ICOR.

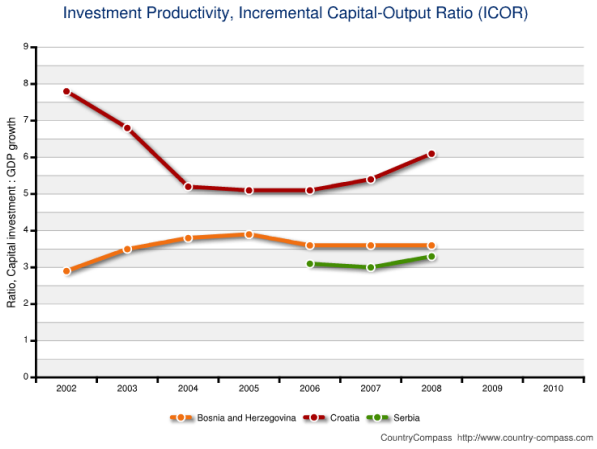
Observing 11 transitional countries Lovrinčević, Mikulić i Marić[9] conclude that: „a) high growth rates in certain transitional countries in the observed period (1994–2002) are the result of more efficient investments (smaller ICOR), not a larger volume of investments in GDP, and b) high rates of economic growth and low ICOR may be a consequence of the initial transition decline, but that connection is not verified.

On graph 1.1. is presented a comparative analysis of ICOR values in the period 2002–2010 for Bosnia and Herzegovina, Croatia and Serbia based on the calculation of this variable according to USAID methodology, *The CountryCompass website*. In 2008, the value of ICOR for Bosnia and Herzegovina was 3.6, Croatia 6.1. and Serbia 3.3. In this year, investments in Serbia were the most efficient, as it is known that a lower ICOR value is preferable.

Graph 1.1. Investment Productivity, Incremental Capital – Output Ratio (ICOR) for B&H, Croatia and Serbia from 2002 to 2010

[8] http://www.countrycompass.com/data/postconflict/glossary.php?iid=12S2&s=t (05. 04. 2012, 22.34 h).

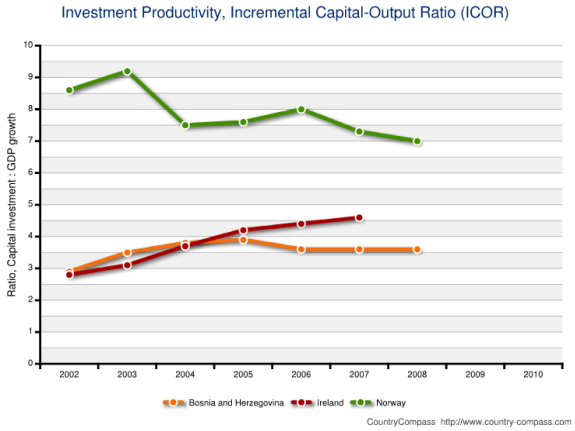
[9] Lovrinčević, Željko, Davor Mikulić i Zdravko Marić. 2004. Investment Efficiency and FDI – old story, new circumstances. Zagreb: Economic overview: monthly edition of the Croatian Association of Economists Zagreb (0424-7558) 55 (2004), 1–2; 3–43. According to Bogdan, Željko. The impact of FDI on the economic growth of European transitional countries. Zagreb: University of Zagreb, Faculty of Economics. Series of Articles. Article no 09-06, page 14. The paper is entirly available on the web page: http://web.efzg.hr/RePEc/pdf/Clanak%2009-06.pdf (06. 04. 2012, 22.45 h). (note: modified text).



Source: http://www.countrycompass.com/data/standard/timeseries.php?lb=c&pcid=26 &syr= 2002&eyr=2010&iid[]=11S2 (06. 04. 2012, 15.02 h).

ICOR values for countries with an approximate number of inhabitants, for Bosnia and Herzegovina, and for two developed European countries, Ireland and Norway, for the period 2002–2010, is shown on graph 1.2.

Graph 1.2. Investment Productivity, Incremental Capital – Output Ratio (ICOR) for B&H, Ireland and Norway for the period 2002–2010



Source: http://www.countrycompass.com/data/standard/timeseries.php?lb=c&pcid=26&syr=2002 &eyr=2010&iid[]=11S2 (06. 04. 2012, 15.05 h).

In the period 2002–2005, Ireland and Bosnia and Herzegovina recorded similar values of ICOR, which indicates that investments in both countries were equally efficient. ICOR values in Norway deviated significantly, they ranged between 9.2. and 7. Higher values of ICOR indicate lower growth rates of this economy from 2002 to 2010, and high investments in research and

development and capital-intensive industries.The comparison of ICOR given in table 1.1. is also interesting for China, Japan, Korea and Taiwan, during periods when these economies recorded high growth rates.

Table 1.1. The comparison Incremental Capital – Output Ratio (ICOR) for China, Japan, Korea and Taiwan, during the periods of high growth

		Investment growth (% BDP)	BDP growth (%)	ICOR
		a	b	a/b
China	91–95	39,6	11,6	3,4
	96–00	37,6	8,4	4,5
	01–03	40,5	8	5,1
	1991–2003	39,1	9,5	4,1
Japan (1961–1970)		32,6	10,2	3,2
South Korea (1981–1990)		29.6	9.2	3.2
Taiwan (1981–1990)		21.9	8.0	2.7

Source: http://www.rieti.go.jp/en/china/04061801.html (07. 04. 2012, 21.51 h).

From the table 1.1. it is observed that from 2001 to 2003 China invested 40.5% of GDP and achieved 8% GDP growth, ICOR was 5.1 (40.5/8). China's average ICOR from 1991 to 2003 was 4.1, which is much higher than for Japan, South Korea, and Taiwan during their high growth periods. Despite the fact that during the 1960s, Japan's GDP growth was 10.2%, much higher than in China in the period 1996–2003, the share of investments in GDP was 32.6%, so the ICOR was lower, hovering around 3.2. The ICOR for South Korea and Taiwan in the 1980s was 3.2 and 2.7, which is much lower than in China during the 1990s.

In table 1.2. ICOR was calculated for the Republic of Srpska and Bosnia and Herzegovina, based on the database of economic indicators of the Investment and Development Bank of the Republic of Srpska and USAID data, *The CountryCompass website*.

Table 1.2. Investment Productivity, Incremental Capital – Output Ratio (ICOR) for the Republic of Spska and Bosnia and Hercegovina for 2009.

	2004	**2005**	**2006**	**2007**	**2008**	**2009**
	1	**2**	**3**	**4**	**5**	**(1 + 2 + 3 + 4 + 5) / 5**
Share of realized investments in GDP (in %)	15,9	17,3	14,9	18,6	21,0	17,54
Average GDP growth rate (in %)	6,8	7,1	6,0	6,7	6,2	6,56
ICOR of the Republic of Srpska						**2,67**
Share of realized investments in GDP (in %)	17,3	21,9	24,9	29,5	24,7	23,66
Average GDP growth rate (in %)	6,1	5	6,2	6,8	5,4	5,9
ICOR of Bosnia and Herzegovina						**4,01**

Source: Creation of a doctoral student based on the database of economic indicators of the Republic of Srpska, downloaded from the Internet page: http://www.irbrs.net/Statistika.aspx?tab=1&lang=cir

(01.11.2011.21:30h), and data about ICOR in B&H, downloaded from the Internet page: http://www.countrycompass.com/data/postconflict/dataworksheet.php?lb=c&pcid=26&syr=2005&eyr=2008&iid%5B%5D=12S2 (08. 04. 2012, 24.12 h).

After explaining the ICOR variable, it is necessary to briefly explain the Revised Minimum Standard Model - RMSM, a statistical model created by the World Bank, based on the Harrod-Domar model, with the aim of making a direct connection between medium-term growth and its financing.

2. Purpose, structure and function rmsm (revised minimum standard model)

The World Bank used the Revised Minimum Standard Model (RMSM, known as RimSim in the jargon of this institution) in the 70s and 80s of the 20th century to predict the economic development of developing countries, calculating through it the necessary level of foreign aid that will compensate lack of savings. The model was very popular because of its simplicity, which also created certan limitations. As such, it is based on the Harrod-Domar model. Simply, if consumption falls or external borrowing increases, the desired rate of economic growth is not achievable, and this is a signal that policies need to be changed. The amount of investments is controlled by ICOR.

For example, in one of its early uses, the World Bank in 1975 set a target economic growth rate of 7.7 percent for Kenya in the period 1974–1978, which causes the required level of investment of 26 percent, and the generally desirable ICOR of 3.4 percent. This thinking entails a financing gap larger than existing financing, and World Bank economists say that a lower target rate of economic growth of, for example 5.5 percent is not an "acceptable alternative" because the already poor income may decline further (GDP growth in Kenya in the period 1974-1978 was 4.5 percent).[10]

The RMSM was created in 1973 as a means of consistent access to World Bank projections with the intention of facilitating comparisons between countries. These goals are met through the provisions of a standard list of variables and a minimum set of economic relations. RMSM is a tool for thinking and planning. Its primary purpose is to show users what level of investment,

[10] William, Easterly. 1997. The Ghost of Financing Gap. How the Harrod-Domar Growth Model Still Haunts Development Economics. Washington: The World bank, Development Research Group. Policy Research Working Paper World Bank.1807. str 10. Document is available o the web page : http://wwwwds.worldbank.org/servlet/WDSContentServer/ WDSP/IB/2000/02/24/ 000009265_3971110141350/ Rendered/PDF/multi_page.pdf (13. 04. 2012, 23.43 h). (note: modified text).

imports and external borrowing is required for the target GDP growth rate. Planners choose a realistic growth rate that will determine what level of investment is necessary.[11]

The basic expanded version of RMSM was created later in the 90s of the XX century. It is known as the Revised Minimum Standard Model eXtended (RMSM-X). RMSM-X serves as a working tool for World Bank economists to facilitate their analysis of the economic policy package, and help in the projections of three key documents: Country Assistant Strategy, review of the country's portfolio in relation to credit risk, and structural adjustment operations.

The World Bank's RMSM-X production function can be represented as following:[12]

Production = f (land, labor, capital, technology),

where are:

– land - resources and environment,
– workforce – health, population and education,
– technology - investment strategy.

The Harrod–Domar production function omits all factors of basic production, except for capital. This means that there is no connection of the RMSM-X model with the consideration of the impact of health and education on labor productivity, the conservation of resources and production, the impact of environmental factors on health and productivity, or the impact of population growth on the workforce, or the development strategy on technological investments.
The RMSM-X model consists of two models: the flow-fund model - popularly called RMSM-X and the external debt model. The basic version of RMSM-X contains four economic agents or sectors: public, private, financial and external. The public sector is defined as the central government, and the financial sector is defined as the monetary system, which consists of the Central Bank and deposit bank. This means that the private sector (the so-called private sector is interpreted as the other sector, i.e. regardless of the sector, users who are not separated are specifically located in this private sector) or the appropriately marked sector of the rest of the economy additionally contains households and private companies, government agencies, parastatals and non-monetary financial institutions. The external sector is simply the balance of payments seen outside the country, which means that loans and debts are turned away from the view of the normal balance of payments.[13]

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[11] Addison, Doug. 1989. The World Bank revised minimum standard model (RMSM): concepts and issues, Volume 1. Policy Research Working Paper. Washington DC: The World Bank. Paper is entirely available on webpage:http://econ.worldbank.org/external/default/main?pagePK=64165259&theSitePK=469372&piPK=64165421&menuPK=64166322&entityID=000009265_3960927223714 (08. 04. 2012, 21.25 h). (note: modified text).

[12] Barney, Gerald O. i Matteo Pedercini. Models for National Planning. USA: Millennium Institute (MI). Paper is available on the web page: http://www.systemdynamics.org/conferences/2003/proceed/PAPERS/247.pdf (09. 04. 2012, 20.26 h). (note: modified text).

[13] Ranaweera, Thilak i Jos Verbeek. Integrated global models of sustainable development. Vol. 1. The Revised Minimum Standard Model Extended (RMSM-X). USA: World bank. Development Data Group, page 3. Paper is

RMSM-X and the Harrod–Domar production function were criticized intensively, but that did not help. For many years, criticisms of the World Bank and IMF models have been quite serious, coming from these institutions. William Easterly, before leaving the bank, wrote a rather honest and severe criticism in a paper from May 1997, *The Ghost of Financing Gap: How the Harrod-Domar Growth Model Still Haunts Development*. While many people recognized several limitations of RMSM-X, no one at the World Bank with a good technical understanding of the RMSM-X problem seems to have felt responsible for making changes to the model, so the model has continued to be used for decades. It was especially popular in the early 1980s, when most countries in Latin America and Africa were facing debt repayment problems. In fact, RMSM-X reflects the thinking of many international organizations on issues of economic development of individual countries. This is especially visible in the countries of Central and Eastern Europe, in the case of their transition from communism to capitalism or the example of the post-war reconstruction of certain countries (such as Uganda in 1996).

There are several examples of the practical application of the RMSM-X model by economists of the World Bank, in different regions and countries in the last few decades. For the purposes of this analysis, three models that were popular in the 90s of the 20th century will be briefly presented here:

- **RMSM-X model for Chile:**

The RMSM-X model for Chile is one of a series of models that includes several models that include, in increasing order of complexity, the RMSM-XX and MACOR models. The three models share the same budget accounts for the economy broken down into several sectors, such as the private, public, financial and external sectors, and are organized within the framework of the movement of funds. The RMSM-X model combines simple behavioral structures with a basic accounting framework and can be explained recursively to use macroeconomic consistent projections for a set of endogenous variables. RMSM-XX will determine more the links between economic variables and will require simultaneous solution procedures. MACOR is a standard medium-sized macroeconomic model that introduces more sophisticated behavioral structures into the basic accounting framework.[14]

- **RMSM-X model for Turkey:**

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available on the web page: http://www.eolss.net/Sample-Chapters/C15/E1-47-06.pdf (09. 04. 2012, 21.33 h). (note: modified text).

[14] Practical application of RMSM-X model for Chile is presented in the paper: Servern, Luis. 1990. A RMSM-X (Revised Minimum Standard Model) for Chile, Volume 1. Policy Research Working Paper World Bank. Washington: The World Bank. The paper is available on the web page: http://econ.worldbank.org/external/default/main?pagePK=64165259&theSitePK=469382&piPK=64165421 &menuPK=64166093&entityID=000009265_3960929193051 (10. 04. 2012, 21.01 h). (napomena: modifikovan tekst).

To improve macroeconomic modeling capabilities, the RMSM-X and RMSM-XX models were developed, which share a common accounting framework and ensure economic consistency between economic sectors. The RMSM-X model for Turkey clarifies budget constraints and clear market conditions, based on a detailed theoretical model and a complete set of historical data. The debt model is presented, as well as alternative debt settlement procedures.[15]

- **RMSM-X model for Egypt:**

The RMSM-X model for Egypt focuses on the efficiency of investment in industry and the link between investment and growth. The uniqueness of the model is in the sectoral growth model that links overall macroeconomic performance with sectoral output and investments. In Egypt are shown reforms together with the model.

The simulation is presented as a risk scenario, showing what can happen if there is a lag in the case of domestic politics.[16]

The analysis of the application of the Harrod-Domar model by economists of the World Bank or the governments of some developing countries indicates differences between theoretical thinking about the problems of economic growth and the actual application of the model, the results of its use, which do not correspond to the given theoretical assumptions. It is necessary to look at this, in order to correctly approach the projections of the economic growth of the Republic of Srpska with the use of this model, adapted to nowadays.

3. Analysis of the application of the harrod-domar model in economic growth planning - practical examples of the use of the model in individual countries

The Harrod-Domar model implies the promotion of investments through government planning and it is adopted by the need to accelerate economic growth in underdeveloped economies. The Harrod-Domar model provides a framework for economic planning in developing countries. An example of these claims is India's first five-year plan.

[15] Practical application of RMSM-X model for Turkey is presented in the paper: Everaert, Luc, Garcia-Pinto, Fernando i Ventura, Jaume. 1990. A RMSM-X model for Turkey. Policy Research Working Paper World Bank. Washington: The World Bank. The paper is available on the web page: http://documents.worldbank.org/curated/en/1990/08/700192/rmsm-x-model-turkey (10. 04. 2012, 21.20 h). (note: modified text).

[16] Practical application of RMSM-X model for Egypt is presented in the paper: Karsten Nimb Pedersen. 1993. An Extended RMSM-X Model for Egypt: Quantification's of Market-Oriented Reforms. Policy Research Working Paper World Bank. Washington: The World Bank. The paper is available on the web page: http://siteresources.worldbank.org/INTMENA/Resources/WP7.pdf (10. 04. 2012, 21.57 h). (note: modified text).

- **Harrod–Domarov model based of example of India's economic growth**

India's economic development is based on planning, through five-year plans and it is created, executed and supervised by the Planning Commission, that was formed by the Government of India after the independence of this country, a former British colony. The first five-year plan (1951–1956), adopted by the Parliament of India at the end of 1951, was based on the Harrod-Domar model.[17]

The program had two goals: the first was to correct imbalances in the economy (due to the influx of refugees, serious food shortages, inflation) and to initiate balanced development that could provide an increase in national income and a stable improvement in the living standard.[18]

The plan also had historical importance for India, since it represented the first domestic development program, prepared by a number of Indian doctoral students, educated at prestigious foreign universities, who found employment in the Planning Commission. The Government of India has continued the policy of adopting and implementing five-year development plans. The 11th Plan (2007–2012) is now under implementation.[19]

In the middle of 1951, the Planning Commission presented the Draft of the first five-year plan, which consisted of two parts. The first part consisted of a large number of projects that will be implemented in any case, while the second part contained projects that will be implemented only in case international aid is provided. In this form, the plan underwent a large number of consultations with all relevant professional and political structures in the country, even with the citizens themselves. Its final form consisted of the final number of projects, which were included in the form of a single document. The total budget of the plan of 23560 million Indian rupees is divided into seven areas: irrigation and energy (27%), agriculture and development of the European Community (17.4%), transport and communications (24%), industry (8.4%), social services (16.64%), land renewal (4.1%) and other sectors and services (2.5%).

The plan emphasized agriculture, irrigation, and electricity to reduce the country's dependence on grain imports, address food shortages, and reduced the problem of raw materials, especially jute and cotton. About 45% of the resources were allocated to agriculture, while industry received a modest 4.9%. The goal was to maximize the social product from agriculture, which will then provide an incentive for industrial growth. Although the first plan was adopted fast, it is considered to have successfully fulfilled its objectives. Agricultural production

[17] the data in this analysis is based on the First Five Year Plan (1951–1956), adopted by the Planning Commission of India, which can be downloaded from the website:
http://planningcommission.gov.in/plans/planrel/fiveyr/welcome.html (11. 04. 2012, 21.52 h).

[18] http://ib-economics.wikispaces.com/Harrod-Domar+Growth+Model (12. 04. 2012, 20.07 h).

[19] a brief overview of the goals of all 11 five-year plan, as well as its content, is available on the web page: http://www.tradechakra.com/indian-economy/five-year-plans/index.html i
http://planningcommission.gov.in/plans/planrel/fiveyr/welcome.html (12. 04. 2012, 21.23 h).

increased dramatically, national income increased by 18%, per capita income about 11% and per capita consumption by 9%.[20]

Appart from the fact that after independence India faced a lack of savings and capital, it is considered that the first plan was successful, thanks primarily to the active role of the government in its implementation, and to the long-term development concept and the commitment of the state. The successful implementation of the plan was also influenced by a good harvest in the last two years, which contributed to stabilisation of lower food prices and higher savings.

This cannot be claimed on the use of the Harrod-Domar model example in order to project the economic growth of Ecuador, which is based on the use of foreign aid.

- **The example of Harrod-Domar model on the Ecuador's economic growth**

Ecuador is one of the poorest countries in Latin America, more than 50% of the population lives below the poverty line, with less than 2 USD a day, with a total debt of over 14,000,000,000 USD. Ecuador is also one of the most indebted countries in the world (per capita), a good example for analyzing the application of Harrod-Domar's model.[21]

Before the depth repayment crisis, in the 1980s, Ecuador had three export phases that led to development: cocoa (1860–1920), bananas (1948–1972) and oil (1972–1982). The Harrod-Domar model was adopted in 1948, as an aid within the program of the US Government, along with the expansion of banana exports from Latin America, which was represented by the UN Economic Commission for Latin America. Therefore, in this period, the political authorities invested all the aid in the banana industry, which was in the hands of foreign companies, which did not reinvest this money, but took it out of the country. In contrast to this, during the oil export period, all aid was invested in the domestic processing industry, which again depended on the import of raw materials. Foreign aid is not the only source of Ecuador's economic growth, since two basic assumptions of the model, created by World Bank economists, have been proven incorrect: a) aid goes to investments one-to-one and b) there is a linear relationship between investments and growth. Unfortunately, these settings did not prove to be correct even on the example of other economies.[22]

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[20] http://www.tradechakra.com/indian-economy/five-year-plans/index.html (12. 04. 2012, 21.36 h).

[21] the analysis in this chapter is based on the claims stated in the paper Westerberg, Lotta. 2001. Foreign Aid and Economic Growth in Ecuador: A Test of the Harrod-Domar/Financing Gap Growth Model. page 9. Paper is available on the web page: http://www.scribd.com/doc/24708419/A-Test-of-the-Harrod-Domar-Financing-Gap-Growth-Model-Ecuado (12. 04. 2012, 22.08 h).

[22] Look at testing Harrod Domar model in the paper: William, Easterly. 1997. The Ghost of Financing Gap. How the Harrod–Domar Growth Model Still Haunts Development Economics. Washington: The World bank, Development Research Group. Policy Research Working Paper World Bank.1807. Available on the web page: http://wwwwds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2000/02/24/000009265_3971110141350/Rendered/PDF/multi_page.pdf (13. 04. 2012, 23.43 h).

In the case of Ecuador, it is clear that consistent economic policies and current oil prices had an impact on economic growth more than foreign aid. Aggressive lending at the beginning of 1976 led to a crisis in 1980, which was not overcome even by 2012. The example of Ecuador shows that the advice of World Bank economists to developing countries regarding the use of the Harrod-Domar model is not always successful. The model is just one way to encourage these countries to use external loans, which they will later pay back with interest. It would be much more important for these countries to develop the capital (human, financial and social) that already exists in their societies.

Similar to Ecuador, the example of Zambia indicates that foreign aid is not always a sufficient factor to ensure economic growth.

- **The example of Harrod-Domar model on the Zambia's economic growth**

According to the estimates of the World Bank, in Zambia, more than in any other African country, it is expressed the connection between foreign aid donated by the international community and economic reforms implemented by the government in recent years. After independence from England in 1964, this country is highly dependent on foreign aid. According to poverty indicators from 1975 to 2011, Zambia is considered one of the poorest countries in the central part of East Africa (65% to 70% of its population lives at or below the poverty line). Two periods are significant in the economic development of this country: a) the period known as the years of President Kaunda - from independence in 1964 to 1991 and b) from 1991 to 2011, the years of President Chiluba.[23]

The main economic branches of Zambia are agriculture and mining, the country is rich in copper and cobalt deposits. Despite this, shortly after independence, in the early 1970s, the economy of this country stagnated or declined. One of the reasons for this is the nationalization of all mines by the state, which resulted in their poor management. At the same time, the state began to take on debt, borrowing money from the international community for the metal industry, as well as the public sector, justifying it by trying to implement certain reforms in the state, which did not meet with wider public support. All this led to an increase in political instability in the country, as well as an increase in external debt, which additionally did not favor the implementation of economic reforms. These negative effects marked the period of President Kaunda's rule, and at the same time marked the coming of the opposition to power, in the early 90s of the 20th century.

[23] Uliane, Appolinario. Professors: Cedric DUPONT and Daniel TRACA. 2008.-2009. The Effectiveness of foreign aid in case study: Zambia. Geneva: Graduate Institute of International and Development studies. Master en etudes du development, Global Political economy, pages 19–20. Available on the web page: http://graduateinstitute.academia.edu/UlianeAppolinario/Papers/309054/The_Effectiveness_Of_Foreig_Aid _Case_Study_Zambia (13. 04. 2012, 22.00 h). (note: modified text).

The coming to power of the opposition was accompanied by additional international aid in the amount of USD 1,500,000,000, which is linked to two economic programs: a) the program of economic reforms and b) the program of privatization and reforms in the public sector.[24] The new government began intensively implementing a set of reforms, under the influence of the international community. One of the most significant reforms that came into effect was the privatization of the mining industry. The reforms again very quickly led to even greater dissatisfaction among the local population, and at the same time to an increase in poverty indicators. This led to renewed political instability in the country, a clash of previous and current political options, which resulted in a reduction in the flow of aid from donors.

The presented data on the use of foreign aid directed towards investments on the example of the country of Zambia, at the same time indicate the failure of the Harrod-Domar model in countries with large aid and high initial investments.

The Harrod–Domar model predicted a per capita income of approximately $20,000 by the end of 1994. Instead, from independence until today, despite total foreign aid and high investments, the level of income per capita has remained low, around USD 600.

In the case of Zambia, it has become more than certain that the shortcomings, problems in the practical application of the Harrod-Domar model in developing countries have proven to be justified. Economic growth and economic development are not the same. Economic growth is a necessary but not sufficient condition for development. Practically, it is difficult to stimulate the level of domestic savings, especially in the case of developing countries, if it is known that incomes are very low. Borrowing from abroad will fill the gap caused by insufficient savings, but will cause problems with debt repayment later. Increasing productivity is never easy. The lack of educated and trained workforce means that the new capital is not used efficiently enough. An additional problem is the lack of organizational and management skills for managing money, which leads to inefficient use of money. Research and development are very often underfunded in developing countries, access to foreign technologies is usually expensive and unavailable.

Data on graph 1.3. show a comparison of the current average income per capita in this country vs what it could have been. Zambia should have been one of the industrialized countries, instead of being one of the poorest countries in the world. Zambia is a case of the worst design, since it had a high investment rate and received a lot of aid. The investment rate moved down, not up, as aid grew, in any case, investments did not lead to ICOR's yield, i.e. to growth.[25] The financial gap between the economic growth that Zambia should have achieved with a large

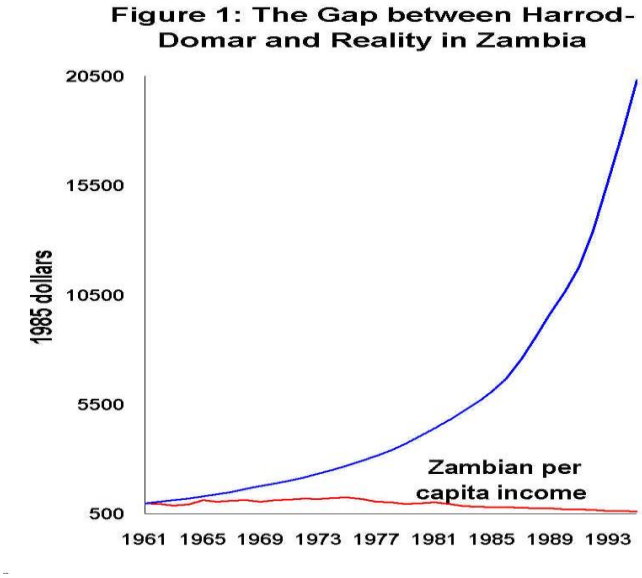
[24] Ibidem.

[25] William, Easterly. 1997. The Ghost of Financing Gap. How the Harrod-Domar Growth Model Still Haunts Development Economics. Washington: The World bank, Development Research Group. Policy Research Working Paper World Bank.1807. Dokument je dostupan na internet stranici: http://wwwwds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2000/02/24/000009265_3971110141350/ Rendered/PDF/multi_page.pdf (13. 04. 2012, 23.43 h).

[203] Ibidem, str. 29.

amount of foreign aid according to the Harrod-Domar model and the real growth that it achieved during that period is shown in graph 1.3.[26]

Graph 1.3. The financial gap between Harrod–Domar model and reality in Zambia



Izvor: William, Easterly. 1997. The Ghost of Financing Gap. How the Harrod–Domar Growth Model Still Haunts Development Economics. Washington: The World bank, Development Research Group. Policy Research Working Paper World Bank.1807. Document is available on the web page: http://wwwwds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2000/02/24/000009265_3971110141350/Rendered/PDF/multi_page.pdf (13. 04. 2012, 23.43 h).

An example of the application of the First Plan of India in the period 1951-1956. indicates that the successful application of the Harrod-Domar model requires a long-term commitment of the state to development issues and the use of existing resources in the direction of the best economic growth policies.

The examples of the countries of Ecuador and Zambia have shown that external aid and a certain level of investment are not a sufficient condition for achieving the desired rate of economic growth and the economic development of society as a whole. Foreign aid directed towards investments is a desirable but not a sufficient condition for economic growth.

Conclusion

This paper attempts to analyze the premises of the Harrod-Domar model, the theory of economic growth, developed after the Second World War. The reason for this is contained in the fact that this simple model created in the post-war period, has remained relevant to this day. The model promotes investments as the primary component of economic growth, it is very often used for economic development planning, as well as understanding of development issues, especially in underdeveloped countries.

Although it has been too long since the theoretical setting of the Harrod-Domar model, after the Second World War, economists dealing with the issues of developing countries still apply this model to calculate the short-term investment required for the target growth rate. They calculate the financial gap between required investments and existing resources and often fill this financial gap with external aid.

The Harrod-Domar model is a thinking tool for economists of leading international financial institutions (World Bank, IMF, EBRD), who use its equation and the statistical models they have developed, such as the RMSM and RMSM-X model, in the fastest and simplest way to calculate the desired growth rate and the required level of investment in certain less developed economies, firstly to determine what their possibilities are in terms of repaying external debts.

The Harrod–Domar model has its flaws, like any other model. Analysis of the experiences of developing countries, that used this model when planning long-term economic growth, indicates that the application of the model has shown different results. Good results occurred in cases where there was a long-term committment to reach the planned values of economic growth, as well as a consensus regarding development issues from a large number of key actors in society. An example of such a country is India, which, after gaining independence from Britain in the early 1950s, used the Harrod-Domar model as a starting point for the adoption and implementation of the First Five-Year Development Plan. In cases where countries impulsively approached the problems of economic growth and development, resorting to external debt to solve the short-term financial difficulties without real long-term orientation, investments in strategic development branches, the model did not yield results. Zambia and Ecuador are such examples of countries. Regardless of the recommendations of the Harrod-Domar model, almost more than half a century ago, these countries are still ranked among the poorest countries. The positive and negative experiences of these countries in the application of the model should help the Republic of Srpska to establish its own development model.

In an extension of the research, using the example of the Republic of Srpska, the intention is to prove that it is possible to ensure long-term economic growth, with the application of the Harrod-Domar model. It is necessary to give an answer to the question whether the economic development of the Republic of Srpska is really possible based on premises of this model.

The decision to choose and apply this theory of economic growth and development, in the case of development model of the Republic of Srpska, is found in the simplicity of its conclusions: "*GDP growth is proportional to the share of investment spending within GDP*"

The assumption for these claims is to eliminate all the shortcomings in the application of this model, which proved to be more than obvious in the case of Ecuador and Zambia. External debt should not be directed towards short-term consumption of the population or solving the problem of repayment of existing debts, but towards investments. External debt would not be used in non-productive projects that do not bring financial effects.

The application of the Harrod-Domar model on the example of the Republic of Srpska should show that investment growth and productivity growth are a necessary prerequisite for the long-term economic growth of the Republic of Srpska in context of globalization. The model would be developed based on the use of statistical analysis methods (time series analysis, correlation analysis, regression analysis), through application software (3Bstat and IBM SPSS Statistics). By using these statistical analyzes through application software, it would be proven that the increase in investment in certain sectors has an impact on the growth of GDP in a ten-year period, and therefore changes occur in the structure of GDP. The share of individual sectors within the GDP is changing. Also, the speed of realization of these investments has a direct impact on the shift of GDP. It would be emphasized that the long-term growth of GDP depends on the increase in productivity, investments in certain sectors, which lead to production of greater newly created added value, and therefore result in increase of production and exports. Through economic policy, stimulating investments are directed towards those sectors that bring the greatest economic growth. Economic growth that leads to the creation of a larger GDP would make it possible to catch up, approach the income of medium-developed European economies. This is one of the conditions for membership in the European Union.

In fact, of crucial importance for the long-term development concept of the Republic of Srpska with application of Harrod–Domar model is the quality management of funds borrowed from abroad, their direction towards investments that bring future economic income. Additionally, it is necessary to try to incorporate the positive experiences of India's planned development into the development model of the Republic of Srpska.

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