

# Development of System Dynamic Model of Latvia's Economic Integration in the EU

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## Abstract

*Joining the European Union big opportunities in the international markets have opened for Latvia. Paper purpose is to investigate influence of international integration processes on development of economy of Latvia. Latvia's incoming in EU increased the amount of received means from structural and cohesion funds, removed the trading barriers, increases foreign investments, reduced unemployment and increased labor migration. In the paper the system dynamics model, which describes integration of the Latvian economy into EU, is developed. In the model international financial flows connected with Latvia and EU; import, its relation to internal producing; and migration processes are considered. Model functioning is measured considering various scenarios of situation development. The developed model can be used not only in the analysis of Latvia's economic integration in the EU, but on its basis it is possible to create models of regional cohesion in Europe.*

**Keywords:** Europe, integration, cohesion, economic grow, migration, capital, price, inflation, consumption, output, GDP, unemployment, economic forecasting, system dynamic, simulation

## Introduction

International integration is one of the most important factors contributing to the economic development in our century. Latvian international integration process received a strong impetus to the development after Latvia's entering the European Union (EU) in 2004. Since then it has accumulated enough statistical data about integration process, but is still lacks research, which could indicate the main parameters of development, which could quantitatively estimate Latvia's gains and losses from incoming in the EU.

In the paper researched problem is related to the external (international) economic part of Latvian economy estimation.

Novelty element relates with the integration and globalization process quantitative estimation, using the system's principles. Most often, when estimated Latvia's entering in EU, only certain sectors of economy, such as international finances or foreign trade sectors are analyzed. Any of economy sectors are inseparable from whole economy, so some sector estimation does not reflect the effects of the integration process. On the other hand, estimating the common economic indicators, such as gross domestic product, it is possible to see common situation. But this kind of analysis does not show change influential factors. It is necessary to find the optimum balance between the detail level of process analysis and amount of system describing elements that can be done using a systems approach.

The object of research is the Latvian economic integration in the EU and the international economy. The research subject is the Latvian economy changes as result from Latvia entering to the EU.

The paper aim is to comprehensively analyze the effects of international integration process of the Latvian economy.

To achieve this aim the following tasks are set:

- To develop system dynamics model, which shows influence of integration processes on economy of Latvia;
- To present the general scheme of the developed model, to show influence of feedback, as well as stock-flow scheme of the model;
- To develop system dynamics model, which shows Latvian economy reaction to integration processes;
- To evaluate models, and to analyse various variants of situation development.

The study shall use both traditional mathematical, statistical, economic and econometric analysis methods, such as time-series trends, regression method, and specific modeling method - system dynamics method.

As the information base of study is used LR CSB, European Communities, Eurostat and LR Financial and Capital Market Commission (FCMC) data. Some materials are taken from experts, news agencies, newspapers and the Internet. The base of research is LAS Institute of Economics, LR President's Strategic Analysis Commission, LR Ministry of Foreign Affairs and LR Ministry of Welfare completed researches. Methodological basis of research based on the Latvian and world's top scientists works: international economic theory - MacConell C. and S. Brue (2003), Latvia EU integration processes - Karnite R. (2007), I. Brivers (2008), system dynamics - Sterman J. (2000), Yamaguchi K.(2010), Wheat D. (2009), Chevalley T.(1992).

## **Background and context: analysis of Latvia integration in the EU**

Taking into account limits of volume of this paper, there are shown only main results of background analysis, full analysis will be published in separate paper (Skribans 2010).

### *Latvia's entering into the EU direct financial effect*

For Latvia, joining in the EU, the new financial contributions were formed. Contributions are directed to the EU's budget. Also, from the EU received funds significantly increase. The difference between received funds and contributions increased national income, which is the direct benefit of the Latvia's accession to the EU.

Latvia received funds from the EU before joining the EU and majority of them were related to the EU realizable strategy, working with prospective EU members. After joining the EU, according to EU principles, Latvia contributed to the EU budget, and funds were received from the EU budget to promote structural reforms in Latvia. In 2007 the EU budget principles are changed. Next we discuss their impact on the Latvian economy in detail.

Big part of Latvian contributions to the EU is based on the national income. Significantly smaller is VAT based contributions, the UK rebate and customs duties. Latvian contributions to the EU limit the domestic consumption: part of VAT contribution, as well as customs duties, increases prices, which is consumption limiting

factor; national income part contribution also limits domestic consumption. Contrary, the received EU budget funds promote natural resource conservation and domestic production increase.

From author's point of view, these contributions, grant system does not encourage the development of Latvian economy. To successfully develop the production, demand is necessary. The Latvian market is small; it is not profitable to produce all range of goods in Latvia. For Latvia it is sufficient small producers, but they can not compete with large producers, considering the higher cost per production unit. Problem-solving way might be Latvia's specialization in specific products' production. Latvian specialization is wanted for several years, the priority directions are given to a highly technological and / or natural, environmentally friendly products. By author's opinion, wanted product class may be supplemented with products whose mass production is difficult or output growth does not lead to costs decrease.

### *Influence of free movement of goods and services on the Latvian economy*

According to economic theory one of the ways to develop the country's economy, is to increase net exports. One of the Latvia's benefits from incoming the EU is growths of market, the removal of barriers to exports goods to EU.

For Latvian net exports calculation the author uses LR CSB data on exports and imports. Through net exports, exports and imports data analysis using time series (trend) modeling techniques have made conclusion that all three indicators' trends are similar. Considering that net exports reflect the difference between exports and imports, only net exports data are analysed in the paper.

In Latvia net exports are positive (greater than zero) only for wood and wood products group. In some groups, such as Textiles and textile articles, in some years also have been seen a positive net exports, but these groups have such a low share of net exports, that they may be disregarded in the analysis.

Wood and wood products net exports from 2001 to 2007 grow gradually, with the linear trend. Net export growth in this group was related with gradual development, with previously established cooperative extension. Latvia's accession to the EU had no effect on net exports increased in this group. It can be concluded that with contemporary globalization level, **national independence from various unions and associations can not stay competitive goods exports**. Author's opinion, even more, **incoming into economic union does not encourage competitive exports**, because competitive products would be required not only in union countries, but also in third countries, which can fully use internal potential of exporting country.

It is important to note that in 2008 wood and wood products net exports fell, which is related to the global economic crisis and reduction in foreign trade.

In another key product groups and total net exports were negative. Other groups net exports changes were gradual, with linear trend. Only if the wood and wood products group net exports grew, in the other groups it fell. This would indicate that Latvia is not fully using the opportunities form accession to the EU. Net exports were not expanded, imports dominated in foreign trade.

It is important to note that throughout the test period, exports and imports grew, but imports grew faster than exports, consequently, the net exports decreased. In 2008, with the global economic crisis, imports fell more than exports, which increased net exports.

In these cases it can be said that the crisis had a positive impact on Latvian foreign trade balance.

Net exports are reflecting not only international competitiveness, but also internal production problems. Situation in which net exports are reduced, but exports and domestic production grow (and more faster grow imports), can be considered as favorable, since such circumstances, demand expansion takes place so fast that production can not supply goods and attract imports. In future production growth can replace imports. Before it is estimate net export data, regardless of internal production. Net export data reflect changes in foreign trade after Latvia joined the EU. To estimate impact of foreign trade expansion on domestic production, we will analyze the industrial output changes.

In reality, assumption that accession to the EU promoted Latvian internal production development is called in question. Industrial output growth was at one level between 2001 and 2006. In 2007, a year before the crisis, industrial output growth came to a halt, and since then has seen reduction.

Analyzing separately industrial products groups it is concluded that production growth related with EU accession was not finding in any group. Production increase, which was observed in mining and quarrying industry, in time coinciding with the Latvia' accession to the EU, is related to the construction boom in Latvia at that time. In general, EU accession did not develop Latvian industries.

#### *Influence of free capital movement on the Latvian economy*

Availability of capital in country can be an economic development factor. Economic theory defines that in closed economic system, availability of capital or investment in the country can be less or equal to savings. Savings that population placed in bank accounts and deposits become available for investment in the form of loans. Small offset from this equilibrium can form banks capital. Bank with its own resources also can participate in the credit market. In theory, after Latvia's accession to the EU, capital can come to Latvia in the loan form or as investments in banks capitals and leave Latvia by placing credits or investments in other countries.

Analyzing banking capital increase in Latvia, we can say that its development was gradual. Analyzing the structure of capital allocated in Latvia, that consists of residents' capital and non- residents' capital, it is evident that capitals have a different dynamic. Residents' capital increased by 46% per year from 2003 to 2008, in this time non-residents' capital increased by 347%. Capital growth rates differ almost 8 times. Total banks capital increase in Latvia is formed with non- residents' capital increase. It can be concluded that the international capital came to Latvia. But to draw conclusions, that it was related with the Latvia's joining the EU, it is not possible.

Before Latvia's accession to the EU foreign (non-residents') capital also have important role. Its share in total banks capital was from 70% (in 2000) to 51% (2003), and its minimum (51%) directly before Latvia's incoming to the EU. Later, foreign capital share in total banks capital grew and reached 78% (in 2008). Also, to approve the capital flow to Latvia can deposit and loan volumes.

Before Latvia joined the EU savings were more than granted loans about 20-25%%. Local resources were sufficient to cover domestic demand in the capital. A few months after the EU integration credit and deposit ratio started to fall. Granted loans grew faster than growing deposits. In September 2005 loans were balanced with deposits, but since

then, granted loans have become significantly greater than deposits. Additional resources for loans banks attract from international capital markets. Latvia's entering the EU is related with the credit system development and credit boom in Latvia. In contrast, entering the EU did not increase amount of deposit, deposits grew gradually.

The rapid credits growth could trigger economic development, if credits are directed towards to industry. Analyzing credit structure, it is visible that from 30% (in 2000) to 50% (in 2010) credits are issued to non-residents, households and for other purposes. Of these credit types, consumer credit growth could contribute to economic development if consumers choose to buy domestically produced goods. As we saw in the previous section, in Latvia production growth was not observed. Consumer loans stimulated import or/and increased prices in the country. Foreign trade growth after Latvia's joining the EU is discussed in the previous section, but prices grow will be discussed later.

Loans structure shows that biggest part of loans was directed to the service sectors, including real estate, trade. Only 14% of loans were allocated in manufacturing, which explains why, despite the loan portfolio growth in Latvia, internal production growth did not happen. Manufacturing is relatively large, complex industry, if distribute credit by subdivisions, for each subdivision will be a small part of credit, for the largest - up to 3.5%. Some manufacturing subdivisions, such as food production, size and economic effects could be compared with the primary industries. If sector or subsector receives 3-7% of total credits, its development is a gradual and balanced, if less - development is weak, as was in case of manufacturing. If sector received above 10% of resources it caused accelerate growth, or boom, which was observed in construction industry. Booms lead to economic development instability cycles. Granting credits to the "air" (Karnite et al 2007), with financial transformation related sectors, does not lead economic development. Thus, capital incoming is not being used to promote positive changes in the Latvian economy.

### *Influence of labour free movement on the Latvian economy*

In 2004 several EU states opened their labour markets to workers from Latvia. The largest amount of labour force went to Ireland, Great Britain and Sweden. In these countries salaries were substantially higher than in Latvia, which contributed to labour migration from Latvia. The hypothesis of the research is that labour migration is determined primarily by the payment level in the countries under consideration and the indicator derived from it – payment differences in the countries compared; as well as employment level, unemployment level, number of work places (market capacity) and number of vacant work places. Secondary factors influencing migration may be costs connected with labour migration, formal legal barriers to migration and personal propensity for migration.

Since entering the EU, both the average wage and the number of employees in Latvia have grown along with the increase in the number of vacancies. At the same time the number of unemployed persons decreased as well. The number of employees has increased almost by 10%, the number of unemployed persons decreased by 23%. This does not automatically mean that previously unemployed people have moved to the group of employed ones. Employed and unemployed people in total form labour force. During the period under examination the amount of labour force in Latvia increased by

7%, but the amount of working age population decreased by 1%, which is the factor, influencing labour market.

Decrease in working age population in Latvia may be connected with the negative natural increase of population as well as migration processes. Indirect calculations using LR CSB data, taking into account population reaching pension age, increase of young people under working age, as well as death rates in working age, show that the decrease of natural labour force is 20 thousand persons. The number of migrating persons differs in various sources, for example, Eurostat data show that from 2004-2005 on average 981 people a year left Latvia, in 2006 this indicator increased 2.1 times. LR CSB data (CSP) show that the population of Latvia during this time decreased by 4.7 thousand persons. But all these data do not explain the difference of approximately 352 thousand persons between working age population and labour force.

Such large labour force differences can be associated with long-term unemployment, which is excluded from the number of unemployed persons, as well as with migration processes, which are not properly registered and estimated. The first reason, increase of the hidden unemployment along with the increase of the number of employees and vacancies (which was in Latvia in 2004-2008), from the experts point of view, is not possible. Experts have other thoughts about labour migration process.

Labour migration data are relative and varying, and therefore cannot be exact. Some experts consider that about 50 thousand people (Viķe-Freiberga 2006) have emigrated from Latvia, other estimations show that totally about 100 thousand (LETA 2008) or even 110 thousand (LETA 2007) job migrants, students and their family members have left Latvia. If data taken from statistical sources are too small and do not show unofficial migration, then the estimations of experts are sometimes unrealistically large, because none of the population groups or total population showed that large decrease. Variation of data indicates that labour migration statistics cannot be applied in such researches.

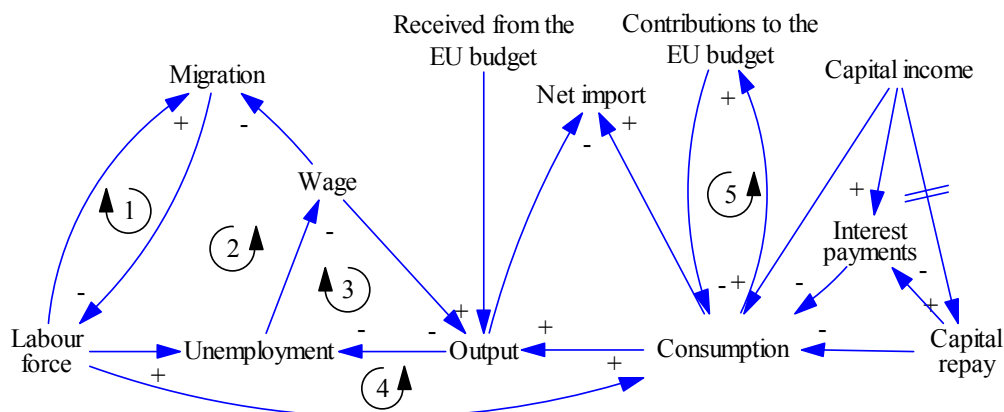
From the author's point of view labour migration in Latvia is limited only by propensity to migrate. It is hard to estimate this indicator; however, taking into account population polling results, 19% of Latvia's population is ready to leave (Delfi, 2008) and 40% of population have at least once considered the possibility to leave Latvia (Lotina 2008).

## **Model of Latvia's integration in the EU**

### *Developing of the conceptual model*

Based on the relationships defined in the previous chapter, the model of Latvia's integration in the EU is developed. The general scheme of the model is shown in Fig. 1. The general scheme of the model reflects the interaction of included indicators, without specifying how much indicators affect each other, and does not show the factors determining the strength of the interaction between mentioned indicators. These questions will be considered in the next sub-section.

The Fig. 1 shows that the model consists of parameters that affect integration: migration; contributions to the EU budget, subsidies from the EU, net import and the movement of capital, as well their impact on key macroeconomic processes in Latvia is shown. We consider these processes separately.



**Fig. 1.** Conceptual model of Latvia's integration in the EU

The greatest influences on the Latvian economy have migration processes. Migration is formed by the difference of wages in the EU and Latvia. Latvia's accession to the EU did not change wages in the EU, thus the wages in the EU are taken as a constant pointer. Low wages in Latvia defines migration from Latvia. Wage increases in Latvia will reduce migration. Between these parameters there is a negative relationship, as indicated by a minus sign near the arrows.

With migration increasing, size of the workforce also will be reduced. Migration has a negative impact on the workforce. Workforce reduction will lead to a reduction in migration that means, the amount of labor has a positive effect on migration. The relationship between migration and amount of labor describes the first feedback loop displayed in the Fig. 1.

Changes in labor force volume cause changes in the same direction among the unemployed. In circumstances of constant number of jobs, labor force reduction leads to a reduction in the number of unemployed. Increase in the labor force, with constant number of jobs, leads to an increase in unemployment. Between these indicators there is a positive relationship. Changes in the labor force have influence not only on the number of unemployed, but also on consumption. In this case, the labor force serves as a measure of the population, which can be changed only with mentioned factors of the model that means, based on the migration processes. Changes in consumption are proportional to changes in the labor force, between these relationships there is a positive relationship.

One of the factors determining the level of wages from the supply side is the level of unemployment. The fewer unemployed in the system, the higher wage growth. In conditions of high unemployment wage growth stops, and, as in Latvia in recent years, wages may decrease. The unemployment has a negative impact on wages.

Wages, migration, labor force, unemployed form a second feedback loop displayed in the Fig. 1. Low wages lead to migration, which reduces the amount of labor force and unemployed in the system, reduction of the number of unemployed will increase wages. This part of the system will be closer to equilibrium when the level of wages in Latvia will be approximately at the average level of wages in the EU.

Wages growths in the country not only affects on the willingness of labor force to participate in the labor market, but also the demand of it. Wage growth reduces the business profitability, and the output level of production in the country decreases. This reduces employment and increase unemployment. Unemployment growth reduces wages, which again increases production. It describes the third feedback loop, Fig. 1.

EU policies through subsidies encourage business development and growth of Latvia's production. The model envisages that increase in subsidies increases production volume in Latvia. Production increase is also affected by the growth of the consumption. The relationship between consumption and production are included in the fourth feedback loop. Changes in consumption and production change the number of unemployed, wages, migration and amount of labor force.

As shown above, changes in the labor force change consumption. Without taking into account other feedback, this loop can exponentially affect the system. Any increase in consumption causes forced growth of consumption, as well as any reduction in consumption causes forced reduction in consumption. This is a very important element of the system, because contributions to the EU budget and capital flows affect consumption.

In previous section it was determined that contributions to the EU budget depend on consumption, and likewise they reduce consumption in Latvia. This is shown in the fifth feedback loop. Consumption growth in Latvia will increase payments to the EU budget, and these payments will reduce consumption.

More significantly consumption affect capital flows. Firstly, as defined in the previous section, the inflow of capital causes increase of consumption in Latvia. After some time, capital leaves the system, which leads to decrease in consumption. Inflow and outflow of capital will form a cyclical loop in consumption by increasing consumption when capital inflows and reducing consumption when capital goes out.

The inflow of capital has one more effect. Incoming capital increases the cost of maintenance of capital, i.e., interest payments. These payments are taken out of the economic system and are transferred to owners of capital. Interest payments for foreign capital decrease consumption in Latvia.

There is no feedback in the capital flows, because usually in Latvia capital is not reinvested, it has mostly speculative nature that was shown in the previous section. Fig.1 also shows net imports. The indicator of imports has an important role in the economy of Latvia. Latvia cannot produce all necessary goods, import substitute domestic production.

The aim of the European subsidies is to create a competitive environment in Latvia, assisting substituting import with internal production. Fig. 1 shows that development of production (output grow) reduces import. These indicators have negative relationship. Import changes also have influence on the changes in consumption. Increase in consumption will increase net import, because the production can not satisfy growing demand. These indicators are connected with positive relationship. In fact, increase in consumption is distributed between increase in production and increase of import.

Developing practically a model of Latvia's integration into the EU, the author has used two approaches. Firstly, the author develops a model with a minimum number of indicators from domestic economy and, secondly, incorporates integration model into a model of macroeconomic equilibrium. Let's consider each of the approaches separately.

#### *Integration model with limited number of economic indicators*

Developing a model with a minimal number of economic indicators, the main task was to research the direct impact of integration on the state economy. The developed model flow - reservoir diagram is shown in Fig. 2.



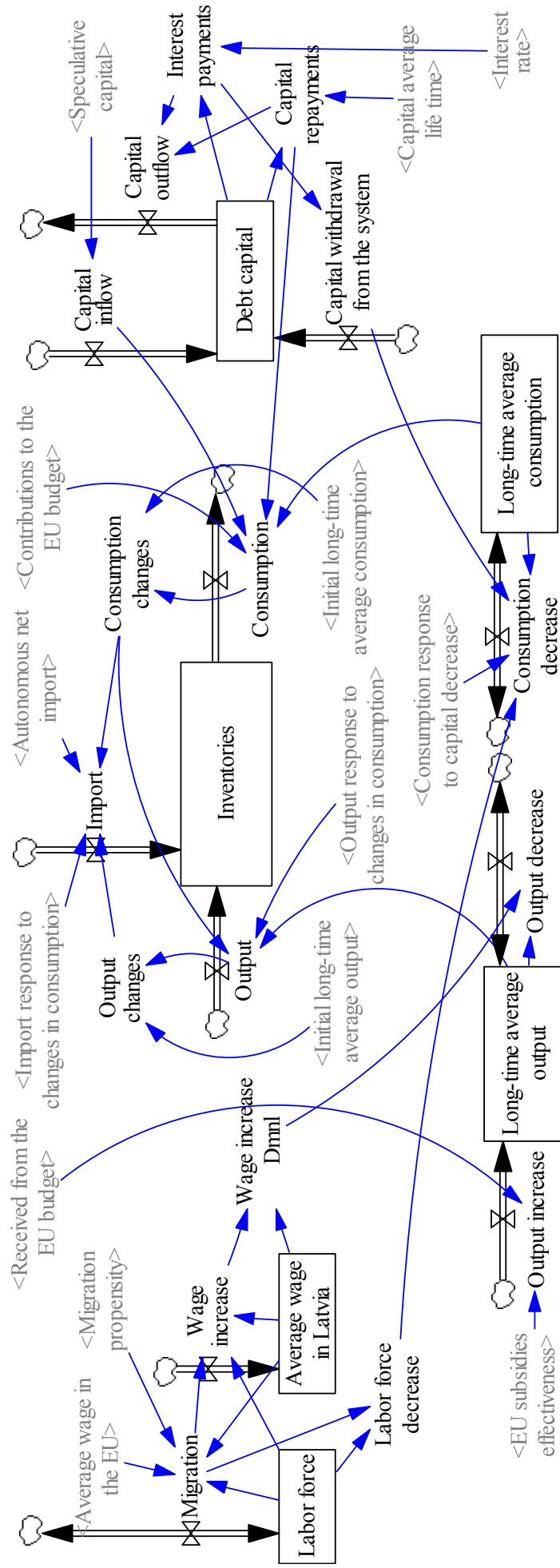


Fig. 2. Flow - reservoir diagram of model of Latvia's integration in the EU

The Fig. 2 shows the model relationships, all constants are specified as variables from other sub-models. This allows us to avoid explanations of the essence of the constants. In fact, the model has no sub-models; the whole diagram is shown in Fig. 2.

Comparing the diagram to the general scheme of the model we can see some differences. In the diagram, there is no indicator “unemployed”. The workforce reduction has a direct impact on wage growth. Labour migration is determined not only by the quantity of labour, wages in the EU and Latvia, but also by the propensity to migrate. This ratio generally reflects all non-formalized migration barriers, such as the language barrier, patriotism, etc.

Production and consumption are analyzed in two parts: in a long-term and in actual indicators. Actual output and consumption are based on a long time period output and consumption, taking into account the short-term influencing factors. They are for consumption - the inflow of capital and payments to the EU budget, for the production - changes in consumption.

Capital inflow and payments to the EU budget are considered as short-term factors, because as soon as their effect will disappear, the volume of consumption will return to a balanced level in the long run. Similarly, short-term fluctuations in production are determined by changes in consumption. The reaction of production to changes in consumption shows factor "Output response to changes in consumption".

Changes in long time period output and consumption are associated with fundamental factors. For the production it is amount of EU subsidies, which are aimed to foster the business environment, and the efficiency ratio of these grants. For consumption it is capital withdrawn from the system (interest payments for foreign capital) and the ratio of consumption reaction to capital withdrawal. EU subsidies are defined as long-term influencing factor, because at the expense of an effective entrepreneurial activity it continues to operate despite the termination of grants.

Similarly, withdrawn from the system capital (interest payments) reduce the consumption forever. According to economic theory capital inflow, its removal, as well as maintaining costs (interest payments) are associated with the development of production output. In Latvia, as defined in the previous section, capital flows are directed to the speculation and to consumption, thus repayment of capital and interest payments in the model are also associated with the consumption.

In the diagram (Fig. 2) production and consumption are combined within the inventory reservoir. The output increase material reserves in the system and the consumption reduces them. The difference between consumption and production is covered with material stock changes, as well as net imports. After consumption and output changes follow changes in imports and / or in material stock.

The capital flows in the diagram fully display the general scheme of the model, so there is no need to analyze them again.

#### *Calibration of the model. Simulation runs results*

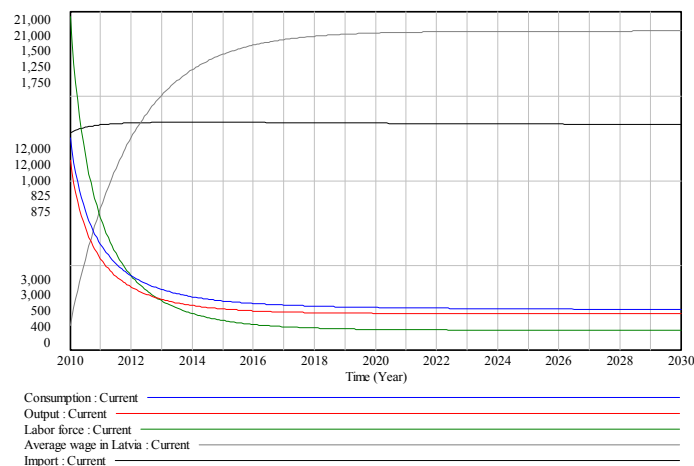
Implementing the model in practice, some parameters are impossible to obtain from the statistics or to calculate from available data using mathematical methods. That would be the propensity to migrate, the effectiveness of EU subsidies, the consumption reaction to capital decrease in the country, the output response to changes in consumption. To obtain information on the effect of these coefficients to the system, author has

conducted several experiments with the model. Firstly, for all coefficients boundary fluctuations from 0 (no influence) to 1 (fully correlated) were determined.

Secondly, experiment with zero values of all coefficients was conducted. And thirdly, the experiments were conducted with increasing coefficient values up to 0.5, keeping other coefficients at zero level. In experiments coefficient “import reaction to changes in consumption” refers to the coefficient “output response to changes in consumption”, they correlate negatively. Changes in consumption are covered with import or output, small deviations from this rule is related with changes in inventories. The results of experiments are the following.

In the first experiment, with all zero coefficients, all researched indicators (consumption, output, labor force, the average wage in Latvia, import) were constant, indicators did not respond to Latvia's accession to the EU. Migration did not occur, wages, imports, long-term consumption and production remained unchanged. It is important to tell, that in this experiment inventories show a slight growth, i.e. import and production were slightly higher than consumption. This experiment is the starting point, which allows to estimate and to compare the net effect of factors on the behavior of the system.

The first examined parameter is propensity to migration. Its influence on the system is reflected in Fig. 3.

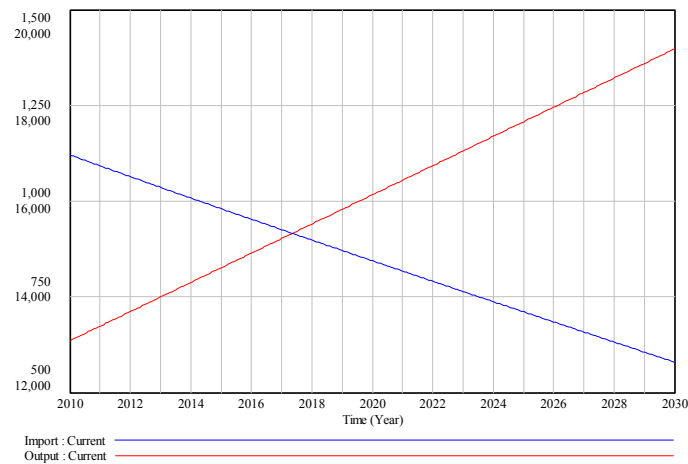


**Fig. 3.** Migration propensity influence on the system

Fig. 3 shows that with migration propensity coefficient increasing to 0.5 in Latvia consumption, production and labour force will decrease, at the same time the wages will increase. Changes in import are negligible. This situation corresponds to the shown relations. High migration propensity coefficient and low wages in Latvia leads to migration, a direct consequence of migration - rising wages and decreasing labor force (population).

Reduction of population causes reduction of consumption. Both consumption reduction and wages increase cause the decline of producing. Migration propensity coefficient 0.5 is a very high coefficient. In 6-8 years it will reduce the population almost 3 times. In addition, the decrease of consumption and producing will be similar. At the same time, wages in Latvia will reach EU level. Development of the state due to migration is not available. According to the author's opinion, the coefficient of migration propensity should be around 0.01.

The next examined coefficient is EU subsidies efficiency. The reaction of the system on its changes is shown in Fig. 4.

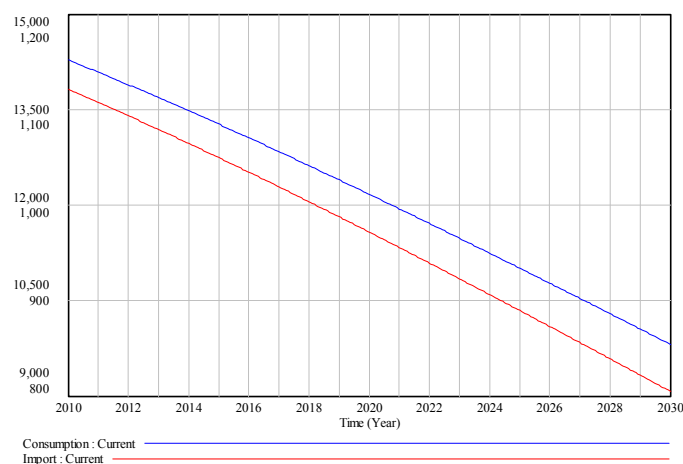


**Fig. 4.** EU subsidies efficiency influence on the system

In Fig. 4 the amount of analyzable indicators is considerably abated, because, according to the results of the experiment, EU subsidies does not affect consumption, labour force and wages in Latvia. This corresponds to the facts. Most often, with the means from subsidies new, efficient equipment has been bought abroad to replace old. Employment does not change, consumption and wages in the country remain unchanged, but increased production displaces import, as shown in Fig. 4.

From the author point of view, in Latvia the EU subsidies efficiency is not so high, it is closer to zero. The simulation results show, that such high efficiency may lead to overproduction in Latvia because production grows faster than import reduction. In Latvia the EU subsidies efficiency coefficient should be around 0.25.

In the next Fig. 5 there is analyzed the influence of coefficient “consumption reaction to capital decrease” on the system.



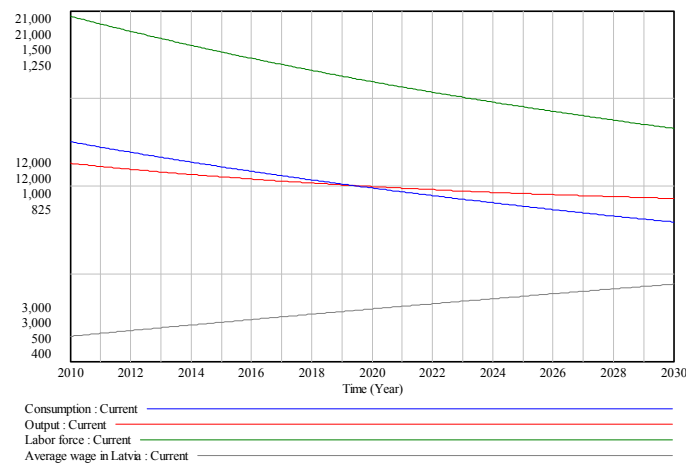
**Fig. 5.** Coefficient “consumption reaction to capital decrease” influence on the system

The Fig. 5 shows that coefficient “consumption reaction to capital decrease” affects only consumption and imports. Capital reduction in the system reduces consumption, reduction of consumption reduces import (in this experiment, the output does not react

to changes in consumption). All other indicators do not depend on reduction of capital in the system.

According to experiment's logic, next experiment should be carried out with coefficient "output response to changes in consumption". Unfortunately, this experiment is not possible to implement, according to the above scheme. If all other parameters have no effect on the system, then there is no change in consumption. In the absence of changes in consumption, it is impossible to study the reaction on it.

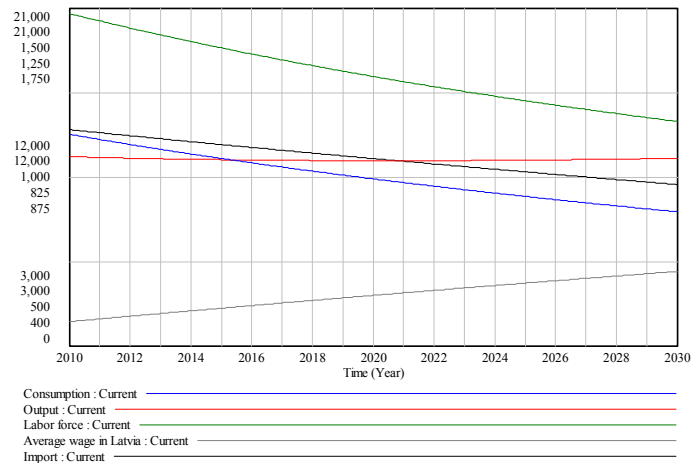
The impact of coefficient "output response to changes in consumption" on the system will be evaluated later. In the next experiment there are examined the parameters defined by the experts. This experiment represents the most likely scenario for the Latvia's economy integration into the EU.



**Fig. 6.** Coefficient "output response to changes in consumption" influence on the system

The Fig. 6 does not show a net import, because import and export will be kept at initial level. Changes in other indicators explain the next. Labour force will be reduced, that leads to wages increase and consumption decrease. As a result decrease in output will happen. Increasing wages would not only reduce production, but also substitute production with import. This expected increase of import will be compensated by diminishing of import, which will be related to reduction of consumption in the country. Therefore, the import remains unchanged, at steady state. EU subsidies will contribute to industrial development, despite of increase in labor force cost. Production will exceed consumption, there can be over-production in the system and inventories increase. This could mean that EU subsidies have limited effectiveness. After a certain stage, to encourage business development in Latvia would be useless. Deeper crisis will be caused by the lack of demand. Production without the sales market is useless.

For objectivity, it is important to remind, that previously it was not estimated how production would respond to changes in consumption. In the previous experiment, the reaction level was at the expert determined level of 45%; the change in consumption caused almost by half smaller changes in output. The following Fig. 7 analyzes the behavior of the system, provided that the production does not respond to changes in consumption (with a zero coefficient), keeping the other coefficients at the level determined by the experts.



**Fig. 7.** Production reaction to changes in consumption analyse and its influence on the system

The Fig. 7 shows that the production has remained almost unchanged. In a previous experiment constant import at this time will decrease. All other indicators (labor force, consumption and wages) are the same as in the previous experiment. This could mean that if the output does not depend on domestic demand, production could replace imports and form export capacity. But this is utopian situation.

Export potential form the stable operating companies whose products are demanded in domestic and foreign markets. In Latvia, there are almost no such companies and the small domestic market does not allow forming them. Also there are no opportunities that well-known producers will build their factories in Latvia. There are no cheap resources in Latvia. Soon the volume of labor force will diminish and a wages will be near to the EU level.

Unfortunately, Latvia does not look for exit from this deadlock. Priorities of Latvia at present are financial stability of the state (avoidance of default) and, in the longer term, accession to the euro zone.

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