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INFORMATION TECHNOLOGIES IN FOREIGN TRADE MODEL OF THE REPUBLIC OF ARMENIA

Dissertation topic:
**The issues of impact assessment of
 Information technologies
 on the economic growth of the
 Republic of Armenia**

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Import in economic systems, regardless of the type of product or service, is considered as an internal variable, the dynamics of which is closely related to other economic variables, in particular, variables describing the country's economic activity, the country's exchange opportunities in the international market, and the competitiveness of imported products and services with respect to local products and services. As a result, the forecast of import volumes depends on the forecast of the variables that are influenced by the individual decisions implementing economic policy, as well as other external variables.

Main notations: arrange the following appointments: M_t - import in period t , Y_t - outcome in period t , P_t^x - domestic price index, P_t^m - import price index, X_t - exports in period t .

Utilizing fundamental notations, the import model, contingent upon external variables [1], can be represented as follows:

$$M_t = f\left(Y_t, \frac{X_t}{Y_t}, \frac{P_t^x}{P_t^m}, t, \varepsilon_t\right) \quad (1):$$

The general appearance of the model can be presented as follows:

$$M_t = a_0 Y_t^{a_1} \left(\frac{X_t}{Y_t}\right)^{a_2} \left(\frac{P_t^x}{P_t^m}\right)^{a_3} e^{a_4 t} \varepsilon_t \quad (2),$$

where $\varepsilon_t > 0$ is the random errors and a_i are the parameters obtained from the log-linear regression.

If it is known that $a_i > 0$ when $(i=0, \dots, 3)$, then imports will be positively related to the coefficient of economic activity, Y_t , the relative purchasing power of imports, X_t/Y_t , and the price index ratio, P_t^x/P_t^m .

Import elasticity and the linear model. Since all the variables in equation (2) are positive, then the parameter a_0 is also positive. Thus, other things being equal, import can have both decreasing and increasing trends. It can be assumed that there are: exponentially increasing import trend, $e^{a_4 t}$ if $a_4 > 0$, and decreasing trend if $a_4 < 0$.

And the import growth rate is given as parameter a_4 because $\partial M_t / \partial t = a_4 M_t$ and $(\partial M_t / \partial t) / M_t = a_4$.

The elasticity of imports with respect to exports of the independent variable X_t is determined in the same way: $(\partial M_t / \partial X_t)(X_t / M_t)$: Thus, a_1 , a_2 , and a_3 are elasticity indicators.

Results of Regression analysis of the RA IT services import model					
	a_0	a_1	a_2	a_3	a_4
coefficients	405267,028	2049,593	23681,581	-786691,344	1584,968
Standard errors	279394,955	1490,507	68544,141	534716,563	1874,828
R^2	0,782				
F (Fisher coefficient)	9,868				

In particular, the elasticity of import with respect to export is equal to a_2 , and the elasticity of import with respect to domestic and import price indices is equal to parameters a_3 and $-a^3$, respectively. From the above formulations of elasticity, it is assumed that export, output and import prices are constant. If the coefficient of X_t/Y_t is stable, it means that the import elasticity is equal to the parameter a_1 . Therefore, the marginal propensity to import will look as follows:

$$\partial M_t / \partial Y_t = (a_1 - a_2) a_0 Y_t^{a_1 - 1} \left(\frac{X_t}{Y_t} \right)^{a_2} \left(\frac{P_t^x}{P_t^m} \right)^{a_3} e^{a_4 t} \varepsilon_t \quad (3)$$

Meanwhile, the average propensity of import will be as follows:

$$M_t / Y_t = a_0 Y_t^{a_1 - 1} \left(\frac{X_t}{Y_t} \right)^{a_2} \left(\frac{P_t^x}{P_t^m} \right)^{a_3} e^{a_4 t} \varepsilon_t \quad (4)$$

The marginal and average import propensities in equations (3) and (4) are functions of three economic variables: the economic activity coefficient, the purchasing power of imports, and relative prices.

For the presentation of the import model in the field of IT services (2), let's consider the general model in a linear form:

$$M_t = a_0 + a_1 Y_t + a_2 \left(\frac{X_t}{Y_t} \right) + a_3 \left(\frac{P_t^x}{P_t^m} \right) + a_4 t + \varepsilon_t \quad (5)$$

Import model of IT services: Let's consider the model of import of IT services in the foreign trade of RA, based on the equation presented in the model (5) and the statistical data of the field of IT services of RA: internet services and software development [2-4].

Based on the basic definitions, in the linear model of the import of IT services of the Republic of Armenia, the internal variable M_t is the volume of the import of IT services of the

Republic of Armenia in quarter of t , and the external variables are the output of the IT services sector, Y_t , the ratio of exports and output of the IT services sector, X_t/Y_t , the relative index of domestic and foreign prices: P_t^x/P_t^m and random error: ε_t .

Using [2-4] 2 quarterly statistical data of 2006-2009 and equation (5) we construct a linear regression in order to conduct an econometric analysis. Microsoft Excel, as well as E-Views, SPSS, SAS and other data analysis programs, provide an opportunity to analyze linear regression using econometric methods.

The table shows the estimates of parameters a_0 , a_1 , a_2 , a_3 , a^4 , as well as R^2 , standard errors and Fisher coefficient.

Based on the data in the table, we get the following import function of RA IT services:

$$M_t = 405267 + 2049Y_t + 23682\left(\frac{X_t}{Y_t}\right) - 786691\left(\frac{P_t^x}{P_t^m}\right) + 1585t + \varepsilon_t \quad (6):$$

Based on the data of the econometric analysis of the IT services import model of RA, the following conclusions can be made:

- Since $R^2=0.78$, the input model (6) accurately represents the relationship between the variables. In other words, with a probability of 78%, it can be claimed that the changes in the import of IT services in RA foreign trade are due to the external variables presented in the model: the result of the IT sector, the relationship between exports and results, the relative index of foreign and domestic prices and the period.

- Since the degree of freedom in the input model is 12 ($16-5+1$), comparing the critical values of the Fisher distribution table with F obtained in the table of the considered model ($F_{cr}<F$), it can be asserted that the selected variables are significant for the model.

- The significance of each variable is greater than 50%. This statement can be arrived at using the Student's t -distribution table, when the degree of freedom is 12 ($16-5+1$).

In fact, with the remaining 22% probability, the import volumes change due to the influence of other variables. The lack of other external variables in the model of IT services of RA is due, in particular, to the existing shadow environment in terms of import and the absence of a number of research data, which do not allow to more accurately assess the exact model of IT import. As well as in the balance of payments of RA [4] the data of IT software patent fees and author's fees (royalties) are not recorded.

Thus, drawing out the exact model of import of IT services can become a stimulus for economic development and the development of a system of tax benefits for enterprises providing IT services, due to the reduction of the black market and the development of the domestic market, which will also promote the export of IT products.