

research and development of the model being built, that can be used for further research and policy recommendations.

References

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Kovtun Khrystyna
Master student, LNU
 Oliskevych Marianna
Professor, LNU

SYSTEM DYNAMIC MODEL OF ENDOGENOUS ECONOMIC GROWTH FOR NORTH AND SOUTH COUNTRIES

The large difference in the levels of economic development between the countries has made many views of the world as being divided between the rich North and the poor South. We built the model of endogenous economic growth for these two kinds of countries. The model is based on the relationships between output, Y , knowledge, A , capital, K , and labor, L .

We assume that the output and capital accumulation in region i ($i = N, S$) is given by

$$Y_i(t) = (K_i(t))^\alpha [A_i(t)(1 - a_{Li}) L_i]^{1-\alpha}, \quad (1)$$

$$K_i(t) = s_i Y_i(t), \quad (2)$$

where a_{LN} – fraction of the labor force used in the resources and development sector that is located in North,

a_{LS} – fraction of the labor force engaged in learning Northern technologies,

a_{Li} – endogenous and constant,

$1 - a_{Li}$ – fraction of the labor force used in the goods-production sector,

α – elasticity of capital in goods-production sector, so it is a variable that measures the reaction of output to a change in levels of capital,

$1 - \alpha$ – elasticity of labor in goods-production sector,

s_i – saving rate.

Technologies or knowledge can be produced at first only in North, after that they become to be available to South. So new knowledge in North are given by third equation:

$$A'_N(t) = \text{Ba}_{LN}A_N(t) \quad (3)$$

Improvements in Southern technology, on the other hand, are made by learning from Northern technology:

$$A'_S(t) = \mu a_L s_L S [A_N(t) - A_S(t)] \quad (4)$$

Figure 1 represents the economic growth model for Northern economy.

The model includes Stocks for Labor with constant growth rate; Stock of Capital that increases when savings rate is increasing and when depreciation of capital is less than investment; Stock of Knowledge that increases with effect of contribution of labor in R&D and contribution of knowledge. Output increase when contribution of effective labor or contribution of capital increases.

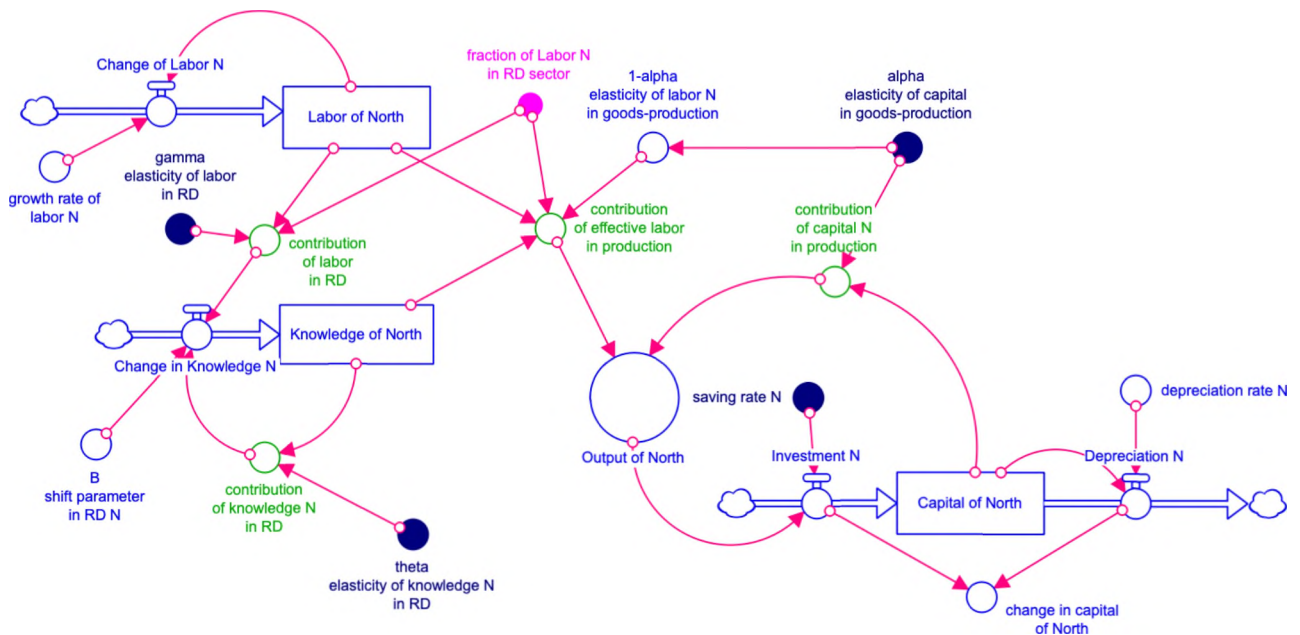


Figure 1. System dynamic model for Northern economy

The model of South economy is basically the same except knowledge accumulation. The full model includes both North and South. In this model there is a connection from Northern stock of knowledge to change in knowledge in South.

Now let's see some dynamics. The Dynamics of Capital for North and South with different initial values for Capital. We assumed that depreciation rate = 0. For the first image we used saving rates = 0.25. In the second image for North $s_N = 0.25$, for South $s_S = 0.5$. From these dynamics, we come to conclusion that stock of capital is rising more quickly when saving rate increases.

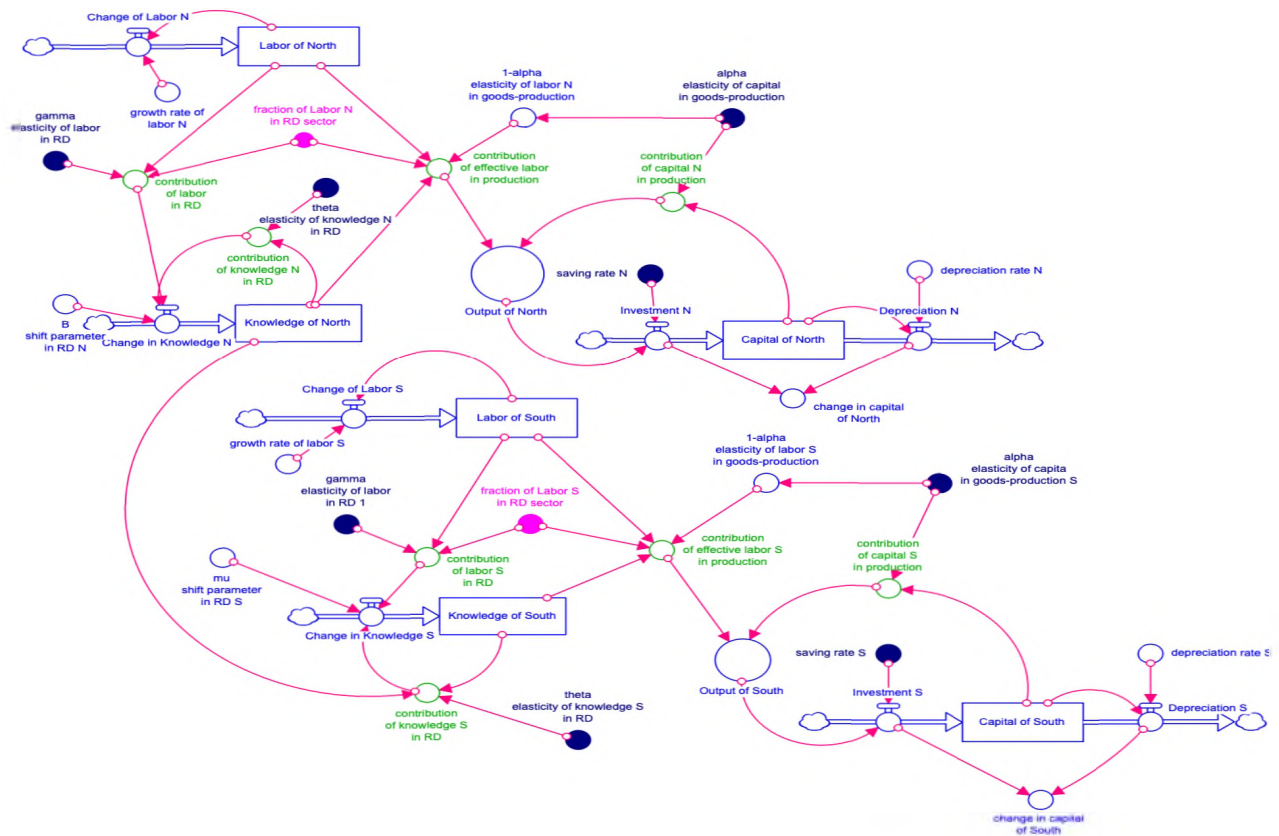


Figure 2. Northern and Southern economy model

The dynamics of Knowledge of North and South with different elasticity of knowledge and labor is presented in the Figure 3.

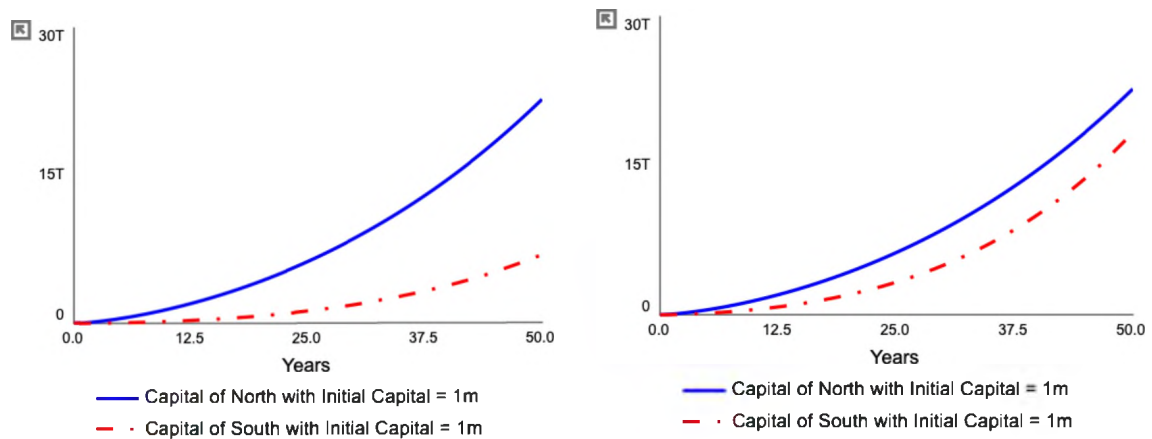


Figure 3. Dynamic of Capital for North and South

From these graphs we can say that speed of knowledge depends on the elasticity of knowledge (when theta increases the knowledge increases).

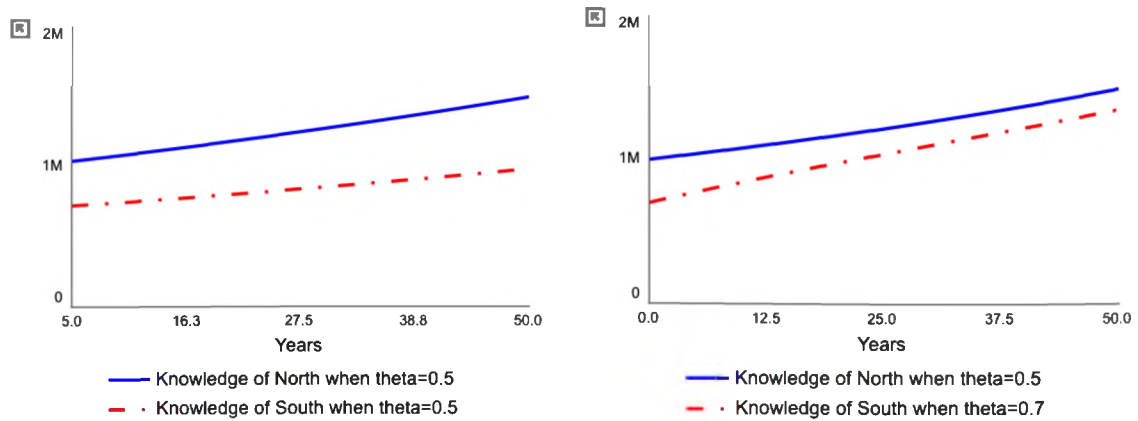


Figure 4. Dynamic of Knowledge for North and South

The dynamics of fraction Knowledge of South to North with different elasticity of knowledge for Southern region is presented in the graph 5. When the elasticity of knowledge for Southern is greater than 0.5, then the division between knowledge approach one. Otherwise the dynamic of the fraction decline.

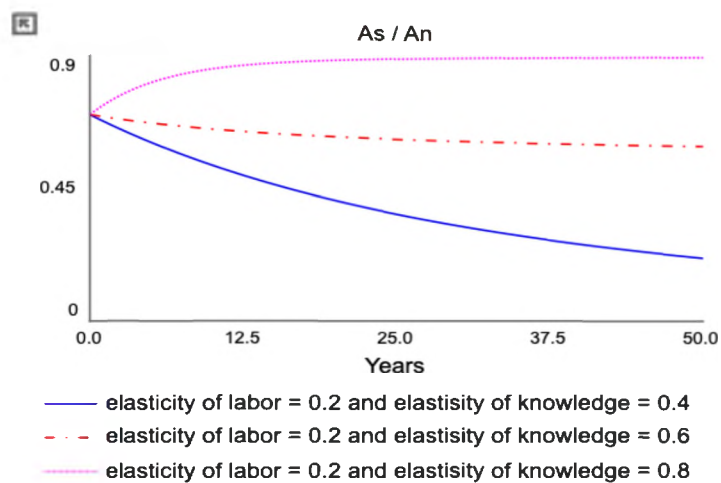


Figure 5. Fraction of Knowledge - South over North

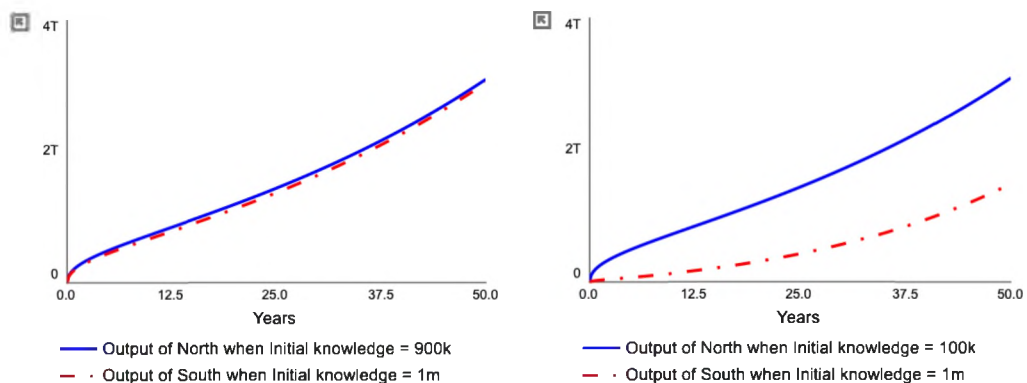


Figure 6. Dynamics of Output for North and South with different initial value of knowledge

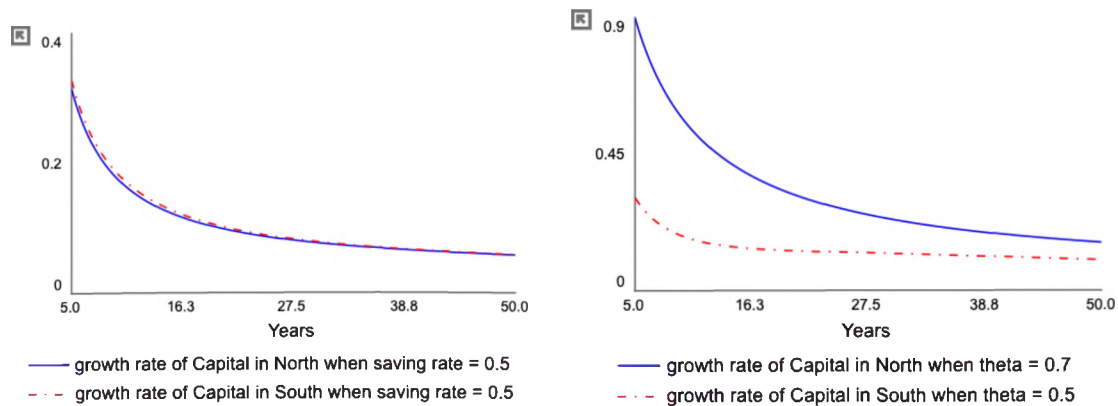


Figure 7. Dynamics of growth rate of capital in North and South

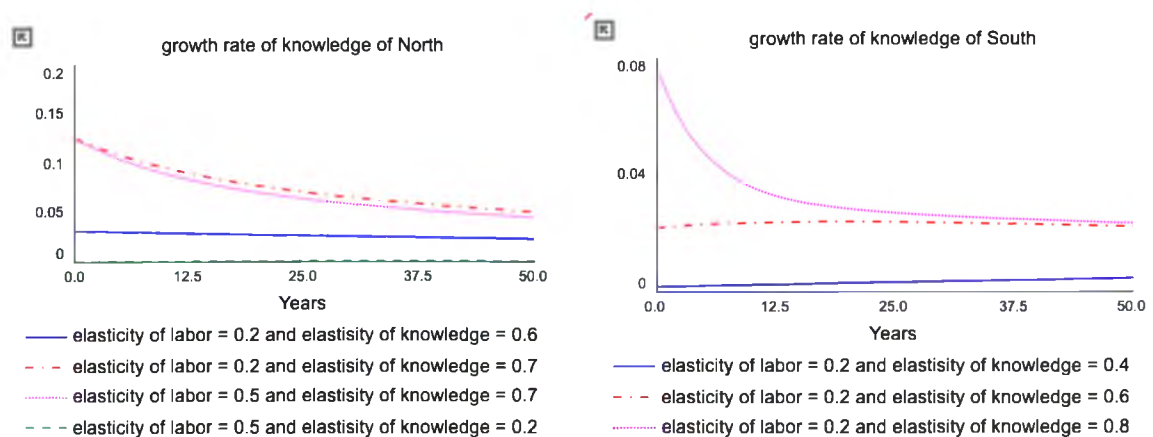


Figure 8. Dynamics of growth rate of knowledge in North and South

The results show that southern growth depends on northern growth and the growth rate of the South is restricted by the growth rate of the North. The model being built is sufficiently adequate and can be used for further research and policy recommendations.

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