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Khanzhyn V. V.,
philosophy doctor (PhD), interim assistant professor at economic theory and international economics department,
Petro Mohyla Black Sea State University, Mykolayiv, Ukraine,
email: vkhanzhyn001@gmail.com

THE ROLE OF THE FINANCIAL SYSTEM IN OVERCOMING THE UNEVEN REGIONAL DEVELOPMENT OF A COUNTRY

This study utilizes a simple endogenous growth model and extends it to the case of two regions linked through their financial sectors. We model the influence of the financial development on the regional growth and extend the model for the multiple-region case to enable the empirical analysis using data on the US states. Despite our interest in uneven regional growth in developing countries, the model is best tested using data from the regions of developed countries. These countries have accumulated sufficiently detailed and consistent data. In this study, I propose to use US state-level data. The specific historic development of the regional banking in US, particularly the restrictions on intrastate and interstate banking, created regionally distinct banking systems.

Key words: *regional development; finance-growth nexus; endogenous growth model; financial development.*

Research problem statement. Among many economic problems in developing countries and countries in transition is the problem of uneven regional development. For instance, in Ukraine 7 regions out of 24 obtain about 60 % of the annual investment [1]. One of the fastest developing sectors of Ukrainian economy nowadays is financial service sector. Even though the amount of financial intermediaries increases, there is still growing regional disparity. The general trend of the businesses to locate closer to the fastest growing regions is motivated by the difficulty of availability of the credit resources for the small and medium businesses in the stagnating regions. The analysis of the regional economic development programs in Ukraine showed that they don't treat the financial development of the region in a systematic way.

That in brief shows the importance of the theoretical framework, which would enable a more complete analysis of the regional development in the long-run perspective. The analogous studies show the growing interest in the so-called finance-growth nexus in the regional context also in developed countries (for instance [4]).

Literature review. A number of researchers have contributed to the literature on finance-growth nexus. Among most prominent contributors to the English-language literature on the topic are: J. Schumpeter, R. Goldsmith, H. T. Patrick, and R. Levine, R. G. Rajan, L. Zingales, and A. Demirguc-Kunt. Ukrainian literature on the topic is still very limited [2, 3, 5, 7, 8, 10].

Identifying the previo uslyunsolved parts of the general research problem. There is a lack of the formal regional models, despite the growing popularity of using state data in the empirical works. To till this gap we utilize the endogenous growth theory and build a two-region framework with no perfect capital mobility assumption that is used to analyze how difference in financial development of the two regions can account for the difference in the rates of convergence (and even cause divergence) of their per capita outputs. The framework is then extended to multiple-region case.

Stating the goals of the paper. The objective of this research is to study the role of the financial system in the regional development disparity. I am trying to answer the question if the difference in the financial development of regions can explain the difference in their economic growth, measured as per capital output. My interest in this subject stems from a desire to understand the uneven development and levels of capital investment in regions within developing countries. However, given the limited quality of sub-national data available in most developing countries I must test the model utilizing regional data from a developed country. In particular, I utilize data from 50 United States.

The body of the research. Following Romer [9] we develop a simple two-regional endogenous growth model, where the type of the connection between the regions resembles that of Center-Periphery. We use the idea of Kang and Sawada [6], who implement endogenous growth model in studying the influence of the financial development on the growth. Since our primary interest is to study the effect of the financial system development on the growth differential between the two regions, we simplify the underlying production function to only two production factors, excluding human capital. The source of growth in our model is neoclassical technological advance, *A*. The production of the new knowledge is modeled as a research and development sector, which utilized

production factors and existing level of technology. The focus is on the way the difference in the financial development of the regions influences the difference in their per capital output growth.

To model the financial sector on the regional level we use the simple endogenous growth model in continuous time, developed in Romer [9]. Gradually we break the single-region economy into two-region case and then add the model of the financial system and study the development of the output per capita in those models.

The production function is assumed to be the same for both regions and it is of the Cobb-Douglass form: $Y_i = K_i^{\alpha}(AL_i)^{1-\alpha}$, $i = 1,2$. The capital accumulation is given by: $\dot{K}_i = sY_i = I_i$.

In this case the source of the regional investment is solely domestic regional savings. Following Romer, for simplicity the capital is assumed to be used up entirely in one period, so there is no depreciation included into the capital accumulation rule.

The production function of the new technology is assumed to be Cobb-Douglas form: $\dot{A} = BK^{\beta}L^{\gamma}A^{\theta}$, where $K = \sum K_i$ and $L = \sum L_i$.

We extend this two-region model by allowing the interregional capital flows. We assume the Center-Periphery relationship between the regions, where the total amount of economy's savings is being redistributed among the regions in the form of investment in some fixed proportion. We further assume that the financial system of one region manages to attract only a constant fraction of aggregate savings φ. Themodified investment rule is in the simple linear form: $I_1 = \varphi I$, where $I = \sum I_i$ is the total level of investment in the economy.

In the two-region case the total level of investment thus can be expressed through the levels of regional investments respectively:

$$I = \frac{I_1}{\varphi} = \frac{I_2}{(1-\varphi)}.$$

In turn each of the region's investment is $I_1 = \varphi sY$ and $I_2 = (1-\varphi)sY$ respectively.

We now consider two possibilities: constant φ and changing φ. In first case we the steady-state growth rate of the outputs in each region is the same in both regions and equals the usual result of this type of model: technological growth plus population growth:

$$g_{K_1}^* = g_{K_2}^* = g_A^* + n.$$

Since K_1 and K_2 grow at the same rate in the long run, then their sum, K, will grow at the same rate, or putting it in a formal way $g_{K_1}^* = g_{K_2}^* = g_K^*$. So the constant–$\varphi$ investment rule does not affect the long-run steady state growth rate of the economy. What about the levels? To answer this question I use the computer simulation.Figure 1 represents the change of the per capita outputs of the regional economies over time.

It is clear that the model with constant φ predicts diverging levels of per capita outputs.

We now consider one more extension of the model. Now instead of a constant φ we consider a dynamic φ. So to model this situation we assume that the growth rate of the fraction of the total savings that is allocated by the local financial system is defined by some function of the financial development $\psi(F)$: $\frac{\dot{\varphi}}{\varphi} = \psi(F)$.

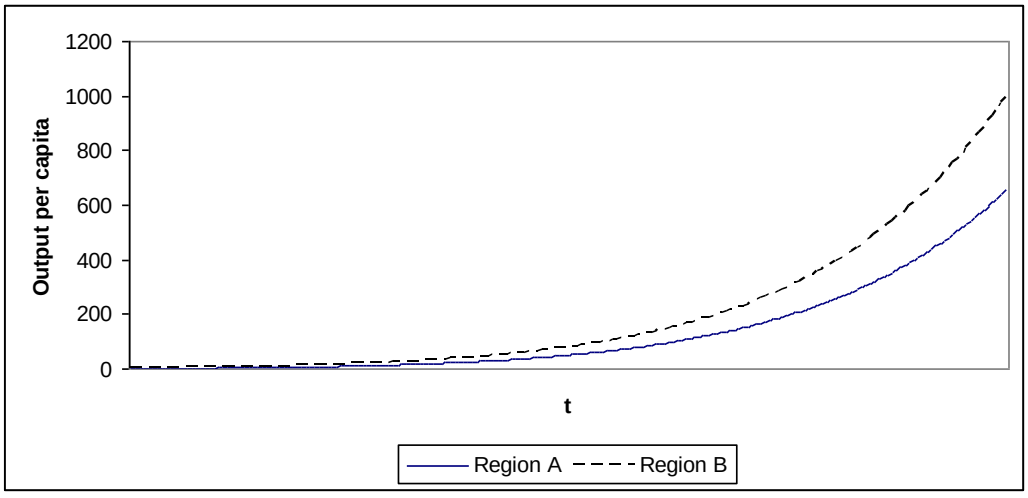

Figure 1. Regional per capita output for a model with constant φ

That is in the Center-Periphery relationship Center region starts attracting more and more savings into it's investment projects and in the long run receives total economy's investment.

As we can see the divergence between the regions is much more pronounced in this case. This is mostly due to the fact that in this scenario unlike in the previous one the growth rates of per capita outputs are also diverging instead of converging.

Let's now assume we have N regions. Some of them are Central and some are Peripheral. We are interested in the question if the difference in the development of the regional financial system can explain the difference in the growth rates in the regional economies. Using the same

setting of the model as previously, except for the fact that we have now N regions, we can show that as long as φ_i and φ_j are changing over time, the difference in the regional per capita output growth rates will be proportional to the difference in the growth rates of the corresponding regional investment ratios $g_{Y/L,i} - g_{Y/L,j} = \alpha(g_{K_i} - g_{K_j}) = \alpha\left(g_{\varphi_j} - g_{\varphi_i}\right)$.

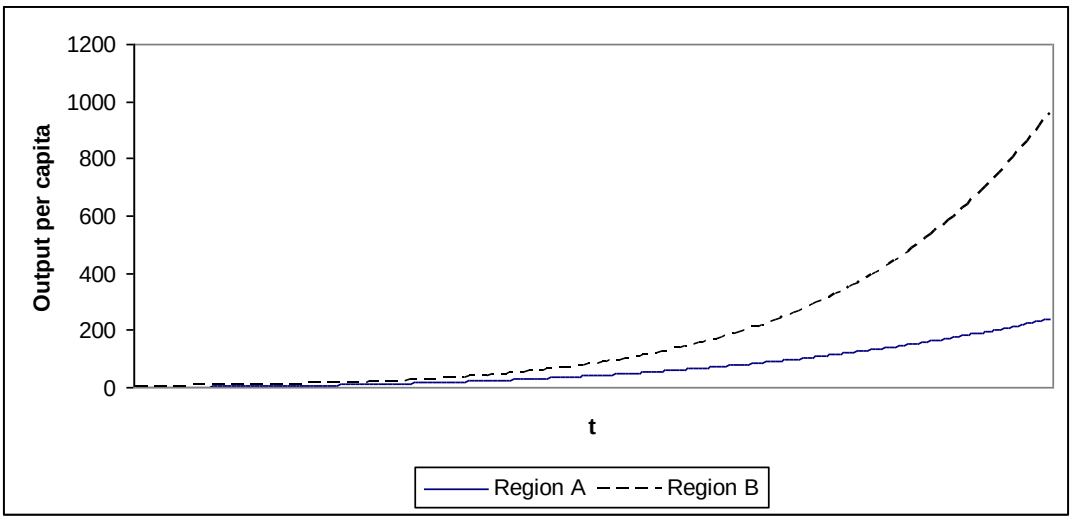

Figure 2. Regional per capita outputs

We have two main results. First, is that if we have a Core-Periphery type of relationship between the two regions (modeled on the level of their financial sectors), then we get a long-term divergence of their output growths. The multi-regional extension shows that if we have two similar-in-structure regions, then the difference in their output per capita growth can be explained by the difference in the financial development.

The multi-regional model suggests that the two regions growth rate differential can be explained by the differential in the growth rate of their respective portions of the total regional group investment $g_{\frac{Y_i}{L_i}} - g_{\frac{Y_j}{L_j}} = \lambda\left(\frac{\dot{\varphi}_i}{\varphi_i} - \frac{\dot{\varphi}_j}{\varphi_j}\right)$,where λ is some coefficient of proportionality. For the notational convenience we change $g_{\frac{Y_i}{L_i}} - g_{\frac{Y_j}{L_{j1}}}$ for Δ_{gy}, and $\frac{\dot{\varphi}_i}{\varphi_i} - \frac{\dot{\varphi}_j}{\varphi_j}$ for $\Delta_{g\varphi}$. Thus, adding the disturbance, we can rewrite the equation as a stochastic model:

$$\Delta_{gy} = \alpha_1 + \alpha_2 \cdot \Delta_{g\varphi} + \nu .$$

To test the model I am using data on 48 US states (excluding Alaska, Hawaii and DC) over the period of 1971 – 1994 (24 years). There are two major sources of data: Bureau of Economic Analysis (BEA) and Federal Deposit Insurance Corporation.

The investment oriented bank loans (IOBL) are calculated as the sum of loans, secured by real estate, loans for agricultural production, commercial and industrial loans, and loans to individuals. The portion φ_i is calculated by dividing the IOBL in the state i to the total amount of IOBL in the corresponding Census region.

One of the reasons why the data of the United States can be used to test the model is the regional bank regulation. One of the key model's assumptions is closed economy. It is assumed that there are no financial outflows and inflows into the connected regions and the totality of the savings are redistributed into the investment within the same group of regions. The existence of the banking regulation in the United States to some extent created this situation, when such assumption is not far from reality.

There are three possible regulations: intrastate branching, interstate banking, and interstate branching. Following Stiroh and Strahan (2003) we use two sets of dummies: for the intrastate branching deregulation effects and for the interstate banking deregulation effects [11].

The dependent and independent variables are expressed as growth differentials between pairs of states. So now we need to create the pairs of states to get the data sample.

Two samples of state pairs are designed. The multi-regional extension of the two-region model assumes Center-Periphery (C-P) relationship between the states within a Census division. In order to form the pairs, we need to classify the states as either Center or Periphery. As it has been discussed earlier, the main characteristics of the Center region are:1) higher level of per capita output and 2) more developed financial system.

The first sample consists of 38 pairs of states. Center region is chosen in each of the Census regions and then paired with the rest of the states in the corresponding region. This sample was designed to include most of the US states, so that it enables us to test the model in a more general case. The choice of the center regions was based on the financial classification: the ratio of employment in the financial sector to the total population of the state. At the same time the major metropolitan areas were taken into consideration.

Periphery states show faster growth rage, averaged over the sample period, which is consistent with the theoretical and empirical findings of convergence of states per capita incomes.

The second sample consists of only 9 pairs, which correspond to each of the Census regions. The choice of the

Center regions for this sample stayed unchanged. The difference is that instead of paring all the states in the region, the average of the Periphery states is computed and then the difference between the Center and the «average» Periphery for each Census region is taken. The descriptive statistics for each sample are presented in the following tables

Table 1

Descriptive statistics for the first sample (38 pairs)

Variable	Mean	Std Dev	Variance	Minimum	Maximum
Δgy	-0,0016	0,0254	0,0006	-0,2859	0,1176
Δgφ	-0,002	0,1029	0,0106	-1,1718	0,6967

Table 2

Descriptive statistics for the second sample («average» Periphery)

Variable	Mean	Std Dev	Variance	Minimum	Maximum
Δgy	0,0035	0,0459	0,0021	-0,0861	0,1488
Δgφ	-0,0082	0,1122	0,0126	-0,3159	0,6998

The estimation results of the model using the first sample are presented in Table 3 below.

Table 3

Estimation results for the first sample

	OLS	OLS with fixed effects	2SLS	2SLS with fixed effects
Constant	-0,0023	-0,0097*	-0,0038*	-0,0193*
	(-1,6413)	(-1,7284)	(-1,7721)	(-1,6918)
$\Delta_{g\varphi}$	0,0813***	0,0883***	0,1335**	0,1973**
	(3,5030)	(3,6774)	(2,3375)	(2,0057)
Dummy1	0,0029	0,0058**	0,0041*	0,0109*
	(1,5523)	(2,1067)	(1,7039)	(1,8671)
Dummy2	-0,0015	-0,0028	-0,0014	-0,0038
	(-0,9014)	(-1,4777)	(-0,7254)	(-1,3478)
$\Delta_{g\varphi}$*Dummy1	-0,0551**	-0,0555**	-0,1030*	-0,1514*
	(-2,2362)	(-2,1776)	(-1,8982)	(-1,7035)
$\Delta_{g\varphi}$*Dummy2	0,0126	0,0087	0,0191	0,0181
	(0,8745)	(0,5777)	(1,0092)	(0,7920)
Δ_{gy}(-1)	0,0637**	0,0426	-0,4465	-0,9657
	(2,0392)	(1,3360)	(-0,8972)	(-1,1307)
Sample size	874	874	874	874
R^2	0,04	0,06	-	-

** – significant at 10 %; ** – significant at 5 %; *** – significant at 1 %.*

The t-statistic is given in the parentheses. The R^2 is not reported for the 2SLS estimations because of statistical incomparability with that, calculated for the OLS.

The estimation results of the model using the second sample are presented in the table blow.

Table 4

Estimation results for the second sample

	OLS	OLS with effects	2SLS	2SLS with effects
Constant	0,0115***	0,0079*	0,0119***	-0,0059
	(4,0040)	(1,6615)	(4,0359)	(-0,6687)
Δgφ	-0,0287	0,0578***	-0,0369	0,0972***
	(-1,0138)	(2,8797)	(-1,1928)	(3,0985)
Δgy(-1)	0,5714***	0,2165***	0,6111***	-0,4785
	(8,1246)	(3,1434)	(6,5948)	(-1,3647)
Sample size	207	207	207	207
R2	0,28	0,78	–	–

** – significant at 10%; ** – significant at 5%; *** – significant at 1 %.*

For the first sample (38 pairs) the coefficient on the $\Delta_{g\varphi}$ is positive as expected in all specifications. For OLS it is highly statistically significant, and less significant, but still within 1–5 % probability range, for 2SLS. Under the hypothesis, that OLS gives inconsistent estimates, we can conclude, that it underestimates the effect of $\Delta_{g\varphi}$. So we get 0,13 % (0,08 % in case of OLS) increase in the C-P per capita output growth difference as a result of 1 % increase in the C-P differences in growth rates of portion of the total investment oriented loans, on average, ceteris paribus. Note that the change of 1 % represents the value of the level change of the difference, (since both dependent and independent variables are measured in per cents) and not change as a percentage of the initial value. The deregulation effects are insignificant but the interaction term on the first dummy (interstate banking deregulation)

gives a significant coefficient with negative sign, as expected. So the deregulation of intrastate banking decreases the level of C-P relationship by 0,05 % of the difference in growth rates as reported by OLS, and 0,10 % as reported by 2SLS. That means that after the intrastate branching deregulation, the effect of the $\Delta_{g\varphi}$ on the difference in the growth rates of regional incomes per capita decreases to 0,03 % as reported by both estimates.

The inclusion of the pair-specific state effects didn't influence the difference in the effect of $\Delta_{g\varphi}$ as reported by OLS. But this difference is more significant in the case of 2 SLS estimation: 0,197 from 0,133. The net effect of the $\Delta_{g\varphi}$ after the deregulation, as estimated by 2 SLS, didn't change significantly.

For the second sample (9 pairs) the estimated effect of $\Delta_{g\varphi}$ is insignificant in the specification without pair-specific fixed effects, but becomes very statistically significant once the models are augmented to include them. According to the results, 1 % growth in difference in the growth rates of φ increases the difference in the growth rates of real per capita incomes by 0,097 % (0,058 % in case of OLS), on average, ceteris paribus. The results reported by both estimates are within the range of before- and after-deregulation effects of $\Delta_{g\varphi}$, estimated from the model specifications for the first sample. Since the model specifications for this sample does not include the deregulation dummies, so that might average the effect over the whole sample range, whereas the specification for the first sample (38 pairs) allows for the change of the effect once the bank branching deregulation was enacted in one of the states in the pair.

Inclusion of the spatial effects (pair dummies) into the models shows that in there is higher degree of heterogeneity among the «averaged» C-P pairs, then between the pairs in the first sample. The first sample includes a lot of neighboring pairs of states, where as the second includes only nine region – «averaged» pairs.

Conclusions and suggestions for future research. The main goal of this research on the one hand was to derive more evidence for the finance-growth nexus discussion, and on the other – to find the explanation for the differences in the regional development in the different levels of financial development. A growing literature provides both theoretical and empirical evidence in favor of the influence of the financial development on the economic growth.

We developed a two-regional model and its multi-regional extension that is based on the endogenous growth model. We dropped the perfect capital mobility assumption and used Center-Periphery type of relationship between the two regions developed by Dow [4]. To introduce the role of the financial development into the model we follow Kang and Sawada and augment the simple endogenous growth model with two endogenous factors – capital and technology [9] – with the investment distribution rule: the total pool of savings in the two regions is redistributed into the investment into corresponding regions in some proportion, which is defined by the quality of functioning of their regional financial systems. We assume that Center type of region has a more developed financial system. That is why it gets the larger portion of the total investment. The case with the fixed proportions showed that it doesn't influence the relative regional growth rates. That is why a dynamic investment distribution rule was introduced, where the relative portion of investment into each region is changing over time. When the portion of the relative investment is defined endogenously, then it influences the relative regional growth resulting in divergence.

The multi-regional extension of the model showed that if the two similar in structure regions are growing at different rates then the difference can be explained in part by the difference in the financial development.

We test the result using data on 48 US states. Using the US Census Bureau regional division, we define 9 groups of states, which correspond to 9 census regions. For each of the regions we define the Center state and then pair it with all other states in the group, defining thus the Center-Periphery pairs. Among our empirical findings are the following. First, we find statistically significant association between the difference in the financial development and difference in the economic development among US regions, estimated for the two specifications that we used for two samples. Second, the intrastate branching deregulation proved to have negative effect on the strength of relationship of interest. The interstate banking deregulation turned out to have insignificant effect, despite the theoretical expectations. Thirdly, the inclusion of the spatial effects into the models showed some difference in the estimation of the effect. This reveals the spatial heterogeneity of the finance-growth relationship and stresses the importance of further development of the existing models in this direction.

And finally, one of the implications of the empirical part is that one can use the data of the developed countries to develop and test theoretical models based on the assumptions which are more realistic for the current situation in the developing countries and countries in transition. As argued by Goldsmith, the possibility of any empirical work in the field of finance-growth nexus rests on the assumption that there is universal path of financial development, and difference in the countries' (which could be extended to regions of a particular country as well) financial development is presented as their different relative location along this path. In this research the development of the theoretical model was resting on the Center-Periphery type of relationship, more commonly experienced by the regions of some developing economies rather than economies with almost frictionless financial and capital markets, such as US. But the historical conditions, which created region-distinct banking system, mimic the assumptions of the model and thus provide grounding for the empirical work conducted.

The future research should focus more on the data for developing countries. More data is being collected by the national statistical agencies on the financial sector which will enable the type of research for these countries.

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В. В. Ханжин,
Чорноморський державний університет ім. Петра Могили, м. Миколаїв, Україна

РОЛЬ ФІНАНСОВОЇ СИСТЕМИ У ПОДОЛАННІ НЕРІВНОМІРНОСТІ РЕГІОНАЛЬНОГО РОЗВИТКУ КРАЇНИ

Це долідження використовує просту модель ендогенного розвитку як основу для побудови моделі з двома регіонами, які пов'язані між собою через їх регіональні фінансові системи. Ми моделюємо вплив фінансового розвитку на регіональне зростання та розширюємо модель для випадку із багатьма регіонами для того, щоб можна було використати теоретичну модель у емпіричному аналізіна основі статистики США. Не дивлячись на те, що нас в першу чергу цікавлять моделі, які здатні пояснити нерівномірний розвиток у країнах, що розвиваються, модель краще за все тестувати, використовуючи дані з розвиненої країни, через повноту таких даних. У цьому дослідженні ми пропонуємо використовувати дані по штатах США, оскільки у цієї країни особлива історія розвитку банківського (та фінансового) сектора. Особливість цього розвитку полягає у жорсткому регіональному регулюванні банківскої діяльності в середині кожного штату та між штатами.

Ключові слова: *регіональний розвиток; зв'язок «фінанси – економічне зростання»; ендогенна модель економічного зростання; фінансовий розвиток.*

В. В. Ханжин,
Черноморский государственный университет им. Петра Могилы, г. Николаев, Украина

РОЛЬ ФИНАНСОВОЙ СИСТЕМЫ В ПРЕОДОЛЕНИИ НЕРАВНОМЕРНОСТИ РЕГИОНАЛЬНОГО РАЗВИТИЯ В СТРАНЕ

Это исследование использует простую модель эндогенного развития как основу для модели с двумя регионами, которые связаны между собой через их региональные финансовые системы. Мы моделируем влияние финансового развития на региональный рост и расширяем модель для случая с многими регионами для того, чтобы можно было применить теоретическую модель в эмпирическом анализе на основе статистики США. Несмотря на то, что нас интересует в первую очередь модели, которые способны объяснить неравномерное развитие в развивающихся странах, модель лучше всего тестировать, используя данные из развитой страны в виду полноты таких данных. В этом исследовании мы предлагаем использовать именно данные по штатам США, поскольку в этой стране необычная история развития банковского (и финансового) секторов. Особенность этого развития лежит в строгом региональном регулировании банковской деятельности (в пределах каждого штата и меж-штатные отношения).

Ключевые слова: *региональное развитие; связь «финансы-экономический рост»; эндогенная модель экономического роста; финансовое развитие.*