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INNOVATION IN THE CONTEXT OF THE GLOBAL ECONOMIC CORE-PERIPHERY HIERARCHY: THE POTENTIAL OF THE BIOTECHNOLOGY SECTOR IN LITHUANIA

Метою даної статті є огляд стану сектору біотехнології у Литві. Автори вважають, що Литва має «перевагу другого місця» за допомогою залишеної в спадок радянської інфраструктури разом з високим рівнем освіти робочої сили. Поєднання цих факторів дозволяє сектору біотехнологій ставати все більш важливою та інноваційною силою в економічному розвитку країни.

The goal of this paper is to give an overview of the state of the biotechnology sector in Lithuania. We find that Lithuania has a "second place advantage" by using "inherited" Soviet biotechnology infrastructure along with a highly educated workforce. A combination of these factors is allowing the biotechnology sector to be an increasingly important and innovative force in the country's economic development.

Ключові слова: біотехнологія, інновації світового системного аналізу, Шумпетер, Литва.

Keywords: Biotechnology, Innovation, World-systems analysis, Schumpeter, Lithuania

This paper aims to provide an overview of the current state of Lithuania in the context of the global core-periphery hierarchy by focussing on the country's ability to innovate, especially in the field of biotechnology. Purely economic measures, such as annual gross domestic product (GDP) per capita do not take non-economic factors into account. Developmental economists recognized this, and in 1980 developed the human development index (HDI), which combines measures of life expectancy, literacy, educational attainment, and GDP per capita [11]. Lithuania's HDI was 0.749 in the year 2000, increased to 0.793 in 2005, then further increased to 0.810 in 2011, which placed it in the "highly developed" category according to the United Nations ranking [29]. Other indicators which suggest an upward trend for Lithuania is the Economist Intelligence Unit's quality of life index. Compared to the other Baltic countries, Lithuania rates the highest on this indicator, which is based on such factors as health, family life, political stability, and political freedom [6].

The purpose of this paper is to analyze Lithuania's position in the core-periphery hierarchy, focussing on the role of Lithuania's unique ability to innovate in such sectors at biotechnology as a means by which it can move up in the hierarchy. The CPH is based on such indicators as per capita gross national income (GNI), the human development index, and the percent of export of manufactured goods. We draw upon Schumpeter's idea of innovation to analyze the potential of Lithuania's skilled workforce, while the theoretical model that the CPH is based on originates from world-systems analysis.

One way to conceptualize Lithuania in the global economy is the world-systemic perspective, which developed as a reaction to dependency theorists [2;3;13;19;35]. During the 1970s, historical economic sociologists such as Wallerstein and Frank began to conceptualize an expanding European economic world-system, which could be used to explain the historical economic development (or lack thereof) of countries around the world [8;31]. Capitalist market relations are seen as a means of wealth redistribution, from the periphery to the core, or from the global South to the global North [4;28]. We are not analyzing the question of resource redistribution, but rather are interested in Lithuania's potential for mobility in the CPH. Additionally, while the world-systemic perspective alludes to entrepreneurial labor as a form of capital, it does not emphasize it. The structural emphasis of world-systems analysis on Kontratiev business cycles have been criticized by some [23]. Unlike world-systems analysis, we emphasize that Schumpeterian innovation is an important means by which Lithuania's economy can expand.

World-system theorists view the scope of capitalist accumulation as global, and the entire world is seen as economically interconnected though an international division of labor which became increasing resilient with the rise of mercantilism in the 1500s [5]. In this hierarchy, there is a powerful central region (the core) that economically, politically, and militarily dominates weaker external areas (the periphery). Between the core and the periphery lie semi-peripheral nations.

The ideas of Joseph Schumpeter [21] can be drawn upon in the case of Lithuania to emphasize the importance of innovation on one hand, and the danger of stagnation on the other. Schumpeter popularized the term "creative destruction," by which he meant that innovation by entrepreneurs has the ability to radically change stagnant industries or an entire economy.

To which distinct zone does Lithuania belong? First it has to be stated that there is disagreement among world-system scholars about the boundaries between the three zones. Chase-Dunn [5] argues that there are no concrete criteria to separate the core and periphery categories, but rather, semi-peripheral countries are those which display a blend of qualities found in the core and periphery. For example, Lithuania is a part of NATO and the European Union - core qualities. Militarily, economically, and politically (at least in terms of foreign policy), Lithuania is rather weak, which are qualities of peripheral countries. Core nations include the powerful nations of Western Europe, the United States, and Japan. Examples of periphery countries are many sub-Saharan African and South East Asian countries.

Chase-Dunn [5] argues that only the poorest countries of the world belong to the periphery and that all the other countries not belonging to the core are semi-peripheral. Others argue that the world division of labor has become so complex that it makes no sense anymore to divide the world in three distinctive zones [22]. In order to find out to which distinct zone Lithuania belongs, it is required to provide an overview of the character tics of the core, periphery and semi-periphery.

After the break-up of the Soviet Union, Lithuania transformed rapidly, politically as well as economically [24;25;30]. Lithuania embarked on a path that strived for the adoption of two main features of the core: the capitalist market system and the system of electoral democracy. In 2004, Lithuania obtained full membership of the European Union and became fully integrated into the capitalist world-system. In the same year, Lithuania was also incorporated into NATO, thereby institutionally aligning itself with the hegemonic core state: the United States.

Core states are strong politically and have a strong foreign policy. They are relatively integrated with other core states in the world system and have articulated national economies in which production is relatively capital intensive and wages are relatively high. In core states there is relatively less internal economic and political inequality than in peripheral states [5]. Available economic data [7;32] shows that Lithuania clearly falls short to be classified as a core country, although it has several characteristics of a core state. For example, Lithuania's economy is industrialized and diversified. The service sector dominates, adding 61% to GDP, while the industry sector adds 38% to GDP and agriculture only 5%.

Lithuania is a small and open economy. Integration into the EU boosted growth in foreign trade. The 26 other member states of the EU accounted for 61.4% of Lithuania's total exports and for 55.9% of total imports. In 2008, Lithuania saw its total exports of goods and services increasing with 28.4%. Minerals made up 25.6% of total exports, electrical machinery and mechanical equipment 10.3%, chemical products 9.2%, transport vehicles and equipment 7.7%, agricultural products 5.7% and plastic products 6.2% [14]. Despite minerals topping the list of exports in 2008, the overwhelming majority of Lithuania's exports consisted of manufactured commodities, rather than raw materials, although high technology exports make up only a small proportion of total exports. Lithuania's increasing export of manufactured goods as another example of Lithuania's rise in the global hierarchy [9].

However, Lithuania is relatively poor compared to the western European member states of the European Union, although during the recent decade the gap with these countries is gradually closing as a result of high economic growth. This gap is far from being closed tough. Lithuania has several characteristics that are typical for the periphery. Lithuanian GDP per capita in Purchasing Power Standards (PPS) is only at 60% of the average GDP per capita in PPS of all the EU member states together. Compared to the EU average, labor costs in Lithuania are five times cheaper [7].

Compared to other semi-peripheral countries, Lithuania has a relatively skilled labor force. 59% of the total labor force in Lithuania has secondary education. Lithuania has a decisive advantage over other semi-peripheral countries in this respect. In South Africa for example, only 33.4% of the total workforce enjoyed secondary education, in Mexico only 21.8%, in Turkey only 17.2% and in Malaysia only 10.2%. Lithuania even has a more decisive advantage over other semi peripheral-countries concerning the working force with

tertiary education. 34.2% of the total labor force has tertiary education, while in South Africa this is only 12.8%, in Mexico 17.5%, in Turkey 15.0% and in Malaysia 2.9% [33].

Skilled labor is one of the characteristics of the core and Lithuania fulfills this condition. However, poor remuneration had been causing a brain-drain and many highly qualified workers emigrated to the United Kingdom and Ireland where the financial rewards are more attractive [1]. Emigration is a serious problem for the economic development of Lithuania as highly skilled labor flees abroad, while the Lithuanian government has been paying for their education. On the other hand, the scarcity of skilled workers has driven up the wages for highly qualified vacancies, making it less attractive to emigrate. Paradoxically, during the recent years the Lithuanian government has been issuing working permits for Belarusian and Ukrainian immigrants in order to fulfill the vacancies which require highly qualified personnel.

It can be argued whether Lithuanian state institutions are either strong or weak. In foreign policy, the Lithuanian state is not able to dictate its will to other countries and is dependent on its main ally, the United States. On the other hand, Lithuania is relatively independent of outside control. Lithuania thus shows qualities of both the core and the periphery and therefore it can be concluded that Lithuania belongs to the semi-peripheral zone [17].

Another indicator showing Lithuania's changing position in a global hierarchy is per capita GDP. According to the CIA World Factbook [26], Lithuania ranked 150 in 1993 (the first year data was available for Lithuania). In 1995, Lithuania's position on this ranking rose to 82. The most recent data available (2011) show Lithuania to be in 66th position. Therefore, using per capita GDP as an indicator, Lithuania is rising in a global economic hierarchy.

Other signs of the country rising in the CPH is shown in its economy expanding beyond its borders with more companies investing in neighboring countries and becoming involved with regional trade networks [15,16]. Also, Lithuania's political economy is increasingly tied to the European Union. For example, Lithuania is straining to meet the EU's strict Maastricht criteria in order to introduce the Euro [20].

Lithuania, though a relatively small and poor country, nonetheless is now a part of the European Union, and the past fifteen years have indicated incredible changes to the country. Little by little, Soviet inefficiency, and the "command economy" mentality are giving way to more a more pragmatic capitalist approach - merging with the rest of Western Europe. Thus, we argue that Lithuania is indeed rising in the capitalist world-system. Although still a part of the semi-periphery, the country is engaging in such "core" types of industries as biotechnology, which further suggests upward mobility.

Innovation can be a means by which to rise in the CPH, while stagnation - a means to fall. Schumpeter [21] suggested that innovation and entrepreneurship acts as a sort of engine for economies to expand. National institutions such as the government and economy must create favorable conditions for the entrepreneur to be able to bring new

commodities to the market. In such countries as Lithuania, still undergoing a post-Soviet transition, opportunities abound for new business ideas.

One sector where Lithuania is utilizing the "second place advantage" successfully is biotechnology, where it is a regional leader. According to the Lithuanian Biotechnology Association, the biotechnology sector in Lithuania has been growing by about 22% yearly for the past five years. Two such companies, Fermentas and Sicor Biotech were sold in 2007 for more than 28 million Euros [12]. Fermentas was in turn bought by the large multination company Thermo Fischer Scientific company for 193 million Euros [27].

An explanation of why foreign companies invest in biotechnology in Lithuania is due to the relative "natural monopoly" status that this industry had enjoyed in Lithuania since the fall of the Soviet Union. In 1975, the biotechnology firm Fermentas was a part of the former Institute of Applied Enzymology, which was a Soviet funded genetic research laboratory. After Lithuania's independence, the firm began to operate independently, and began expanding operations globally, with joint ventures in Germany, Canada, and the United States. Thus, unlike other places where labor is relatively inexpensive, such as Mexico, Lithuania had such relevant factors as an educated workforce or the already built factories and researchers.

For these reasons, we also argue that there is an element of business clustering present in Lithuania [18]. Biotechnology firms are clustered about Vilnius, and have ties with business and research centers at Vilnius University. Therefore, there was momentum in the development of the Lithuanian biotechnology sector that other regions did not have. Building on this momentum the Vilnius city municipality and two major universities (Vilnius University and Vilnius Gediminas technical university) are building a major research park, the Saulėtekio slėnis (Sunrise Valley). On the hand, a relevant question is why American pharmaceutical companies, such as Eli Lilly, have opened factories in much more expensive Denmark. One explanation may be because business clusters were already present in that country, while Lithuania's was still being privatized.

Another positive development of the biotechnology industry in Lithuania is related to immigration and the "brain drain" phenomenon. As an example, seventeen advanced Lithuanian experts who had previously emigrated have decided to return to the Vilnius Institute of Biotechnology. Dr. Daumantas Matulis from the Institute of Biotechnology, has stated that, "The growing importance of life sciences and biotechnology in Lithuania is being recognized with ScanBalt Forum 2008 to take place in Vilnius. This is a chance to promote Lithuania as an attractive place to work, live and invest. We intend to further strengthen our position as a strong player within life sciences and biotechnology in the Baltic Sea Region" [12]. More generally, the rate of Lithuanians migrating abroad appears to be reducing, perhaps due to increasing opportunities domestically [10].

Such old Europe economies as Germany are juggernauts, compared to the nimble Lithuania. The country has a very highly educated population, and competitive universities that produce bright graduates. Thus, all things equal, per capita, Lithuania needs fewer

innovators to make potentially large changes in its much smaller economy, which unlike EU-15 countries, is still in a condition of flux.

Another advantage for Lithuania in terms of innovation is the attractiveness in the previous regard to foreign direct investment. Although Lithuania may lack the capital of "old Europe," it has a skilled and educated workforce, and low labor costs. This makes it an attractive place for foreign firms that want to also "out innovate" the competition. Why build a factory in the traditionally more expensive EU-15, than in the less expensive business climate of such new member countries at Lithuania?

The current economic crisis can in a sense be seen in a positive light for tiny Lithuania. While the economy is under stress, Lithuanian firms can continue to innovate. However, when the global economy does improve - which, with time, it will - it will take a far smaller "push" to restore Lithuania's economy to a strong position, compared to much larger EU-15 countries. Although premature to draw any conclusions, there are glimmers of hope. For example, the IMF's Robert Zoellick stated on March 22 2009 that, weighted down by large, sluggish economies, the global economic recovery is expected in 2010, at which point major economies will break even. History has shown that Zoellick was correct [32]. Lithuania's economy contracted by 14.74% from 2008 to 2009, but regained positive growth (1.33%) from 2009 to 2010. A year later, in 2011, Lithuania's economy is already expanding [34].

Lithuania has certain real advantages compared to larger economies in terms of innovation. First, Lithuania's industries are still in a relatively nascent stage. Twenty years after the collapse of the Soviet Union, its industries are specializing and adapting to a global marketplace faster than the industries of such "old Europe" countries as Germany. This is a case of the so-called "second place advantage," where a newly opened economy can learn from the mistakes and consequently "out innovate" them, since they have no new infrastructure to need to replace. Regionally, the European Commission states that biotechnology will be a very important part of Europe's economy in the coming decades. Although information about the biotechnology sector in Europe is incomplete, Ernst and Young find that the Lithuanian biotechnology market is one of the largest in the region. 99% of biotechnology products are exported to 86 countries. In 2006, the biotechnology industry had sales in excess of 90 million Euros. Among former Communist countries, Lithuania follows only Hungary in sales volume. The Lithuanian government is wisely to investing in this up and coming sectors by increasing biotechnology research funding in recent years [12].

Although Lithuania's economy had been growing, the overall rate of economic development in Lithuania compared to other countries is not as rapid. One explanation is that foreign investors may be increasingly diversifying their investment to more countries, causing the rate of investment and development in Lithuania to flatten out. Additionally, with the increasing cost of labor in Lithuania, foreign investors may find it more profitable to invest in a country with a less expensive workforce. Low costs are not the only explanation

for diversification. Companies may also seek technological success by using local, highly educated talent.

The goal of this paper was to illustrate the concept of the core-periphery hierarchy in relation to Lithuania's global position. We found that Lithuania is on a rising trajectory in the hierarchy. Lithuania has many qualities of a semi-peripheral country, and given such booming innovative sectors as biotechnology, it is well-poised to weather the current European economic crisis better than other countries. Future research will examine the possibility of a North / South European economic divide, with the European North focusing on higher technology exports, such as biotechnology products compared to the European South.

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