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Innovation in "new" and "old" Europe: A comparison of the Lithuanian and Bavarian biotechnology sectors

The goal of this paper is to uncover what are the circumstances surrounding the favorable development of the biotechnology sectors in "new" Europe (Lithuania) and "old" Europe (the Bavarian region of Germany). Drawing upon Schumpeter's ideas of innovation and Porter's business cluster theory, we argue that Lithuania is "at the right place and the right time" to make it a regional leader in Baltic biotechnology. Germany, on the other hand, has had a strong biotechnology sector that has been developing for some time and is already contributing greatly to its economy. In both Lithuania and Bavaria we find that determined government support and business clusters greatly aided in the formation of the respective regions' biotechnology sector development.

Keywords: biotechnology, innovation, Lithuania, Bavaria, Schumpeter, business cluster theory.

Šiame straipsnyje yra keliamas klausimas, kokios sąlygos sukuria palankią aplinką biotechnologijos sektoriaus plėtrai „naujojoje" Europoje (Lietuvoje) ir „senojoje" Europoje (Bavarijos regionas Vokietijoje). Remiantis Schumpeter'io inovacijų koncepcija ir Porter'io verslo klasterių teorija yra teigiama, kad Lietuva yra „reikiamu metu ir reikiamoje vietoje" , kad taptų Baltijos regiono biotechnologijos lydere. Tuo tarpu Vokietijoje biotechnologijos sektorius šiuo metu yra gana stiprus, jo plėtra vyksta jau kurį laiką ir jis ženkliai prisidėjo prie šalies ekonomikos plėtros. Straipsnyje daroma išvada, kad tiek Lietuvoje, tiek Bavarijoje, vyriausybės atitinkama verslo klasterių parama reikšmingai prisidėjo prie atitinkamų regionų biotechnologijos sektorių susiformavimo ir plėtros.

Raktiniai žodžiai: Biotechnologija, inovacija, Lietuva, Bavarija, Schumpeter, verslo klasterių teorija.

JEL classification: B59/F23/052/O57.

Introduction

The goal of this paper is to compare the development of the Bavarian and Lithuanian biotechnology sectors. **A task** of the paper is to provide an overview of the current state of Lithuania in the context of the global economy by focusing on the country's ability to innovate in the field of biotechnology. We use a comparative-

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historical methodological approach using secondary data to illustrate our points. Bavaria is already highly developed, but Lithuania is rapidly increasing in the global core-periphery hierarchy. Purely economic measures, such as annual gross domestic product (GDP) per capita do not consider traditionally non-economic factors, such as innovation. Development economists in 1990 conceptualized the human development index (HDI), which combines measures of life expectancy, literacy, educational attainment, and GDP per capita (Haq, 1996). Lithuania's HDI was 0,831 in the year 2000, increased to 0,862 in 2005, then further increased to 0,869 in 2008, which placed it in the "highly developed" category according to the United Nations ranking system (United Nations, 2009). Other indicators that 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 (The Economist, 2007). To what degree might biotechnology contribute to macroeconomic indicators suggesting national economic growth in both Lithuania and the Bavarian region?

Theoretical framework

One way to understand innovation is the world-systemic perspective, which developed as a reaction to dependency of theorists (Amin, 1976 and 1994, Kohler and Tausch ,2002; Yotopolous and Sawada, 2005). During the 1970s, historical economic sociologists such as Wallerstein (1974) and Gunder-Frank (1978) began to theorize an expanding European economic world-system beginning approximately in the 16th century, which could be used to explain the historical economic development (or lack thereof) of countries around the world. This model sees capitalist market relations as a means of wealth redistribution, from the poor peripheral regions to rich core countries, or from the global South to the global North (Arrighi, 1995; Turchin, 2007).

One of the structural definitions of the world-systemic perspective is the assumption of centuries old business cycles. This emphasis on 45 to 60 year Kondratiev business cycles have been criticized by some for not explaining the origins of the cycle, or Kondratiev waves as being simply economic correlations rather than a cause of economic growth or depression (Solomou, 2004). Unlike world-systems analysis, we emphasize Schumpeterian agency in the form of innovation, rather than blind adherence to historical business cycles, as an important means by which Lithuania's and Bavaria's economy can focus on what Ricardo (1817) may have called its comparative advantage in the field.

The ideas of Joseph Schumpeter (1943) can be drawn upon in the case of the regions 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 even an entire economy.

Generalized clusters emerge when human activities are likely to agglomerate to shape urban areas. This phenomenon has traditionally been labeled urbanization economies. The clustering of activities produces the basis for sharing the costs

of a variety of services. Larger aggregate demand in an urban area leads to the emergence and growth of various infrastructural, economic, social and cultural activities which cannot occur when costumers would be geographically dispersed. Specialized clusters emerge when firms in the same or closely related industries establish in the same locations to form what is sometimes coined industrial zones. This phenomenon is known as localization economies. The bases of specialized clusters emerge because of the geographical proximity of firms that perform different but linked functions within certain production networks (Dicken, 2003).

Taking a closer look at the geo-economic map, geographical concentrations of economic activity can be distinguished in Lithuania and Bavaria. This phenomenon in which economic activities tend to agglomerate in specific locations is known as localized geographical clustering. Two types of clustering can be distinguished: generalized clusters and specialized clusters. These two types are based on the concept of externalities, which are the positive spillovers that emerge when economic activities in a particular location are connected with each other, both directly in the form of specific transactions and indirectly. The main idea is that the whole (the cluster) is greater than the sum of its parts, because of the advantages which are provided by spatial proximity (Dicken, 2003).

Clusters tend to create two forms of interdependency, which are traded interdependencies and untraded interdependencies. Traded interdependencies are direct transactions between firms in a production network, such as the supply of intermediate goods from one firm to another. In these cases, spatial proximity reduces transaction costs because of lower transport costs and by a reduction of the uncertainties that are related to customer-supplier relationships. Untraded interdependencies capture less tangible benefits from geographical clustering. Examples of untraded interdependencies are the development of a skilled labor pool, research and development in universities, business associations and government institutions. Three important processes underlie geographical clusters: face-to-face contact, social and cultural interaction and the development of knowledge and know-how (Dicken, 2003).

Porter (1998) defined clusters as "geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated organizations (such as universities, standard agencies, and trade associations) in particular fields that compete, but also co-operate.

Porter's definition contains two core aspects. First, the firms in the cluster are linked in a certain way. Clusters are composed of interconnected firms and associated institutions which are linked by commonalities and complementarities. Links can be both vertical and horizontal. Vertical links reflect the buying and selling of chains, while horizontal links are comprised of complementary goods and services, the use of similar particular inputs, technologies and institutions. Porter argued that these linkages comprise social relationships or networks which are beneficial to the firms. These networks guarantee certain forms of shared aims increasing the frequency and impact of transactions. The second aspect is that clusters are groups of firms that are located on geographical proximity. This locating together creates benefits in the form of networks of interaction among firms.

The case of Lithuania: innovation and Lithuania in the world-System

After the break-up of the Soviet Union, Lithuania transformed rapidly, politically as well as economically. Lithuania embarked on a path that strived for the adoption of two main features of core economies: the capitalist market system and the system of electoral democracy. In 2004, Lithuania obtained full membership of the European Union and thus integrating itself more deeply 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.

Economic data (e.g. World Bank, 2008a; Eurostat, 2008) 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 60,3% of Lithuania's total exports and for 57,3% of total imports. In 2008, Lithuania saw its total exports of goods and services increasing with 28,4%. Minerals made up 24,8% of total exports, electrical machinery and mechanical equipment 10,6%, chemical products 9,7%, transport vehicles and equipment 8,6%, agricultural products 6,1% and plastic products 6,0% (Lithuanian Department of Statistics, 2009). Despite minerals topping the list of exports in 2008, the overwhelming majority of Lithuania's exports consisted of manufactured commodities, rather than raw materials. Lithuania's increasing export of manufactured goods as another example of Lithuania's rise in the global hierarchy (Giedraitis, 2007).

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-25. Compared to the EU average, labor costs in Lithuania are five times less expensive (Eurostat, 2008).

Table 1 shows, for as a semi-peripheral country, Lithuania has a highly skilled labor force. 59% of the total labor force in Lithuania has secondary education. This is comparable to other CEECs that are member states of the European Union (see table 1). However, taking a closer look at the ratio of the workforce which has tertiary education, Lithuania has a significant comparative advantage over the other CEECs, with a percentage of not less than 34,2% which makes it a regional leader in this regard.

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 (Adamczyk, 2009). 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 (OECD, 2008).

Another indicator showing Lithuania's changing position in a global hierarchy is per capita GDP. According to the CIA World Factbook, Lithuania ranked 150 in 1993 (the first year data was available for Lithuania). In only two years, Lithuania's position on this indicator rose to 82. The most recent data available (2005) show Lithuania to be in 59th 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 (Mockaitis et. al., 2005 and 2007). 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 (Pranulis et. al., 2008). 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.

Biotechnology may potentially be a similar "disruptive" technology, with Lithuania being at the confluence of a number of favorable factors.

The theoretical discussion of business clusters can be applied to 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 (Innovations Report, 2008).

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.

Table 1

Education levels in various countries

CEEC Country	Labor Force with Secondary Education (% of labor force)	Labor Force with Tertiary Education (% of labor force)
Bulgaria	51,8	30,5
Hungary	60,4	23.3
Latvia	61,7	27,4
Lithuania	59,0	34,2
Poland	66,0	23,2
Romania	57,5	12,8
Slovakia	75,0	15,3

Source: World Bank Edstats, 2008.

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 strong aspect of business clustering present in Lithuania (Porter, 1990). 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 other 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" (Innovations Report 2008). More generally, the rate of Lithuanians migrating abroad appears to be reducing, perhaps due to increasing opportunities domestically (Gruzevskis, 2007).

Such old Europe economies as Germany are juggernauts, compared to 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. Given such evidence, we find that our hypothesis of business clusters being a cause of the success of biotechnology in Lithuania to be supported.

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 as 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. However, developing nations' economies such as Lithuania's are expected to expand by up to 4,5% (World Bank, 2008a).

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 sector by increasing biotechnology research funding during the last five years (Innovations Report, 2008).

The case of Germany: from agriculture to biotechnology

Originally being a rather agricultural dominated country, the Bavarian region of Germany has developed within the last decades into one of the economic powerhouses of Europe. Meanwhile Bavaria has a GDP which is bigger than 20 of the 27 EU Member-states and its average GDP per capita is well above the German average. The Bavarian Biotechnology sector has developed from a latecomer into the most dynamic sector of its kind in Europe (Kaiser and Grande, 2002). Germany was in 1972 initially the first country to implement a public funded research program in biotechnology, but the country now known as "pharmacy of the world" was not able to catch the momentum and lost ground in this emerging technology (Kaiser & Grande, 2002).

Extraordinary high growth rates of this sector outside Germany, have however pushed the government to consider biotechnology as one key to overcoming rising unemployment. This decision was not controversial, as a significant part of German society is rather risk averse and has an anti-technology sentiment. The green party especially, which is in a coalition with the Social-Democrats in several German states, regards biotechnology as a threat to society. The 1990 enacted "Embryo Protection law" and the "Genetic Engineering Law" were therefore a first attempt by the conservative government to find a compromise between fears within the German society and the interests of commercialization of the industry (Kaiser, 2003). The effects have however been marginal, that the government decided in 1993 to liberalize the Genetic Engineering Law further. An amendment of EU directives in 1996 regulate the treatment of microorganisms in open and closed systems allowing for advanced research.

The development of the biotechnology sector in Germany can be summarized in three phases (Kaiser & Grande, 2002).

The first phase can be described by a network of relatively few SMEs which were specialized technology suppliers for bigger pharmaceutical companies. Most of the market players have been spillovers of pharmaceutical companies (Kerviler et al., 2007). The second phase (until 1997/1998) is characterized by changes of the Genetic Engineering Law and a new funding approach by the federal government. Extended funding programs resulted in Germany having a heavy dependence on public funding (in relation to private risk capital) - far higher than in the U.S. or Germany (Ernst & Young, 2000). During the third phase, a larger number of SMEs entered the market which engaged in drug development and full in-house R&D programs.

Important milestones on the federal level have been the founding of "centers for genetic research" and the BioRegio contest which was launched in 1995 to close the gap to American and British counterparts (Zeller, 2001). By focusing on existing firms and research institutes within a specific region, the objective was to increase Germany's international competitiveness in generic technology (Dohse, 2007). Besides stimulating the evolution to commercialize the scientific knowledge, the contest aimed to establish a close network of actors in the economic field.

A second important initiative has been the InnoRegio contest, equipped with a budget of 256 million Euros (Dohse, 2007). As the objective of this competition was concentrating on reducing the gap between the western and the eastern states, it will not be covered in detail. The two programs were followed by various smaller programs (BioFuture, BioChance, BioProfile, Interregional Alliances, NEMO etc.) with rather different aims and conceptual designs.

A second important driver to the development of biotechnology clusters is the European Union - or the process of Europeanization. This multinational organization has gained significant power and has established a central role in regulating biotechnology (Kaiser and Prange, 2004). Although not creating a common market for venture capital, its programs and directives determine the development and evolution of biotechnology clusters.

The cluster development was heavily, though not initially, determined by the federal government. Some strong states in Germany (Baden-Württemberg, North Rhine-Westphalia and Bavaria) have performed business cluster policies long before the federal level has realized its importance (Dohse, 2007). In fact, the states have enormous influence on the overall policy of the country. Each state grants or withholds approval to conduct research and build production facilities, leaving the federal state in an observer position (Adelberger, 1999).

A first experience with cluster building in Bavaria was made in the electronics sector and particularly the aerospace industry. The Bavarian aviation cluster was the result of an initiative by the former German defense minister who had a personal interest in the industry, and encouraged the industry to invest in his home state. By the 1970s, approximately two-thirds of the German aviation industry was located in Bavaria (Trischler, 2004).

The network of biotech clusters in Bavaria consists nowadays of 9 cities (Munich, Martinsried, Freising, Würzburg. Erlangen, Nuremberg, Bayreuth, Straubing and Regensburg) and is formally represented by three cluster organizations (BioM Biotech Cluster Development GmbH, BioPark Regensburg GmbH and the Bio-Med/

ZMK in Würzburg). The first one represents and coordinates the activities of the entire Bavarian biotech cluster. In total, the cluster contains 164 active (2008) biotech SMEs, whereby most of them are located in the area around Munich. According to biotechnology terminology, the biotechnology sector is divided in "red", "green" and "grey" biotechnology (Cooke, 2002). Grey biotechnology has a focus on the environment, whereby green biotechnology focuses on agro-food business. Bavarian biotechnology engages mainly in the red biotechnology sector, which stands for medical and biopharmaceutical research. The main focus is on the development and marketing of diagnostic and therapeutic products. A second focus is on developing devices and reagents. In total the Bavarian biotech cluster employs more than 3200 people, which is about 15% of all employees in the Bavarian life science industry.

Munich was (among two others) the only region in Bavaria which emerged as a winner of the BioRegio contest and was awarded with 25 million euros and additional benefits. The contest was regarded as an important vehicle which helped Bavaria to jump-start its industry, which was alongside supported by legislative changes and finally lead to a boom of the joint venture industry (Stockinger et al, 2009; Cooke, 2002). Not only the three winners of the competition benefited, also the other participating regions started to promote and focus on Biotechnology (Adelberger, 1999). All 17 participating regions received a grant of 50,000 Euros in order to prepare their application, which forced decision makers - often for the first time - to consider biotechnology as an option for their economic development.

Most important however has been the financial and psychological support that the cluster received by the state of Bavaria. It was in 1993 when elected prime minister Edmund Stoiber, who declared it as his personal aim to modernize Bavaria to Germany's most innovative and advanced country. The privatization efforts of the early 90s generated 4 billion Euros, of which 700 million Euros were used to launch a "High-Tech Offensive" (HTO) - a cluster policy par excellence (Stockinger et al., 2009). More than two-third of this budget was channeled into the biotechnology sector (Kaiser, 2008). This was followed in 2006 by the "Allianz Bayern Innovative" which was supplying an 50 million Euros for managing cluster platforms. Martinsried, a southwestern part of the Munich area, was equipped with a new biomedical center, financed with 135 million Euros by the Bavarian Government (Kaiser and Liecke, 2008). Bavaria is furthermore trying to promote biotechnology through the upper house of the German Parliament (Bundesrat).

The focus on the cluster policy was to support primarily strong locations which are focusing on key technologies ("strengthening of the strong") (Sternberg and Tamasy, 1999). Within the Bavarian biotechnology cluster, the area around Munich has been the favored area for public investment and initiatives. One of the rationals for the focus on Munich have been the important research facilities of the pharmaceutical industry, which have been located in Penzberg and Tutzing since the 1950s (Oßenbrügge and Zeller, 2002).

It was essential that the political will of the Bavarian government would invest a larger amount of money over a longer period of time. The city of Vienna, which tried to copy the success mode of the Munich region failed to achieve these aims (Kaiser, 2001). Another determinant of success, was that the centralized Bavarian

government decided to focus in the earlier years entirely on the area around Munich. That helped Bavaria to build up a name in biotechnology - which was an indirect advantage for other Bavarian regions.

An other determinant of this development was a relatively liberal interpretation by the Bavarian government of the federal law concerning taxation of venture capital portfolio managers (Kaiser and Liecke, 2008). Investors were furthermore attracted when the Bavarian government minimized obstacles such as delays of permissions for production facilities (Cooke, 2002).

Innovation in the case of Bavarian biotechnology

Ossenbruegge and Zeller (2002) provide a summary of the spatial structure of input factors. A highly qualified workforce provided by several world-class universities and organizations as the Max Planck Institute supply crucial employees for research oriented firms. Despite the high mobility of the global skilled workforce, the labor factor is an essential argument in the promotion of a cluster. Many Bavarians are trained in life sciences, and the quality of life in Munich attracts many more scientists (Kerviler at al., 2007). Contrariwise, Kaiser and Prange (2004) conclude that Germany has started relatively late to build up Bioinformatic studies and that the number of graduates is still below the OECD average.

In terms of innovation, knowledge and technology play an important role among all input based factors for research-based biotech firms. Start-ups especially rely on the knowledge of their employees, with mutual understanding and trust. The Bavarian government established in the mid 1990s the Bavarian Research Association to improve the collaboration between industry and research institutes. The state initiated (but stock market listed) BioM AG was founded in 1997 to encourage intra- and inter-cluster partnering and networking (Kaiser and Liecke, 2008). The organizational form was chosen in order to combine the advantages of a private company which can bypass strict regulations for public companies and on the other hand emphasize the strong link to political decision makers. A strong culture towards intellectual property rights, exemplified by the European Patent office located in Munich, supports trust in knowledge transfers.

The capital sources in the case of Bavaria are relatively unspecific. As mentioned, the cluster has benefited from federal as well as the state grants. Furthermore, regional support and European Union programs have provided further seed capital. Research oriented firms involved in transatlantic competition are relying mainly on global and local venture capital sources. The localization of risk friendly venture capital firms was essential for the Bavarian success, as traditional banks favored established industries (Kaiser and Liecke, 2008). Since the 1990s several international operating venture capital firms like Atlas Venture, Apax Partners & Co or Techno Venture Management have founded branches in Bavaria (Zeller, 2001).Two public investment companies, "Technologiebeteiligungsgesellschaft" (federally owned) and "BayernKapital" (state owned) were founded to absorb risk and provide additional capital for young start ups. Collaborations with multinational players allow for higher security and a steady income source for young entrepreneurs.

On the other hand the level of shared means of production are relatively

underdeveloped in Bavaria. Intermediate products in the biotechnology cluster which are research-based in general play no significant role. A close proximity to hospitals and industry allow service-oriented firms a face-to-face contact to customers, guaranteeing regular orders. The aging German population and a generous health care system guarantee a stable demand (Kerviler et al, 2007). Despite the current financial crisis, the Bavarian biotechnology industry was therefore able to keep its positive momentum which is based on the success of earlier years (Cluster Biotechnology Bavaria, 2009). On the other hand, Ernest and Young declared Germany as "Europe's most densely populated biotech kindergarten" (Ernst & Young, 2001). However the clusters within that country are not as developed as their foreign counterparts. One of the weaknesses is that companies within the Bavarian cluster are in comparison to their American or British competitors not strongly connected to other foreign biotechnology clusters (Dohse, 1999; Cooke, 2002). Furthermore, the Bavarian cluster is heavily dependent on public funding, which may change in future given economic conditions. A general problem to the German Biotechnology cluster is the lack of qualified scientists and lack of technical personal. The booming American biotech sector attracted with high salaries a big group of German scientists. Considering the amount of public money which was invested, the cluster did not show yet yield favorable results in terms of new jobs, firm-revenues or tax-revenues (Kaiser and Liecke, 2008).

Conclusions

In this paper we showed the different ways that the biotechnology sectors have been developing in the Bavarian region of Germany and in Lithuania. Our main findings based on our comparative-historical approach are as follows:

1. Bavaria is already contributing greatly to the country's economy. Contrariwise, in the case of Lithuania, biotechnology is rapidly expanding in importance, and is seen as a future leading edge sector. Thus, biotechnology is contributing to both economies and at increasing rates.

2. 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.

3. Both Lithuania and Bavaria both benefitted greatly from government investment in the biotechnology sector.

4. Additionally, In both instances we find that the strength of business clusters greatly benefitted to formation of the biotechnology sectors. Unlike Bavarian, Lithuania also benefitted from the "inherited" infrastructure from the breakup of the Soviet Union, and the resulting cheap and highly educated labor force.

References

1. Adamczyk, A. (2009). "Institutional changes in the economies of Central and Eastern European countries and the situation of the labour market." Ekonomika: 85.
2. Adelberger K. (1999), A Developmental German State? Explaining Growth in German Biotechnology and Venture Capital , BRIE Working Paper 134.

3. Amin S. (1976). Unequal Development: An Essay on the Social Formations of Peripheral Capitalism. New York: Monthly Review Press.
4. Amin S. (1994). Re-reading the postwar period: an intellectual itinerary. Translated by Michael Wolfers. New York: Monthly Review Press.
5. Arrighi G. (1995). The Long 20th Century. Money, Power, and the Origins of Our Times. London, New York: Verso.
6. Chase-Dunn, C. (1991). Global Formation: Structures of the World Economy. New York: Blackwell.
7. Cluster Biotechnology Bavaria (2009), Biotechnology in Bavaria 2009 (2009), BioM Biotech Cluster Development GmbH.
8. Cooke, P. (2002). Biotechnology clusters as regional, sectoral innovation systems. International Regional Science Review, 25(1).
9. Dicken, P. (2003). Global Shift: Reshaping the Global Economic Map in the 21st Century. London: Sage.
10. Dohse, D. (2007). Cluster-based Technology Policy: The German Experience Industry and Innovation, 14 (1). Internet access: http://www.ifw-members.ifw-kiel.de//reference_catalog/lookupObject?uuid=4afa8727acbafa77a3e0216a1e0c411f [Accessed October 5 2010].
11. Dohse, D. (1999), The BioRegio contest: Results of an empirical investigation. Kiel, Institute of World Economics
12. The Economist (2007). Internet access: http://www.economist.com/media/pdf/Democracy_Index_2007_v3.pdf. [Accessed April 14, 2009].
13. Ernst & Young (2001), European Life Sciences 2001: „Integration". The Eigth Annual Ernst & Young Report on the European Biotechnology Industry. Stuttgart.
14. Ernst & Young (2000). Gründerzeit. Zweiter Deutscher Biotechnologie-Report 2000, Stuttgart.
15. Eurostat (2008). Internet access: http://epp.eurostat.ec.europa.eu [Accessed April 3, 2009].
16. Frank A. G. (1992). "Economic ironies in Europe: a world economic interpretation of East - West European politics." International Social Science Journal, 131, February.
17. Giedraitis, V. (2007). The New Cold War in the Post-Socialist Era: Domination through.
18. Multi-Dependency in Lithuania. Berlin: VDN Verlag Dr. Muller.
19. Gruzevskis, B. (2007). Labour Migration in Lithuania. Institute of Labour and Social Research. Vilnius.
20. Haq, M. (1996). Reflections on Human Development. Oxford University Press. Internet access: http://en.wikipedia.org/wiki/Oxford_University_Press [Accessed April 14, 2009].
21. Hollander, S. (1979). The Economics of David Ricardo. University of Toronto Press.
22. Innovations Report (2008). No author. "Lithuanian biotech growing fast." Internet access: http://www.innovations-report.com/html/reports/life_sciences/report-106502.html [Accessed April 3, 2009].
23. Kaiser, R. (2003), Multi-Level Science Policy and Regional Innovation: The Case of the Munich Cluster for Pharmaceutical Biotechnology. European Planning Studies 11 (7).
24. Kaiser, R. (2001), Organization: Regional Clustering. In: van Waarden (ed): National Systems of Innovation and Networks in the Idea- Innovation Chain in Science based Industries, Project funded by the European Community under the Targeted Socio-Economic Research (TSER).
25. Kaiser, R. and Grande E. (2002), The Emergence of the German Pharmaceutical Biotech Industry and the Role of the National Innovation System, Building Bridges Betweeb Ideas and Markets, Final Report to the European Commission of the TSER Project "National System of Innovation and Networks in the Idea-Innovation Chain in Science based Industries , Munich; Technische Universität München.
26. Kaiser, R. and Liecke, M. (2008), Sub-National Capabilities to Perform a Strategic Innovation-Policy, the Example of Biotech in Munich, Druid Working paper 08-21.
27. Kaiser, R. and Prange, H. (2004), The Reconfiguration of National Innovation Systems – The Example of German Biotechnology, Research Policy.
28. Kerviler, G. et al. (2007), Biotechnology - Life Sciences in Munich/ Germany, Harvard Business School, unpublished.
29. Köhler G. and Tausch A. (2002). Global Keynesianism: Unequal exchange and global exploitation. Huntington: Nova Science.
30. Lithuanian Department of Statistics (2009). "Exports and Imports by CN Section". Internet access: http://www.stat.gov.lt/en/pages/view/?id=2392 [Accessed April 15, 2009].
31. Mockaitis, A., Giedraitis, V., Vaiginiene, E. (2007). "How Active are Lithuanian Manufacturing SMEs in International markets? Some Preliminary Findings." Transformations in Business and Economics. 11.

32. Mockaitis, A.; Giedraitis, V.; Vaiginiene, E. (2005). "The Internationalization Efforts of Lithuanian Manufacturing Firms – Strategy or Luck?." Research in International Business and Finance. 19.
33. OECD (2008). International migration outlook 2008: Country notes Lithuania. OECD. Internet access: http://www.oecd.org/dataoecd/57/11/41255896.pdf [Accessed April 16, 2009].
34. Oßenbrügge, J. and Zeller, C. (2002), The Biotech Region Munich and the Spatial Organization of its Innovation Networks. In: L. Schätzl (ed): Technological Change and Regional Development in Europe. Heidelberg: Springer, 2002.
35. Porter, M. (1990). The Competitive Advantage of Nations. New York: Free Press.
36. Porter, M. (1998). On Competition. Boston: Harvard Business School.
37. Prebisch, R. (1950). The Economic Development of Latin America and Its Principal Problems. New York: United Nations.
38. Pranulis, V.; Giedraitis, V.; Grundey, D.; Vogelius, R. (2008). "A Myopic Vision: Risks Beyond the Maastricht Inflation Criteria." Transformations in Business and Economics. 7.
39. Ricardo, D. (1817). On the Principles of Political Economy and Taxation. London: John Murray.
40. Schumpeter, J. (1943). Capitalism, Socialism, and Democracy. London: Unwin University.
41. Shannon, T. (1996). An introduction to the world-system perspective. Boulder: Westview.
42. Solomou, S. (2004). Phases of Economic Growth, 1850-1973: Kondratiev Waves and Kuznets Swings. New York: Cambridge University Press.
43. Stark, D. (1992). "The Great Transformation? Social Change in Eastern Europe: From System Identity to Organizational Diversity: Analyzing Social Change in Eastern Europe." Contemporary Sociology. 21.
44. Sternberg, R. and Tamasy, C. (1999), Munich as Germany's No. 1 high tech region: empirical evidence, theoretical explanations and the role of small firm/large firm relationships, Regional Studies, 33(4).
45. Stockinger, D. et al (2009). Cluster Policy in Coordinated vs. Liberal Market Economies: A Tale of Two High-Tech States., DRUID Summer Conference, Kopenhagen, 17-19.06.2009.
46. Szelenyi, I., Eyal, G., Townsley, E. (2001). Making Capitalism without Capitalists: The New Ruling Elites in Eastern Europe. New York: Verso.
47. Trischler, H. (2004). Nationales Innovationssystem und regionale Innovationspolitik. Forschung in Bayern im westdeutschen Vergleich 1945 bis 1980, in Bayern im Bund, Band 3, Politik und Kultur im föderativen Staat 1949 bis 1973 ed. Schlemmer Thomas, Woller Hans R., Oldenburg Verlag, München.
48. Turchin, P. (2007). Modeling Periodic Waves of Integration in the Afroeurasian World System. Globalization as an Evolutionary Process: Modeling Global Change. Ed. by George Modelski, Tessaleno Devezas, and William R. Thompson. London: Routledge.
49. United Nations Human Development Reports. Internet access: http://hdr.undp.org/en/reports/. [Accessed January 3, 2009].
50. Verdery, K. (1996). What was Socialism and What Comes Next? Princeton: Princeton University Press.
51. Wallerstein, I. (1974). The Modern World-System, New York: Academic Press. Internet access: http://en.wikipedia.org/wiki/Immanuel_Wallerstein [Accessed April 3, 2009].
52. World Bank (2008a). "Statement by World Bank Group President Robert B. Zoellick on the Summit of G20 Leaders." Internet access: http://web.worldbank.org/WBSITE/EXTERNAL/NEWS [Accessed April 3, 2009].
53. World Bank (2008). "Edstats – Country Profiles." Internet access: http://go.worldbank.org/JVXVANWYY0. [Accessed April 16, 2009].
54. Yotopoulos P. and Sawada Y. (2005). "Exchange Rate Misalignment: A New test of Long-Run PPP Based on Cross-Country Data" CIRJE Discussion Paper CIRJE-F-318, February 2005, Faculty of Economics, University of Tokyo.
55. Zeller, C. (2001). Die Biotech-Regionen München und Rheinland. Räumliche Organisation von Innovationssystemen und Pfadabhängigkeit der regionalen Entwicklung, In: Regionale Innovationsnetzwerke im internationalen Vergleich. Internet access: http://www.geodok.uni-erlangen.de/cgi-bin/geodok/geodok.pl?z=Regionale+Innovationsnetzwerke+im+internationalen+Vergleich [Accessed April 3, 2009].

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INOVACIJOS „SENOJOJE“ IR „NAUJOJOJE“ EUROPOJE: BAVARIJOS IR LIETUVOS BIOTECHNOLOGIJOS SEKTORIŲ PALYGINIMAS

S a n t r a u k a

Šiame straipsnyje yra lyginamas Bavarijos ir Lietuvos biotechnologijos sektorių išsivystymo lygis. Jame yra keliamas klausimas, kokios sąlygos sukuria palankią aplinką biotechnologijos sektoriaus plėtrai „naujojoje“ Europoje (Lietuvoje) ir „senojoje“ Europoje (Bavarijos regionas Vokietijoje).

Straipsnio tikslas yra įvertinti šiandieninę Lietuvos padėtį pasaulinės ekonomikos kontekste, daugiausia dėmesio skiriant šalies gebėjimui diegti naujoves biotechnologijų srityje.

Remiantis Schumpeter'io inovacijų koncepcija ir Porter'io verslo klasterių teorija yra teigiama, kad Lietuva yra „reikiamu metu ir reikiamoje vietoje“ tam, kad taptų Baltijos regiono biotechnologijos lydere.

Bavarija yra jau labai išvystyta, bet Lietuva sparčiai auga globalinėje pagrindinėje periferinėje hierarchijoje. Grynieji ekonominiai rodikliai, tokie kaip metinis bendrasis vidaus produktas (BVP), tenkantis vienam gyventojui, neatsižvelgia į tradiciškai neekonominius veiksnius, tokius kaip naujovių diegimas. Raidos ekonominės krypties ekonomistai 1990 metais parengė žmogaus socialinės raidos indeksą (ŽSRI), kuris apima laukiamos gyvenimo trukmės, raštingumo, išsilavinimo vertinimą bei bendrojo vidaus produkto, tenkančio vienam gyventojui rodiklį (Haq, 1996). Lietuvos ŽSRI 2000 metais buvo 0,831, 2005 metais jis buvo padidintas iki 0,862 ir vėliau jis buvo nuolat didinamas bei 2008 metais pasiekė 0,869. Tai reiškė, kad Lietuva pateko į šalių kategoriją „labai išvystyta“ pagal Jungtinių Tautų pateiktą vertinimų sistemos skalę (Jungtinės Tautos, 2009). Kiti rodikliai, kurie taip pat atspindi Lietuvos plėtros tendenciją, yra gyvenimo kokybės indeksas, kurį pateikia Ekonomist Intelligence Unit's. Palyginti su kitomis Baltijos šalimis, Lietuvai suteikta aukščiausia šio rodiklio reikšmė. Minėtas rodiklis apima tokias visuomenės gyvenimo sritis, kaip sveikata, šeimos gyvenimas, politinis stabilumas, ir politinė laisvė (Ekonomistas, 2007). Kokiu mastu biotechnologija galėtų prisidėti prie nacionalinės ekonominės plėtros, vertinamos įvairiais makroekonominiais rodikliais tiek Lietuvoje, tiek Bavarijos regione?

Šiame straipsnyje keliais būdais parodyta, kad biotechnologijos sektorius yra išvystytas ir šiuo metu yra gana striprus Bavarijos regione, Vokietija, ir stiprėja Lietuvoje. Bavarijoje, šio sektoriaus plėtra vyksta jau kurį laiką ir jis jau reikšmingai prisideda prie šalies ekonomikos plėtros. Lietuvos atveju, biotechnologijos svarba greitai didėja, ir jis yra laikomas ateities ekonomikos varomaja jėga. Užsienio investuotojai, vis labiau diversifikuodami savo investicijas į daugiau šalių, gali sumažinti? sulyginti investicijų ir išsivystymo lygį Lietuvoje. Be to, didėjant darbo jėgos sąnaudoms Lietuvoje, užsienio investuotojai gali rasti daugiau pelningų investavimui šalių, kurių darbo jėga yra ne tokia brangi. Tačiau maža kaina nėra vienintelis galimas diversifikavimo paaiškinimas. Kompanijos gali taip pat siekti technologinių pasiekimų vartodamos vietinį, gerai išsilavinusį žmogiškąjį potencialą. Straipsnyje daroma išvada, kad tiek Lietuvoje, tiek Bavarijoje, vyriausybės parama verslo klasterių plėtrai reikšmingai prisidejo prie atitinkamų regionų biotechnologijos sektorių susiformavimo ir plėtros. Ir Lietuva, ir Bavarija, abi turėjo daug naudos iš vyriausybės investicijų į biotechnologijos sektorių. Be to, abiem atvejais buvo pastebėta, kad verslo klasterių koncentracija daug prisidėjo prie biotechnologijos sektorių susidarymo. Skirtingai nuo Bavarijos, Lietuva taip pat pasinaudojo „paveldėta“ infrastruktūra po Tarybų Sąjungos žlugimo ir pigia bei gerai išsilavinusia darbo jėga.