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# Innovativeness of the US economy. Permanent or weakening dominance?

## Abstract

*The main purpose of the paper is to analyze the innovativeness of the US economy against those of European and Asian economies. The particular attention was given to the reasons for the forming of the US dominance in the field of innovation. The paper also considers the process of vanishing of American dominance at the end of 1990s.*

*The paper is divided into three parts. In the first one, main causes of American leadership in the field of technology are explained. In the second part, innovation performance of the US economy in comparison with the EU and Asian economies is presented. Finally, there is an analysis of innovation capacity of US economy in the context of challenges resulting from the financial and economic crisis.*

## 1. Introduction

In the contemporary globalized economy, knowledge and innovation are the main incentives for the economic growth and the progress of civilization. Successful economies are able to create such system solutions that boost a strong tendency of economic entities to create and promote innovativeness. According to Paul Romer, the economic future of nations depends on their ability to

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innovativeness which is dependent on the quality of a higher education sector. US economy is a peculiar laboratory of innovativeness, whose dynamism might set an example for other countries. United States have established dominance in the field of innovativeness thanks to a series of various beneficiary processes and factors which shaped the American model of economy comprising mechanisms setting innovative attitudes of enterprises and the society. (Bossak 2008, p. 170).

The main purpose of this paper is to explain the origins of American dominance in the field of innovativeness, analyze the US economy innovativeness against that of European and Asian economies, as well as discuss the perspectives of US remaining on the leader position in the face of a technological race.

The article starts with an introduction followed by the characteristics of main factors and processes which brought about the rise of the US economic dominance in the field of innovativeness; next, an analysis of the decreasing innovative superiority of the economy over the rest of the world is provided; and finally, we focus on the question of the current economic crisis influence on the perspectives of the USA remaining a technological dominator has been focused on.

## 2. Factors determining US dominance in the field of innovativeness

When considering factors contributing to the US dominance in the field of innovativeness, one should apply a many-sided analysis of the issue. The dominance results from a series of various events and factors which include not only factors reflecting development potential of economy (natural, human, capital and technological resources), but also, or even foremost, factors dynamizing the potential, like social-economic system, institutional solutions (e.g. manners, work ethics) and the nature of economic policy (Bossak, Bieńkowski 2004, pp. 215–218). In economic and socio-cultural terms, American system generates conditions and attitudes that are exceptionally favorable for innovative activity of economic entities. The DNA of American economy is a conglomerate of various factors, among which one should mention: flexible economy, freedom of starting one's business and the spirit of entrepreneurship, protestant work ethics, economical and cultural advantage of criticism over dogmatism, ethnical variety of emigrants, immigrant labour that is constantly being revived with subsequent generations of talented people from around the world, high rate of work mobility, etc. (the factors permeate and the outcome is creation of mechanisms that boost pro-innovative performance in all

areas of economy). Other economies might copy some of American solutions, nevertheless, they will never be able to reconstruct the whole series of innovativeness factors occurring in the United States. It is hard to believe that the American university system, being the symbol and essence of American achievements in the field of innovativeness, is reconstructed in other countries (Romer 1990, pp. 71–102).

The principal rule of American economic philosophy is "creative destruction". The so far activity is given up, factories closed up or moved without sentimental attachment; entrepreneurs and share holders move in search of higher profits and salaries (Sorman 2008, p. 221). Universities and research institutes play a vital role in the process as their mission is "producing" ideas likely to be transformed into innovations. American university model is one of the best in the world which is proved in multiple research achievements expressed in the number of patented inventions and Noble Prizes (in 2009, 9 out of 13 Nobel Prize winners were American)[1]. Although universities generating innovative ideas are not enterprises, they act in accordance with market regulations. They compete for money on research, professors and students. State-run institutions conduct policies favouring the development of scientific research mainly by means of subventions granted to specific research projects rather than institutions.

In the analysis of the origins of American technological dominance, three processes (rooted in the end of the 1930s and the WWII period) must be taken into account. The first one was the wave of destruction which ravaged almost all the countries competing with the United States. Germany, Great Britain and France were destroyed, the industry – especially German – ruined and universities closed. Financial destruction was not the only war effect. Political and economic systems of some European countries were dominated by populists and communists. The United States position was quite reverse and, as for technology, they didn't have a serious rival for nearly twenty years after the war.

The second process, strictly related to the first one, was the appearance of a generation of immigrants who left Europe and joined American universities, research institutes and think tanks. It is not possible to overestimate its benefits to the intellectual and research potential of the United States. In the 1930s, Germany was the world leader in the field of scientific research most of which had been carried out by German Jews. Despite immigration restrictions, more than 100 thousand Jews left for the US in the 1930s. In the 1950s, American research system, embracing universities, research institutes and companies,

[1] American universities employ 70% of all Noble Price winners; also, around 30% of world articles on sciences and technology are published there.

attracted talented scientists from all over the world. After liberalization of immigration barriers in 1965, the next wave of immigration appeared. It was the time when thousand of Indian and Chinese people – very often with scientific achievements – arrived in the United States (Zakaria 2008, p. 73).

The essence of the third process were huge US investments which began at the time of the Great Depression and then got substantially intensified during the Second World War. Federal government radically increased its layouts on scientific research and development works, and allocated most of them to research universities. The Cold War contributed to raising the expenditure to record levels and in 1950s, the United States spent 3% of their GPD on R&D. The outlays made more than a half of the total world expenses on R&D (Zakaria 2009).

The strong support of the US Federal Government to scientific research brought about surprising results. In the last five decades, in the USA the following inventions have been created and developed: internet, lasers, microprocessors, magnetic resonance imaging of DNA sequencing, satellite navigation systems and many other products and technologies. The government often financed inventions which did not come from federal laboratories. The best illustration of the statement is the development of microprocessor production and the success of Silicon Valley in California. After J. Kilby's (of Texas Instruments) invention of a microprocessor, for several years Federal Government purchased practically each processor that companies were able to produce (Leonardi 2002, p. 21).

It is believed that the period 1958 to 1990 was the golden age of the technological development of American economy after the Second World War. The military and Space Race between US and the Soviet Union was the driving force of the development. In 1957, the Soviet Union launched *Sputnik 1* (a satellite) into space and it owned a hydrogen bomb. The events were perceived as a sign of the end of US technological advantage over the Soviet Union, but also as the beginning of a direct threat to the US security (Michałek 2004, p. 328). American government reacted to Soviet *Sputnik challenge* by inspiring a space research programme, which later became an integral part of J. F. Kennedy's ambitious programme launched in 1961. From the very beginning, space activities were to serve three objectives): political (proving one's advantage in the ideological competition with the Soviet Union), military (ability to apply technological solutions in the armaments industry) and cognitive (scientific exploration). The government launched multiple research programmes (the so called "impact programmes") thanks to which university laboratories, private companies, as well as government laboratories were flooded with streams of money. The increased interest of the government in development

and promotion of technological innovations brought about the blooming of *high-tech* sector that carried out research assigned by the government. Government layouts allocated to the sector gave rise to the development of Silicon Valley, the famous scientific and technological area in the neighbourhood of a few government laboratories, like Laurence Livermore National Laboratory. The main results of space and army programmes were not only inventions increasing country security but also new products meant for civic purposes. The offer was quite immense and included items from powder food up to portable calculators.

Space flight programmes (Apollo programme), especially manned missions, allowed for modernization of American rocket arsenal. They led to the increased number of various intercontinental missiles launched from land and submarines. In 1968, the USA owned 1054 missiles (Soviet Union ZSRR – 858) of the first kind and 656 (Soviet Union – 121) of the second kind. Apart from that, research on multi-warhead rackets of MIRV system were developed. That allowed the US to gain superiority over the Soviet Union in the field still at the beginning of the 70s (Michałek 2004, p. 351).

In the last two decades, the three processes – which originally ensured the United States hegemony in the field of innovativeness – have lost in power. American economy hasn't got a dominant position once and in for all. At the beginning of the 21st century, the growing economic power of China and India presented a serious threat to the US dominance. That entailed the phenomenon of „brain drain" in the reverse direction – from the USA to China and India (Sorman 2008, p. 75).

## 3. Innovativeness of the United States economy in statistical analyses

In the United States, there has been an era of uncertainty and disappointment going on – it is one of the most difficult periods in their history since WWII. High unemployment rate reaching 10%, rapidly growing budget deficit and national debt, political fights over health service reform as well as energetic policy weaken the US position as a world leader[2]. Disintegration of the financial system revealed how deceptive the wealth generated before the financial crisis was – it resulted from a carefree credit expansion rather than productive activity. The rise of share and real estate prices did not reflect the

[2] According to the US Congressional Budget Office, budget deficit in the fiscal year of 2009 reached over 1,4 billion dollars, which makes 11,2% of gross domestic product. Therefore, it has been the highest deficit for over 60 years.

growth of American national wealth. Assets prices were artificially boosted up by abnormally low interest rates establishes by Fed. Expenditure on saving the American financial system reached exorbitant levels. Enormous nation's confidence placed in president B. Obama will soon fade if recapitalization of banks and fiscal package will not help revive economy and curb the growing unemployment rate (Gray 2009, p. 10).

Despite severe crisis, US economy has managed to keep the leader position in the field of information technology, nanotechnology and biotechnology. Nevertheless, one question arises: aren't American achievements (in the area of innovativeness) a reflection of the past rather than a prognosis for the bright future and remaining a dominant position? In the World Economic Forum report, the United States have often been presented as an example of the most competitive and innovative world economy; however, in 2009, it was Switzerland that took the first position in the ranking (The Global Competitiveness Report 2009–2010, p. 13). Data used for this report, as well as for other ones, are predominantly based on opinion polls carried out among big company directors, scientists and investors. Almost two thirds[3] of the World Economic Forum data comes from the polls. Reports based solely on government statistics and other hard data much better reflect the real position of a given economy. Such reports were created in Boston Consulting Group and Information Technology and Innovation Foundation. They point to the position of particular economies in the field of latest technologies and education development. Both rankings, place the USA much lower than World Economic Forum reports.

In 2009, Information Technology and Innovation Foundation (ITIF), an American non – profit think tank specializing in research into innovative processes, work effectiveness and digital economy (Atkinson, Andes, 2009) – carried out and published a deep and comprehensive analysis of global competitiveness, based on evaluation of achievements in the field of innovation. Contrary to other reports evaluating economical structure of a country, its economic policy and economic achievements, the report is based on a belief that all elements should be looked at altogether, so that to understand how a given economy operates in the conditions of global competitiveness. To estimate global competitiveness, 16 general competiveness indicators have been used. They are classified into 6 categories: human capital, innovative ability,

[3] There was also another report, prepared by world-famous Institute for Management Development (IMD), where one-third of data came from opinion polls.

entrepreneurship, information technology infrastructure, economic policy and economic results[4].

According to ITIF analysts, in 2008 the US were on the sixth position (out of 40 countries and areas – European Union and NAFTA) in an innovativeness and competitiveness ranking. Table 1. and Table 2. show the general ranking of countries and areas in 2008, as well as further changes of the competitiveness and innovativeness index in the period 1999 to 2008.

[4] Particular categories of indicators are a set of partial indicators). Human capital category comprises achievements in the field of Higher Education Sector and human potential of science and technology researchers; innovative ability is expressed through enterprises and government investments on scientific research and development works as well as scientific and technical publications; entrepreneurship refers to venture capital investments and new companies set up; information technologies infrastructure comprises e-administration, broadband Internet and enterprises' investment on information technologies; economic policy refers to effective tax rates for enterprises as well as conditions for starting and running a business; economic results stand for trade balance, BIZ inflow, GPD per one adult worker and GPD per one man-hour.

**Table 1. Competitiveness and innovativeness ranking by country and area in 2008**

| Rank | Countries | Points | Country's position | Countries | Points |
|---|---|---|---|---|---|
| 1 | Singapore | 73,4 | 21 | Czech Republic | 47,9 |
| 2 | Sweden | 71,0 | 22 | Estonia | 46,1 |
| 3 | Luxemburg | 66,2 | 23 | Spain | 43,7 |
| 4 | Denmark | 64,5 | 24 | Hungary | 42,5 |
| 5 | South Korea | 64,2 | 25 | Lithuania | 40,8 |
| 6 | The USA | 63,9 | 26 | Italy | 40,2 |
| 7 | Finland | 59,6 | 27 | Portugal | 38,7 |
| 8 | Great Britain | 59,2 | 28 | Slovenia | 37,6 |
| 9 | Japan | 59,0 | 29 | Slovakia | 37,0 |
| 10 | NAFTA | 58,6 | 30 | EU–10[3)] | 36,9 |
| 11 | Holland | 58,4 | 31 | Latvia | 36,5 |
| 12 | France | 57,3 | 32 | Malta | 36,2 |
| 13 | Ireland | 56,4 | 33 | China | 36,0 |
| 14 | Belgium | 56,3 | 34 | Poland | 35,4 |
| 15 | Germany | 55,0 | 35 | Russia | 35,1 |
| 16 | Canada | 54,4 | 36 | Cyprus | 33,2 |
| 17 | Austria | 52,6 | 37 | Greece | 31,5 |
| 18 | EU–15[1)] | 52,5 | 38 | Brazil | 30,1 |
| 19 | Austria | 51,5 | 39 | Mexico | 26,0 |
| 20 | EU–25[2)] | 50,6 | 40 | India | 21,6 |
| | | | | AVERAGE | 36,5 |

[1)] EU–15 includes „old" Member States.

[2)] UE–10 includes new Member States which joined EU in 2004.

[3)] UE–25 includes all Member States except for Bulgaria and Romania.

Source: Atkinson R. D., Andes S. M., op. cit., p. 2.

**Table 2. The change of competitiveness and innovativeness level in the period 1999 to 2008**

| Rank | Countries | Points | Country's position | Countries | Points |
|---|---|---|---|---|---|
| 1 | China | 19,5 | 21 | Sweden | 10,7 |
| 2 | Singapore | 19,0 | 22 | France | 10,6 |
| 3 | Lithuania | 14,8 | 23 | Portugal | 10,1 |
| 4 | Estonia | 18,1 | 24 | Malta | 9,9 |
| 5 | Denmark | 17,4 | 25 | Belgium | 9,5 |
| 6 | Luxemburg | 16,9 | 26 | EU–25 | 9,4 |
| 7 | Slovenia | 16,7 | 27 | Poland | 9,4 |
| 8 | Russia | 15,2 | 28 | Great Britain | 9,0 |
| 9 | Cyprus | 14,7 | 29 | EU–15 | 8,5 |
| 10 | Japan | 14,4 | 30 | Mexico | 8,0 |
| 11 | Hungary | 14,3 | 31 | Holland | 7,9 |
| 12 | Slovakia | 14,1 | 32 | Austria | 7,4 |
| 13 | Czech Republic | 13,8 | 33 | Finland | 7,3 |
| 14 | India | 13,6 | 34 | Canada | 6,3 |
| 15 | Latvia | 13,4 | 35 | Germany | 6,3 |
| 16 | Austria | 13,2 | 36 | Italy | 5,2 |
| 17 | South Korea | 13,2 | 37 | NAFTA | 5,1 |
| 18 | Ireland | 12,9 | 38 | Greece | 5,1 |
| 19 | EU–10 | 12,8 | 39 | Brazil | 3,7 |
| 20 | Spain | 10,8 | 40 | USA | 2,7 |
| | | | | AVERAGE | 11,2 |

Source: Atkinson R. D., Andes S. M., op. cit., p. 2–3.

Data in Table 1. show that the United States occupy the sixth position in the ranking of 40 countries and areas scoring 63,9 points, which is 15% less than Singapore – the ranking leader. EU–15 countries treated as an area took the eighteenth position with a 40% lower result than Singapore. According to the ranking, the States are not a leader in the field of competitiveness and investment, however, they still outdistance Europe.

Surprisingly, ITIF analysis revealed the States progress being the lowest of 40 countries and areas, in the area of economical innovativeness and competitiveness advance (Table 2). In the period 1999 to 2008, the general index for the US went up only by 2,7 points, at average 11,2 points growth for the whole group. China and Singapore had the biggest rate growth – by 19,5 and 19,0 points respectively.

In case of human resources, two indicators were applied: the percentage of adults at 25–34 years of age with a university degree and a number of researchers (scientists and engineers) per 1000 of employees. Tables 3 and 4 show the States' position in a ranking based on the two indicators.

**Table 3. Achievements in higher education (the percentage of people at the age of 25–34, with a university diploma and the change expressed in percentage) in 2005 and the change dynamics in the period 1999 to 2005**

| Rank | Country | % of people at the age of 25–34, with a higher education diploma 2005 | Rank | Country | The change in % 1995–2005 |
|---|---|---|---|---|---|
| 1 | Russia | 56% | 1 | Poland | 117% |
| 2 | Canada | 54% | 2 | South Korea | 46% |
| 3 | Japan | 53% | 3 | Ireland | 41% |
| 4 | South Korea | 51% | 4 | Austria | 31% |
| 5 | Ireland | 41% | 5 | Great Britain | 30% |
| 6 | Spain | 40% | 6 | EU–25 | 27% |
| 7 | France | 39% | 7 | France | 26% |
| 8 | USA | 39% | 8 | EU–15 | 25% |
| 9 | Australia | 38% | 9 | Spain | 21% |
| 10 | Singapore | 38% | 10 | Japan | 18% |
| 11 | Sweden | 37% | 11 | Sweden | 16% |
| 12 | Great Britain | 35% | 12 | Canada | 15% |
| 13 | NAFTA | 35% | 13 | Mexico | 13% |
| 14 | EU–15 | 30% | 14 | NAFTA | 6% |
| 15 | EU–25 | 29% | 15 | USA | 3% |
| 16 | Poland | 26% | 16 | EU–10 | no accessible data |
| 17 | EU–10 | 22% | 17 | Singapore | no accessible data |
| 18 | Germany | 22% | 18 | Germany | no accessible data |
| 19 | Mexico | 18% | 19 | China | no accessible data |
| 20 | China | 9% | 20 | Russia | no accessible data |
| 21 | India | 9% | 21 | India | no accessible data |
| 22 | Brazil | 8% | 22 | Brazil | no accessible data |
| | average | 23% | | average | 22% |

Source: Atkinson R. D., Andes S. M., op. cit., p. 10.

Two conclusions may be drawn on the basis of Table 3 data. The first refers to the US position in terms of higher education achievements measured by the number of people at 25–34 years of age, with a university degree in this age group. In this case, the States are much ahead of European Union countries (EU–15 and EU–10). The second conclusion is related to the analysis of this index tendencies in the period 1999 to 2006. The analysis reveals a completely new image of the US in terms of higher education. During this period, US had the lowest rate growth in the whole group (with all data accessible); it was 3%, at average 22% growth for all countries, and 117% for Poland.

**Table 4. Scientists and engineers per 1000 employees in 2006, and growth dynamics in the period 1999 to 2006**

| Rank | Country | Researchers per 1000 employees | Rank | Country | The change in % 1999–2006 |
|---|---|---|---|---|---|
| 1 | Sweden | 12,5 | 1 | China | 111% |
| 2 | Japan | 11,0 | 2 | Mexico | 98% |
| 3 | Singapur | 9,7 | 3 | South Korea | 71% |
| 4 | USA | 9,7 | 4 | Singapore | 70% |
| 5 | Australia | 8,4 | 5 | Brazil | 67% |
| 6 | France | 8,0 | 6 | EU–10 | 64% |
| 7 | South Korea | 7,9 | 7 | Spain | 63% |
| 8 | NAFTA | 7,8 | 8 | India | 50% |
| 9 | Canada | 7,8 | 9 | Poland | 43% |
| 10 | Germany | 7,0 | 10 | Sweden | 38% |
| 11 | Russia | 6,8 | 11 | France | 31% |
| 12 | EU–15 | 6,2 | 12 | Australia | 26% |
| 13 | EU–25 | 6,0 | 13 | Ireland | 25% |
| 14 | Ireland | 5,9 | 14 | Canada | 23% |
| 15 | Spain | 5,7 | 15 | EU–25 | 18% |
| 16 | Great Britain | 5,5 | 16 | Japan | 14% |
| 17 | Poland | 4,7 | 17 | EU–15 | 11% |
| 18 | EU–10 | 4,7 | 18 | NAFTA | 10% |
| 19 | China | 1,5 | 19 | Germany | 9% |
| 20 | Mexico | 1,2 | 20 | USA | 8% |
| 21 | Brazil | 1,0 | 21 | Russia | 0% |
| 22 | India | 0,3 | 22 | Great Britain | –4% |
| | average | 6,2 | | average | 35% |

Source: Atkinson R. D., Andes S. M., op. cit., p. 10.

The number of researchers (scientists and engineeres) per one thousand of employees is a significant index for the analysis of innovativeness in particular countries . the United States are distinguished by a high rate of researchers per one thosand of employees reaching the level of 9,7 (the 4th position in the ranking). However, the growth rate was very low in the period 1999 to 2006 when it reached 8%, at average growth of 35% for all countries. What is more, one should remark on the huge progress made in the field by the following countries: China – 111%, Mexico – 98%, South Korea – 71%, Singapore – 70%, EU–10 – 64%, and Poland – 43%.

The comparisons deserve additional commentary. It should be noticed that 80% of researchers in the United States work for enterprise sector, in Japan – 66%, and in European Union countries – around 50% (Science Technology and Industry Score Card 2007, 2007). The high rate of US researchers carrying out their scientific research for enterprises is favourable for the process of adjusting their performance results to economic needs.

The level of outlays on R&D activity by enterprises and government is often thought to be a strong advantage of American economy's innovativeness. Data in Tables 5. and 6. present the share of outlays on R&D in US GPD, and are contrasted with the values of some countries of the world, mainly European.

**Table 5. The share of outlays on R&D in GPD in 2006 and the 1999–2006 dynamics in the period 1999 to 2006**

| Rank | Countries | Enterprises' layouts on R&D (the percentage of GPD) | Country's position | Countries | The change in % 1999–2006 |
|---|---|---|---|---|---|
| 1 | Japan | 2,6% | 1 | China | 160% |
| 2 | Sweden | 2,5% | 2 | Mexico | 129% |
| 3 | South Korea | 2,4% | 3 | South Korea | 55% |
| 4 | Germany | 1,7% | 4 | Australia | 40% |
| 5 | USA | 1,7% | 5 | Singapore | 37% |
| 6 | NAFTA | 1,6% | 6 | Spain | 36% |
| 7 | Singapore | 1,4% | 7 | Japan | 20% |
| 8 | France | 1,1% | 8 | EU–10 | 14% |
| 9 | EU–15 | 1,1% | 9 | Canada | 14% |
| 10 | EU–25 | 1,1% | 10 | Germany | 9% |
| 11 | China | 1,0% | 11 | EU–25 | 4% |
| 12 | Australia | 0,9% | 12 | Ireland | 3% |
| 13 | Canada | 0,9% | 13 | Sweden | 2% |
| 14 | Great Britain | 0,8% | 14 | EU–15 | 1% |
| 15 | Ireland | 0,8% | 15 | NAFTA | –4% |
| 16 | Spain | 0,6% | 16 | France | –5% |
| 17 | EU–10 | 0,4% | 17 | USA | –5% |
| 18 | Brazil | 0,3% | 18 | Great Britain | –10% |
| 19 | Russia | 0,3% | 19 | Brazil | –13% |
| 20 | Mexico | 0,2% | 20 | India | –22% |
| 21 | Poland | 0,2% | 21 | Poland | –29% |
| 22 | India | 0,1% | 22 | Russia | –39% |
| | Average | 1,4% | | Average | 32% |

Source: as in Table 4, p. 12.

At the top of the ranking of countries by the rate of enterprise's self investment on R&D are: Japan (2,6%), Sweden (2,5%) and South Korea (2,4%). The Unites States take the fifth position – 1,7% rate. It should be noticed that the US outdistance most European countries in the ranking (except for Sweden and Germany). For instance, the rate analyzed for fifteen old EU countries, is 64% lower than the United States rate, and for UE-10 it is 22% lower.

Rate change analysis in the period 1999 to 2006 reveals a completely different picture of the US position in the ranking. The data show an unfavourable tendency as for the levels of expenditure on R&D performed in the enterprise sector; the rate (of enterprises' layouts on R&D) went down by 5% during that period. At the same time, there was a 160% rise in China, 129% - in Mexico%; in well-developed countries, the rate is between 55% in South Korea and 10% in Great Britain. In case of China and Mexico, the low starting level of expenditure on R&D contributed to its impressive growth. And as for well-developed countries, dynamic rate growth is caused by economic strategy changes aimed at strengthening innovative potential of their economy.

An important element of innovative potential of a given economy are government outlays on R&D devoted mainly to basic and applied scientific research which are high risk research projects without prospects for immediate commercial results. In 2006, government outlays on nanotechnology in well-developed countries reached 52 % of the total expenditure on scientific exploration. Enterprises' share in the costs was 43%, and *venture capital* funds made 5% of it (2008 Global R&D Report, 2008, p. 12).

Table 6. data point to a high fourth position of the United States in the ranking of government layouts on R&D in GDP and a low fifteenth position in terms of change dynamics. Although the US outdistance EU countries (EU–15, EU–25 and EU–10) in government R&D investments, their advantage is shrinking. In the period 1999 to 2006 there was only a 1% rise of the indicator, while in EU–15 countries it went up by 9%. What is more, two EU countries achieved an extremely high rate growth: Ireland – 52% and Spain – 47%.

An important source of financing new developing companies is *venture capital*. It is very often the most important way of capitalization of small and innovation-oriented companies which go into *high-tech* areas like electronics, biotechnology, industrial automatics, medical devices, etc. Innovations in those areas are burdened with high risk which causes difficulties in acquiring funds from traditional sources. *Venture capital* offers a chance to finance risky innovative activities.

Statistical ITIF analyses show the highest rates of *venture capital* investment in GPD for such countries as: Sweden (0,30%), Great Britain (0,29%), South Korea (0,25%), Singapore (0,25%) and the USA (0,18%). In the ranking, the United States outdistance EU–15 (0,11%) and EU–25 (0,10%) countries (Atkinson, Andes 2009, p. 15).

**Table 6. Government outlays on R&D in GPD in 2006 and change dynamics in the period 1999 to 2006**

| Rank | Countries | Enterprises' outlays on R&D (% of GPD) | Rank | Countries | The change in % 1999–2006 |
|---|---|---|---|---|---|
| 1 | Sweden | 0,90% | 1 | Ireland | 52% |
| 2 | Singapore | 0,87% | 2 | Spain | 47% |
| 3 | France | 0,81% | 3 | South Korea | 33% |
| 4 | USA | 0,76% | 4 | Russia | 29% |
| 5 | South Korea | 0,75% | 5 | China | 20% |
| 6 | NAFTA | 0,73% | 6 | Canada | 18% |
| 7 | Australia | 0,72% | 7 | EU–15 | 9% |
| 8 | Germany | 0,72% | 8 | Singapore | 9% |
| 9 | Canada | 0,66% | 9 | EU–25 | 8% |
| 10 | Russia | 0,66% | 10 | Great Britain | 6% |
| 11 | EU–15 | 0,65% | 11 | Australia | 5% |
| 12 | EU –25 | 0,64% | 12 | NAFTA | 2% |
| 13 | Great Britain | 0,57% | 13 | Sweden | 2% |
| 14 | Japan | 0,55% | 14 | France | 2% |
| 15 | India | 0,52% | 15 | USA | 1% |
| 16 | Spain | 0,51% | 16 | EU–10 | 0% |
| 17 | EU10 | 0,40% | 17 | India | –2% |
| 18 | Ireland | 0,39% | 18 | Japan | –7% |
| 19 | China | 0,35% | 19 | Germany | –7% |
| 20 | Poland | 0,32% | 20 | Mexico | –14% |
| 21 | Mexico | 0,23% | 21 | Poland | –20% |
| 22 | Brazil | 0,17% | 22 | Brazil | –47% |
|  | Average | 0,70% |  | AVERAGE | 5% |

Source: as in Table 5, p. 13.

Innovativeness indicators that have been discussed so far referred to economy's innovative potential. For a complete picture of a given economy's innovative activity, one needs to analyze indicators reflecting the results of innovative performance. The list of indicators comprises: the percentage share of high-tech goods in the total export value, the percentage of people employed in medium and high technology industry sectors against general employment value, as well as the number of inventions applied to EPO (European Patent Office), USPTO (United States Patent and Trademark Office) and the number of patents

obtained simultaneously in patent offices in Europe, the USA and Japan per 1 million of inhabitants.

The share of *high tech* products in the total export value in 2007 reached 26,1% for the USA, 20,0% for Japan and for EU–27, the average rate for reached 16,7%. Malta (54,6%), Luxemburg (40,6%), Ireland 28,9%) and Great Britain (26,5%) represent countries with the highest rate value (European Innovation Scoreboard 2007, pp. 16–17, 39–40).

As for percentage share of employees in *medium-high* and *high-tech* industry sectors, the United States fall at the bottom of the list with the rate of 3,84%. In 2007, medium rate for EU–27 was 6,63%. In Japan, it was 7,30%, in Denmark – 10,75%, in Czech Republic - 10,33%, Sweden – 9,72%, Finland – 8,50%, Switzerland – 7,25% and Israeli – 4,40% (European Innovation Scoreboard 2007, p. 16, pp. 39–40).

Data describing the results of research activity by the number of inventions applied and granted with a patent (calculated per 1 million of inhabitants) point to a US advantage over EU–27 countries in this significant area of economy's innovative performance. Indicators showing the number of inventions per 1 million of inhabitants, applied to the Europe Patent Office and United States Patent and Trademark Office in 2007 were 167,6 for the USA, and 273,7 for EU–27 with average level at 128,0 and 49,2 respectively. In terms of the number of inventions patented in three patent offices at the same time (*Triad patents*[5]) per 1 mln of inhabitants, the United States also outdistance European Union countries (33,9 for the USA and 19,6 for EU–27). It should be added that Japanese achievements in the field of patent activity are better than US results; indicators of the activity in 2007 reached the following values: 219,1; 274,4 and 87,0 (European Innovation…, p. 16).

## 4. The crisis influence on the United States economy

In American literature, there is an interesting discussion over evaluation of government anti-crisis policy and steps taken to revive economy and let the United States remain hegemony in the world economy. After the 2008 financial crisis, a lot of intellectuals – mainly economists, political scientists and historians – focused on the fall (dawn) of the US economic and technological superiority. N. Roubini, an economist of New York University, claims that US

[5] *Triad patents* are European Patent Office, United States Patent and Trademark Office and Japanese Patent Office.

economy will have to face a gigantic public debt. In his opinion, high costs of the debt will suppress economic growth in the nearest future. K. Rogoff, an economist of Harvard University, fears that due to high budget deficit and the public debt, the United States might share the Greek fate. J. Stiglitz is of another opinion – he claims that the current administration's weak reaction to the recession and financial crisis will plunge American economy. He predicts that deflation of economy which will lead to a long-term stagnancy (Gross 2010, p. 69). N. Ferguson, a historian of Harvard University says that huge debts and federal budget expenditure will bring about the downfall of American emporium (Ferguson 2009, pp. 58–59).

R. Florida, J. Siegel and E. Phelps present a contrary vision of American economy based on impetus from the fields of innovation and scientific research. R. Florida, a sociologist and economist of Toronto University believes that American system can best analyze its downfalls and apply radical innovations being a realization of the idea of creative destruction. He claims that exceptional flexibility and innovativeness of American nation will let the United States keep their dominant position in the world economy (Florida 2010, pp. 25–28). As for J. Siegel, an economist of Wharton School at the University of Pennsylvania, he does not agree with the opinion that in the next years there is going to be a long period of stagnation in the USA. Quite contrary, he says that during the next decade, American economy might grow faster than in the last fifty years. The main incentive for the growth will be scientific discoveries and systematically introduced innovations that will bring about a technological breakthrough in energetics, medicine and environmental protection (Grosse 2010, p. 72).

E. Phelps also points to the key meaning of innovation for the post–crisis improvement of the economic situation. The author presents the problem in the context of high unemployment which is a painful result of American crisis. He thinks that unemployment might continue for a long period of time and it might exclude quite a large group of people from the economic system. E. Phelps is worried about the signs of weakening economic dynamics in the United States. He lists the following:

- decrease of employment and investments in Sillicon Valley, the American modern technologies incubator[6],
- weakening performance of funds and companies investing in new enterprises,

[6] In comparison to 2008, in 2009 investment in Silicon Valley dropped from 7 to 5 million dollars. In the record-beating year of 2000, investments topped 27 milliard dollars. (Silicon Valley Index 2010, Joint Ventures Group, 2010).

- decrease in the number of new companies set up in the last decade,
- the breakdown of investment on research and development in applied sciences (Phelps 2010, pp. 2–3).

E. Phelps suggests a set of solutions which ought to awake economy innovativeness. It is worth mentioning a few of them:

- increasing economical freedom for entrepreneurs by creating an easy system of employing and dismissing workers as well as facilitating the process of starting a business;
- broadening the system of tax allowances for entrepreneurs undertaking innovative solutions;
- restructurization of economy aimed at creating a system that will boost American economy performance after the crisis (earlier it was dominated by real estate and services sector).

There is no exaggeration in claiming that despite negative results of recession, the United States economy hasn't lost its ability to create new ideas and transform them into product, technological and organizational innovations. During the recession, American companies had to lower the costs and improve their efficiency. In the period from the fourth quarter of 2008 to the fourth quarter of 2009, work efficiency in industry went up by 5,8% (Gross 2010, p. 71).

Automotive industry is a perfect example of revitalized innovative performance of American economy; it has been boosting its sales and regaining the lost market shares after a short period of crisis and radical therapy. The US Congress bill of April 2010 proves the process; the bill makes car producers obliged to reduce fuel consumption in American passenger cars and small trucks until 2016. Energetics Department offers credits on the purpose as well as credit guarantees for big enterprises and new companies (like Fisher Automotive).

## 5. Conclusion

The above deliberations might be summarized in the following way:

- in the last decade, innovative superiority of the US economy over the rest of the world has gone down, and, according to the ITIF innovativeness ranking, it gives way to such economies as Singapore, Sweden, Denmark and South Korea;
- the proceeding globalization and technological achievements of some European countries as well as China and India, contributed to the loss of the

domination by the United States in a few most modern areas of science and technology;

- creative destruction is the main rule of American dynamics; despite post-crisis perturbations, US economy hasn't lost its advantages of an innovation laboratory for the rest of the world.

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## Streszczenie

**INNOWACYJNOŚĆ GOSPODARKI STANÓW ZJEDNOCZONYCH. TRWAŁA CZY SŁABNĄCA DOMINACJA?**

*Celem opracowania jest wyjaśnienie źródeł amerykańskiej dominacji w dziedzinie innowacji, dokonanie oceny poziomu innowacyjności amerykańskiej gospodarki na tle krajów Unii Europejskiej, Azji, a także odpowiedź na pytanie dotyczące perspektyw utrzymania przez tę gospodarkę pozycji lidera w wyścigu technologicznym.*

*Strukturę opracowania można przedstawić następująco: po wprowadzeniu dokonano charakterystyki głównych czynników i procesów, które przyczyniły się do powstania dominacji gospodarki Stanów Zjednoczonych w dziedzinie innowacyjności, następnie poddano analizie zjawisko zmniejszania się przewagi innowacyjnej tej gospodarki nad resztą świata, a w dalszej kolejności skoncentrowano uwagę na zagadnieniu wpływu współczesnego kryzysu gospodarczego na perspektywy utrzymania przewagi technologicznej Stanów Zjednoczonych.*