

TECHNOLOGY AND ECONOMIC IMPACTS OF MEGA-SPORTS EVENTS: A KEY ISSUE? EXPLORATORY INSIGHTS FROM LITERATURE**

Mega-sport events such as Olympic Games or Football World Cup are always presented as providing the hosting nation and/or city with huge benefits. Supporters of such events quote economic, social and cultural impacts for the region as well as contributions to scientific and technological progress and innovation. Obviously, they need to politically justify the impressive and growing financial investment required by organizing Olympic Games or World Cup. The article aims at looking at a quite abundant academic literature with the objectives of defining the various potential impacts and the methods used for their assessment. It concludes that there is no universal and scientifically valid model for evaluating the benefits of mega-sport events and that organizers should be very cautious when arguing in favor of deciding to host such events.

Key words: Mega sports events, technology, the economy, social and cultural impact

Introduction

After the 2008 Olympic Games hosted in Beijing (China), and the 2012 Olympic Games hosted in London (United Kingdom), 2014 is the year of the FIFA World Cup in Brazil. Every major mega-sports event is inevitably the occasion for emphasizing and indeed marketing the contribution of the event to the boost of modernity, universality and globality (Haugen, 2003) as well as economic wealth of the hosting city or country.

In China, Beijing Olympic Committee decided to emphasize three priorities: "Humanistic Olympics, Green Olympics and Science and Technology Olym-

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pics". As far as science and technology issues are concerned, the 2008 Olympic Science and Technology Action Plan was launched jointly by nine departments, such as the Ministry of Science and Technology, State Physical Culture Administration and Chinese Academy of Sciences. The Plan collects scientific and technological innovation achievements, aiming to make use of first-grade technological achievements focusing on solving key and difficult problems in hosting the Olympics.

In London, four years later, the Olympic Games were the main source of urban regeneration in East London (Poynter, 2009) and contributed to major advancements in new technologies for security (Fussey & Coaffe, 2011). Brazil indeed should benefit from the world cup and in 2016 from the next Olympic games.

As far as technology, economic impacts, and the Olympics are concerned, the academic literature is limited. As emphasized by Andreff (2006), when examining the production of economic literature, we realize that there are very few articles and books dealing with such issues, not only in American, but also in European sports economics. Andreff (2006) pointed out the shortcomings of impact economic studies: methodological limitations, and overestimation of multipliers. Such issues are not even quoted in the list of "promising topics" arising from current development in sports economics. Andreff (2006) also pinpointed that one of the research areas to be developed should be technological innovation in the sports goods industry. Tucker (2006) stated that econometric analyses of the economic impacts of the Olympics are surprisingly scarce. Analyses that attempt to build robust models of the expected impacts are virtually nonexistent. The main objective of this article is to summarize the key outcomes of the academic literature on impacts on economy, and technology and innovation.

1. Economic Features and Impacts of Sports Events

Despite obvious gaps and weaknesses in the academic literature, authors emphasize several potential economic impacts of mega-sports events at local, regional and/or national levels on employment and through investment. Veraros & al. qualify such benefits as a multiplier effect. As acknowledged by Atkinson & Mourato (2005), Preuss (2004) has published one of the most comprehensive and authoritative discussion of the economic consequences of hosting the Olympic Games.

There are indeed many positive and negative effects of sports events which are not only of economic and technological essence. Mangan (2008) edited a special issue of *The International Journal of the History of Sports* in which several games and hosting cities are analyzed using the concept of legacy to capture the value of sports facilities and public improvements generated on the occasion of summer and winter games. In this special issue, Gratton & Preuss (2008) found various characteristics of legacy from tangible aspects such as urban plan-

ning and sport infrastructure to less tangible such as “urban revival, enhanced international reputation, increased tourism, improved public welfare, additional employment, more local business opportunities, better corporate relocation, chances for city marketing, renewed community spirit, better interregional cooperation, production of ideas, production of cultural values, popular memory, education, experience and additional know-how”. The authors added negative legacies such as debts from constructions, high opportunity costs, infrastructure not needed after the event, temporary crowding out, loss of tourists, ... property rental increases and socially unjust displacement and redistributions” (Gratton & Preuss, 2008).

1.1. Job creation

It is obviously difficult to evaluate jobs created due to holding the Olympic Games. Opponents claim that Olympic Games create only a few transitory jobs. Preuss (1998) argued that “despite the susceptibility of the calculations to errors, [...] the Olympic Games lead to considerable employment effects”. Such mega-events not only create new jobs but secure existing jobs. According to his calculation (Preuss, 1998, 2004), new person/years by primary effect, i.e. related to all autonomous expenditures caused by the Olympics, were 23,200 in Munich (1972), 37,900 in Munich (1976), 28,600 in Los Angeles (1984), 191,300 in Seoul (1988), 281,200 in Barcelona (1992) and 87,500 in Atlanta (1996).

Hotchkiss, Moore, Zobay (2003) note that hosting the 1996 Summer Olympic Games boosted employment by 17% in the counties of Georgia affiliated with and close to Olympic activity, relative to employment increases in other counties in Georgia.

Tziralis & al (2006) evaluate that the labor force in Attica prefecture (Athens) increased by 11.8% between 1998 and 2004 when it increased by 7% in Greece, in particular in the construction industry and hotels/restaurants.

Recently, Tucker (2006) published an extensive literature survey as well as a new comprehensive theoretical model to assess the deviation from the expected city employment for Seoul, Barcelona, Atlanta, Sydney and Athens. His conclusions seem to be interesting:

- 1) There is a positive impact on employment associated with the Games;
- 2) Employment levels increase long before the Games in response to construction and increased international visibility;
- 3) Job creation is significant only one year after the Games;
- 4) Olympics induce more employment in wealthier countries than in poorer countries, probably because wealthier countries are in better position to take advantage of the opportunities offered by the Games (foreign direct investments, tourism, etc.);
- 5) The greatest employment benefits the cities that spend the least.

Tucker (2006) recognizes the limitations and bias of his model. He also acknowledges that his study represents only the first step towards addressing the impact of the Olympic Games. He calls for further research towards a complete model of the “Olympic effect”.

1.2. Economic Impacts

Dealing with macroeconomic impacts, Sterken (2005) shows that both descriptive statistics and economic growth models suggest that Olympic summer games¹ enhance GDP per capita growth rates. But the author adds that “if there is any impact, it is insignificant”.

H. Preuss has published extensively on the economics of staging the Olympic Games. According to his research (Preuss, 1998; 2004), the balance between revenues and operative expenditures were positive from Munich (1972) up to Atlanta (1996), if the investments are ignored. However, if the investments are included, then Munich (1972) and Montreal (1976) experienced a deficit.

Arthur Andersen (1999) estimated the overall economic impact of the Sydney Games in 2000 as an increase of 0.12% over a 12-year period from 1994. For Tziralis & al (2006), total expenditures for the Athens Games in 2004 were 11.3 bn€ of which 20.1ù were privately funded. For capital expenditures, 6 bn€ were put on context activities and 2.5 bn€ on Olympic activities. For operating expenditures, 0.6 bn€ were spent on context activities and 2.4 bn€ on Olympic activities.

According to Berman & al. (2000), the appointment of a given city to host the Olympic Games has a positive impact on stock value of specific industries at national level: building materials, developers and contractors, engineering and services. The authors show from the Sydney case that such benefits are confined to locally based companies. Veraros & al. (2004) suggest that stock exchanges may anticipate the outcome of the voting and may not reflect a significant effect of the announcement itself. Interestingly, they point out that Olympic Games will have a much stronger effect if granted to an economic pole rather than a political or administrative center. Yelkur & al. (2012) demonstrate that there is a clear benefit in stock value for companies which advertise and/or sponsor summer as well as winter Olympic Games. The firms which are official sponsors (such as Visa, Coca Cola, McDonalds, etc.) significantly outperform the stock returns of other firms.

Visitors’ expenses are indeed supposed to balance a part of the cost of the investment. Gratton & al. (2000) looked at the economic importance of major sports events and found out that one of the major international spectator events such as the Olympics and Football World Cup, i.e. the so-called Type A sports events, generate significant economic activity and media interest. Major sports

¹ But this is not the case for the World Cup Soccer.

events are a significant part of tourism industry in Great Britain, Australia and United States of America because many domestic sporting competitions attract the interest of foreign spectators. Australia estimates that such events contribute 5% of the national tourism income each year.

Matheson (2006) finds out that *ex ante* economic studies of the multiplier effects are highly overstated and theoretically deficient due to the substitution effect (consumers spending money at sporting events rather than in other activities elsewhere), the crowding out effect (visitors not coming because the event) and the leakages (expenses going out of the local economy). The author claims that *ex post* studies are also biased, mostly because they are produced by institutions which are involved in the event. The vast majority of independent academic studies show the benefits of being a fraction of those claimed by the organizers.

1.3. Supportive Impacts

Organizing the Olympic Games might have several supportive effects which are indeed difficult to assess and evaluate:

- Building up the image of the hosting city, region and/or nation;
- Boosting the tourism industry;
- Attracting investment in manufacturing and services not directly related to the event;
- Developing sustainable transport networks such as railways, underground railways and tramways;
- Expanding modern road infrastructure and then reducing pollution, noise, cost of traffic congestion as well as improving safety.

Berkowitz & al. (2007) show that China has used the Olympics in order to improve its image across the globe. They introduce the concepts of nation and place branding as an essential impact of such organization thanks to the global visibility offered by the extremely large media coverage of the event. Obviously, this has been a deliberate strategy of the Chinese authorities at all levels, from the central government to local institutions.

1.4. Physical Impacts: Urban Changes

The Olympic Games have several physical consequences (Chalkley & Essex, 1998, 1999 and 2004), which are indeed difficult to measure in dollar terms:

- Catalyst of and stimulus to urban change: from providing additional sports facilities to stimulating building of the environment (from Rome 1960) and contributing to a comprehensive urban renewal;

- Direct physical impacts: new road systems, public transport initiatives, air terminals, urban renewal programs, tourist and cultural facilities, parks and beautification projects;
- Shift towards sustainable development at Sydney (2000) emphasizing solar power, recycled water, passive heating/cooling, car dependence reduction.

1.5. Social and Cultural Impact.

There are lots of social and cultural related issues in terms of impact from mega-sports events.

For example, Paciluna in 1992 was considered as successful in that the event brought positive impact upon local city and people in city construction, imagination of media, local political system, labor market, cultural and sociologic learning, as well as local economic and technological progress. (Moragas de, Botella, 1995).

Other studies on Calgary Winter Olympic Games in 1988 were mainly for responsiveness of local residences, and possible impact upon local traditions. Jeong & al. (1990) applied a questionnaire to investigate responsiveness of local people in Seoul to the Olympic Games in 1988 in Korea, while Pyun (1999) conducted research particularly on economic impact of the Olympics in Seoul.

Social and cultural change based on the Olympic Games effect is frequently discussed in related research during competition for the hosting City, organization and construction. One of the major issues implies that the Olympic Games as an international heritage may influence local culture in the long run (such as research report entitled *Staging the Olympics: the Event and its Impact* by Cashman and Hughes, 1999). Lee, Cornwell and Babiak (2012) developed a comprehensive but extremely complex instrument synthesizing numerous items and aiming at evaluating the global societal impacts through five dimensions: social capital, collective identity, health literacy, well-being and human capital. Although it needs to be confirmed by applied research of case studies in real conditions, this attempt looks very interesting and promising.

1.6. Elements of discussion

According to Lee (2001) and Matheson (2002), evidence suggests that not only are there theoretical reasons to believe that economic impact studies of large sporting events may overstate the true impact of the event, but in practice the *ex ante* estimates of economic benefits far exceed the *ex post* observed economic development of host communities following mega-events or stadium construction. Kasimati (2003) published illuminating figures about the Sydney Olympics.

Burton (2003) concludes that “it appears difficult to justify hosting the Games solely on a financial return on investment basis” and that “answering the

question of whether the community was better off for having hosted the Olympics may remain a discussion driven more by qualitative observations than by quantitative facts”.

Kurscheidt (2007) thinks that most strategic management approaches of socio-economic impact of a sport event are done by applying an expenditure approach and a multiplier analysis. He suggests the use of cost-benefit analysis (CBA) to assess the “total value” of the event relative to a consistent set of goals, comprehending both quantitative and qualitative information and including both direct and indirect effects as well as tangible and intangible costs and benefits. An *ex ante* measure will be based on potential demand and infrastructure endowment, and result in alternative scenarios. Kurscheidt (2007) proposes that sensitivity analysis would be the appropriate tool for assessing the match between impacts and expected values: it examines, *ceteris paribus*, the effect of variations in only one single parameter on the total outcome of a specific investment. The author tested the following parameters: stadium capacities, multipliers, discount rate, proportion of foreign tickets, capacity utilization, tourist expenditure, investment expenditure.

Atkinson & Mourato (2006) advocate the integration of “intangible” benefits and cost. The authors list seven categories of intangible benefits:

	Intangible Benefits	Intangible Costs
1	Uniting people/feel good factor/national pride	Crowding
2	Improving awareness of disability	Increased risk of petty theft
3	Motivating/inspiring children	Increased safety and security risks
4	Legacy of sports facilities	Local disruption during construction
5	Environmental improvements	Transport delays
6	Promoting healthy living	Excessive media coverage
7	Cultural and social events	

Source: Atkinson & Mourano (2006).

They measure the cost-benefit balance through the concept of “willingness to pay” for hosting the 2012 Olympic Games in London.

Using the word “fallacy”, Owen (2005) is very critical with economic impact studies: they have led to acceptance of their findings with little or no critical evaluation... the economic effects are taken as given...costs are treated as benefits... opportunity cost are not computed, etc... Benefits to local economics are often very short living.

2. Mega-sports Events, Technology and Innovation

As previously mentioned, the literature about innovation in the context of the Olympic Games and other mega-sports events is very limited. If one takes the “extensive” view of innovation, i.e. extending the scope from pure technological innovation in products, services and processes to organizational and societal innovation, it could be said that staging and participating in such events might foster innovative capabilities.

2.1. Generating Product Innovation

Small amount of academic literature deals with innovation in sports goods. According to Dall Monte, Leonardi, Menchinelli & Marini, (1987), advanced technology and biomechanics were applied in the development of a new bicycle. The factors investigated included the position of the cyclist, geometry of the bicycle, the transmission system, and the drag characteristics. Several wind tunnel tests were conducted to determine the minimum drag conditions for bicycle configurations and positions of the athlete. The results showed a clear advantage for non-spoked disc wheels of high composite material without discontinuity between the tire and the wheel. The conventional bicycle frame was redesigned and the optimum body position of the cyclist was determined. These findings were utilized in the development of the bicycle ridden by Francesco Moser in establishing a new 1-hour world record in 1984, and also in aiding the gold-medal-winning 4 x 100 Ism Italian team in the 1984 Los Angeles Olympic Games.

Bierklie (1993) pinpointed that as innovation in sports equipment threatens to turn the Olympics into the world’s greatest technology tourney, rules committees struggle to ensure a level playing field. Competition sports equipment undergoes constant technological improvement. Whether bicycles, kayaks, javelins, barbells, archery gear, or fencing swords, just to cite a few, the tools of the athlete’s trade are now lighter, stronger, and better designed than even a few years ago. As an example, Speedo developed a new Fastskin LZR suit to be tested during the Beijing Olympics (Dollinger & al., 2010). In practice, innovation in sports products is generally initiated by industry with a close involvement of users (Hyysalo, 2009) and when adopted by users they might be generalized.

There is little evidence that the Olympic Games had been a driver to new products in other manufacturing industries. Even if some Chinese academics claim that the so-called green 2008 Beijing Olympics will boost research and development in clean and intelligent transportation (Ma & al., 2004), it seems that there will not be any innovation in ground transportation. Omega, the Swiss watchmaker, innovated with an ultra-sensitive and extremely accurate touchpad for swimming able to record the one-hundredth of a second (Dollinger & al., 2010).

The Olympic Games, as well as major sports events, are a strong incentive for innovation in pharmaceutical and chemical industries for good as well as bad purposes (cheating).

Stuart (2004) states that with each Olympics, drug-taking and drug-testing gets more sophisticated. Anti-doping authorities are constantly developing more advanced ways to keep ahead of the cheats. At the Sydney 2000 Games EPO testing was conducted for the first time.

Human growth hormone testing was also carried out for the first time in Athens (2004) using a test developed by scientists at Southampton University. Although human growth hormone has been on the list of banned substances since 1989, its detection has not been possible for more than a decade. An initial test can detect if human growth hormone has been used by an athlete in the past 36 hours, and the second test can detect if it has been used in the previous 84 days.

2.2. Generating Process Innovations

It is hardly possible to find a reference to process innovations generated by the Olympic Games. Pitsis & al. (2003) present a few technical innovations induced by a large-scale project in Sydney 2000 Olympic infrastructure.

In Beijing, several major innovations in design, architecture and construction industry were introduced specially for the Olympic Stadium. Designed by Herzog and De Meuron, the “Bird’s Nest” is the largest use of biometrics in modern architecture. As pointed out by Rogers & al. (2008), this is an experiment in bio mimicry; “a new science that studies nature’s models and then imitates or takes inspiration from these designs and processes to solve human problems. The authors state that the National Olympic stadium in Beijing is an innovative building in terms of its design and the way it functions through its use of bio mimicry and that this building will influence future buildings (especially stadia) to exploit bio mimicry to create safer, healthier, economically and environmentally responsible structures.

Orr (2007) emphasizes the architectural innovativeness generated by the Water Cube National Swimming Centre. The author shows that innovation is linked to a demand for radically new types of buildings and structures. According to Orr (2007), the Olympic Games act as a driver for innovative architecture because the hosting nation (or city) “strives to couple challenging program requirements with cultural aspirations”. A multi-cultural team challenged the dominant design in the swimming stadium to create a culturally-specific building based on the membrane structure technology which might be largely disseminated in the future (Da-wei & Lu-cheng, 2007). Dollinger & al. (2010) state that, in the Beijing Olympics, the Bird’s Nest stadium, which impressed the whole world, required creation of new knowledge in welding techniques and methods. Berkowitz & al. (2007) and Ren (2008) confirmed such statement pre-

senting such innovation as a major deliberate contribution to the nation branding efforts. Broudhoux (2008) explained the pros and cons of the new innovative buildings built up for the Olympics.

2.3. Service Innovation

The Olympic Games are often an excellent opportunity to innovate with new services based on information technology in particular. The Beijing Olympics (2008) saw the innovation in services such as the so-called digital Olympics speech-to-speech translation system (Stuker, 2006).

2.4. Accelerating Innovation Diffusion and Implementation

Mega-sports events are a tremendous occasion, due to massive public and private funding, for accelerating the diffusion or implementing innovative technologies and services.

Slater (2000) argued that the Tokyo Olympic games in 1964 were the ignition for the first intercontinental direct television broadcast via satellite in geostationary orbit. Spooner & al. (2000) point out that it is widely recognized that Sydney used the Olympic Games (2000) to shift towards “green technology”, especially through the first solar energy village ever built, i.e. Newington, aimed at creating a practical example of more sustainable living for the 21st century. Each home has 1 kW (peak) of roof-integrated PV connected to the grid via an inverter system.

Hausman (1999) claims that cellular telephone introduced in 1983, heavily benefited from the 1984 Olympic Games in Los Angeles, which was the first large city to be fully equipped.

Kalotychos, Gkikas, Kenterlis & Ellinas (2004) identify educational application on mobile phone (information on campus, schedule, location, access, examinations, contacts, etc.) developed by the Department of Electronic Computer Systems (Piraeus, Greece) during the Athens games (2004).

IBM stated that building and managing the technology infrastructure for the Sydney Games was the “largest, most complex information technology challenge in the world”. The official Games Web site, powered by IBM, handled unprecedented Internet traffic with 11.3 billion hits, a 1,700 percent increase over the Nagano Games official site in 1998. More than 13 million lines of software code were written and thoroughly tested before the Games began. Almost 6,000 people provided technology support for 300 medal events in 37 sports competitions held at 39 venues.

The Olympic Games were an ideal occasion for handling critical applications of IT:

- Games Management Systems for coordinating the behind-the-scenes, logistics, ranging from accreditation and accommodations to staffing and transportation, that are critical to the success of the Games;
- Games Results System which captured the results from all competition events and distributed information to judges, scoreboards, commentators, media and the Official Games Web site;
- Commentator Information System (CIS), part of the Results System, which provided real-time competition information to TV and radio broadcasters to enrich their event coverage.

It is interesting to pinpoint that for the London Olympics in 2012, an explicit choice was made by the London Organizing Committee (LOCOG) that all technology used will be based on that used in the previous games (Douglas, 2012).

Goldenberg & al. (2010) argue that the Olympic Games have been a tremendous opportunity for radical innovations in sport practices such as the famous Fosbury flop in 1968 which contributed to a true revolution in high jumping. While Fosbury was the only one champion to use this technique in 1968, all competitors adopted it during the next Games in 1972.

2.5. Case study: Technological Change and Innovation in Olympic China

As scholars in innovation management fields have noticed, one of the most interesting aspects is the technology change under progress of the Olympic Games.

Perhaps a Japanese case can be cited as the Olympic backed technology change. The Tokyo Olympics held in 1964 was put into national income growth plan by government in Japan. Transportation facilities and city expansion including construction of hotels and integrated service facilities improved dramatically the development of real estate, service sectors, and telecommunication sectors, which created the so-called "Olympic Prosperous" between 1962 and 1964. Technology change accompanied by frequent product innovation was remarkable during those years.

In China, scientific and technological contents of the Olympic Games have also been greatly encouraged by government, including "863" national scientific and technology scheme. According to the Olympic Games S&T Scheme (2008), 1,234 projects with total input of 3.6 billion RMB were conducted in science and technology Olympic plans. 35000 technical personnel participated in various kinds of such programs. About 320 inventions applied for patent ownership to Patent House in China (180 were granted), created by both domestic and overseas participants. It is reported that 10 different typical technology contented achievements can be found in the 2008 Beijing Olympic City:

- Modern stadium construction;
- Information services;
- Sport technology facilities;
- Energy and environmental protection;
- Cultural products in creative industries;
- Weather forecast technology;
- Safety technology and management;
- Food health
- Transportation technology and facilities;
- Gardens and planetary.

It is reported that these technical backed achievement raised the level of innovation in local Beijing, and provided solid technology foundation for other related industries. In fact, the Olympic based industrial structure change is a major concern of local government, since it requires larger inflows of technology resources and related funds, as well as frequent mobility of technical personnel. This is also closely related to the development of local construction sectors, transportation sectors, tourist sectors, financial & insurance, broadcasting sectors, etc.

Energy intensive and heavy pollution sectors are expected to be eliminated gradually before and after the Olympic Games. High tech industries, city industries, and headquarters as well as R&D institutes should be major economic driving force in such local economies. Greener Olympics strive even further towards the adoption of newly developed environment friendly technologies and the restriction of energy intensive productions. In the meantime, consumers' tastes are raised for better and more versatile market.

Another significant part of the Olympic effect upon technology change is opening up economic development model to be continually applied in the local market, which can easily facilitate technical knowledge and technology transfers.

China's focused research on the Olympic Game related area is not as extensive as overseas studies. Initially, such research was conducted purely on sports and gamatics, the example being a general purpose textbook on the Olympic Games edited by nation-wide sports universities (Xu, 2006). However, since Beijing won the final role in organizing the 19th Olympic Games in China, the related research has started increasing dramatically. Song & Ranelli (2008) mention several studies by Chinese academics dealing with the following issues:

- Evaluating long-term social, economic and political implications and legacies (Fang, 2004; Jinxia & Mangan, 2008; Bridges, 2011);
- Acceleration of GDP growth rate (Ma, Lin, Huang, Xu, Li and Zhang, 2007);
- Greening of Chinese technology and economy (Ma, Wu, Liu, Yu, Teng, Liu, 2004);
- Increasing budget and income from Olympics (Wei, 2007);
- Increasing tourism income (Chen, 2008, Sun & Ma, 2008);

- Estimating Olympic-related Investment and Expenditure (Hashmi & al., 2008; Li ShiNa & Blake, 2009, Li, ShiNa, Blake, A., Thomas, R., (2013),);
- Olympic Effect on Total Investment in Fixed Assets and in Real Estate (Xu, 2007);
- Impact of Olympic-related Investments on Regional Economic Growth through an interregional Input–Output Approach (Zhang & Zhao, 2007);
- City branding (Zhang & Zhao, 2009; Jin & Bu, 2010);

There are also many academic publications on the relationships between the Olympic Games and various environmental issues:

- Crowding effects (Yan, 2004);
- Olympic Games and environmental protection (Cheung & Tuen Mun, 2010, Du & Mendelsohn, 2011);
- Reducing greenhouse gases emissions (Wu & Zhanga, 2008);
- Developing solar energy (Spooner & al., 2000);
- Diffusion of electric vehicles (Dixon, Wang & al., 2011);

Conclusions

1. Concerning the impacts of mega-sports events, there are still on-going debates amongst academic scholars.

One of the major weaknesses of impact studies, and consequently the skepticism associated, is that they emphasize the benefits without paying attention to the costs generated by sports events (Crompton & Howard, 2013). The authors particularly pinpoint the implicit and explicit opportunity costs of sports investments. They also show that, generally speaking, economic benefits are over-estimated, costs are under-estimated, while “economic impact is too often erroneously equated with profitability”.

Recent evaluation of economic benefits for local population even shows that such impacts are not significant compared with the total size of the economy. Shina & al. (2013) estimated to less than 170 million of US dollars of welfare gains from the 2008 Beijing Olympics! Ganguly (2012) and more recently Banutu-Gomez and Rohrer (2014) state that there are Olympic cities that still have not recovered from the economic damage they suffered such as the Montreal Olympics in 1976, which cost the city and tax payers too much money and continue to be a financial drain. Moscow (1980), Athens (2004) and London (2012) are also considered as financial failure (Ganguly, 2012). As far as Beijing is concerned (2008), analysts blame a very limited impact outside the Beijing region (Yao, Maseri & Rasli, 2010).

The 2014 FIFA world cup is also going to be a huge financial disaster for Brazilian citizens. According to the official website of the World Cup, the total

cost of investments in the 2014 World Cup Matrix of Responsibilities (including public and private resources) will reach US\$ 12.4 billion for an expected return of US\$ 6 billion².

2. When analyzing the relationships between such events and innovation and technological change, the academic literature is far from convincing.

As emphasized by Walsh (2006) about China - but this is also verified in other fast emerging countries - there is a perceived faith in technological solutions associated with a growing national pride in the country's technological achievements. Advances in industrial R&D are also likely to benefit from this "techno mania" and growing popular emphasis on innovative solutions to global socio-economic challenges. This "can-do" spirit has been undoubtedly on display at the Beijing Olympics thanks to two of the key strengths of the Chinese system of innovation: the high involvement of State funding and policy making, and the huge financial capacity of the industrial R&D stakeholders due to the size of the domestic market.

As far as economic and societal impacts are concerned, it is obvious that mega-sports events play a crucial role despite the impossibility to measure their impact accurately. The academic literature is quite clear and consensual about the nature of positive effects of hosting both summer and winter Olympic Games. Scholars are less easy with negative impacts, in particular when they are native of the organizing country. Despite the number and quality of existing research, it is obvious that further economic research is needed at both theoretical and applied levels.

Regarding the relationship to innovation, there is a consensus on inter-relationships between major sports events and technological innovation, from generation to diffusion and generalization. But it is obvious that the evidence is insufficient, and that further research is sorely needed. Most data available and most academically reliable literature are based on profession of faith rather than scientific evidence.

On this very specific issue, further research should focus on surveys and case studies dealing with innovation and technology management in former and future Olympics or other mega-sports cities. Particular attention should be paid to issues such as high tech companies' development, organizational innovations, and entrepreneurship based on or generated by sports events.

² <http://www.copa2014.gov.br/en/noticia/estimated-investments-income-and-employment-generation-during-preparations-2014-fifa-world>.

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TEHNOLOGIJA I EKONOMSKI UTICAJ MEGASPORTSKIH DOGAĐAJA: KLJUČNO PITANJE? ZAKLJUČCI NA OSNOVU ISTRAŽIVANJA

S a ž e t a k

Megasportski događaji poput Olimpijskih igara ili Svetskog šampionata u fudbalu se uvek predstavljaju kao događaji koji donose velike koristi naciji i/ili gradu domaćinu. Oni koji podržavaju takve događaje navode ekonomske, društvene i kulturne prednosti za čitav region, kao i doprinos naučnom i tehnološkom napretku i inovacijama. Jasno je da oni moraju politički da opravdaju ogromne finansijske investicije neophodne za organizovanje Olimpijskih igara ili Svetskog šampionata. Ovaj rad razmatra brojne akademske radove u cilju definisanja različitih potencijalnih uticaja i metoda koji se koriste za ocenjivanje ovakvih događaja. Zaključak do koga se dolazi je da ne postoji univerzalni i naučno validni model za ocenjivanje koristi od megasportskih događaja, kao i da organizatori treba da budu krajnje oprezni kada se zalažu u korist odluke o kandidaturi za ovakve događaje.

Ključne reči : Mega sportski događaji, tehnologija, ekonomija, socijalni i kulturni uticaj