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INTERMEDIARY ORGANISATIONS IN THE ISRAELI AND POLISH INNOVATION SYSTEMS

Key words

Innovation, national innovation system, technology transfer, intermediaries.

Summary

The paper presents and compares organisation of national innovation systems in Poland and Israel focusing on the role of innovation, entrepreneurship and technology transfer centres, as the intermediaries between the R&D and the industry. The paper argues that close cooperation and mutual interactions between the world of science and business accelerate innovation commercialisation processes and stimulate innovative and competitive growth of the economy.

Introduction

Effective technology transfer depends on a number of interrelated factors, such as policies, legal mechanisms, society disposition, as well as the performance of main technology transfer actors, i.e. universities, R&D institutions, industrial companies, and intermediary organisations [1]. Hence, in

order to stimulate national innovative performance, it is crucial to design or adapt effective innovation systems that would enable and promote interactions between authorities, universities, research institutes and enterprises responsible for the design, creation, distribution and practical application of novel process and product solutions, and as a result facilitate successful knowledge transformation and innovation commercialisation processes.

Intermediaries bridging science with business are set up to stimulate know-how and experiences exchange, promote scientific entrepreneurship and support the creation of research-based spin-offs. They fall into same structural and organisational categories, i.e. Technology Parks, Incubators or Technology Transfer Offices, however their internal practices and policies vary and the level of governmental support and engagement differs in order to best fit into the socio-economic context of a given country [2].

The authors of the article present the major modes of the operation of Polish and Israeli intermediary organisations. The selection of the above stated countries was intentional. The main aim was to juxtapose two different approaches to R&D, innovation and innovation-based development of the developed (Israel) and transferring (Poland) economy. The case of Israel was chosen due to the country's outstanding economic performance, considerable achievements in the realm of high technology industry, successful innovation system and original models of technology transfer. Poland has been selected for analysis as, due to recent policy efforts, it has become one of the most successful transferring economies in the Central and Eastern European region and since its accession to the European Union in 2004, its overall performance has greatly improved and the interest in the development of an innovation policy for the support of sustainable economic development has grown.

1. Israel

Israel's innovation system is a key driver of economic growth and competitiveness. While the success of the Israeli system is primarily attributed to vibrant high-tech sectors, innovation and a strong entrepreneurial culture, the government has played an instrumental role in triggering innovation financing mechanisms, especially in start-ups and SMEs, and in providing a well-functioning framework for innovation dissemination, including venture capital (VC), technological incubators, strong science – industry links, and quality university education [3]. Moreover, Israel's expenditure on civilian R&D is the highest among the OECD countries, as it reached 4.3% of GDP in 2009, with almost 80% of this amount financed by the business sector [18].

Apart from the government and public research institutes, civilian and military enterprises and a number of medical centres, R&D in Israel is carried out primarily at the universities that continue to play an important and

innovative role in Israel's technological advancement [4]. The seven public universities¹ are concentrated both on education and research and have set up their own Technology Transfer Companies (TTCs) which are primary vehicles for the commercialisation of their research results.

Tradition of technology transfer between academia and industry in Israel may be traced back to the 1959 when the first TTC, Yeda R&D at Weizmann Institute was established. It is now one of the most successful and profitable technology transfer organizations worldwide. It was followed by Yissum at the Hebrew University which is ranked second among the country's TTCs in terms of efficiency. The success of the two leading technology transfer enterprises may be attributed not only to their lengthy experience, but also to a strong research and invention base at their universities.

Israeli TTCs are fully university-owned, though independent for-profit companies that do not fall into the basic university structures, which ensures a relatively high level of their autonomy. They vary in age, tradition, size, efficiency, and business model, but they share a similar goal, i.e. finding commercial application of the university research results in return for revenues.

As the intellectual property (IP) in Israel belongs to the university within which it was developed, and not to the researcher themselves, TTCs are sole technology transferors and no independent attempts to commercially deploy university know-how are possible. TTCs provide researchers with a full range of services, and their activities concentrate on the following:

- identification of promising inventions;
- assessment of innovations' maturity level, commercialisation readiness and marketability;
- management of the patenting process;
- selection of the most appropriate commercialisation path;
- acquisition of external funding and end market players;
- industrial deployment.

Commercialisation strategies employed by the Israeli TTCs represent all available tracks: licensing, establishing spin-off companies, joint ventures and collaborative research. In fact, TTCs attempt to commercialise the invention at the most embryonic stage, in order for the development to take place out of the university [1]. They are in general more in favour of the licensing to established enterprises in exchange for royalty payments than the equity in newly established start-up companies, as the latter bear a virtual risk of university share dilution. However, since each invention is an individual case, also in terms of its market potential, most of the Israeli TTCs are relatively flexible in

¹ These are: Bar-Ilan University, Ben-Gurion University of the Negev, Hebrew University of Jerusalem, Technion Israel Institute of Technology, Tel Aviv University, University of Haifa, Weizmann Institute of Science

their technology transfer strategies and it is not rare a situation to implement hybrid commercialisation paths. At all stages of technology transfer, the role of the researcher is emphasised by the TTCs. Nevertheless, in the case of the start-up companies spun off from the university, the researcher's engagement in a new venture is usually restricted by the university policy to time-limited consulting services or another non-managerial position. In this view, it is worth pointing to the characteristic of Israeli university spin-off model which involves licensing to a new start-up company established and managed by external entrepreneurs (Canetti, Kenan, Naiberg, Oren, Soffer, interview).

Besides TTCs, another main structure for the support of knowledge transformation and technology transfer functioning within the Israeli innovation system are Technological Incubators. Israeli incubators are the outcome of the government Technological Incubators Programme established in 1991, aiming at the utilisation of potentially marketable innovations developed by the immigrant or veteran Israeli scientists and their industrial application both in and outside the country, which would bring profits to the entire economy. The programme was established at the time of a large immigration from the former Soviet Union to Israel, which comprised a significant number of highly-educated people and specialists. Thus, it became a mechanism to channel qualifications and skills of the new incoming citizens.

Israeli incubators are to some degree a unique adaptation of the American model in which the government, local authorities, universities, high-tech business enterprises and private investors are full partners in the incubation process, provide financial help in the business start up and thus share the risks involved in the innovation creation and commercialisation processes.

The main goal of the programme is to boost the creation of high-tech start-up companies by providing them with financial resources at the seed stage of development when securing funding is both critical for the company to set out, and, at the same time, most difficult to secure due to the embryonic phase, as well as high risk of the innovative venture.

Technological incubators emerged as support non-profit corporations whose shareholders initially involved private entities, such as municipalities. At the stage of the programme inception, the main role of the incubators was to foster the development of the regions they operated in. In 2002 the incubators underwent a structural change. Upon identification of certain deficiencies in their then-shareholders' business and technical skills, the incubators were privatised in order to raise the effectiveness and success rate of the incubator graduates (Smoler, interview).

Currently there are 26 technological incubators in Israel, involving 23 'regular', 2 industrial and 1 biotechnological, each supporting on average 8 projects at a time.

The incubators are located both near city agglomerations or in peripheral areas. They operate in all the R&D fields, particularly in: medical devices, ICT, biotechnology and pharmaceuticals, clean-technologies and electronics. They provide newly-established start-up companies, including those spun out from universities, with infrastructure, funds, tools, professional guidance and administrative assistance – so that, during their stay in the incubator, their abstract technological concepts and potential ideas for new high-tech venture companies may be turned into novel products advantageous to the competitive development of the Israel's economy.

The incubators programme is a significant mechanism of start-ups creation, which is particularly visible in biotechnology sector, searching constantly for new technologies in which to invest in and establishing over 70 new start-ups each year [7]. The main criteria for the project to be accepted into technological incubators programme are:

- innovativeness and uniqueness;
- early-stage;
- high-risk;
- originating from the high-tech sectors;
- marketability.

An enterprise can generally remain within an incubator for two years, within which it is expected to complete development of its product and find independent sources of its financing.

Intermediary organisations have played a key role in the development of the advanced, knowledge-based and high-tech oriented Israel's economy. They are strategically located near Israeli R&D centres, bridge them with the industry and the military sector, and thus provide constant know-how flow possibilities, which are of crucial importance to innovation development processes and result in steady growth of the Israeli economy.

2. Poland

R&D investment in Poland remains at a very low level and reflects weaknesses of the national innovation policy in which public research and the industry are not sufficiently linked together [8]. Most of the R&D funding in Poland comes from the State budget and the business contribution constitutes only a fraction of the public funds, which is the reason why Poland ranks low on the European Innovation Scoreboard [9]. However, it needs to be noted that despite being categorised as a “moderate innovator” with an innovation performance below the EU-27 average, the rate of improvement is higher than the average [9], as there is a growing recognition that research and innovation are important for the sustainable economic development and the overall welfare of the entire country. One of the main weaknesses of the Polish innovation

system concerns the flow of know-how between the R&D and the industry sectors. Even though science-business links in Poland take all the forms of successful and effective cooperation (i.e. exchange of tacit and explicit knowledge and experiences; development of new technological solutions, processes or services; verification, audit, assessment or improvement of existing technologies, processes and services the enterprise offers; or joint realisation of R&D projects), due to many human (i.e. personality, motivation, knowledge, drive) and non-human (i.e. legal regulations, structure of organisation, internal policies, infrastructure, bureaucracy) factors it still is not satisfactory, and that is why the role of intermediary organisations for the support of knowledge transformation and technology transfer is of great importance to the Polish innovation system. Intermediary organisations in Poland bridge universities and non-academic research institutions with the industry and facilitate research results commercialisation by means of supporting entrepreneurial behaviour and self-employment; helping academicians and students start up new businesses; coordinating technology transfer from universities to business enterprises; and stimulating networking and cooperation between science and industry [10]. The intermediary organisations in Poland are known as innovation and entrepreneurship centres, that can be further divided into centres for innovation; centres for entrepreneurship; and parabanking structures (Table 2) [11].

Table 2. Innovation and entrepreneurship centres in Poland

INNOVATION AND ENTREPRENEURSHIP CENTRES IN POLAND			
Centres for innovation	Centres for entrepreneurship	Parabanking structures	
Technology Transfer Centres Academic Pre-Incubators Entrepreneurship Incubators Technology Incubators Technology Parks: – Science-Technology Parks – Industry-Technology Parks		Local and Regional Loan Funds Local Guarantee Funds	Seed capital Funds Business Angels Networks
Technology Platforms Clusters	Business Support Centres		

Source: Author based on K. B. Matusiak, Ośrodki innowacji i przedsiębiorczości w Polsce, 2010 Report, PARP, Warsaw 2010.

Out of all the technology transfer structures that function in Poland, the most popular ones are Technology Transfer Centres and Technology Parks,

within which Entrepreneurship Incubators and Technology Incubators are frequently located.

Technology Transfer Centres in Poland are independent non-governmental units set up by foundations, agencies, or academic organisations for the support of innovation and entrepreneurial behaviour, and the main scope of their activity is to help the researchers and innovators commercialise their research results, usually through facilitating direct technology and knowledge transfer that enhances regional development and in consequence results in a higher level of competitiveness of the entire national economy [12, 13].

According to the Polish Law on Higher Education² Technology Transfer Centres in Poland are established to commercialise or deploy (free of charge) the R&D results into economy. They usually function as units within the structure of the university or independent organisations in form of foundations of enterprises. The basic functions of Technology Transfer Centres is to bridge the R&D sector with the industry. This is obtained by means of providing both the researchers and the entrepreneurs with assistance and advisory services in the area of project proposal writing, IP protection and spin-off creation procedures. Moreover, Technology Transfer Centres help commercialise research results and promote locally and regionally developed cutting-edge technological solutions. All the Technology Transfer Centres in Poland vary with reference to their organisation and legal status (whether a university owned unit or an independent company), infrastructure, staff and financial potential and technological orientation. The greatest number of Technology Transfer Centres can be found in big city agglomerations, particularly in the cities of Warsaw, Poznan, Cracow, Lodz and Lublin [11]. By the end of 2007 there were ca. 70 Technology Transfer Centres in Poland, but the number is steadily growing and the second half of 2010 saw 90 of such entities functioning in the Polish arena [11].

First entrepreneurship incubators started to appear in Poland at the beginning of 1990's, and although they were created at universities, they were not aimed directly at the academic society, but at the development of post-industrial facilities and entrepreneurship, as well as the growing unemployment counteraction in regions under structural and financial crisis *per se*. The first decades of their functioning, saw a significant rise in the number of entrepreneurship incubators being established across the country. This was the result of the realisation of "TOR #10 Small Business Development Project", Local Initiatives Programme and Know-How and USAID funds programmes [11, 14]. The changing trends in the Polish economy and the transfer to more technically advanced production, caused that some of the incubators started to offer their support to innovative companies, using the results of research in such

² Section 1365, art. 86, Journal of Laws 2005, nr 164.

branches as teleinformatics, microelectronics or biomedical engineering. The result of a quick development of entrepreneurship in various economic branches was the extension of infrastructure supporting this process [15]. The main areas of the activity of Polish Entrepreneurship Incubators includes:

- creation of new jobs;
- support for the underprivileged groups (the unemployed, the disabled);
- support in new business start up;
- providing access to technical and research infrastructure;
- financial and legal advice.

An enterprise can remain with the incubator for the total of 42 months, however most of the incubators generally sign agreements for the period of 3 years. The ones most likely to be accepted into the incubation programme are those, whose innovation ideas have high commercial potential and will be advantageous to the competitive growth of the region or the entire Polish economy. Polish Entrepreneurship Incubators are mainly concentrated outside big city agglomerations. Most of them are located in the Silesian region.

Even though the number of Entrepreneurship Incubators significantly grew in the 1990–2000 period, it has dropped after 2004 and since then remained at the same level of ca. 40–45 incubators (by the first half of 2010 the total of Entrepreneurship Incubators in Poland amounted to 45). This downward tendency results from the fact that the public interest, government financial support and the European Structural Funds are now located in other forms of incubators known as Technology Incubators, as they provide good conditions for innovation development and commercialisation. For that reason, existing Entrepreneurship Incubators started to be more innovation oriented and began to offer support and advice in the area of technology transfer as well. Newly created incubators, were no longer referred to as Entrepreneurship Incubators but Technology Incubators.

As of 2010 there are more than twenty incubators in Poland that are focused primarily on facilitating knowledge transformation and technology transfer processes, but do offer entrepreneurial advice as well. These Technology Incubators bridge the R&D sector with the industry, stimulate know-how and experiences exchange and support the creation of research-based spin-offs. The main scope of their activity includes the following areas:

- facilitating R&D and industry cooperation;
- transfer and commercialisation of innovative solutions;
- supporting the development of new technological ventures;
- providing access to technical and research infrastructure;
- supporting local and regional development;
- creation of new jobs.

Enterprises can remain with the Technology Incubator between 3–5 years. Enterprises most likely to be accepted into the incubation programme offered at

Technology Incubators in Poland must be in the possession of marketable innovative solutions originating from the Polish R&D organisation, have strong growth potential, and good and realistic business plan. Technology Incubators, contrary to Entrepreneurship Incubators, are located mainly in big city areas, particularly within Industrial and Technology Parks.

Industrial and Technology Parks in Poland are clusters of separate buildings together with a technical infrastructure, created with the aim of attracting an influx of knowledge and technology for scientific bodies and businesses [16]. Innovative entrepreneurs within Industrial or Technology Parks are offered services in the form of:

- consultancy in the establishment and development of an innovation-based venture;
- knowledge transformation into innovative product and process solutions or services;
- technology transfer;
- creating favourable conditions for businesses.

There are over twenty Technology Parks in Poland. However, the number is likely to grow, as there are currently over twenty more Technology Parks initiatives [11]. The parks are independent enterprises, usually in the form of the limited liability company or a public company. Some of them also function as foundations or academic or regional units. Majority of Industrial and Technology Parks in Poland are located in city agglomerations, primarily in the Lower Silesian and Minor Poland voivodeships. The parks provide infrastructure and services to entrepreneurs in all R&D fields, particularly in ICT, biotechnologies, environmental technologies, chemical technologies, medicine, electronics materials engineering and nanotechnologies.

The very occurrence of such a phenomenon as Technology Parks is of great advantage to the local and regional development of Poland. However, especially when compared to the best international practices, the outcomes of their functioning are not that great. This is the result of very many factors. First of all, majority of Technology Parks in Poland are not mature, established organisations, but are still in the phase of planning, designing and development [17], and thus are unable to create strong ties with the world of business, being simply unattractive and too risky for the big players to locate their companies in them. Secondly, they are mainly concentrated on the cooperation with the Polish academia and do not create close interactions with non-academic research institutions, and that is why the number of spin-off companies and their patent activity remains at a low level. The bonds with the local authorities are also neglected. The Parks do of course collaborate with the policy makers, but that is not the result of the joint realisation of R&D projects advantageous to the entire region, but rather revolves around the issues of financial or infrastructural connections. Twining, that is cooperation with other Technology Parks, is not

practiced by the Polish Technology Parks either. What is the greatest disadvantage from the point of practical innovation dissemination, especially by means of spin-off venture creation, is the fact that no excellence centres, venture capital (VC), guarantee funds and other financing bodies are located within Polish Technology Parks.

Conclusions

Intermediary organisations are one of the most important actors in national innovation systems. They are set up with a view of facilitating the flow of know-how and exchange of experiences between the R&D sector and the industry, and stimulating entrepreneurial behaviour among researchers and the competitive growth of the economy, by means of providing the scientists, future entrepreneurs and the representatives of the SME sector with training, consultancy, information, infrastructure and financial services. Despite their application, such globally recognised technology transfer structures as Technology Transfer Centres, Entrepreneurship and Technology Incubators or Technology Parks within which they are located still do not properly function within the Polish economy. This is the result of numerous legislative, organisational, structural, financial and psychological factors that rather hamper the functioning of such intermediary organisations instead of promoting knowledge transformation and technology transfer processes. Thus, both Israeli TTCs and Technological Incubators, which function as unique industry liaison and innovation commercialisation units, and by having strong ties with the Israeli science and business sectors constitute a good example of technology transfer intermediaries, to some extent may serve as a model for the Polish transferring economy. However, it is necessary to stress that intermediary organizations do not operate in vacuum, but are strongly embedded in country-specific conditions, which in the case of Israel comprise a consistent innovation-oriented government policies and tools, implemented in response to the certain market failures, geopolitical circumstances, as well as exploiting the potential embodied in the Israeli society. Thus, Israeli technology transfer mechanism do not appear to be easily emulated on the Polish ground. However, they may be a good point of reference to create tailor-made solutions and improve technology transfer processes in Poland.

Interviews

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2. Oren Shlomo, Carmel Haifa University Economic Corporation, University of Haifa – CEO, interview held on June 20, 11.
3. Soffer Benjamin, T3-Technion Technology Transfer, Technion Israel Institute of Technology – CEO, interview held on July 5, 11
4. Naiberg Amir, Yeda R&D, Weizmann Institute of Science – CEO, interview held on June 6, 11.
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Organizacje pośredniczące w transferze technologii stosowane w izraelskim i polskim systemie innowacji

Słowa kluczowe:

Krajowy system innowacji, innowacja, transfer technologii, organizacje pośredniczące, Polska, Izrael.

Streszczenie

W artykule zaprezentowano i dokonano porównania izraelskiego i polskiego systemu innowacji, ze szczególnym uwzględnieniem roli, jaką w tych systemach odgrywają organizacje pośredniczące w transformacji wiedzy i transferze technologii z instytucji sektora B+R do przemysłu. W artykule podkreślono kluczowe znaczenie tych struktur wsparcia komercjalizacji wyników prac badawczych jako stymulantów powiązań pomiędzy światem nauki a biznesu i akceleratorów zrównoważonego rozwoju gospodarki.

