INNOVATIVE ECONOMY
NATIONAL COHESION STRATEGY
INSTITUTE FOR SUSTAINABLE TECHNOLOGIES
NATIONAL RESEARCH INSTITUTE IN RADOM
EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND

Project co-financed by the European Union from the European Regional Development Fund

Urszula WNUK, Stefano TOMMEI
Institute for Sustainable Technologies – National Research Institute, Radom

PUBLIC RESEARCH-BASED SPIN-OFFS IN ITALY AND POLAND: SIMILARITIES AND DIFFERENCES IN POLICIES, PROCEDURES AND PERFORMANCE

Key words

Technology transfer, commercialisation of research results, spin-off, university, research institute, Italy, Poland.

Abstract

Since, along with licensing, research-based spin-offs have become the most promoted and desired mechanism of knowledge and technology commercialisation, the aim of this article is to contribute to the literature on public research spin-off activity in selected EU Member States. Based on literature review and empirical studies, the authors compare the major modes of creation and operation of research-based companies established by the Italian and Polish universities and non-academic public research organisations. The analyses the authors conducted for each country concerned the following three detailed research areas: (1) the national regulations governing the establishment of spin-offs at universities and research institutes introduced, (2) the institutional spin-off policies and procedures as implemented by the Italian and Polish research organisations, and last but not least (3) the statistical analysis on public research-based spin-offs in the two socio-economic contexts. The studies

employed a desk research method. Interviews with the representatives of units responsible for the commercialisation of research results at research organisations selected for analyses were also conducted.

Introduction

Research-based spin-offs are defined as new companies set up by a host institute (university, technical school, public/private R&D department) to transfer and commercialise inventions resulting from their R&D efforts (Clarysse et al. 2000) [1].

As discussed in Wnuk and Mazurkiewicz [2] there are different terms present in literature that are used with reference to scientific, particularly academic entrepreneurship, and the most commonly used ones are *academic spin-offs or spin-outs*. These terms refer to companies based on intellectual property (IP) owned by the parent research organisation. However, the literature [3, 4, 5] further differentiates between these two. Academic and non-academic research-based *spin-off companies* are independent of the parent institution and their creation is financed from external (e.g. venture capital) funds (Chiesa and Piccaluga [6]), whereas *spin-out companies* remain closely tied to the parent institution by means of financial or operational (i.e. shared professional and administrative) dependencies. The authors of this article have decided to use the *spin-off* term with reference to enterprises based on university (institute) know-how (IP) established by the scientific staff or the alumni of universities and PROs.

Research-based companies have received a lot of attention from policy makers, researchers, innovation managers, economists, and even sociologists. Such growing interest in this way of commercialising the results of publicly funded research stems from the fact, that research-based spin-offs are considered to be one of the key factors in the development of science and technology policy in all industrialised countries (Mustar 2001) [7]. They are of economic significance for innovation activity (Helm and Mauroner 2007) [8], stimulate economic development and boost market competitiveness by introducing state-of-the-art technologies (Shane 2005 [9], Varaldo and Minin [10]), and also trigger regional growth and modernisation through the establishment of a growing technology base (Parker 2001 [11], Bramwell et. al. 2008 [12], De Turi and Garzoni 2014 [13]). Apart from facilitating regional and national innovativeness, competitiveness and economic development, research-based spin-offs are also important for organisations from which they emerge. Shane (2005) [9] claims that they encourage entrepreneurial behaviour amongst researchers and involve the inventors in the process of technology commercialisation, an opinion which is also expressed by Clarysse and Moray 2004 [14], Visintin and Pittino 2014 [15], Tamowicz [16], Stawasz [17]). Nevertheless, some authors underline that such positive results depend strongly

on the background and skills and competences (both academic and entrepreneurial) of the spin-off founders (Grandi and Grimaldi [18], Fini et al. [19]). Research-based spin-off companies also generate more income for the parent institution than licensing to established companies, and are an effective tool for the commercial implementation of emerging or breakthrough technologies originating from parent research institutions.

Research-based spin-offs have been a popular means of commercialisation of research results in the USA since 1950s, however nowadays the most advanced national economies also use this means of exploiting and diffusing public research to generate economic wealth (Clarysse et al., 2005) [20]. Contemporary policies of the US and EU governments stress the importance of research institutes and universities in the process of technology creation, transfer and commercialisation. As a result they have introduced various regulations that support commercialisation and foster entrepreneurship. Most of those regulations focus on enabling the research and educational institutes to commercially deploy their research through spin-off companies. Additionally, the universities and research institutes themselves have also introduced internal regulations and guidelines on technology transfer, particularly licensing and spin-off establishment. This means that the policies and procedures for spin-off processes vary across countries and among research institutions, as presented in the OECD's Report 2013 [21]). For that reason, the scope of the article is the analysis of regulations governing the establishment of spin-offs at universities and research institutes introduced at macro and micro levels. The authors review laws and governmental acts concerning protection and commercialisation of intellectual property. This is followed by an overview of the institutional spin-off policies and procedures as implemented by the Italian and Polish research institutes and universities, and statistical data concerning spin-offs in these two countries. The studies were conducted using a desk research method and interviews with technology transfer officers employed at research organisations selected for the analyses.

1. Legal regulations

What is considered to be a breakthrough regulation in the IPR protection and commercialisation of publicly funded research results is the American Bayh-Dole Act (1980) [22]. It established a consistent patent granting policy, gave the small businesses and non-profit organisations, including universities, intellectual property control over their inventions, even if they were discovered with government's support or under federally-funded research programmes, and resulted in the creation of technology transfer offices (TTOs) at most US universities, research institutes, and federal laboratories (Wnuk, 2010 [23]). The introduction of this legislation greatly facilitated patenting activity and the commercialisation of research results through research-based companies, and

ever since the act was signed, the number of start-ups and spin-offs has significantly increased as well. The enormously successful Bayh-Dole Act soon became emulated in other countries. In the European Union, for example, many Member States have built a legal framework for the support of technology and innovation transfer and commercialisation that is somewhat based on the American Bayh-Dole Act. As stated in the OECD's report (2003) [24], the regulations introduced in the EU Member States have been mainly focused on encouraging ownership of innovations by the institution. Countries like Denmark, Finland, Germany, and Norway all introduced new laws and changed to university ownership models similar to the Bayh–Dole Act of 1980 (Damsgaard and Thursby 20013) [25]. However, not all countries have adopted the employer ownership model. The exceptions are, *inter alia*, Sweden and Italy, in which the professor's privilege has not been abolished. Polish regulations concerning IP ownership indicate that the IP generated in publicly funded research should belong to the employer – the research institution.

Italy

Intellectual property in Italy[1] has been regulated for many decades by numerous laws and governmental acts, which did not manage to introduce a coherent definition and understanding of the complex issue of IP ownership and commercialisation. It has only been from the 1990s onwards that, when the world started to rapidly change its scientific innovation rates and its economic balances, such regulations have been taken into consideration for a wide and comprehensive reform. The law that introduced an organic and well-structured regulation about protection and valorisation of industrial property rights, was the "Industrial Property Code" (IPC) of 10th February 2005 no. 30 [26], which significantly simplified more than 40 other laws and governmental acts, and reorganised the existing provisions on Intellectual Property. The Act also lists possible means to protect intellectual property that include trademarks, geographical indicators, designs and utility models, semiconductor topographies, and new plant varieties. Ever since its introduction, the IPC has been modified many times, and each modification has promoted harmonisation towards the EU legal evolution of the subject and simplified control system and bureaucracy. As far as the IP ownership is concerned, all regulations, according to the national

[1] In Italy the term "Intellectual Property", is mainly used with reference to all kind of "creations of the mind" Nevertheless, the latest legal doctrine has raised criticism towards this nomenclature, since it overlaps between contemporary concepts (like literary and artistic works, inventions, trademarks, brands, designs and competition) and concepts connected to a more traditional definition of property (namely material goods, belonging to Roman law). Therefore, as for the latest legal and judicial definition introduced by the "Industrial Property Code" (2005), the "Industrial Property" term is preferred.

law, grant the creator(s) the moral right to the innovation, no matter what their role in the university or research institute is. As far as IP ownership is concerned, the general rule for any employee who reaches a new invention is that the right belongs to the employer [27][2]. Nevertheless, while the rest of Europe was abandoning this position, the IPC has provided a specific regime for university and research institute employees [28][3]. Professors and researchers have the so-called "professor's privilege", which means they have the individual ownership of the invention and they are entitled to have priority on any emerging right regarding the invention. So, moral right and economic rights belong primarily to them. The moral right is also fully recognised to regular university or institute graduate students and interns, but their participation in the rights share is always in practice rapidly concluded with a one-time transaction. With regard to the right to register the patent, the IPC provides a sort of inventor's priority, but individual regulations diverge from this common framework. Differences are based on the room for maneuver given by the national law and the policies introduced by the Italian universities and research institutes concerning research management and commercialisation.

Legislation concerning research-based spin-offs in Italy has been introduced in 1999 with the issuing of the first legal act is the Legislative Decree of 27th July 1999, no. 297 *Tiding legislation up and procedure streamlining to support scientific and technological research, technology dissemination and researchers mobility* [29], which governs scientific and technological research activities, and gives Italian universities the right to establish spin-off companies to encourage youth employment, and foster transfer of university technologies. It was followed by the Ministerial Decree of 8th August 2000, no 593 [30], which implemented provisions of the Legislative Decree 297/99 and came into force in February 2001. This Ministerial Decree established a new system for financing public research, more strongly controlled by the Ministry of Education, University and Research. All funds, are provided by the national body "Fondo Ageviolazioni alla Ricerca" (FAR – Relief Fund for Research), which decides on beneficiaries and limits. The latest legal regulations concerning the matter of research-based spin-offs are the Law of 30th December 2010, no 240 concerning *Rules about University organization, academic personnel and its recruitment, as well as enabling act to the Government to foster quality and efficiency of the University system* [31], and the Ministerial Decree of 10th August 2011, no. 168. concerning *Rules defining criteria of professors and researchers' possibilities to participate to Research Spin-off (or Start up), implementing Article 6, paragraph 9 of Law 30th December 2010, nr. 240* [32]. The first of them just gives an insight into the subject, in which it states that university professors or researchers cannot participate in any form of commercial activity other than a

[2] IPC article 64.
[3] IPC article 65.

research-based spin-off. The latter, on the other hand, gives guidelines on eligible proposing parties, procedures, incompatibility and conflict of interests regarding the establishment of a research-based spin-off company.

Poland

The IP rights in Poland are governed and regulated by two legal acts: the Copyright Act of February 04, 1994 [33] and the Industrial Property Act of June 30, 2000 [34]. The Copyright Act recognises both the economic rights and the moral ownership of the creator and indicates that, unless the employment contract states differently, the copyright to work developed by the employee under the contract of employment, belongs to the employer (i.e. the PRO or the university) not inventors themselves. However, when the work has been commissioned to the researcher and executed outside their permanent employment contract, then the copyright is not automatically owned by the employer, and if they wish to have legal rights to the work developed, the contract should state so. The Industrial Property Act, on the other hand, defines the means to protect intellectual property (patents, registration of utility models, registration of industrial designs and registration of trademarks). It also maintains employer ownership over inventions stemming from work performed under the employment contract. However, the situation is more complicated in the case of research commissioned by external parties and financed from public funds. Here the Act states that the company that orders the university or research institute to conduct research for them has the right to patents, trademarks, industrial designs and utility models to research results, unless the contract between these two parties states differently.

The matter of research-based spin-offs in Poland is not regulated by any separate regulations concerning this form of commercialisation of research results, but it is included in two more generic acts, i.e. the Act on Research Institutes of 30th April 2010 [35], and the Law on Higher Education of 27th July 2005, recently amended by the Act of 11th July 2014 [36], and brought into force on 1st October 2014. The Act on Research Institutes grants these entities the right to diffuse research results, [4] create capital companies, purchase shares and stock in such enterprises, and attain income from them, [5] but only with the supervisory ministry's (the Ministry of Economy) official consent. Without the Ministry's consent PROs cannot engage in this form of business activity. The Law on Higher Education, as amended in 2014, extends the regulations concerning commercialisation of research results, and introduces important changes concerning the organisation and execution of commercialisation of university research. Before its amendment, the Law on Higher Education of 2005 stated that each university should develop its own rules and policies concerning

[4] Section 2.2 of the Act.
[5] Section 3.17 point 5 of the Act.

commercialisation of its technologies. However, new Act stipulates that, for the period of three months from the date of invention disclosure, the university is the owner of the rights to commercialise their employees' research results, but if no steps to commercialise the research results are taken within that time, the IP ownership is transferred to the creator. The Act also regulates the issues concerning the establishment of designated technology transfer units at universities and the matter of royalty distribution.

2. Institutional policies and procedures

Regardless of the governmental regulations concerning commercialisation of research results, which very often introduce general guidelines and serve as recommendations, universities and research institutes may develop own procedures to commercialise their innovations, and actually the majority of EU research organisations do so. In this section, the authors present the results of their analyses concerning institutional policies and procedures for commercialisation of research results.

a) Research sample selection methodology

The studies were conducted for selected Italian and Polish research organisations. The research sample was selected based on the analysis of national rankings of research organisations NETVAL Report (2014) [37] (Italy), and the 2014 University Ranking by Perspektywy [38] (Poland) and it includes the top institutions from the Italian and Polish rankings. In the case of Italy these are top 6 institutions, and Poland five. This discrepancy results from the fact that the Italian ranking takes into consideration both research institutes and universities, while the Polish one concerns only universities. Since research institutes in Poland are not centres of education, they are not incorporated in the national study conducted by the Perspektywy journal. As there is no separate ranking of Polish research institutes, these institutions are not further analysed by the authors. Regarding Italy, the NETVAL Report is a useful tool to understand the overall situation of commercialisation of public research results in the Peninsula. The Report mainly analyses patent regimes and spin-off activity run by all national public research organisations. Nevertheless, the report, even when pinpointing the presence of the Top 5 Institutions, never says clearly the names and never refers to a specific group. In order to select the Top 5 group, the authors decided to mix together the results concerning the list of Top Patentees and Top Spin-off Establishers, to create a list of 5 eminent public research traders. When analysing the 2014 Ranking of the Polish Universities, the authors took into consideration only one of the assessment criteria adopted in this study, i.e. "Innovativeness", as it is the only criterion directly connected to the issue of commercialisation of research results. The criterion includes the following data: the number of patents and protected IPR, the consumption of EU

funds, the number of licenses and spin-off companies, policies and structures facilitating protection and commercialisation of university research.

The list of research institutions included in the case study analysis is presented in Table 1. A desk research method was employed in the study. The analysis of case studies encompassed the review of documents (e.g. annual reports, technology transfer regulations, guidebooks and procedures, etc.) and the analysis of web pages, and statistical data concerning commercialisation of research results in these organisations (e.g. commercialisation mechanisms used (i.e. sale, licensing, spin-off)). The latter data are presented in the next section of the article. Additionally, interviews with the representatives of units responsible for the commercialisation of research results were also conducted for organisations in which no data were publicly available.

Table 1. Research institutions analysed by the authors

	University	**Research Institute**
Italy	– Politecnico di Torino (POLITO), – Università degli Studi di Padova (UNIPD), – Università degli Studi di Bologna (UNIBO), – Scuola Superiore Sant'Anna di Pisa (SSPI) – Università degli Studi di Genova (UNIGE)	– Consiglio Nazionale delle Ricerche (C.N.R.)
Poland	– Akademia Górniczo-Hutnicza (AGH) – Politechnika Poznańska (PP) – Politechnika Wrocławska (PWr) – Uniwersytet Przyrodniczy we Wrocławiu (UPW) – Politechnika Łódzka (PŁ)	---

b) Regulations implemented by institutions covered by the analysis

Italy

In general, revenues from licence are divided between inventors and the U/Is they work for. The inventors gain, from a minimum of 50% to a maximum of 70% shares, which is also regulated by the national law. The 50% royalty division is the regular standard for C.N.R., UNIBO and UNIGE. POLITO provides 50%, but if the holders are the inventors, the quota goes up to 70%. UNIPD grants 60%. SSPI has a peculiar system: the inventors can gain 70%, 60% or 50% of revenues accordingly respectively to classes of < 25.000€, between 25.000 and 50.000€ and > 50.000€. In each case, the remaining quota is given to the U/Is, that usually can designate the main part for the central administration and a lower quota for the Department of origin of the patent/inventor(s). Moving on from this, not all U/Is make express reference to the possibility and potential of giving licence to

Spin-offs. The U/Is that state such a policy (C.N.R., UNIPD and SSPI[6]) just provides preferential licensing practices. All U/Is of the group have separate and quite detailed regulations for Spin-off establishment, usually recently updated in 2014. Regulations are composed of a minimum of 10 detailed articles (C.N.R., UNIPD and UNIBO) up to 12 (SSPI), 14 (POLITO) and a maximum of 19 articles (UNIGE). These regulations provide all the information concerning the establishment procedures, shareholding agreements, conventions on U/Is logo/know-how/facilities use, conventions about U/Is' personnel employment and IPR sharing between U/Is and spin-offs. As far as the spin-off establishment is concerned, all regulations pinpoint as possible and privileged promoters the natural persons like the teaching staff, technical and administrative staff, PhDs, Research Fellows and Scholarship Holders. Only POLITO and UNIGE consider the legal person of the U/I as a possible proposer. Only SSPI consider eligible to be proposer also graduate students and interns. As far as potential partners are concerned, besides the proposers who are natural partners with stronger duties towards the spin-off, there are almost no restrictions. All regulations give the possibility to U/Is to be a partner to the spin-off, and the participation is open to any external, but interested natural or legal person. The U/Is which exclude non-direct personnel (from PhDs to graduate students) from being a proposer, recognise the right to be a partner.

With regard to the establishment procedures provided by the regulations, it is possible to determine a sort of "standard procedure" since the sequence of phases and involved Bodies are very much like ones to the others. The proposal of the spin-off establishment must be submitted to the U/Is with a description of the activity (related to the exploitation of a U/I patent, if necessary), a duly fulfilled business plan and drafts of a shareholding agreement and a request, if needed, for U/I participation in the corporation stock. The proposal is analysed, at first, by a "Spin-off Commission". This commission has different names according to what is provided by each regulation. The composition generally is made of 5-7 high level professional, usually elected by the dean, if also the dean is not a member of the Commission (SSPI). Only C.N.R. requires the presence of two external professionals. Member re-election is never prohibited and there are no strict deadlines to the commission duration in charge, which can last from 3 up to 5 years. Its function is standardised. It has to make a professional and detailed analysis of the proposal, evaluating spin-off's practical and economic feasibility and, if requested, the feasibility of the U/I participation in the corporation stock.[7] If the commission's opinion is positive, the proposal is transmitted to the Administrative Council (AC). The AC is the final body involved which has to

[6] C.N.R. Patent Regulation article 26; UNIPD Patent Regulation article 5.3; SSPI Patent Regulation articles 5 and 6.2.

[7] Moreover, the Commission usually works as a monitoring Body, which receives annually information from the active Spin-offs about their business, and a Reviewer for Spin-offs' profitability.

deliberate on the matter and has the power to deny approval. When the AC gives its consent, the spin-off is officially authorised to be established. Moreover, with its deliberation the AC also issues the definitive text of the Shareholding Agreement and of all the conventions about U/I logo, know-how and facilities use and U/I personnel employment, as well as the nomination of the U/I representative in the Spin-Off AC and Spin-off Board of Statutory Auditors (one for each body). The procedure is not complex and not too long in average. The litmus test can be given with, on one side, the C.N.R.'s procedure as the quickest and, on the other side, the UNIPD's procedure, which asks for four different opinions before the AC deliberation. Referring to the Spin-off activity, and more precisely to the Spin-off interaction with the U/I of origin, the analysis passes on the agreements and conventions draft in the establishment procedure. Shareholding agreement includes all the aspects concerning the participation, in terms of corporation stock, of the U/I and of the Spin-off proposers and, in addition, it provides guidelines on how to deal with changes in the quota sharing, especially for the U/Is. As far as U/Is participation is concerned, if the AC decides for a direct participation, the Agreement provides the limits in terms of sharing percentage and years to detain it. These respectively are: C.N.R (up to max 25%, minimum 3 years), POLITO (from 4% to 40%, maximum 5 years, or less according to law), UNIPD (always participated, max 5%, minimum 2 years), UNIBO (up to max 10%, maximum participation 3 years, renewable only one time), SSPI (it says just to act accordingly to the law) and UNIGE (max 15%, max 3 years). For all U/Is it is provided that they must benefit from the possibility of receding and from a "put option" on their quota. Proposers, instead, are not always asked to hold a precise quota, but they are asked to participate and do not recede before a period that can be between 2 and 3 years. The exception here is the UNIPD, which also grants itself a right to compensation, in case the spin-off's commercial activity would not work. The agreements on the employment of U/I personnel in all/some spin-off activities are also very relevant. In order to have a transparent and efficient cooperation, all Regulations considered introduce specific norms on how to avoid, and in case sanction, situations of confidentiality infringements, incompatibility or conflict of interest. Especially, all U/I provides that the dean, their delegate, members of the AC, members of the Academic Senate or the Scientific Council and (except with dean's authorisation) department directors cannot participate in operating bodies of the spin-offs. In average, it can be said that all U/I provides that their personnel can work for the spin-off, without prejudice to their main employment duties at the U/I, and it is always requested to ask for a formal permission. Teaching staff benefits from a lighter regime, since often it can ask to the dean or the AC just once for permission (e.g. UNIPD). Some U/Is provide that for technical and administrative personnel the cooperation must be authorised each time (e.g. UNIBO and UNIGE). When considered, non-direct personnel can cooperate under specific authorisation and on desultory basis (e. g. SSPI, POLITO and UNIPD). The final aspect, in terms of Spin-off characteristics stated in the

Regulations, is the IPR management. In general, all U/I recognise that innovations created during the Spin-off activity belong to the spin-off itself. Nevertheless, all U/I requires the spin-off to give a free use licence (usually not sub-licensable) for all the time of the U/I participation in the corporation capital. On the other hand, only C.N.R, UNIPD and SSPI mentioned the idea of letting the establishing/just established spin-off to obtain U/I's licences more easily in comparison to other partners or industrial entities.

Poland

Contrary to their Italian counterparts, only one Polish university analysed (PP) has a separate regulation concerning commercialisation of research results through spin-off ventures[8], while the other four universities have only implemented general regulations concerning the protection, utilisation and commercialisation of university IP (both industrial property and copyright). However, taking into consideration the recent amendments to the Law on Higher Education, all the universities are now amending their internal regulations as well. This means, that the new acts are not made available to the public yet, or even (like in the case of PWr) they are not intended to be publicised at all, and they will only be available to the employees of the university. The contemporary biding regulations were prepared before the amended Law on Higher Education came into force. They were created based on the provisions of the following five national laws: (1) the Industrial Property Act (2000), (2) the Copyright Act (1994), (3) the Law on Higher Education (before amendment) (2005), (4) the Act on Combating Unfair Competition (1993), (5) and the Act on National Finances (2009). The regulations are composed of a minimum of 7 detailed articles (PŁ), up to 9 (AGH and PP) and 13 (PWr), and the maximum of 17 (UPW). They serve as guides to the ownership, distribution and commercial development of university IP, and provide information on the rights and responsibilities of universities as employers and their employees concerning dissemination and commercialisation of research results. They also provide a step-by-step description of the university IP protection procedure, list possible routes to commercialise university IP, and define royalty distribution. Additionally, the regulation implemented at the PŁ has four annexes, i.e. a template of a contract on royalty distribution, an innovation disclosure form, a template of a contract on the property rights transfer, and a template of a publishing agreement with the transfer of copyrights. According to the regulations analysed, the university is the body that bears the costs of IP protection (patenting). The shares from commercialisation of research results are divided between the researcher (creator), and the university. All but one regulation (except for AGH) further divide shares of the university between the department the researcher represents and/or the innovation commercialisation

[8] However this act is not available to non-employees.

unit (usually a technology transfer unit). The distribution of royalties in the universities analysed is as follows (1) AGH – 60% creator, 40% university, (2) UPW – 60% creator, 10% department, 30% university, (3) PWR and PP – 60% creator, department and university 20%, (4) PŁ – 60% creator, 30% department, 10% – technology transfer unit. The distribution of royalties can be negotiated and the shares of the university in a spin-off company can be individually determined in the company agreement. The regulation of the PŁ additionally states that the researcher, who in return for their remuneration from the utilisation of a technology receives shares in the spin-off company, is not entitled to any benefits the university obtains from this means of commercialisation, and the profits are shared only between the university and the technology transfer unit in the 25%–75% ratio.

The analysis of procedures applied by the selected Polish universities to transfer the results of their research revealed some similarities. Like in the case of the Italian research organisations, the authors observed a kind of a standard commercialisation procedure. The transfer of university research in Poland is always performed by technology transfer units. These are mainly technology transfer offices (in form of limited liability companies (sp. z o.o.)), however their activity is also frequently assisted by university non-faculty units and departments designated to protect and disseminate university inventions. In the case of AGH there are two bodies responsible for the commercialisation of this university's research results. One of them is a technology transfer office (CTT AGH – a non-faculty university unit) and InnoAGH sp. z o.o (Ltd). The first of them is responsible for invention protection and commercialisation by means of licenses and sale, while the latter organises and manages the commercialisation process by means of a spin-off company. Similar approach to the issue of university technology transfer has been adopted by UPW, where there are also two separate bodies responsible for the sale, licensing, and the creation of spin-off companies. The first of them is the Innovation, Implementation, and Commercialisation Department (a non-faculty university unit) and the latter – a special purpose vehicle UNINOVA S.A. (joint stock company). In the case of PWr the research results are first disclosed to the Department of Intellectual Property and Patent Information, which is responsible for the protection of inventions, and then to the Wroclaw Technology Transfer Centre, which promotes, disseminates and transfers university IP to industrial practice. The activities of the two above-listed units are coordinated by the Contact Point for Technology Transfer in the Centre for Scientific and Technical Knowledge and Information Centre (a university department within which the Department of Intellectual Property and Patent Information is located as well). The transfer of technologies developed at PŁ is organised in a manner similar to the procedure at PWr. The inventions are first disclosed to the Technology Transfer Department that offers consulting services and valuates the invention, and then to the Technology Transfer Office sp. z o.o. (Ltd.) that commercialises

university results through sale, licensing and spin-off ventures. At PP, the Intellectual Property of the university is disclosed to and commercialised by the Innovation, Development, and Technology Transfer Centre[9].

It needs to be noted, that in all cases analysed, the technology transfer offices are not the only bodies responsible for the commercialisation of university research, and this matter is also managed by academic entrepreneurship incubators whose main role is to assist entrepreneurial researchers in their attempts to commercialise research results through spin-off companies. The presence of different structures designated to execute a commercialisation process is unfortunately frequently equivalent with the overlapping of their responsibilities, and though these are in fact the technology transfer offices that should supervise the entire technology transfer process, their employees often do not have information on the activity of the incubator.

3. Research-based spin-off companies: Empirical Analysis

The authors conducted a crossed empirical analysis in order to evaluate the specific and overall numbers of active spin-offs and the main specific and overall field of activities. What emerges is as follows:

Italy

- **Numbers of active spin-offs:** in order

University/Institute of origin	Number of active spin-offs
POLITO	69
C.N.R.	68
UNIPD	47
UNIGE	44
UNIBO	37
SSPI	35
TOTAL	**300**

At present, POLITO has the highest number of active spin-offs, followed by C.N.R (very close) and UNIPD with a significant gap. POLITO's performance is impressive, if we consider that from NETVAL Report it successes in over passing C.N.R.. The C.N.R.'s performance is stable. Anyway, the selected group represents still a valid reference class, since on its own, according to the total number of spin-offs surveyed by NETVAL Report (1102), it counts alone for circa one fourth of all Italian Public Research spin-offs.

[9] Currently there are attempts to reorganise this unit into a centre focused on the transfer of technologies only.

- **Sectorial fields:**

University/Institute of origin	Main sectors (Number of spin-offs)
POLITO	ICT (17) Energy&Environment (11) Electronics (11) Industrial Automation (11)
C.N.R.	ICT (12) Electronics (12) Nanotechnologies and new materials (11) Life Sciences (10)
UNIPD	ICT (8) Industrial Automation (8) Life Sciences (7) Energy&Environment (6)
UNIGE	Energy&Environment (13) ICT (10) Electronics (5) Industrial Automation (5)
UNIBO	Life Sciences (12) ICT(6) Electronics (5) Innovation Services (5)
SSPI	Biomedical (9) ICT (8) Life Sciences (4) Innovation Sciences (4)
TOTAL (300)	ICT (61) Life Sciences (40) Electronics (39) Energy&Environment (37) Industrial Automation (36) Innovation Services (34) Biomedical (25) Nanotechnologie and new materials (19) Others (9)

The analysis clearly indicates that the dominant sector in which university spin-offs operate is the ICT field.

Poland

- **Numbers of active spin-offs:** in order

University of origin	Number of active spin-offs
AGH	12
PP	9
PWr	2
PŁ	2
UPW	2
TOTAL	**27**

Being at the top of the Polish University Ranking 2014, AGH is at the same time the university with the greatest number of active spin-offs. Surprising is the fact that PŁ, which was the top-ranked university in terms of its innovativeness in 2013 has only two active spin-off companies.

- **Sectorial fields:**

University of origin	Main sectors (Number of spin-offs)
AGH	Innovation services (5) Nanotechnologies and new materials (2) Medicine (1) Aerospace (1) Technical safety (1) Mechatronics (1) ICT (1)
PP	Innovation services (5) Transportation (2) Mechatronics (1) ICT (1)
PWr	ICT (1) Electronics (1)
PŁ	Nanotechnologies and new materials (2)
UPW	Innovation services (1) ICT (1)
TOTAL (27)	Innovation services (11) Nanotechnologies and new materials (4) ICT (4) Transportation (2) Mechatronics (2) Medicine (1) Aerospace (1) Technical safety (1) Electronics (1)

The analysis shows that the spin-offs from the Polish universities analysed most frequently operate in the field of innovation services.

Conclusions

Commercialisation of research results is a valid and topical matter and both Italian and Polish research institutions strive to increase the effectiveness of the transfer of their technologies. The authors have observed a number of similarities concerning the governance and execution of the commercialisation process at the research institutions they analysed, however major differences concerned the regulations on the establishment of spin-off companies, as in Italy such acts have been adapted by all institutions analysed, whereas in Poland they are still a scarce phenomenon. Nevertheless, the Italian experience shows that the risk of establishing redundant procedures, harmful for the spin-offs success and efficiency, is high in the public research field. However, the empirical analysis shows that Italian research organisations are far more successful in the implementation of a spin-off as a mechanism for the commercialisation of research results, while in Poland even the most innovative universities have relatively low results in this field. The sectorial fields in which the research-based spin-offs operate also significantly vary between the countries.

The research was mainly conducted using a desk research method, but interviews with the representatives of units responsible for the commercialisation of research results at research organisations selected for analyses were also conducted in the case when the data were not disseminated or sometimes they were not even made public at all. This was particularly true in the case of the Polish universities that adopt different definitions of spin-off companies and frequently count student start-ups into this category. Additionally, obtaining information on the number of spin-offs was more difficult than in the case of Italian research institutions due to the fact that the commercialisation process at Polish universities is not conducted by one designated organisation, and technology transfer offices and academic entrepreneurship incubators seem not to disseminate the information even among each other. On the other hand, in Italy, all relevant U/Is have active and well-functioning Technology Transfer Offices, but it has to be underlined that the dissemination process still suffers from the lack of fluidity.

Scientific work executed within the Strategic Programme "Innovative Systems of Technical Support for Sustainable Development of Economy" within Innovative Economy Operational Programme.

References

1. Clarysse, B., Heirman, A., Degroof, J.J. (2000): *An Institutional and Resource based Explanation of Growth Patterns of Research Based Spin-offs in Europe*, [Online], Available: http://www.babson.edu/entrep /fer/XXIX/XXIXA/XXIXA.htm.
2. Wnuk U., Mazurkiewicz A. (2012): Research-based spin-off processes and models in different economic contexts, Maintenance Problems 2/2012, pp. 177–191.
3. Głodek P., Guliński J. (2008): Firma odpryskowa spin-off i/lub spin-out [in] Matusiak K.B. (ed.) Innowacje i transfer technologii. Słownik pojęć, PARP, pp. 97–99.
4. Chyba Z. (2008): Klastry przemysłowe a przedsiębiorstwa spin-off, *Economics and Organization of Enterprise (Ekonomika i Organizacja Przedsiębiorstwa)*, ISSN 0860-6846, No 3(698), s. 47.
5. Piccaluga A., Cesaroni F., Moscara P. (2005): Imprese spin-off della ricerca in Italia: modelli di sviluppo e percorsi di crescita, in Piccola impresa/Small business, n°276.
6. Chiesa V., Piccaluga A. (1999): La nascita di imprese ad alta tecnologia, in "Impresa e Stato" n. 43.
7. Mustar P. (2001): Spin-offs from Public Research: Trends and Outlook, STI Review, no. 26, Special Issue on Fostering High-tech Spin-offs: A Public Strategy for Innovation, OECD, pp. 165–172.
8. Helm R., Mauroner O. (2007): Success of research-based spin-offs. State-of-the-art and guidelines for further research.
9. Shane S. (2005): Academic entrepreneurship. University Spinoffs and Wealth Creation, Edward Elgar Publishing Ltd, Cheltenham, UK, Edward Elgar Publishing Inc., Northampton, MA, USA.
10. Varaldo R., Di Minin A. (2009): A new form of entrepreneurial capitalism based on innovation and Research in Italy, Finmeccanica Occasional Paper
11. Parker P. (2001) Local – global partnerships for high-tech development: integrating top-down and bottom-up models, Economic Development Quarterly, 15 (2001), pp. 149–167.
12. Bramwell A., Nelles J., Wolfe D.A. (2008): Knowledge, innovation and institutions: global and local dimensions of the ICT cluster in Waterloo, Canada Regional Studies, 42 (2008), pp. 101–116.
13. Garzoni A., De Turi I. (2014): The role of academic spin-offs in entrepreneurial innovation and regional development. The Apulia case, OFEL Conference 2014, Dubrovnik.
14. Clarysse B., Moray N. (2004): A process study of entrepreneurial team formation: the case of a research-based spin-off, *JOURNAL OF BUSINESS VENTURING*, Vol: 19, pp. 55–79.

15. Visintin F., Pittino D. (2014): Founding team composition and early performance of university-based spin-off companies, Technovation, 34 (1), pp. 31–43.
16. Tamowicz P. (2006): Przedsiębiorczość akademicka. Spółki spin-off w Polsce, PARP.
17. Stawasz E. (2007): Stymulowanie przedsiębiorczości środowiska naukowego w Polsce, Zeszyty Naukowe Uniwersytetu Szczecińskiego nr 453, Ekonomiczne Problemy Usług nr 8, s. 265–276.
18. Grandi A., Grimaldi R. (2005): Academics' organizational characteristics and the generation of successful business ideas, JOURNAL OF BUSINESS VENTURING, 2005, 20, pp. 821–845.
19. Fini R., Grimaldi R., Sobrero M. (2009): Factors fostering academics to start up new ventures: an assessment of Italian founders' incentives, JOURNAL OF TECHNOLOGY TRANSFER, 2009, 34, pp. 380–402.
20. Clarysse B., Wright M., Lockett A., van de Velde E., Vohora A.: Spinning out new ventures: a typology of incubation strategies from European research institutions Journal of Business Venturing, 20 (2) (2005), pp. 183–216.
21. OECD (2013), Commercialising Public Research: new trends and strategies
22. The Bayh-Dole Act at 25, Bayhdole25, Inc., 2006, http://bayhdolecentral.com/BayhDole25_WhitePaper.pdf.
23. Wnuk U. (2010): Legal Regulations and Governmental Initiatives Fostering Research Results Commercialisation, Problemy Eksploatacji 3/2010, pp. 175–185.
24. OECD (2003) Turning Science into Business. Patenting and Licensing at Public Research Organisations.
25. Damsgaard E.F., Thursby M.C. (2013): University Entrepreneurship and professor privilege, Industrial and Corporate Change, Vol. 22, No. 1, pp. 183–218.
26. Decreto legislativo 10 febbraio 2005, n. 30, Codice della proprietà industriale, a norma dell'articolo 15 della legge 12 dicembre 2002, n. 273".
27. Decreto Legislativo 27 luglio 1999, n. 297 "Riordino della disciplina e snellimento delle procedure per il sostegno alla ricerca scientifica e tecnologica, per la diffusione delle tecnologie, per la mobilità dei ricercatori".
28. Decreto Ministeriale 8 agosto 2000, n. 593 "Modalità procedurali per la concessione delle agevolazioni previste dal Decreto Legislativo 27 luglio 1999, n.297"
29. Legge 30 dicembre 2010, n. 240 "Norme in material di organizzazione delle Università, di personale accademico e di reclutamento, nonché delega al Governo per incentivare la qualità e l'efficienza del sistema universitario"
30. Decreto Ministeriale 10 agosto 2011, n. 168 "Regolamento concernente la definizione dei criteri di partecipazione di professori e ricercatori

universitari a società aventi caratteristiche di spin off o start up universitari in attuazione di quanto previsto all'articolo 6, comma 9, della legge 30 dicembre 2010, n. 240.
31. Copyright Act of February 04, 1994 (Ustawa o prawie autorskim i prawach pokrewnych, Dz. U. 1994 Nr 24 poz. 83).
32. Industrial Property Act of June 30, 2000 (Ustawa o prawie własności przemysłowej z dnia 30 czerwca 2000.
33. Act on Research Institutes (Ustawa o instytutach badawczych z dnia 30 kwietnia 2010, Dz.U. z 20100 nr 96 poz. 618).
34. Act of 11th July 2014 on the amendment of the Act on Higher Education and selected other acts (Ustawa o zmianie ustawy – Prawo o szkolnictwie wyższym oraz niektórych innych ustaw, Dz. U. 2014, poz. 1198).
35. XI Rapporto NETVAL (Network per la Valorizzazione della Ricerca Universitaria) sulla valorizzazione della ricerca pubblica in Italia "Unire I puntini per completare il disegno dell'innovazione", 2014.
36. Perspektywy, Ranking Szkół Wyższych 2014.

Firmy spin-off we Włoszech i w Polsce: podobieństwa i różnice w obrębie zasad i procedur tworzenia i działania

Słowa kluczowe

Transfer technologii, komercjalizacja wyników badań, spin-off, uczelnia, instytut badawczy, Włochy, Polska.

Streszczenie

Ze względu na fakt, że firmy spin-off są obecnie, obok licencjonowania, jednym z najbardziej promowanych i popularnych mechanizmów transferu wyników prac badawczych do zastosowań gospodarczych, zaprezentowany artykuł skupiony jest na kwestii tworzenia tego typu firm w wybranych krajach UE. Na podstawie analizy stanu wiedzy i badań empirycznych autorzy porównują zasady powstawania i funkcjonowania spółek typu spin-off tworzonych przez pracowników włoskich i polskich jednostek naukowo-badawczych. Autorzy skupili się na analizie czynników zewnętrznych (regulacji krajowych) jak i wewnętrznych (wewnątrzinstytucyjne przepisy i procedury) determinujących powstawanie tego typu struktur transferu technologii, a także dokonali analizy statystycznej z zakresu działalności firm spin-off we Włoszech i w Polsce. W badaniach wykorzystano metodę 'desk research' oraz wywiady z reprezentantami jednostek ds. transferu technologii przy uczelniach i instytutach objętych próbą badawczą.