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Vsebina / Contents

ARTICLES

Slovenian and German Competition Policy Regimes: A comparative analysis

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Abstract

We use an institutional approach to analyze differences and similarities between competition policy regimes in Slovenia and Germany. We first indicate differences that exist in the implementation of EU competition law at the national level, given the unified framework of EU competition policy. In a next step, we discuss recent cases in both countries and indicate how historical developments and economic factors influence decision making and case law. We also discuss recent developments of the national competition policy regimes and indicate how the digital economy might shape competition policy in the future.

Keywords: Competition policy, competition cases, competition law, transition countries

Introduction

Competition policy aims to ensure free competition in the market. The EU competition policy regimes consist of a joint framework, complemented by national competition policy legislations that are characterized by diverse historical, institutional and economic backgrounds. Due to the expansion of the European Union in 2004 to 10 East European countries, one dividing line can be drawn between "old" competition policy regimes (e.g., Germany, France and Great Britain) and "new" ones from the Eastern member states (e.g., Slovenia, Hungary and Poland). Whereas the old regimes may be characterized by a long-standing experience in competition policy implementation, the new ones may benefit from the absence of status quo biases (Samuelson & Zeckhauser 1998; Cooper & Kovacic 2012) and the implementation of lean and efficient rules and proceedings.

"The competition policy is an expression of the current values and aims of society and is as susceptible as political thinking generally" (Wish, 2009, p. 19). Different countries have establish different competition systems of law with different concerns.

While the German tradition of competition policy played a special role in the implementation of many competition policy regimes (Mikek, Slebinger, & Mlinaric, 2004), the Slovenian competition law has recently been reformed. Before the reform, it was divided into two parts, the suppression of unfair competition and

NG
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NAŠE GOSPODARSTVO
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Vol. 63 No. 2 2017

pp. 3–14

the law of prevention of restriction of competition. Through the latest amendment to the Prevention of Restriction of Competition Act, both areas are regulated by a single law.[1] In Germany, the Act against restraints of competition was most recently amended in 2013, while the ninth amendment is currently being discussed.

The aim of this paper is to provide a comparison of the Slovenian and German competition policy regimes. We assert that both regimes act as role models given the stated context. The German system has a long tradition, starting in 1958, and it influenced the institution building with the Eastern amendment of the European Union. In contrast, Slovenia is a small transition economy characterized by strong economic dynamics, whose competition regime in its current form was set up in 1993. While both countries are EU Member States, in this paper we determine the extent of similarities and differences in national legislation and case law, given the unified EU approach and the different historical backgrounds of the countries under review. To do so, we provide a comparative analysis of the institutional regimes, present selected case studies and statistics and provide an outlook to current issues in national competition policy regimes. We focus the analysis on the restriction of competition by private undertakings, especially the conclusion of cartel agreements and abuse of a dominant position. The cases are very diverse, and thus the analysis of all different forms of restrictive practices would be too extensive for the purposes of this paper.

A Comparative Analysis of Competition Policy Regimes

EU competition policy

Competition policy is one of the oldest common policy fields in the European Union. The EU competition rules are regulated by the Treaty on the Functioning of the European Union (TFEU) and several acts of secondary legislation, as well as other acts adopted by the EU institutions. Case law of the Court of Justice of the European Union also plays an important role. These rules are sector-independent and cover all areas of the economy.[2] While the suspension of unfair competition law has a minor effect on the liberalisation of infrastructure sectors, the law of prevention of restriction of competition, particularly in the communication and energetics sector, plays a significant role (Ferčič, 2015a).

The main provisions are Art. 101 (the provision of cartel prohibition and merger control) and Art. 102 TFEU (the prohibition of abuse of a dominant position).[3] These rules are quite general and are specified in regulations and guidelines. Regulations are directly implemented and common EU law in all member states, whereas guidelines give information on how the European Commission applies these rules.[4]

The most prominent regulation is Merger Regulation 139/2004, which is currently under revision. It sets the principles for ex ante merger control (Art. 4), gives thresholds for the procedure of obligatory notification to the European Union (Art. 1), defines the SIEC-test ("significant impedance of effective competition") as the standard of proof in merger control (Art. 2), and states potential outcomes of the merger control procedures (Art. 8). These provisions are complemented by guidelines that indicate how the commission applies these general rules. The "Horizontal Guidelines" state principles of merger control in horizontal mergers, whereas the "Non-Horizontal Guidelines" state such principles for vertical and conglomerate mergers. Also important are the guidelines on the definition of the relevant market, remedies and case referrals.[5]

With respect to cartel prohibitions, the European Commission has applied a leniency program since 2006. This program grants fine reductions up to full immunity under certain conditions if a cartel member initially reports a cartel to the Commission. The leniency program has the aim to destabilize cartels and provide incentives to report about them. Since 2015, there have also been provisions for settlement procedures with respect to cartel cases, which grant fine reductions in response to a cooperative cartel settlement procedure with the involved firms.

All EU Member States are required to abide by rules of this EU legal order, as the establishment of competition rules is necessary for the functioning of the internal market and an area of exclusive Union competence[6] The Member States are empowered by the European Union or for the

[1] In force since 24 October 2015. Official Gazette RS, No 76/2015. Until 2015, the suppression of unfair competition was regulated by the Protection of Competition Act, and theprevention and restriction of competition was regulated by the Prevention of Restriction of Competition Act.

[2] The special position of certain sectors like agriculture, transport, and atomic energy should be noted (Jones & Sufrin, 2008).

[3] We do not refer to state aid here, which is also a pillar of EU competition law.

[4] For detailed discussions of the theory of competition policy and descriptions of the EU institutional framework, compare, for instance, Belleflamme and Peitz (2015), Bishop and Walker (2010), Motta (2005), Russo, Schinkel, Günster, and Carree (2010), Schmidt and Schmidt (2006), Van den Bergh and Camesasca (2006).

[5] All relevant information provided http://ec.europa.eu/competition/mergers/legislation/legislation.html.

[6] Article 3(1)(b) TFEU

implementation of Union acts[7] Details are set in regulation 1/2003, which determines the competencies of the European Commission and the member states and provides procedures for cooperation. Council Regulation (EC) No 1/2003[8] of 16 December 2002 on the implementation of the rules on competition laid down in Articles 101 and 102 TFEU abolished the centralised scheme and increased the links between national competition authorities in line with the principle of subsidiarity. In accordance with the provisions of Paragraph 1 of Article 3 of Regulation 1/2003/EC, the monopoly of the European Commission (hereinafter the Commission) was eliminated regarding the decisions on exceptions from prohibition of agreements restricting competition and provided, at the same time, a basis for more effective private enforcement of EU competition law rules before national courts. "Given the central role of national courts the success of decentralised competition law enforcement depends to a large extent on the national court's ability to apply the law accurately and consistently" (Blanco & Jorgens, 2013, p. 92-93). The Commission, through its numerous notifications and guidelines, and the Court of Justice through its case law (where the institute of reference for a preliminary ruling is particularly important), ensure the uniform application of EU competition rules. As courts are independent national authorities, the cooperation between them and the Commission is established in the form of non-binding assistance of the Commission as *amicus curiae*—that is, the court is neither obliged to seek the Commission's assistance or to take it into consideration after receiving it.[9]

Slovenian competition policy

The Constitution of the Republic of Slovenia,[10] hierarchically the highest norm in Slovenia, guarantees in its Article 74 free economic initiative, which means that individuals can freely decide to pursue economic activities in the market. In doing so, they should take into consideration specific constraints, referring primarily to their legal and organisational status, as they are allowed to operate only in one of the legally available forms and in accordance with the public benefit. Secondly, individuals must respect competition when acting in the market. According to this provision, "[u] nfair competition practices and practices which restrict competition in a manner contrary to the law are prohibited.".[11]

Accordingly, the area of competition law is divided by the Constitution into two sub-areas or constitutional categories. We refer to the competition policy rules in the following, as these are the relevant provisions for the abuse of a dominant position and cartel prohibition.[12]

Until its amendments entered into force in 2015, the Competition Act was considered the central regulation on the restriction of competition in the Slovenian market. As its name indicates, it prohibits practices that prevent, distort or restrict competition in the market, for which, in theory, a simplified term is used—namely, practices having as their object the restriction of competition. Therefore, this act governs restrictive practices, concentration of companies, restriction of competition by the state or governmental agencies, and actions for the prevention of restrictive practices and concentrations that significantly impede effective competition, when they produce or may produce effects in the territory of the Republic of Slovenia.[13] Furthermore, the Competition Act lays down the body (Slovenian Competition Protection Agency; hereinafter SCPA), responsible for supervision of the implementation of this Act and the implementation of Articles 101 and 102 of the Treaty on the Functioning of the European Union. According to the Competition Act, the SCPA has two functions: it operates as an administrative authority and as a minor offence authority. When exercising its competence as an administrative authority, the SCPA focuses mainly on procedures regarding restrictive agreements and concentrations, whereas as a minor offence authority it sanctions those who infringe the provisions of the competition law. In practice, therefore, a situation may arise in which the SCPA simultaneously acts in two capacities and carries out two procedures at the same time. It is debatable whether this approach is efficient and contrary to legal predictability, thus raising concerns (Bratina, 2009).

From the perspective of the entities interfering in the restriction of competition in the market, it is possible to differentiate between the restriction of competition by state or government, when the competition is restricted by public authorities and organisations as well as individuals exercising the powers, and the restriction of competition by private undertakings, when companies and individuals performing economic activities are involved in restrictive practices (Repas, 2010). Traditional forms of restriction of competition by private undertakings

[7] Article 2 (1) TFEU.

[8] Official Journal of the EU L No 1, of 4 January 2003.

[9] Adopted from Repas, ibidem, p. 105.

[10] Official Gazette RS, No 33/1991, as amended.

[11] Paragraph 3 of Article 74 of the Constitution of the Republic of Slovenia.

[12] The unfair competition was first regulated in a separate law (Protection of Competition Act). With the amendments in 2015, that area was moved to the Competition Act, and the Protection of Competition Act was repealed on the ground that both the unfair competition acts as well as acts that restrict competition affect the functioning of the market and competition (The bulletin of the National Assembly of the Republic of Slovenia "Poročevalec" on 18 June 2015).

[13] Paragraph 1 of Article 1 of the Competition Act.

mainly include, firstly, restrictive practices in the form of agreements, decisions by associations of undertakings and concerted practices[14] (cartel agreements[15]) as well as abuses of a dominant position;[16] and secondly, concentration of undertakings[17]or restrictive associations. All types of cartel agreements and abuse of a dominant position are prohibited, whereas, as regards concentrations of undertakings, only those concentrations are prohibited which substantially impede effective competition in the market.[18] When carrying out the supervision, the SCPA operates *ex post* in the case of cartel agreements and abuses of a dominant position, which means that it assesses practices that have already been carried out or are still ongoing, whereas it operates ex ante in cases of concentrations of undertakings, in order to prevent the restriction of competition in the market in advance (Repas, 2010). The SCPA is the central competition regulator in Slovenia. When carrying out its regulatory function, it cooperates with other national authorities, local authorities, institutions and individuals.[19] It was established on the basis of the amendment to the ZPOmK-1 from 2011[20] to carry out its tasks and powers in accordance with the Competition Act. It took over the tasks and powers of the previous authority, the Slovenian Competition Protection Office. By setting up the SCPA, the legislator also wished to stress its autonomy and independence and (unlike the Office, which used to be a body within the Ministry) to separate it from the Ministry of Economy and Technology. Moreover, a change in the status of the competition protection body was necessary in view of a high degree of state ownership in large corporations, requiring greater autonomy and independence of the authority, without any political pressures when assessing the practices of the companies in the market (Mitić, 2011). Independence (organizational, legal, functional and financial) of the SCPA is a necessary condition for its professional work (Ferčič, 2015b).

The SCPA has different competencies as set out in the Competition Act. First, it monitors the application of the provisions of the Competition Act and of Art. 101 and 102 TFEU.[21] Within this function, the SCPA mainly monitors any infringements of the provisions related to restrictive agreements, abuses of a dominant position and concentrations. It exercises control by monitoring the situation in the market by means of information published in the media, on the basis of reports about disputed practices of companies or through own activities, such as sectoral research or requests for information. However, the SCPA is not competent for the control over acts of unfair competition and does not act as an administrative or minor offence authority in such matters, as the overall legal protection of unfair competition was given to the judicial authorities by the amendment to the Competition Act in 2015.[22] In addition to the monitoring of the restriction of competition by private undertakings, the SCPA also monitors the restriction of competition by state or government agencies. However, the SCPA acts only as a consultative body (Bratina, 2009). While not binding, it forwards its assessment to the competent authorities regarding the necessary actions to eliminate restrictions in competition resulting from statutory or other provisions.

Second, the SCPA acts as an administrative authority when the information obtained shows the likelihood of infringements of the law. The SCPA initiates ex officio a procedure carried out in accordance with the provisions of the Competition Act with the subsidiary application of the provisions of the General Administrative Procedure Act (hereinafter the ZUP).[23] While it always initiates a procedure on its own motion (ex officio) when detecting restrictive practices, this occurs only exceptionally in the case of concentrations, as the procedures of the appraisal of the concentration are normally initiated on the basis of a notification. The matters brought before the SCPA are specific and differ, by reason of their legal nature, from other (normally) administrative matters decided upon by the competent authorities by applying the provisions on general administrative procedure.[24] The control procedure, in which control measure are also imposed in the form of acts set out by the Competition Act, refers to the restrictive practices and to the concentration procedures.

Third, the SCPA acts as a minor offence authority regarding the infringements of the provisions of the Competition Act and the provisions of Art. 101 and 102 TFEU. It conducts the proceedings in accordance with the law governing minor

[14] Governed by Article 6 of the Competition Act and Article 101 of the TFEU.

[15] For a more accurate distinction between the two types of restrictive practices, a decision was made to use the term "cartel agreements" for all types of restrictive agreements; in this context, the term "cartel" refers to all types of restrictive agreements, both horizontal and vertical, even though in competition law theory a cartel agreement means agreement only between entities of the same type of position (between competitors).

[16] Article 9 of the Competition Act and Article 102 of the TFEU.

[17] Article 10 of the Competition Act.

[18] Paragraph 1 of Article 11 of the Competiton Act.

[19] Article 14 of the Competition Act. To avoid exceeding the scope of this paper, the focus below will be on the presentation of the SCPA. As far as other authorities are concerned, the role of courts and the European Commission will be presented in brief for the sake of gaining a wider perspective.

[20] Official Gazette RS, No 26/2011.

[21] Paragraph 1 of Article 12 of the Competition Act.

[22] Paragraph 3 of Article 12 and Article 63.b of the Competition Act.

[23] Official Gazette RS, No 80/1999, as amended.

[24] Extracted from the grounds for the judgment of the Supreme Court of the Republic of Slovenia, No VS4001813 of 27 September 2011.

offences (the Minor Offence Act),[25] unless stipulated otherwise by the Competition Act. The SCPA decides on infringements regarding restrictive practices and concentrations. It imposes fines on infringers, amounting to up to ten percent of the annual turnover of the company in the previous financial year, whereas the fine on the responsible officer of the undertaking ranges between 5,000 and 10,000 Euros.[26] Regarding the restrictive agreements and concentrations of undertakings, the SCPA is responsible, if any infringements have been found, to impose fines as well as to submit applications requiring from competent courts a civil sanction for the breach (i.e., seeking to establish the invalidity of the restrictive agreements and anti-competitive merger or acquisition practices).[27]

Fourth, with the adoption of the amendment to the Agriculture Act,[28] the SCPA has additional competences to govern the relationships within the food supply chain. The amendment to the Act sets up a monitoring authority (i.e., a food supply chain relationships ombudsman), who will monitor the conduct of the food supply chain participants and notify the SCPA, *inter alia*, of any illicit practices.

Finally, as regards the implementation of the supervisory function, the role of judicial authorities must be highlighted. The courts cooperate with the SCPA in investigation procedures: they issue investigation orders on a proposal from the SCPA and decide on the existence of privileged communication (communication between an investigated company and a lawyer).

Moreover, judicial authorities carry out redress procedures. It is impossible to lodge ordinary appeals against the SCPA's decisions; nevertheless, legal protection is provided through judicial remedy. In a judicial redress procedure, the decisions are made by the Administrative Court of the Republic of Slovenia, when that refers to the decisions given in an administrative procedure.[29] Judicial protection against the SCPA's decisions made on minor offences is provided by the Ljubljana District Court as the court with exclusive jurisdiction.[30]

German competition policy

German competition policy goes back to 1958. The introduction of the Act Against Restraints of Competition (ARC) foresaw the prohibition of an abuse of a dominant position and the prohibition of cartelization. The second amendment of 1973 introduced the ex ante merger control procedure.[31] The current form of regulation goes back to the eighth amendment of 2013, while the ninth amendment is currently under discussion.

The Bundeskartellamt implements the ARC as an independent higher federal authority assigned to the Federal Ministry for Economic Affairs and Energy (Bundeskartellamt, 2011). It is the most important (but not the only) competition enforcer in Germany. It only has competences in cases that do not lie within the power of the European Commission. The general provisions of Regulation 1/2003 specify details, and there are special rules with respect to referrals in specific cases, for instance in merger control procedures. Moreover, it is not the only competition authority at the national level. Each federal state may also have a state competition authority, which is usually implemented in the form of departments of the state economic ministries. Moreover, the minister of economics may act as a competition authority under certain conditions in merger control procedures.

In Germany, the federal cartel office is the sole implementing institution with respect to merger control procedures. With respect to cartel cases and abuse control procedures, the state authorities may also conduct cases. A case falls under federal authority if the conduct affects at least two federal states within Germany. If it is restricted to a single state, the state authority has the competency to conduct the case.

As in many jurisdictions, the federal cartel office has discretion with respect to proceedings in cartel and abuse control cases. With respect to merger control, the thresholds of Art. 35 ARC define whether the authority needs to be notified of a merger. The tresholds are defined in terms of turnover values of the involved firms, so there is no discretion available for the authority to step back from seemingly unimportant cases or open a merger proceeding if the thresholds are not met. Whereas this approach has not received much attention in the past, recent mergers in rapidly growing industries like internet-related markets or bus transportation services (a fast-growing industry in Germany due to recent deregulation) raise important questions. Some of these mergers did not meet the thresholds for obligatory notification, even though they were considered economically important. As a consequence, the Federal Cartel Office did not have discretion to open proceedings, and the mergers were implemented without notification. Due to these incidents, the current ninth amendment of the ARC discusses the extension of the notification thresholds (compare Section 3.3.1).

[25] Official Gazette RS, No 7/2003, as amended.

[26] In detail in Articles 73 and 74 of the Competition Act.

[27] Paragraph 4 of Article 12 of the Competition Act.

[28] Official Gazette RS, No 26/14.

[29] Article 48 of the amendment to the Courts Act, Official Gazette RS, No 63/13.

[30] Paragraph 5 of Article 214 of the Minor Offence Act.

[31] The sixth amendment of 1999 introduced rule on the legal protection in award procedures for public contracts, which is not the focus of this paper.

A very important issue in practical competition policy implementation is the role of independent decision making procedures and the risk of regulatory capture. In order to minimize this risk, any decision by the Federal Cartel Office is made by a group of at least three civil servants.[32] From an organizational perspective, the office is divided into twelve decision-making units, with nine organized subject to the industries they cover and three specialized cartel units. This organizational structure supports the accumulation of sector-specific knowledge and assures consistency in decision-making procedures. Decisions are made within these decision units, which are independent of any political influence. The president of the Federal Cartel Office has a mere representative function and no decision-making power. With respect to independence from political influence, two aspects play an important role: as the decisions are made within the authority by civil servants in the decision units, influences from outside, politics or administration usually do not play important roles.

Second, there is a peculiarity in German competition policy with respect to merger control. The ministerial allowance procedure gives the minister of economics the right to overstate a prohibition decision by the Federal Cartel Office in special cases. The underlying idea is that the competition authority is restricted to the assessment of competitive effects of a merger in its case decision. However, if the case affects issues of general overall importance, the merging parties may call the minister of economics to overrule the prohibition decision of the Federal Cartel Office for reasons beyond competitive concerns. In this procedure, the minister is not allowed to overrule the competitive assessment of the Federal Cartel Office per se, which he has to accept. However, in addition, he may consider aspects beyond the purely competitive assessment and may thus grant ministerial allowance. This is the case if the overall economic benefits of the proposed merger outweigh its competitive harm, or if there is an outstanding general interest in the implementation of the merger (Art. 42 ARC). Ministerial allowance procedures are rarely employed in Germany, with this one being only the 22nd in the last four decades. Moreover, the majority of cases have been rejected (BMWi 2016). In the proceedings, the minister conducts investigations, hears the affected parties and is obliged to receive a non-binding statement of opinion of the monopoly commission (an independent advisory board to the government in the field of competition policy and regulation). It is generally accepted that this separation of powers supports the office's independence in decision making, because it enables it to focus on the competitive assessment in its decisions without being obliged to take political considerations into account.

[32] From a practical experience, important cases are often discussed by the whole decision-making department.

Competition Policy in Practice

Case statistics

This section provides summary statistics on the activities of the Slovenian and German competition authority. We start with a representation of the most important sectors in terms of cartel case law and abusive behavior. Next, we describe some important cases in more detail. The section concludes with a discussion of important current issues in national competition policy regimes.

Germany

Table 1 lists the number of abuse control, cartel and merger cases for the ten sectors with the highest number of case proceedings over the period of 2005-2015. The data indicate that abuse control and cartel cases play the most important role in the energy sector. It is very likely that this unusually high number of cases reflects activities of the German energy industry during the process of market liberalization, the transformation of the energy markets towards renewables, the market opening and the introduction of competition. With respect to the other industries, cartel cases and abuse control proceedings show no particular patterns. The small number of abuse control cases in many industries might indicates that these industries show at least some degree of competition, such that market dominance—a prerequesite for abuse control cases—tends to be of less importance.

Table 1: Case statistics for the ten most frequent sectors in Germany for 2005-2015

	Cartel cases	Abuse control	Merger cases	Sum
Energy	30	36	15	81
Media	1	0	12	13
Hea lth care	7	1	26	34
Construction	4	1	12	17
Chemicals	4	1	26	31
Food	0	2	11	13
Machine construction	0	0	21	21
Waste disposal	3	0	7	10
Telecommunications	5	1	7	13
Financial services	1	0	8	9
Sum	55	42	145	242

Source: Bundeskartellamt.

Table 2: Case statistics for cartel cases, abuse control cases and merger cases for 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Sum
cartel cases	2	4	14	8	5	17	1	4	4	3	62
Abuse control	1	2	1	13	6	14	5	5	1	1	49
Merger cases	1687	1829	2242	1675	998	987	1108	1127	1127	1188	13968
of which: l st phase	1663	1795	2213	1660	976	977	1101	1113	1118	1178	13794
of which: 2nd phase	24	34	29	15	22	10	7	14	9	10	174

Source: Bundeskartellamt

Table 2 provides information about the case development over time. The table clearly indicates that merger control cases make up the majority of proceedings at the Federal Cartel Office. Usually only 1 to 2 percent of these cases enter the second phase of investigation, and the vast majority are cleared after the initial investigation in the first phase. This indicates that there is room for improvement with respect to the notification system in Germany. The allowance decisions in first-phase investigations bind substantial resources in the administration, which cannot be allocated to more important and labour-intensive proceedings. However, this is not a peculiarity of German competition policy and can likely be observed in other jurisdictions (DG Comp, 2017). Moreover, it is important to note that the seemingly low number of other cases reflects a disproportionately high amount of manpower allocated to these cases, as abuse control and cartel cases very often bind substantial resources over long periods of time.

Table 3: Slovenian decisions on the infringements related to restrictive practices during 2005-2014

	Restrictive agreements	Abuse of a dominant position	Total
Telecommunications	0	6	6
Energy sector	2	2	4
Trade	2	1	3
Healthcare	3	0	3
Pharmacy	2	0	2
Funeral services	0	2	2
Maritime agency services	2	0	2
Other	11	8	19
Total	22	19	41

Source: SCPA

Slovenia

With respect to Slovenia, Table 3 provides data referring to restrictive practices of undertakings over the 2005-2014 period. We looked at how many decisions referred to the conclusion of cartel agreements and how many to abuse of a dominant position. Furthermore, the number of all decisions issued by the SCPA during that period was identified. In addition to the quantitative scale of the SCPA's activities, we focused on the area of the infringement; to this end, the decisions were broken down by sectors of the economy.

Most decisions indicated in Table 3 refer to infringements related to restrictive practices in the Slovenian market, while 15 infringements referred to restrictive practices in the EU market, 7 decisions were issued on the basis of Article 101 of the TFEU (Article 81 of the EC Treaty), and 8 decisions were issued on the basis of Article 102 of the TFEU (Article 82 of the EC Treaty).

The data show that the number of decisions issued by the SCPA referring to restrictive practices is relatively low (slightly less than one-ninth of all of SCPA's decisions) compared to its decisions related to concentrations of

Table 4: Slovenian decisions during 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Testrictive agreements	2	4	2	2	1	2	1	3	3	2	22
Abuse of a dominant position	3	1	3	2	2	1	2	2	2	1	19
Other (concentrations)	54	47	50	41	18	20	25	18	25	25	323
Total	59	52	55	45	21	23	28	23	30	28	364

Source: SCPA

undertakings. The majority of infringements in connection with restrictive practices occured in the telecommunications sector (6 cases of abuses of a dominant position), energy sector (4), trade and healthcare (3), funeral services and maritime agency services (2).

The SCPA issues the decisions within the scope of administrative proceedings. The decisions are mainly of a declaratory nature. In the light of effective protection of competition, their biggest problem is that they contain no sanctions for infringers. The SCPA imposes sanctions within the scope of minor offence proceedings. Procedural duality brings about duplication of judicial protection (see section 3.2), and both greatly reduce the possibility of a successful completion of the SCPA's procedures with the payment of a fine. The SCPA's Annual Report provides information indicating that, on the basis of the statistical estimation of the success of the available remedies, the probability of the ultimate payment of a fine is only 20 percent.

Case studies

Germany

We provide two examples of important cases in Germany. The first refers to a merger case in the German interurban bus market. This market developed only recently in Germany, as it was prohibited by law until 2012 to provide coach services.[33] After initial and lively activities with the beginning of liberalization in 2013, the market soon started to consolidate and finally led to the merger of Flixbus and MeinFernbus in 2016, the two most important players. The merged entity is reported to have a market share of about two thirds of the whole market, so it is likely that this merger leads to the establishment of a dominant player. However, the Federal Cartel Office had no means to investigate this case.[34] Even though the estimated turnover in the interurban bus industry is supposed to be substantial and the merged entity comprises a vast part of it, the turnover of Flixbus and MeinFernbus was below the notification thresholds due to the business model the companies employ. As in many internet-related industries, the firms act merely as intermediaries between their end customers (the travellers) and small logistics companies that physically operate the busses. In doing so, they provide the software platform for travel planning and booking and does centralized route planning for its subcontractors. Through the uniform booking platform, their marketing activities and the established brand names, the merging companies act as coach operators, yet theirrevenues comprise only the commission for ticket sales as a percentage of the total ticket price. Revenues are a fraction of the total revenues for coach services in Germany, and despite the seemingly important role of the companies in the interurban bus market, the combined turnover of the involved entities stayed below the notification thresholds of the ARC. As will be discussed in Section 4, this and other comparable cases led to a discussion about the revision of competition law in the digital economy.

Another important recent case was the prohibition of the merger between Edeka and Tengelmann in 2015.[35] Both companies are food retailers ("supermarkets") with a strong position in various regional German markets, including Berlin, Munich and North Rhine-Westphalia. According to the decision, the merger would significantly impede effective competition in the food retail markets against its customers, as well as in the procurement markets vis-à-vis manufacturers of branded products. With respect to the upstream procurement markets, Tengelmann would disappear as an independent purchaser, thus undermining the bargaining position of the remaining cooperating companies. With respect to the end customer markets downstream, there is a substantial horizontal overlap between the merging parties in several regional and local retail markets, which reduces consumers' choice and increases the merging parties' market power. According to the Federal Cartel Office's decision, the merger would lead to substantial overlaps in these regional markets, reduce competitive pressure and leave the merging firms with a higher degree of market power against their end customers.

In the follow-up to this decision, the parties initiated a ministerial allowance procedure, while at the same time they filed an appeal against the prohibition decision before the Court. As discussed in Section 2.3, the ministerial allowance procedure is a peculiarity in the German competition policy regime, granting the Minister of Economics the right to act as a competition authority under special circumstances. In this particular case, the minister issued an approval decision in 2016. However, competitors of the merging firms filed an appeal procedure against this ministerial allowance decision before the Court. In a first assessment, the Court signaled that the stated reasons in favor of the allowance decision might not pass scrutiny. As a consequence (after intermediation by former Chancellor Gerhard Schröder), the merging firms and their competitors negotiated an agreement that allocates a specified number of supermarkets to one of the outside

[33] Historical exemptions from this rule include the provision of bus transportation services to and from Berlin, as well as other minor exemptions (Dürr &Hüschelrath 2016a, 2016b).

[34] The market definition and competitive assessment need to take modal competition into account, so the mere indication of market shares in the interurban bus markets might be misleading.

[35] The description of this case follows the exposition in Polk (2015).

competitors and compensation payments to the others. After abandoning their claims before the Court due to this agreement, the merger was finally implemented in late 2016.

Slovenia

Abuse of a dominant position on the television advertisement market

Administrative procedure

On 24 April 2013, the SCPA adopted an administrative decision stating that PRO PLUS had abused its dominant position on the television advertisement market since 1 January 2003 by requiring exclusivity (a 100% advertising share) from advertisers who advertise on TV or by offering them conditional discounts for loyalty in order to discourage them from placing their ads with PRO PLUS's competitors, thereby driving the competitors from the market or restricting their market access and growth in the market.

PRO PLUS brought an action challenging the administrative decision, and the Supreme Court of the Republic of Slovenia dismissed that action in December 2013. The SCPA's administrative decision thus became final.

Minor offence proceedings

On the basis of the final administrative decision, the SCPA also carried out minor offence proceedings and issued a decision on 21 July 2014, imposing a (minor offence) fine for a dominance abuse case on PRO PLUS and its officers—specifically, it imposed a fine of EUR 4,994,491 on the legal entity. When determining the amount of the fine to be imposed on PRO PLUS, the SCPA took into account the severity and duration of the infringement of the prohibition of abuse of a dominant position by PRO PLUS, which was committed over a period of 10 years and 3 months (i.e., from 1 January 2003 to the date of the adoption of the administrative decision), which is a very long period. Regarding the seriousness of the offence, the SCPA took into account the nature of the infringement, the economic power of the company that had committed the infringement, the geographic scope of the infringement, the impact on the market and the duration of the infringement.

The infringement or violation of prohibition of abuse of a dominant position through the practice of exclusive contracts is one of the most serious violations of competition rules. The business practice was aimed at tying the clients (advertisers), whereby PRO PLUS intended to restrict their free choice of various providers and to prevent competitors from accessing the market and growing in the market or to drive them from the market. The geographic scope of the infringement referred to the whole territory of the Republic of Slovenia, and the SCPA identified an infringement of Article 102 of the TFEU, since the identified abuse of the dominant position also affected the trade between the EU Member States (SCPA, 2014).

Judicial protection

PRO PLUS and its officers brought judicial review proceedings against the SCPA's decision, and the Ljubljana District Court issued a judgment on 3 November 2014, ruling that the facts indicated in the operative part of the SCPA's infringement decision in the PRO PLUS case was no infringement. The District Court considered that the operative part of the decision should include specific conduct of the parties responsible (the legal entity and its officers). As a result, the District Court derogated from its usual practice regarding the wording of the operative part of its decisions, which was followed by both the SCPA and the courts. The SCPA appealed against the judgment, but the High Court dismissed its appeal by judgment VSL0066204 of 18 September 2015 on the following grounds:

Even though the minor offence authority (the SCPA) is bound by its own final administrative decision that does not mean that mere reference to it in this (infringement) procedure is sufficient for the manifestation of the elements of an infringement. Therefore, the court of first instance is correct in the conclusion that the constituent elements of an infringement (in this case they include a dominant position of a legal entity in the market of the Republic of Slovenia and the EU as well as the abuse of that dominant position) must be manifested or described in the operative part of the decision. It is not sufficient to refer to a previously issued final administrative decision in this case, given that the procedure for imposition of administrative penalties requires concrete expression of the infringement in the operative part of the infringement decision.

Current Issues in Competition Policy

Germany

This section deals with two important issues that currently play a role in German competition policy. The first relates to the forthcoming ninth amendment of the ARC (BMWi 2016b). It addresses open questions with respect to fines

in cartel and abuse control cases and extends the scope of merger control. First, the amendment implements Directive 2014/104/EU, which addresses private litigation in cartel cases. With respect to fines in public enforcement cases, the amendment extends liability to the parent company if the parent and subsidiary act as an economic unit during the time of infringement. It is also valid if the parent company was not actively involved in the cartel infringement. Moreover, it intends to close a loophole that enables firms to escape fines from cartel infringements through restructuring.[36]

The second issue relates to the growing importance of internet-related markets, which the federal cartel office subsumes under the term "digital economy" (Bundeskartellamt, 2015; European Parliament, 2015, Monopolkommission, 2016) The growing importance of internet-related markets and their special characteristics make it necessary to check whether the current competition rules address these markets appropriately. For instance, internet-related markets often exhibit strong growth, and past and current turnovers are imprecise indicators of expected future profits and the economic importance of the firms in a merger case. This puts the approach of focusing on past revenues for the definition of merger control thresholds into question. The amendment introduces additional thresholds as to which mergers have to be notified if the value of transaction exceeds 350 million Euro in special cases, even if the turnover of a single unit may be very low.[37]

Finally, as many services in the internet sector are provided free of charge (and in exchange for information and personal data), the role of prices, turnovers and what constitutes market power is under scrutiny in these markets. The ninth amendment for the first time reflects these issues and explicitly states that an economic market might also exist if a service is provided free of charge. Moreover, network effects, complementarities in consumption, scale effects and the access to data are considered important aspects in two- or multi-sided markets. These provisions are closely linked to the growing importance of economic platforms, which facilitate market monopolization in the long run. The ninth amendment indicates in which direction competition policy regimes might adapt to developments in the digital economy in the future; however, it is only a first step. In order to better understand new questions arising with the digital economy, the Federal Cartel Office set up a "task force" to track developments in these fields (Bundeskartellamt, 2016, p. 8).

[36] This loophole has been extensively used by the Germany meat processor ClemensTönnies Group, which escaped fines summing up to 128 million Euro from a cartel investigation by restructuring (Bundeskartellamt, 2016).

[37] Compare the description of the merger between Flixbus and MeinFernbus in Section 3.2.1.

Slovenia

In the period between 17 June 2016 and 17 July 2016, public consultation was held in Slovenia for the draft Prevention of Restriction of Competition Act (ZPOmK-1G), prepared by the Ministry of Economic Development and Technology, together with the SCPA. As a result of the proposed amendment, Directive 2014/104/EU of the European Parliament and of the Council of 26 November 2014 (on certain rules governing actions for damages under national law for infringements of the competition law provisions of the Member States and of the European Union) will be implemented, regulating the following: the right to compensation for harm caused by an infringement of competition law; the effects of decisions by national competition authorities of the EU Member States; joint and several liability for the harm caused by the infringement of competition law; the limitation period; and other legal concepts regulated by the Directive. Furthermore, amendments are proposed at the initiative of the SCPA to its investigatory powers, a more detailed definition of the SCPA's investigation activities actions, whistle-blower rewards, processing concentration of procedures, adoption of decisions on the basis of an admission of an infringement, introduction of a simplified concentration notification procedure, to mention just a few.

The response of the legal profession concerning the proposed draft amendment to the Competition Act was significant, as illustrated below. The Administrative Court of the Republic of Slovenia notes that the draft proposal establishes a new regime of administrative sanctions, whereby the proposed solutions do not provide a clear distinction between administrative sanctions and rules of criminal and minor offence law. The Chamber of Commerce and Industry of Slovenia and the Bar Association of Slovenia raised the question, inter alia, of an excessive expansion of investigatory powers of the SCPA. The proposed provisions of the new Article 27 a allow the SCPA to obtain, when necessary, any information on alleged violations of the Competition Act and Articles 101 and 102 of the TFEU directly at the undertakings. As part of the data collection at the premises of an undertaking, the authorised person of the SCPA may (even) seal such business premises and business documents on the basis of a special decision of the SCPA without an order issued by a competent court for a house search. In this way, the SCPA is granted powers that are not in proportion to the system of criminal investigation law in Slovenia.

In view of the considerable response of legal professionals, which is diverse in terms of the representation of various interest groups, we expect that the proposed draft amendment to the Competition Act will be subject to further modifications and changes. These are necessary in order to

eliminate any alleged systemic imbalances, which undoubtedly would be caused by its implementation.

Conclusions

This paper compares the Slovenian and German competition policy regimes and puts them into an EU context. It discusses particularities of the institutions as well as recent developments and cases.

We show that the development of case law and competition policy practice plays an important role, even though the extent of this role differs in the different regimes. Compared to Germany, there are fewer cases in Slovenia due to the "young" character of the Slovenian authority and the size of the economy. However, given steady economic growth and increasing per capita incomes, we indicate the role that national competition policy implementation might play in the future. Also, the relative low thresholds for merger control cases in Slovenia and the discretion of the authority to open proceedings may work in favour of the advancement of case law in Slovenia. At the same time, the institutions differ with respect to the federal system in Germany, which gives some competencies to the competition authorities of the federal states. Regarding the ministerial allowance in Germany, a comparable procedure does not exist in Slovenia. However, there is room for discussion regarding whether this procedure is beneficial or harmful. Given the economic assessments of the monopoly commission, the degree of transparency in the decision-making process, the potential for bargaining solutions behind closed doors and the negative public attention of recent allowance decisions indicate that this might be an issue worthy of further investigation.

Second, the growing importance of the internet economy might make it necessary to develop more flexible rules, such as rules for notification procedures in merger control cases. The Slovenian regime follows a different approach compared to Germany, and Art. 42 of the Competition Act provides flexible rules. However, due to the lack of cases in Slovenia and experience with the proposed amendment in Germany, it is too early for an assessment of appropriate approaches. This notwithstanding, we believe that an institutional comparison is helpful for the advancement of competition policy rules and its appropriate implementation.

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Sistem konkurenčne politike v Sloveniji in Nemčiji: primerjalna analiza

Izvleček

Z institucionalnim pristopom analiziramo razlike in sorodnosti med sistemoma konkurenčne politike v Sloveniji in Nemčiji. Najprej ugotavljamo, katere razlike prevladujejo pri implementaciji konkurenčnega prava Evropske unije v nacionalno pravo, upoštevajoč enovit okvir konkurenčne politike Evropske unije. V naslednjem koraku razpravljamo o nedavnih praktičnih primerih iz obeh držav in ugotavljamo, kako zgodovinski razvoj in ekonomski dejavniki vplivajo na odločanje in sodno prakso. Obravnavamo tudi nedavne spremembe nacionalnih sistemov varstva konkurence in ugotavljamo, kako bo digitalna ekonomija vplivala na sistem varstva konkurence v prihodnje.

Ključne besede: konkurenčna politika, praktični primeri, pravo varstva konkurence, tranzicijske države.

Changes in Responsibilities and Tasks of Universities in Regional Innovation Ecosystems

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Abstract

Innovation process research is changing. In addition to the former territorial approach (examining countries or regions), the description of innovation cooperation in local areas is becoming more and more accepted. Instead of the innovation ability of the traditional large enterprises, research has begun to study the role of small and medium-sized enterprises, non-governmental organizations, local governments, and educational institutions (especially universities), which foreshadows the development of a new innovation system. In 2015, we conducted a study focusing on the civil and corporate relations of a major university. We tried to determine the new directions based on the economic and social cooperation as well as to search for the practical implementation of the theoretical helixes in these interactions. We came to the conclusion that universities not only are determinative according to the triple helix model but also have a prominent role in the creation of new innovation ecosystems, particularly in a well-defined geographical area.

Keywords: Helix models, innovation, social innovation, university relations

Introduction

The University of Pannonia (a prestigious academic institution in Hungary) was based on an excellent chemical specialist university with good organization and engineering thinking, which had real connections to the industry's big players and gave sector research and knowledge to its market and social partners. This origin still has a positive impact on the university relations. However, the growth of the university also brought the appearance of new disciplines with, therefore IT, engineering and environmental science have been included among the focus areas.

Universities operate in a constantly changing environment. To undersetand the role of a university as a knowledge centre, it is necessary to assess the research competencies and relations of the institution as well as the selected strategic directions in the field of cooperation and the preparation for their implementation.

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A survey was carried out in two stages in 2015 to explore the function of the University of Pannonia as a knowledge centre. The research questions were as follows:

- Has the emergence of new disciplines transformed the corporate and social relations of the institution?
- Were there any changes in the way of building relationships? Can this method be further developed?
- Do the new partners also participate in social innovation processes in addition to the traditional (technological) innovation objectives?

To answer these questions, we considered it necessary to examine innovation cooperation in the preceding three and a half years (from January 2012 to June 2015). A total of 173 contracts were found (together with the project and legal experts of the university, we selected contracts linked to the R & D & I areas). We paid special attention to the competitive tenders that represent new and very important complements of the traditional partnerships. These competitive tenders are important individually as well, because they were intended to solve innovation tasks. The partners and the applications were selected on the basis of a very significant public and scientific filter. After a detailed analysis of the contracts, qualitative studies were carried out on the basis of the results. In terms of the project activity, the most successful university departments, the institution leaders and the researchers responsible for the work specified in the contracts were interviewed (a total of ten colleagues). Our aim was to carry out deeper studies in the field of preparing contracts, their content and the method of networking. Based on the results of the above-mentioned studies, we identified the economic and social innovations that are specific to the university and its partners. We tried to answer the question of whether the responsibility and tasks of the university have changed in the regional innovation ecosystems.

Theoretical Background

Innovation has become one of the most important sources of the national and regional economy growth in the past decades. Subsequently, the unveiling of innovation processes, the recognition of entities involved in renovation, and research on relations and influencing factors have become more and more important. Innovation is, according to the literature, the ability to do things in a new way (Schumpeter, 1939), a change that unveils new dimensions of performance (Drucker, 2003), or a creative idea (Karlsson-Johansson, 2004).

Porter (1985) considers innovation to be a series of small development steps that provide the opportunity for continuous competitive advantage. The term *innovation* has become ever more widespread in disciplines other than economics; therefore, it is often used in the interpretation of social, educational, environmental and social changes. Thus, it became necessary to define the areas of renewal (Oslo Manual). The major novelty of the 2005 edition of the Oslo Manual is that the activities of organisation development and marketing are listed among the innovation areas. "An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations" (Oslo Mamual, 2005, 3rd edition, p.46). This is the most accepted and used definition for innovation in Europe, and its strength is that it can be interpreted for organisations other than economic ones.

The so-called triple helix model of Etzkowitz and Leydersdorf (2000) is an outstanding model demonstrating the innovation process. It describes a common, development-based interactive relation among the three institution types (state, enterprise, university). The correlations between the constituents of the model bolster the various levels of the circulatory system. The key to development is the reduction of factors hindering development, by means of which there is an increased movement in the system, thus opening the way to sustainable development. The supporting role of the state must receive special attention.

There were initiatives to further expand and develop the triple helix model. The existence of a fourth helix appeared (Etzkowitz-Zhous, 2006). In connection with this, suggestions were made of factors influencing innovations, such as labour, risk capital, informal sectors and civic society. Carayannis and Campbell (2009) created a model by thinking about the triple-helix model further and reasoning that the media and culture-based community space appear as the fourth helix. Through the appearance of the new elements it becomes evident that the members of society and communities are linked to business, technical, service and scientific areas; thus, the NGO sphere has a link to the university-industry-government correlation.

Further consideration of the quadruple helix led to the birth of the fifth helix (Carayannis et al., 2010). From this point onwards, the literature differentiates between the social and economic environment, with the ecological aspect suggesting a unified approach with regard to the natural environment, social environment and economic development in such a way that innovation must be used to achieve sustainable social and economic change (also in the case of different regional levels).

In summary of the helix-related literature, we believe that sustainable development technology stands in the centre of the triple helix innovation model, while the fourth helix

highlights the role of the civil society. The fifth helix adds the ecological approach to the previous models. These extensions indicate that the surface of the interpretation of innovation is growing. In addition to the technological objectives, social and environmental tasks also appear. The concept of social innovation tries to deal with the emergence of these extensions.

Mulgan et al. (2007) regard social innovation as a series of innovative activities and services, which are meant to fulfil certain social needs and which are developed and spread by organisations whose primary goal is the well-being of the society. One of the tasks of social innovation is to solve the new social and environmental problems created by social-economic changes by means of social tools (Szörényiné, 2015).

Territoriality is a key constituent of the innovation processes (Birkner-Lehota-Torma, 2013), as there are huge differences based on the spatial imbalances of access to knowledge (Vas–Bajmócy, 2012). Therefore, the regional research on innovation systems is an important approach (Dőry–Rechnitzer, 2000; Cooke, 2001).

The regional innovation system is capable of using the locally available, created knowledge elements typical of a given region. The basic condition hereof is the territorial proximity and the existence and utilisation of interpersonal connection systems (Hau-Horváth - Horváth, 2014). The regional/territorial innovation system includes universities, as elements of the technological offering, as well as research institutes and innovative enterprises, their activities and the connections established among them.

There is an ever-increasing pressure on universities by local interested parties for the sake of coordinating their basic needs with the demands of the region (Chatterton-Goddard, 2000). Bramwell et al. (2012) claim that universities are the motors of regional economic development. The local devotion of universities can bolster the well-being of its environment in many ways, including research, infrastructure development, education, innovation, efficient university-business relations and community development. Therefore, universities undertake the third mission (i.e., the role of development) apart from research and education. When the universities integrate into their own region, they have an obvious impact on the intensity and character of potential relations and thus on the process of spreading knowledge (Gál-Zsibók, 2013). A young academic institution can remain competitive and viable only if it is open to the market and local needs (Kaszás et al., 2015, p. 368).

Researchers investigating the role of small- and medium-sized universities in the Central-East-European region concluded that the role of universities away from cities is crucial in the regional system of innovation; however, the economic impact of these universities is still smaller than that in more developed countries (Gál-Ptacek, 2011; Ernszt et al., 2015, Birkner-Mahr, 2016). Universities with their connections can be the engines of development in these territories. Overall, we can say that with the effective contribution of universities, increasingly complex relationship systems can be created, building new local / regional innovation ecosystems.

Methodology and Results

Before the general analysis, we hypothesized that the research development co-operations of the five-faculty university had moved away from traditional relationships in the chemical industry and that it would be possible to observe the new scientific areas. Specifically, the following hypothesis was formulated:

H: The new disciplines have significant weight in the R & D & I contracts, based on the number and value of the contracts these are the most important relationships today.

We also thought that meeting the demands of the civil society and local government, as well as developing the ecological approach, would be issues that would arise in the innovative research, so we expected to find examples of these issues in the contracts as well.

The data partially confirmed the hypothesis, since there is more cooperation with IT, engineering and agriculture in terms of number of pieces; however, by far the largest number of service users are those major organizations from the past with which the university had a prior relationship. The environmental industry contracts are also important; these are partly the products of the chemical past, but there are also sustainability-related research studies that can be interpreted as results of the fifth helix. The classic civil or government needs did not appear in the direct form (with one exception) by independent contracts, but we found examples of this as well in the concluded cooperation. The agreements were made for a 5.5-month period on average, but in the case of the major contracts a yearly period was typical. Longer studies and works are typical in big-scale tenders.

It can be established from the database that, in terms of geographical location, the university carried out the majority of the contracts with firms in Budapest, the capital of Hungary, while the rest were completed with companies operating in Transdanubian settlements. Regarding the geographical location of the University of Pannonia, this result is not

Table 1: Types of R & D & I Contracts of the University of Pannonia

Types of contracts	Number of contracts (piece)	Ratio of the number of contracts (%)	Amount (EUR)	Ratio of the total contracts (%)
Environmental Protection,environmental industry	27	16%	382.512	14%
Engineering, mechanical engineering	9	5%	162.293	6%
IT	18	10%	612.100	22%
Agriculture	78	45%	246.533	9%
Chemical industry	40	23%	1348.187	48%
Other (results of social relations)	1	1%	33.386	1%
Total	173	100%	2784.961	100%

surprising. Moreover, it is almost a platitude that numerous companies located in the country deal with the innovation contracts at their centre in Budapest. The tenders that focused on competitiveness (a total of 3 pieces out of the 173 contracts that were concluded) showed a very interesting one-sided nature. The university was able to win such big-scale tenders only in the field of informatics. This is a positive process because, through this process, the building and strengthening of the new areas is verified, and it is possible to detect the commitment of the university management. The tenders focused on competitiveness were significantly different from the traditional R&D cooperation, as they can be characterized by the much larger research tasks and amounts of money assigned to them, the investor is the Hungarian state, the leaders of the consortium are world-class large enterprises, and the duration of the tenders is usually 3-4 years. In the case of a traditional R&D, the university fulfills an order coming from the market, while in the case of a tender focused on competitiveness, all the beneficiaries realize their 'own' R&D tasks during the course of the project. The relationships pertaining to competitiveness are built over a long period of time, and the partners have to know each other well, while the normal R&D can be a one-time or unique order.

Following the general analysis of the contracts, we contacted those actors who were successful in the development of innovation relations and task execution, and we formulated the following research question:

Are the existing personal relationships important in the innovation co-operation, and do the companies expect a professional project approach from the universities in the case of R & D & I work?

We asked the respondents ten questions. The most important results are briefly presented below. The colleagues typically gave two types of answers to the question of 'How are the corporate relationships established?' and 'How are relationships built?' These two types of answers are as follows:

- The corporate co-operations are primarily established through personal relationships (with graduated students and ex-colleagues from the university employed at firms as well as the relationship networks of the engineers and professors at the university). Trust, professional quality and authenticity as well as the reference created on the basis of the successfully implemented and closed projects' results are important.
- We put a lot of effort into expanding research development by visiting and getting to know the firms of the region, in terms of who has what motivations and in which projects they are interested.

Based on the responses, we can state that the personal relationships are still important in the development of innovation co-operation, which partially answers our research question. However, a small addition should be made to the statement, as the establishment of new relationships requires substantial extra energy from the university.

The process of communication is successful if the organizations speak to each other about the advantages of co-operation with the university, such as at professional conferences or during university workshops. We have made and continuously upgraded a list of the corporate cooperations in progress, tracing their advancements. The connection with a university is important for the organizations because they look for knowledge and capacity as well as experts through whose involvement they can expand their knowledge or realize developmental tasks for which their financial resources are not enough. The relationships are advantageous for the university, as industrial research comes before academic research; thus, through R&D cooperation it is possible to change the teaching-learning material in a forward-looking way, according to the demands of the industry.

For the question of what expectations / conditions the companies have before the university co-operation, the respondents answered as follows: in the case of the company's expectations, it is very important for operation to be clear,

explicit, and project-based; for the legal environment to be free from unnecessary administration and bureaucracy; for there to be continuous communication; and recording the business interest systems and the co-operation forms. Based on these answers, we can confirm that the companies really expect professional operation from the university in the innovation work.

The name of the university or even a professor used to be a satisfactory condition for the partner. Today, however, more and more requirements have to be met. The participants expect a working team to solve the emerging issues.

Respondents gave the following answer to the question of 'How typical are the local, regional co-operations?' Regarding the fact that only a few capital-intensive enterprises and NGOs can be found in the area (around Veszprém) related to our research topic, the partners of national importance are rather determinative in the relationship network.

The answers to the question of 'How can these relationships be developed?' prescribe tasks for the university management:

- Whether universities organize R&D projects within or outside the university has a determinative importance from the point of view of the relationships between companies, universities and NGOs. To keep the relationships of the University inside the institution, it is necessary to create an innovation system as well as a structural operation and business co-operation culture (legal and financial work processes), which supports the inward direction.
- A university business model does not exist in which certain persons (instructors, researchers, managers) and the partners can serve their interests while the university interests are not impaired. Furthermore, the revenues of the university increase (these are the characteristics of a good business model).

Conclusion

One of the most important areas of innovation is knowledge creation, which is impossible without the institutions of tertiary education. In accordance with this, the University of Pannonia plays an outstandingly important role in this field in its surroundings and in the vicinity of the capital city, as can be deduced from the results of the research. The research portfolio of the university is under transformation. In the case of the tenders focused on competitiveness, the developments in informatics have appeared markedly. These developments also support social innovation, as the relationship building between the actors has become simplified. The university builds its direct partnership through its graduated students as well as its instructors and researchers. This trust relationship greatly contributes to the opportunity for the organizations and the University to find common interfaces in other fields of social innovation, such as through social responsibility, social sensitivity, and civil relationships as well as the intellectual approach to sustainable development. It should be emphasized that the direct social and local NGOs have no significant presence on the customer side; the surveys and interviews have shown only indirect contacts for the time being. The development of the university, the increasing number of employees and its scientific results influence the local and national strengthening of social innovation. Building the innovational ecosystem is outstanding among the desired improvements, which allows the internal operating system and external relations of the university to become sensitive to innovation. This idea greatly supports the development of social innovation in the environment of the institution. Finally, we can say that the constant changes are forcing the market and university actors toward openness, to a new type of communication and everyday development; this is the basis of innovation. In this new space, the tasks, responsibilities and relationships will change, requiring the adequate adaptation of the examined higher education institution.

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Spremembe v odgovornostih in nalogah univerz v regionalnih inovacijskih ekosistemih

Izvleček

Raziskovanje inovacijskega procesa se spreminja, saj postaja poleg predhodnega teritorialnega pristopa (proučevanje držav in najmanj regij) opis inovacijskega sodelovanja v lokalnih območjih vse bolj sprejet. Namesto inovacijske sposobnosti tradicionalnih velikih podjetij se je začelo proučevanje vloge malih in srednje velikih podjetij, nevladnih organizacij, lokalnih vlad, izobraževalnih institucij – še posebej univerz, kar nakazuje razvoj novega inovacijskega sistema. V letu 2015 je bila izvedena študija, v kateri smo se osredotočili na projekt civilnih in korporacijskih odnosov glavne univerze. Poskušali smo določiti nove usmeritve, ki temeljijo na ekonomskem in družbenem sodelovanju, kot tudi poiskati praktično uporabo teoretičnih helixov v teh interakcijah. Prišli smo do zaključka, da univerze niso samo deterministične glede na trojni model helix, temveč imajo tudi ugledno vlogo v ustvarjanju novega inovacijskega ekosistema, še posebej v zelo dobro opredeljenem geografskem območju.

Ključne besede: modeli helix, inovacija, družbena inovacija, odnosi univerze.

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An Empirical Study Regarding Radical Innovation, Research and Development Management, and Leadership

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Abstract

The objective of this research is to empirically compare the management that is most suitable for radical innovation with that needed for incremental innovation. The relationship between the results of research and development and management styles was surveyed using a questionnaire. Respondents included research and development leaders in Japanese manufacturing, with special attention given to the differences between radical innovation and incremental innovation. Results verified, in an integrated way, the management and leadership factors, taking into consideration the differences arising from the object under analysis and the environmental factors.

Keywords: radical innovation, incremental innovation, research and development management, leadership, size of the firm, technology life cycle, kinds of goods

Introduction

The objective of this research is to empirically compare the management that is most suitable for radical innovation with that which is needed for incremental innovation.

Conventionally, many Japanese manufacturers have excelled at incremental innovation (e.g., Lam, 2005). However, the research and development (R&D) management that is appropriate for incremental innovation is not always effective for radical innovation. The traits of Japanese R&D organisations are often compared to rugby (Nonaka et al., 1995): all of the members move forward, little by little, in a horizontal line in cooperation, with no one moving ahead of the others. On the other hand, radical innovation may resemble American football. It is innovation using an idea that is not bound in the past, and it efficiently uses a star's personality and projected capabilities. Therefore, the leadership of an R&D team may be important. There may be a close relationship between the realisation of outstanding innovation and the organisation and its human resource management.

However, as described later in section 2, the findings regarding the relationships between the results of innovation and management styles have not been uniform in previous research study. The causes of this inconsistency include the variations in the R&D results and the mixture of the goods at issue. Furthermore, various

factors are considered to be related to the success or failure of R&D (Griffin & Page, 1993). Similarly, the success or failure of a management style may change as a result of differences in specific industries, products, technologies, and other aspects of the business environment. Therefore, in analysing the optimal relationship between the results of innovation and management styles, classifying various influences, such as the specific companies, technologies, and environments, is important.

As the research question of this research, the relationship between the results of R&D and management styles was surveyed using a questionnaire answered by R&D leaders in Japanese manufacturing, with special attention given to the differences between radical and incremental innovation. The questionnaire items were designed using prior research on R&D management.

Prior Research

After surveying the literature on radical innovation, the prior research on the relationship between innovation and management and leadership was surveyed. Since radical innovation is considered relevant for venture businesses, the size of the firms and their life cycles were given particular attention. In addition, the differences between the types of goods, such as those aimed at consumers and those designed for companies, were noted.

Radical innovation and incremental innovation

Innovation is classified into incremental innovation and radical innovation depending on its degree of newness. (e.g., Dewar et al., 1986). According to Govindarajan et al. (2005), four organisational factors of an existing business are the mastery of operational employees, hierarchical structure, a fixed accountability system, and a risk-hedge corporate culture. Meanwhile, four organisational factors of new businesses are creativity, a flat organisational structure, a system with a flexible ability to learn, and a risk-tolerant corporate culture. Macher (2004) stated that acquisitions are needed for an existing company that is initiating disruptive innovation, because the management for disruptive innovation is different from that for incremental innovation.

Radical innovation and R&D management

Regarding the relationship between management and innovation, Tushman et al. (1980) asserted that an R&D division must consider various directions, such as external technology and the market environment, head-office strategies and intentions, and collaboration between the sales and production departments. According to Morton (1971), by optimising the barriers and bonds of an organisation, a technician can develop his creative power freely and can cooperate well with other technicians. For example, a central laboratory is appropriate for radical innovation in comparison with a division laboratory (O'Connor et al., 2005). In order for a creative group to generate significant results, it is necessary to vary the thinking style and the special capabilities in a group and combine them appropriately (Luecke et al., 2003). According to James (2002), the factors that provide the most motivation to engineers and scientists are their interest and the degree of freedom they are granted.

Radical innovation and leadership

Regarding the relationship between leadership and innovation, today's technical managers are required both to have clear, objective proposals and orientations and to consider the delegation of power, education, and an attractive environment (Farris et al., 2002). Amabile et al. (2004) and Tierney et al. (2004) found a relationship between supportive leadership and creativity. Furthermore, Shin et al. (2003) found a positive relationship between transformative leadership and creativity. According to Cooper (1998), an important role for managers in product innovation is the determination of the go/kill points and the priority of a project. According to Dyer et al. (2011), five skills are needed for a disruptive innovator: associating, questioning, observing, networking, and experimenting.

Radical innovation and the scale of a company

Utterback (2005) argued that innovation occurs in small technical companies and is adopted by large-scale corporations. In large-scale corporations, incremental innovation with economies of scale is dominant. Marcati et al. (2008) found that an entrepreneur's personality is key in the innovation of smaller enterprises. Meanwhile, Revilla et al. (2012) indicated that the relationship between the productivity of R&D and the size of a firm is not constant but is influenced by management methods.

Radical innovation and the different kinds of goods

Problems regarding the objects of the analyses can be considered as one reason why the results of the preceding research on the success factors of product development have not been uniform. For example, Iansiti (1993) showed that the scale and diversity of research activities in the initial development phase are effective in order to evaluate and

select various technologies, based on the analysis of the development project for a mainframe computer. With respect to the research scale, Barnett et al. (1998) showed that the accumulation of knowledge about technological assessments through past experiences was effective in the product development of the chemical industry. Meanwhile, in the case of consumption goods, it is necessary for developers to anticipate potential needs in advance and propose new concepts (Clark et al., 1991).

Radical innovation and the life cycle

Abernathy et al. (1983) considered the maturation of the industry based on the evolutionary patterns of a product's technology and indicated that it moved from the early stage, which is centred on radical product innovations, to a mature phase, which is centred on incremental process innovations. When there are transformations in the external environment, such as changes in technology and consumer preferences, the technology moves to the de-maturity (new growth) phase. According to Tushman et al. (1997), the innovation in a cycle of discontinuous change is produced as a result of the unpredictability of entrepreneurial organisations. Meanwhile, the organisational models in a cycle of incremental change are characterised by formulated roles and responsibilities, intensive processes, an efficiency-oriented culture, a sufficiently designed work process, and a strong manufacturing and selling capability.

Survey Hypotheses and Research Design

Survey hypotheses

The questionnaire was designed to clarify the traits of R&D management for the creation of radical innovations in contrast to those necessary for incremental innovation. The fundamental framework of the research design was based on the above-mentioned prior research and is shown in Figure 1.

Here, the objective variable is the result of radical or incremental innovation.

The explanatory variables are R&D management and leadership. The control variables are the management environments, such as the size of the firm, the kinds of goods, and the life cycle of the company or the product. The cause-effect relationships were thought to be as follows: the optimal organisational management changes with the strategic goals and the business environment, and the optimal leadership changes with the strategic goals, the business environment, and the organisational management. The following survey hypotheses were formulated based on the above framework:

H1. The management of R&D needed to bring about radical innovation differs from the management needed to bring about incremental innovation.

H2. The R&D leadership needed to bring about radical innovation differs from the leadership needed to bring about incremental innovation.

H3. The relationship of the results of innovation, R&D management, and leadership is affected by the scale of a company.

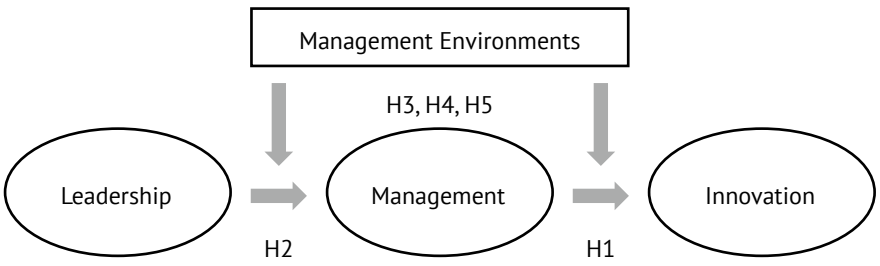
H4. The relationship of the results of innovation, R&D management, and leadership is affected by the kinds of goods involved in this relationship.

H5. The relationship of the results of innovation, R&D management, and leadership is affected by the life cycle of the company and the product.

Methodology and data

The items on the questionnaire were created based on the above-mentioned hypotheses. In addition to the evaluation of the product, which is the final result of the R&D, a patent and academic society publication was adopted as a proxy variable for the R&D process evaluation regarding the

Figure 1. The fundamental framework of the research design



result of the innovation, which is the objective variable. The number of items and the degree of innovation were evaluated. All of the questionnaire items were rated on a 5-point Likert-type scale (Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree). The manufacturers' R&D managers were set as the targets for the survey. The questionnaires were distributed and collected by active businesspeople who are students at the business school that the author heads, as well as over social networks. The survey period took place during October 2015. A total of 100 responses to the questionnaire were received (39 students and 61 respondents over social networks). As a result of the performance of an evaluation of the deficit value or the abnormal value, an evaluation of the ceiling and the floor effect, a reliability assessment, and so forth, the final number of effective responses was 81. With respect to the effective responses to the questionnaire, in order to verify each hypothesis, the following statistical analyses were conducted. SPSS by International Business Machines (Ver. 23) was used to perform the statistical procedures.

Results

Factor analysis results

First, two or more questionnaire items were collected into groups based on the hypotheses, and a factor analysis was conducted. The major factors (with an eigenvalue of one or more) for each group were extracted using the principal factor method (promax rotation).

Two factors were extracted as a result of the factor analysis of the questionnaire items regarding the results of the innovation, which are the objective variables.

The first factor consists of the questionnaire items regarding the numbers of products or the results of the research; this was called the incremental innovation factor. The second factor consists of questionnaire items regarding the degree of the new-product ratio in the product portfolio, or the novelty; this was called the radical innovation factor.

Next, among the explanatory variables, first, as a result of the factor analysis of the questionnaire items regarding the organisational operation of R&D management, three factors were extracted. The first factor consists of questionnaire items regarding personnel exchanges between sections, internal and external interchange, and so one; this was called the personnel-exchanges factor. The second factor consists of questionnaire items regarding the scale of an R&D group; this was called the research scale factor. The third factor consists of questionnaire items regarding the differentiation of the team for original and radical research; this was called the original factor.

Next, three factors were extracted as a result of the factor analysis of the questionnaire items regarding research management in R&D management. The first factor consists of questionnaire items regarding the formation of a new technology-oriented team, industry-university cooperation, and so on; this was called the technical-oriented factor. The second factor consists of questionnaire items regarding a long R&D time period, a stage administration, and so one; this was called the long-term-oriented factor. The third factor consists of questionnaire items regarding the formation of a market-oriented team, the high frequency of performance appraisals, and so on; this was called the market-oriented factor.

Next, one factor was extracted as a result of the factor analysis of the questionnaire items regarding the research diversity in R&D management. It consists of the questionnaire items regarding diversity, such as the specialised fields of study and age, and it was called the research diversity factor.

Next, one factor was extracted as a result of the factor analysis of the questionnaire items regarding the culture of R&D management. It consists of questionnaire items regarding a researcher's discretion, personal respect, and so on; this was called the cultural factor.

Next, two factors were extracted as a result of the factor analysis of the questionnaire items regarding leadership in management. The first factor consists of questionnaire items regarding the flexible business solutions for a project, negotiations, and so on; this was called the flexible factor. The second factor consists of questionnaire items regarding the assignment of work, progress management, control, and so on; this was called the process-oriented factor.

Next, two factors were extracted as a result of the factor analysis of the questionnaire items regarding leadership. The first factor consists of questionnaire items regarding the presentation of a vision and a scheme to followers; this was called the structure factor. The second factor consists of questionnaire items regarding the fiduciary relationship with followers, mental support, and so on; this was called the consideration factor.

Next, one factor was extracted as a result of the factor analysis of the questionnaire items regarding decision making in leadership. It consists of questionnaire items regarding decisions in complicated situations, the participation of followers in decision making, and so on; this was called the decision-making factor.

Next, one factor was extracted as a result of the factor analysis of the questionnaire items regarding individual capabilities in leadership. It consists of questionnaire items regarding networking ability, presentation ability, and so on; this was called the individual-capabilities factor.

Test statistics for each factor analysis are shown in Table 1.

Regression analysis results

With respect to the factor score for each factor, based on the hypotheses, the regression analysis was applied for each hypothesis, and the relationship was verified. First, each innovation result factor was made into an objective variable, and each R&D management-related factor was made into

Table 1: The test statistics for each factor analysis

	T1	T2	T3	T4	T5
Results of the innovation	.518	.000	74.215	56.618	.804
Organisational operation of R&D	.576	.000	74.215	56.618	.750
Research management in R&D	.752	.000	63.000	48.077	.806
Diversity in R&D management	.814	.000	53.474	43.675	.754
Culture of R&D management	.764	.000	60.078	50.975	.825
Leadership in management	.555	.000	53.097	43.568	.795
Leadership	.624	.001	66.015	49.850	.757
Decision making in leadership	.507	.001	54.153	44.964	.761
Individual capabilities in leadership	.583	.006	46.663	30.046	.717

(T1: Kaiser-Meyer-Olkin (KMO), T2: Bartlett's test of sphericity (%), T3: Eigenvalues with cumulative variance (%), T4: Extraction sums of squared loadings with cumulative percentage (%), T5: Cronbach's alpha).

Table 2: The multiple linear regression analysis results during a factor score

Environment	Innovation	Management	Leadership
Large-scale corporation	Incremental	Market oriented (.474*) [.256, .016**]	Process oriented (.442**) [.309, .007**]
	Radical	Personnel exchanges (.581*) [.274, .012**]	
Small and medium-size enterprises	Incremental	Originality (1.481**) [.572, .001**]	
	Radical	Culture (.717**) [.579, .001**]	Flexible (.788*) [.361, .014**]
Industry goods	Incremental	Research scale (.622*)	
		Research diversity (1.015**) [.871, 001**]	Process oriented (.421*) [.429, .040**]
	Radical	Technical oriented (.664*) [.556, .013**]	Structure (.645*) [.503, .022**]
Consumption goods	Incremental	Originality (.346*) [.239, .034**]	Decision making (.669*) [.249, 030**]
	Radical	Market oriented (.474**)	Decision making (.595*) [.239, .034**]
		Personnel exchanges (.375*) [.578, .001**]	
Growth phase	Incremental		
	Radical	Research scale (-1.086**)	
		Originality (1.236:*)	Individual capabilities (1.055*) [.662, .026**]
		Technical oriented (.873*) [.980, .005**]	Individual capabilities (.764*) [.671, .024**]
Mature phase	Incremental	Research scale (.605**) [.309, .009**]	Flexible (-. 688**) [.371, .003**]
	Radical	Long-term oriented (.477**)	Structure (-. 574*) [.215, .034**]
		Research diversity (.411**) [.748, 000**]	Process oriented (.407*) [.224, .030**]
Decline phase	Incremental	Long-term oriented (.628**)	
		Cultural (.410**) [.918, .003**]	Consideration (2.101*) [.975, .012**]
	Radical		

Note: Parentheses () indicate partial regression coefficients; square brackets [] indicate the determination coefficient and the significance probability of the F-test. (** Significant at .01; * Significant at .05.)

an explanatory variable. Subsequently, each R&D management related-factor was made into an objective variable, and each leadership-related factor was made into an explanatory variable.

In each analysis, a regression analysis was applied according to the size of the firm, the kinds of goods, and the life cycle. The size of the firm was measured by the yearly turnover; 100 billion yen (about 800 million euro, which was a near medium value of the samples) or more was classified as a large-scale corporation, while less than 100 billion yen was classified as a small or medium-size enterprise. About 59% of the responses to the questionnaire were from large-scale corporations, and about 41% were from small and medium-size enterprises. The kinds of goods were classified into industrial goods (including capital goods and construction goods) and consumption goods. About 51% of the responses of the questionnaire addressed industrial goods, and about 49% addressed consumption goods. The life cycle was classified into the growth phase, the mature phase, and the decline phase. About 22% of the respondents to the questionnaire were in the growth phase, about 65% were in the mature phase, and about 13% were in the decline phase. The regression analysis revealed only the factors with statistically significant relationships, using the stepwise procedure. The factors and the partial regression coefficients that were revealed are shown in Table 2.

Findings and Discussion

The different relationships between R&D management and leadership were extracted for radical innovation and incremental innovation, respectively, as a result of the statistical analysis of the questionnaire. In addition, those relationships were affected by environmental conditions, such as the size of the firm, company age, and the kinds of goods.

First, the size of the firm was considered. H1-3 belong to this section. In the case of a large-scale corporation, incremental innovation is created by market-oriented research with a leader management style. Large-scale corporations have abundant managerial resources (e.g., human and intellectual resources, R&D equipment, etc.) within the company, and it is considered that the incremental results of the research are steadily created, mass-produced and sold by managing the resources specifically for the market. On the other hand, radical innovation is created by diversified interchange within and outside a company. In order for a large-scale corporation to create radical technology and products, utilising external resources (e.g., a university or a venture business) or promoting the interchange of diverse, talented people in the company is thought to be effective. This result is consistent with the prior research (see 2-4).

Next, in the case of a small or medium-size enterprise or venture business, in contrast to a large-scale corporation, original research is important for incremental innovation. Unique research in a niche area can contribute to successful competition with with a large-scale corporation despite comparatively scarce managerial resources. Furthermore, with respect to radical innovation, a research-oriented culture with flexible leadership is important. This corporate style and culture, which are not present in large-scale corporations and existing enterprises, may induce original and disruptive products. This result is consistent with the prior research (see 2-4). Thus, H1-3 were accepted.

Next, the kinds of goods are considered. H1, H2, and H4 are relevant to this section. In the R&D of industrial goods, incremental innovations are created when the input of resources is increased for R&D and the leader appropriately manages diversity. In the case of industrial goods, it is thought that the customers are also professionals and the evaluation of technology is stringent. In order to create outstanding technology, a large amount of research (e.g., many trial experiments) is required, and the amount of research resources is considered to be important. This result is consistent with prior research (see 2-5). In addition, in order to properly assemble diverse team members, it may be important for the leader to appropriately manage each milestone in the research process. In addition, radical innovation is created in the pursuit of technology by a leader with a visionary style. In order to create radical technology, a leader's transcendent vision and beliefs may help to promote the research project.

Meanwhile, in the R&D of consumption goods, in incremental innovation, original research is useful. Further, a leader's decision-making ability promotes R&D. In the case of consumer goods (since, in general, consumers' needs are ambiguous and fickle), the manufacturing side may be required to positively change a product concept and make a novel proposal. In the case of industrial goods, the quality of a product can be measured by its technical specifications, but market surveys regarding the popularity of consumption goods may have limitations, and a decision from the sales side may be needed. This result coincides with those found in prior research (see 2-5). In addition, in radical innovation, dialogue with marketing or other sectors is useful. Further, a leader's decision-making ability promotes R&D for incremental innovation. In consumer-oriented product development, the proposal of solutions developed through cooperation between distributors and retailers, service companies, and so on may be important. Thus H1, H2, and H4 were accepted.

Finally, the differences arising from the product and corporation life cycles are considered. H1, H2, and H5 are

relevant to this section. First, in the case of the growth phase, the management factor was not extracted for incremental innovation. At the time that a product's market begins to extend, radicalism and novelty in research are considered to be important. With respect to radical innovation, the pursuit of original technology is more useful than the amount of resources injected into R&D. In addition, the results are dependent on an individual leader's capabilities. Research in an organisation in which independence without bondage is higher than in past experiences is considered to be effective in the growth phase. Giving priority to heightening technical capabilities above all other aspects is thought to create results, as are individuals who champion these types of research capabilities. These results coincide with those in prior research (see 2-6).

Next, in the case of the period of maturity, the research scale is important for incremental innovation, and a managing type of leader is more desirable than flexibility. During the period of maturity, in which the objective of R&D is converted from quality to quantity and competition intensifies, steadily improving the product, the production process, and so on is considered necessary to expand the market share and to improve productivity. On the other hand, for radical innovation, long-term research by a transfer-of-authority type of leader and the suitable management of diverse research and talented people are useful. When entering the period of maturity, in which many competitors are entering the market and price competition is intensifying, improvements in productivity and cost reductions are required. On the other side, R&D aimed towards the next phase (i.e., de-maturity) is required. In such long-term R&D, supportive type leaders who respect researchers' independence are thought to be more appropriate than the vision-oriented leaders of the growth phase. In addition, although the diversity of research can improve innovation, in order to assemble diverse, talented people, both within and outside the company, a leader who provides orderly management at each milestone of a process is required. These results coincide with those in prior research (see 2-6).

Lastly, long-term-oriented R&D by leaders with a consideration style is also useful for incremental innovation during the decline phase. In addition, the management factor was not extracted for radical innovation. In the decline phase, in which the protraction of the life cycle of the product serves as the objective, good communication with existing customers is required, rather than radical innovation. Thus, H1, H2, and H5 were accepted.

Conclusion

This research was aimed at empirically clarifying the types of R&D management and leadership that promote radical innovation in contrast to those that are needed for incremental innovation. Although a variety of actual evidence and results have been shown regarding innovation, management, and leadership in the prior research, those results have not been unified together. As a result, radical innovation and incremental innovation remained intermingled; the relationship between management factors and leadership factors remained unexplained; and the influence of environmental factors, such as the kinds of companies and goods at issue, remained ambiguous. One contribution of the present research is that it verified, in an integrated way, the management and leadership factors, taking into consideration the differences arising from the object under analysis and the environmental factors. As an implication of this research, it is expected that the minute positive results of the research will provide support for decision making by the R&D managers of companies. With respect to the limitations of this research, since the analysis of this research is limited to Japanese firms, it is possible that the research findings were influenced by environmental factors specific to Japanese firms. Future research should include the use of a larger number of samples and international comparative research. Also, the interaction among various environmental factors needs to be analysed.

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Appendix

Questionnaire items (translated)

Variables	Items	Scales
Objective variables	✓ Number of products ✓ Number of results of the research	1: 3 or fewer per year 2: 4-6 per year 3: 7-9 per year 4: 10-12 per year 5: 13 or more per year
	✓ Number of conference presentations	1: 5 or fewer per year 2: 6-15 per year 3: 16-30 per year 4: 31-50 per year 5: 51 or more per year
	✓ A large new-product ratio in the product portfolio ✓ Novelty of the products	1: Strongly disagree 2: Disagree 3: Neither agree nor disagree 4: Agree 5: Strongly agree

Variables	Items	Scales
Explanatory variables (Management)	✓ Frequent personnel exchanges between sections ✓ Frequent internal interchanges ✓ Frequent external interchanges ✓ Large-scale R&D groups ✓ Many R&D groups ✓ Existence of a team for original and radical research ✓ Differentiation of tasks of R&D groups ✓ Existence of a new technology-oriented team ✓ Active industry-university cooperation ✓ Evaluation of technology-oriented performance ✓ Long R&D time period ✓ Rigidness of a stage administration ✓ Large ratio of research expense ✓ Priority of the technology road map ✓ Existence of a market-oriented team ✓ Priority of customer needs ✓ High frequency of performance appraisals ✓ Great diversity of specialised fields of study ✓ Great diversity of age ✓ Great diversity of backgrounds ✓ Great diversity of members in a project team ✓ Researcher's much discretion ✓ Great respect for researcher's autonomy ✓ Great independence of the research organization ✓ Flat organization	1: Strongly disagree 2: Disagree 3: Neither agree nor disagree 4: Agree 5: Strongly agree
Explanatory variables (Leadership)	✓ Flexible in business solutions for a project ✓ Excel in negotiation capability ✓ Excel in problem solving ability ✓ Excel in the appropriate assignment of work ✓ Excel in progress management ✓ Excel in process control procedure ✓ Active in the presentation of a vision and a scheme to followers ✓ Acutely conscious of mission ✓ Strong fiduciary relationship with followers ✓ Active in mental support ✓ Active in empowerment ✓ Excel in decisions in complicated situations ✓ Active adoption of followers in decision making ✓ Good under pressure ✓ Excel in networking ability ✓ Excel in presentation ability ✓ Strong intellectual inquiry	1: Strongly disagree 2: Disagree 3: Neither agree nor disagree 4: Agree 5: Strongly agree
Environment variables	✓ Category of industry	1: Manufacturing 2: Other
	✓ Type of occupation	1: R&D manager 2: Other
	✓ Yearly turnover (yen)	1: 100 million or less 2: 100 million – 5 billion 3: 5-10 billion 4: 10-100 billion 5: 100-500 billion 6: 500 billion -1 trillion 7: 1 trillion or more
	✓ Type of goods	1: Industry goods 2: Consumption goods
	✓ Life cycle of the company and the product	1: Growth phase 2: Mature phase 3: Decline phase

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Empirična študija radikalnih inovacij, upravljanja raziskav in razvoja ter vodenja

Izvleček

Cilj raziskave je empirično primerjati upravljanje, ki je najprimernejše za radikalne inovacije, potrebne za postopne inovacije. Kar zadeva metodologijo, smo z anketiranjem vodij raziskav in razvoja v japonski industriji ugotavljali povezavo med rezultati raziskav in razvoja ter stili upravljanja s posebnim poudarkom na razlikah med radikalnimi in postopnimi inovacijami. Raziskava je potrdila povezanost dejavnikov upravljanja in vodenja, upoštevajoč razlike, ki izhajajo iz predmeta analize in okoljskih dejavnikov.

Ključne besede: radikalne inovacije, postopne inovacije, upravljanje raziskav in razvoja, vodenje, velikost podjetja, življenjski cikel tehnologije, vrsta blaga.

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Household Accounting – A Case of Subsidised Self-Employed Entrepreneurs in Slovenia

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Abstract

This paper presents the results of the first empirical study of household accounting in Slovenia, which was conducted on a sample of households of subsidised self-employed entrepreneurs. Based on an original measurement of the levels of household accounting, this study presents the scope of different accounting components in these households. Further, it gives the results of the comparison between those subsidised self-employed entrepreneurs who managed to keep their business and those who failed to do so. The comparison of the results showed a statistically significant difference between the two groups of entrepreneurs only in terms of the scope of monitoring of household costs and expenditures.

Keywords: household accounting, self-employed entrepreneurs, entrepreneurial success

Introduction

According to Weber (2002), the development of modern capitalism was significantly influenced by double-entry bookkeeping, which paved the way for rational entrepreneurship and the separation of a business from a household.[1]

[1] For the purpose of this research, we apply the economic definition of a household (SURS, 2002), according to which a household is "a group of people living together and sharing their income for covering the basic costs of living (accommodation, food, other consumer goods, etc.) or a person living alone."

NG OE

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pp. 32–41

This, in turn, enabled the creation of guilds and, subsequently, of individual entrepreneurship (Adam, 2001; in Weber, 2002, p. 219).

Weber (2002, p. 11) states that wherever there is a tendency towards a rational pursuit of capitalistic acquisition, the corresponding actions are adjusted to calculations. We can therefore conclude that calculation, as it relates to a certain degree of rationality or a certain scope of individual accounting components, exists in households as well, with the latter being the subject of the present research.

Professional accounting in business developed from the accounting performed in households and by individuals, since business affairs in the past were closely interwoven with the living expenses and personal affairs. In fact, separate sets of books were seldom maintained for the 'business'[2] and for the household as distinct units (Fagerberg, 1954, p. 356).

Household accounting has received little attention in research literature on accounting. Accounting in business has advantages over household accounting, both as regards the development of new techniques and methods and in terms of its research (Fagerberg, 1954; Walker & Llewellyn, 2000; Jayasinghe & Thomas, 2008; Jeacle, 2009). Most research on household accounting was carried out towards the end of the previous century and at the beginning of this century. In the Slovenian context, no such study has been performed prior to the present study.

Economic rationalism depends on rational technique and rational law as well as on the ability and discipline of individuals to lead a practical and rational life (Weber, 2002, p. 17). The level of rationality of capitalistic acquisition is the very circumstance that forces a business or a household into accurate calculation (Weber, 2002, p. 11). Therefore, individuals with more entrepreneurial abilities are expected to develop such calculations to a greater degree. For this reason, the present study focuses on household accounting of Slovene entrepreneurs, as this subject has not yet been studied in the Slovenian context.

The endeavour for economic rationalism (as defined by Max Weber, 2002) and the related calculations-oriented behaviour is thus of key significance for both the start-up and the survival of a business. Based on this, the core research questions in this paper are 1) whether there is a relation between the level of household accounting (as an external reflection of economic rationalism, as stipulated by Weber, 2002) and the success of entrepreneurial activity of individuals and 2) what the strength of this (potential) relation is. In this research, this (potential) relation is studied in a sample of subsidised self-employed entrepreneurs in Slovenia. This topic is significant since, to our knowledge, no such research has been conducted prior to this study.

The aim of this paper is therefore to study the level of accounting in the households of subsidised self-employed entrepreneurs in Slovenia and to investigate the interrelatedness of the level of accounting in these households and the success of the entrepreneurial activities of these entrepreneurs.

Literature Review and Hypothesis

One of the few empirical studies on household accounting (based on ten households), which was carried out in Great Britain (Northcott & Doolin, 2000), gives an insight into four areas of the accounting practices of households: (1) *budgeting*, (2) *record-keeping* (setting up and maintaining records), (3) *decision making*, and (4) *long-term financial planning*. The same study also reveals various uses and perceived benefits of these home accounting principles (ibid.):

(1) *being in control* (i.e., to have control over the household financial position). Such financial control appears to have a short-term, cash-oriented focus, reflecting a concern for balancing the household budget and aimed at providing a sense of security as the ultimate goal of household accounting activities;

(2) *accounting in the home's emotional context* (i.e., pursuing a certain quality of life, mitigating uncomfortable emotions and positively reinforcing identity and a sense of security and independence);

(3) *reinforcing identity* (e.g., associating one's personal characteristics as a self-disciplined and conscientious individual with the ability to adhere to budget goals and the ability to not fall into debt); and

(4) *being rational* (i.e., using accounting as means of achieving one's goals).

Pahl (2000) adopted a more sociological approach in her study on accounting and accountability in the household economy. The study was not focused as much on the techniques of accounting as on the implications for individuals

[2] The term 'business' is used for any business venture, which is not necessarily separate from the entrepreneur as a person. It may exist in the form of a company with share capital or in the form of an unincorporated business (e.g., partnership or sole trader). The term 'business' refers to a registered for-profit activity.

within the couples in households, which were a result of pooling incomes and of joint responsibility for the spending and keeping of records of the money spent.

Adopting a micro-historical approach, a number of studies were carried out on *personal account books* or *household books* kept by individuals in the 18th and 19th centuries in Great Britain (MacDonald, 2010; McKinstry & Fletcher, 2002; Virtanen, 2009; Vollmers & Tyson, 2004; Carter, 1999) and in Australia (Carnegie & Walker, 2007a, 2007b). An extensive empirical research was conducted in 1993 in Germany (Piorkowsky, 2000) prior to the design of *The New Household Book* (*Das neue Haushaltsbuch*). This research showed that the accounting practices of households were highly individualized and based on the needs of an individual household and on the abilities and skills of its members.

The research into household accounting in Japan (Komori, 1998, 2006, 2007, 2011; Komori & Humphrey, 2000) shows that a household may have a broader economic and social role than is evident from studies in the Anglo-Saxon context. The Anglo-Saxon-based studies (as well as the research presented in this paper) are based on the assumption that a household unit is merely a place of consumption, where only non-productive activities are pursued. A household in the Anglo-Saxon context holds a less significant social role than other parts of the society compared to a household in Japan (Llewellyn & Walker, 2000; Komori & Humphrey, 2000). Due to the Japanese cultural and economic tradition, the awareness of the significance of the household and its accounting has been present in Japan since the 15th century. This awareness was further strengthened after the Second World War by the endeavours of the Japanese government to promote household accounting. For a number of years, the Japanese government awarded prizes for essays in which the applicants had to give a detailed description of their household accounting practices. The publication of their essays on household accounting practices gave Japanese women a sense of a worth and purpose in society, as the Japanese social structure made it quite difficult for women to work outside the home (Komori, 2007). The research shows a decline of household accounting in typical Japanese families at the turn of the millennium (Komori & Humphrey, 2000) as a possible result of the increased standard of living, which allowed for non-essential expenditures without the need to save every single yen (Komori & Humphrey, 2000).

Based on the existing research regarding household accounting (Carnegie & Walker, 2007a; Carnegie & Walker, 2007b; Jacobs & Kemp, 2002; Komori & Humphrey, 2000; Llewellyn & Walker, 2000; Northcott & Doolin, 2000; Pahl, 2000; Piorkowsky, 2000), we can determine its key components. These are (1) annual and interim budgeting; (2) long-term budgeting of cash flows; (3) collecting, organizing, processing and keeping of accounting data and documents; (4) bookkeeping or records maintenance; (5) preparation/use of accounting information for decision making in households; and (6) accounting analysis as the basis for measuring the economic achievements of a household.

Because the level of rationality of capitalistic acquisition is what forces a business or a household into accurate calculation (Weber, 2002), we can assume that individuals with more entrepreneurial characteristics perform such calculations to a higher degree than other individuals, since entrepreneurial rationality is more developed in individuals who possess more entrepreneurial characteristics (Weber, 2002). Taking into account that calculation is part of accounting and that it requires collecting and organizing a set of data subject to accounting control and analysis, the following research questions arise: 1) *whether there exists a relation between the level of household accounting (the scope of accounting components) and the success of entrepreneurial activity of individuals* and 2) *what the strength of this (potential) relation is*. To our knowledge, no research into this specific topic has been conducted prior to this study.

In entrepreneurship, financial comparison of inputs and proceeds is crucial for determining economic success regardless of how advanced this comparison is (i.e., whether it is done by means of modern book-keeping methods or in a more primitive and crude way) (Weber, 2002). According to Weber (2002, p. 11), economic rationalism is reflected in more detailed calculations. A business run by an entrepreneur using more detailed calculations (i.e., accounting) will therefore most likely survive longer and be more successful. For the same reason, more successful entrepreneurs may also show higher levels of household accounting activities.

On the other hand, entrepreneurs as sole traders are also obliged to keep accounting records for their businesses, and these records also include a certain scope of household accounting, since sole traders are liable for debts with all their personal property. They can therefore keep records of cash flows and flows of real assets between their business and their household as well. In this way, they manage a certain part of their household accounting records by managing the accounting records of their business. Based on this, it is reasonable to expect that sole traders' households keep accounting records that are exclusively related to the household (and thus excluded from the accounting activities related to their sole proprietorship) to a lesser extent than any other households.

This research focuses on households of a specific group of entrepreneurs (i.e., subsidised self-employed entrepreneurs in Slovenia). Providing subsidies for self-employment to the unemployed is one of the forms of fostering entrepreneurship and is carried out by the Employment Service of Slovenia (ZRSZ, 2016) in cooperation with the European Social Fund (ESS, 2016).[3] If the self-employed individual manages to keep the business for more than two years, the Employment Service of Slovenia treats him/her as having succeeded in self-employment.

Based on our research question, the following hypothesis was tested in this study:

H_1 = The scope of components in household accounting of those Slovenian subsidised self-employed entrepreneurs who managed to keep their business for at least three years after receiving the subsidy differs from the scope of components in household accounting of those subsidised self-employed entrepreneurs who did not manage to keep their business.

Research Methodology

Survey participants were sampled in January 2013 from the population of Slovenian entrepreneurs who received a self-employment subsidy from the Employment Service of Slovenia between 2007 and 2010. We assumed that, in order to see whether recipients of these subsidies had been successful in keeping their business, at least three years after the receipt of the self-employment subsidy should be taken into account. The Employment Service of Slovenia divided these unemployed individuals who received self-employment subsidies (11,572 individuals), into two groups, based on data about these recipients' status in the sampling period (January 2013). The first group comprised those individuals who succeeded in their self-employment. The second group included those persons who failed to keep their business (i.e., they were not conducting their entrepreneurial activities at the time of the start of our interviewing, between January and April 2013, or they had discontinued their entrepreneurial activities prior to January 2013). When deciding on the sampling period (i.e., individuals receiving subsidies between 2007 and 2010), we presupposed that the probability of the business established by a subsidised self-employed entrepreneur being successful in the long term increases with the remoteness of the year of its establishment from the year of sampling. The Employment Service of Slovenia randomly selected 400 individuals from each group and sent them our questionnaires (the questionnaires were adapted for each group). The response rate from the successful self-employed individuals was 29.25% (117 completed questionnaires were returned) and the response rate from the unsuccessful self-employed individuals was 22.5% (90 completed questionnaires were returned).

For the purpose of this research, both questionnaires served to obtain basic demographic information about our study participants (gender, year of birth, level of education) and the data about their household accounting practices for 5 types of accounting activities: (1) collecting, sorting, processing and keeping of accounting documents; (2) monitoring of costs and expenditures (disbursements); (3) monitoring of transaction account changes; (4) budgeting of income (cash inflows), costs and expenditures (disbursements); and (5) accounting analysis.

When analysing individual accounting activities, we were not interested only in their existence in individual households but also in their scope (if applicable). Since the latter has not yet been researched, a new variable called '*the scope of household accounting components*' has been introduced, which represents an original approach to household accounting activities research. For each accounting activity, we formulated the responses regarding the existence of the individual accounting component in such a way that the responses also reflected the degree to which each component is present (e.g., records of some or all expenses; records sorted by types or not sorted). Next, we assigned points between 0 and 3 to all possible responses related to each individual accounting component in terms of the degree of their presence in household accounting (as shown in Table 1).

The sum of the scores obtained represents the value of the variable that measures the scope of individual household accounting components; the variable value can thus span between 0 (the lowest value) and 19 (the highest value).

To test the hypothesis, the non-parametric Mann-Whitney U test (Agresti and Finlay, 2009) for two independent groups (significance level of 5%) was performed.

[3] The person who receives such subsidy (i.e., a one-time financial support in the form of a grant) has to start up a business (either a sole proprietorship or a limited liability company) and has to work full time in this business. The receiver of this subsidy is obligated to keep his/her self-employment for at least two years; if this requirement is not fulfilled, he/she must return the corresponding proportion of the subsidy.

Table 1: Scoring of answers to the questions about household accounting activities of the receivers of self-employment subsidies[4]

(1.) Practice of collecting, sorting, processing and keeping of accounting documents				Total 9
	1. keeps all bills	2. keeps bills for higher values / for warranties		max 2
		3. keeps all bank account statements and contracts		1
		4. keeps all payroll statements and personal earnings statements		1
	5. keeps the documents in chronological order, sorted by their purpose	6. keeps the documents in chronological order, not sorted by their purpose	7. no sorting of documents	max 2
8. keeps in binders, file folders / envelopes, separated by type	9. keeps in binders, file folders / envelopes, all together	10. keeps in one place, not sorted	11. keeps in different places	max 3
(2.) Accounting control – control over costs and expenditures (disbursements)				Total 3
a) written records sorted by types / purposes	b) written records kept unsorted – total	c) written records of some – major	d) no written records	max 3
(3.) Accounting control – the control of movements in transaction account				Total 3
a) yes – we record all purchases, check transaction account	b) yes – we record major purchases, check transaction account	c) yes – we check from memory	d) do not check	max 3
(4.) Level of detail of accounting budgeting – budgeting of income, costs and expenditures (disbursements)				Total 2
	a) detailed	b) general	c) no planning	max 2
(5.) Frequency of accounting analysing – budgeting per purpose and budgeting control				Total 2
	a) Yes –plan and control regularly	b) Yes –plan and control occasionally	c) No – do not plan or control	max 2
				Total 19

Results and Discussion

The basic characteristics of the sample, according to the structure of study participants, are shown in Table 2.[5]

Table 3 shows the results of the test of H1: *The scope of components in household accounting of those Slovenian subsidised self-employed entrepreneurs who managed to keep their business differs from the scope of components in household accounting of those subsidised self-employed entrepreneurs who did not manage to keep their business.*

The data for the sample show that households exhibit, on average, the highest relative level of accounting (in terms of the maximum possible number of points per individual component) in the category of the control of movements in transaction account (63.7% in successful and 65.7% in unsuccessful entrepreneurs' households). Such a high level in this category corresponds with the focus on cash control identified as the most important reason for home accounting by Northcott and Doolin (2000) and Carnagie and Walker (2007a) and may also be explained in terms of the availability and accessibility of transaction account data for customers in the modern banking environment. With regard to the fact that record keeping is the oldest form of accounting, it is not surprising that the households in the sample exhibit the second highest level of accounting activities in keeping of accounting documents (53.7% level in successful and 53.9% in unsuccessful entrepreneurs' households). Regarding the method of such document keeping,[6] the highest number (18.9%) of households keep bills only for higher values/ warranties, while a few (7.7%) keep all bills. Sorting of documents by type or in chronological order is exhibited in 19.7% of households in the sample.

[4] The answers in the first column from the left are worth 3 points. The answers in the second column from the left are worth 2 points. The answers in the third and fourth columns from the left are worth 1 and 0 points, respectively.

[5] The structure of study participants according to the successfulness of self-employment, gender and age is almost identical to the structure of the population from which the sample was taken.

[6] Detailed data about the scope of individual activities in Table 1 is available upon request from the authors.

Table 2: Characteristics of the sample (structure in %)

	Successful subsidised self-employed entrepreneurs	Unsuccessful subsidised self-employed entrepreneurs
Gender:		
- Male	48.3	55.7
- Female	51.7	44.3
Age group:		
- 25–34	37.6	32.2
- 35–44	33.3	28,9
- 45–54	24.8	26.7
- 55–64	4.3	12.2
Education:		
- Primary school	0.9	3.3
- 3-year secondary school	16.5	22.2
- 4-year secondary school	34.8	32.2
- Post-secondary / university	42.6	40.0
- Postgraduate	5.2	2.2

Table 3: Descriptive statistics and the results of the Mann-Whitney test for H1

Accounting components (maximum number of points)	Group of entrepreneurs	Mean	Standard deviation	Significance level
Practice of collecting, sorting, processing and keeping of accounting documents (9)	Successful self-employed	4.83	2.54	0.957
	Unsuccessful self-employed	4.85	2.43	
Accounting control –control over costs and expenditures (disbursements) (3)	Successful self-employed	1.04	1.18	0.049
	Unsuccessful self-employed	1.37	1.23	
Accounting control – the control of movements in transaction account (3)	Successful self-employed	1.91	0.95	0.623
	Unsuccessful self-employed	1.97	0.96	
Level of detail of accounting planning – planning of income (cash inflows), costs and expenditures (disbursements) (2)	Successful self-employed	0.67	0.75	0.453
	Unsuccessful self-employed	0.76	0.77	
Frequency of accounting analysing – budgeting per purpose and budgeting control (2)	Successful self-employed	1.01	0.84	0.612
	Unsuccessful self-employed	1.07	0.83	
Scope of all components – total (19)	Successful self-employed	9.48	3.85	0.592
	Unsuccessful self-employed	9.89	4.01	

The lowest average levels of accounting are found for the level of detail of budgeting (33.5% in successful and 38.0% in unsuccessful entrepreneurs' households). The majority of observed households do not prepare a detailed form of a budget but only a simple, unsophisticated one, which is in line with the findings of Ramlugan et al. (2016). The nonexistence of formal budgeting in some households is consistent with Northcott and Doolin's (2000) observation of only mental accounts of the possible monthly spending, as well as with the absence of the need for home budgeting observed by Ramlungan et al. (2016).

Further, the data show that successful self-employed entrepreneurs exhibit a more narrow scope of accounting components than do unsuccessful ones. This is true for all individual accounting components, as well as for all accounting components in total. The results of the statistical test show that we can accept hypothesis H1 only partially—that is, only as regards the scope of accounting components related to accounting control (i.e., the control over costs and expenditures, or disbursements) ($p<0.05$). For all other components of household accounting, the differences between the two groups are not statistically significant ($p>0.05$).

The results of this research thus demonstrate that successful self-employed entrepreneurs in our sample perform household accounting in a more narrow scope than do those entrepreneurs who have discontinued their entrepreneurial activities. This difference, which is statistically significant, may result from the fact that sole proprietors obtain a great deal of accounting information about their households already by carrying out legally mandatory accounting activities for

their businesses. Moreover, this difference could be also connected with some personal characteristics of successful entrepreneurs. For example, research suggests, for persons successfully engaged in entrepreneurship (Baron, 2000, p. 1), "that entrepreneurs are future-oriented and show tendencies toward overconfidence in their own judgements"; thus, they may rely less on formal reasoning. Businetz and Barney (1997) found that entrepreneurs of successful start-ups, as compared with managers, gathered significantly less information, utilized fewer formal techniques to analyze problems, and followed less rational decision processes.

A higher level of household accounting activities performed by unsuccessful self-employed entrepreneurs could potentially also be the result of their lower standard of living.[7] The latter would confirm the assumption made by Komori in Humphrey (2000) that the need for detailed household accounting decreases with the increase in the standard of living. It also corresponds with the findings of Pahl (2000) and Ramlungan et al. (2016) that the less money there is in a household, the more firmly it has to be managed and the more demanding is the job of the family accountant. Consequently, households at the lower end of the income ladder are more prone to use household accounting (Ramlungan et al., 2016).

Although the survey was conducted in 2013, the results are relevant since they provide first information on the level/scope of household accounting of entrepreneurs in Slovenia, obtained by an original measurement. They present a valuable data basis for future longitudinal/panel and cross-country studies of this topic. Further, by observing this issue not only in households of subsidised self-employed entrepreneurs but also in households of non-subsidised ones, additional insight into the importance of household accounting for self-employment subsidies' efficency could be gained.

Conclusion

The present study has been the first to collect empirical data about the existence and implementation of accounting practices in the households of Slovenian entrepreneurs as well as the results of the first measurement of the levels of accounting practices in Slovenian households. The findings of this research, which was based on Slovenian subsidised self-employed entrepreneurs, show that economic rationalism in these Slovenian households is supported by the elements of accounting information activities mainly in terms of monitoring the transactions on transaction accounts and keeping of accounting documents. We have established that successful self-employed entrepreneurs exhibit a lower level of monitoring of or control over costs and expenditures (disbursements) than those individuals who have discontinued their entrepreneurial activities. These findings have demonstrated both the need for and the possibilities of future research into the topic under discussion, mainly as concerns the factors that have an impact on the existence and the development of accounting components in the households of entrepreneurs.

Apart from the above findings, we were not able to detect statistically significant differences between household accounting practices of those Slovenian subsidised self-employed entrepreneurs who managed to keep their businesses and of those Slovenian subsidised self-employed entrepreneurs who did not manage to keep their businesses.

This first measurement of the scope of household accounting also presents opportunities for future research on this topic, which could focus on formulating a model of influencing factors that contribute to the success of subsidised self-employed entrepreneurs. For the binary response variable (in this case, whether the entrepreneur managed to keep his/her business or not), a logistic regression model could be formed, describing the association structure among a set of numeric or categorical variables representing a set of socio-economic (age, gender, household income, etc.) and other factors.

One possible direction for searching for such factors is an investigation into the impact of personality traits as determinants of household accounting and as factors of household accounting's impact on entrepreneurial success. The results of such an investigation could potentially offer a more accurate explanation of this study's findings of a weak relationship between the scope of the observed household accounting activities and entrepreneurial success. Many researchers believe that personality is an important factor of entrepreneurial success (e.g., Rauch & Frese, 2007; Schmitt-Rodermund, 2004). A number of personality traits have already been identified as important for business creation and entrepreneurial success. Need for achievement, generalized self-efficacy, innovativeness, stress tolerance, need for autonomy, dominance, and proactive personality are only some of the most frequently cited (Rauch & Frese, 2007). However, it has yet to be determined which personality traits are related to household accounting behavioural tendency and how they relate to traits already proven to be important for entrepreneurial success. It is quite possible that some of these are inversely related and that the magnitude of the relationship of household accounting with entrepreneurial success is at least partially determined by its

[7] On average, the respondents in this group assessed the financial position of their households worse than the respondents in the group of successful self-employed entrepreneurs.

interaction with such traits. A model including such traits would then not only give deeper insight into the determinants of entrepreneurial success but also a deeper insight into its relationship (or the absence of its relationship) with household accounting behavioural tendencies.

The results of our research also suggest that it would be appropriate to encourage the acquisition of accounting knowledge and practice (through governmental actions, educational activities, etc.) as a tool to help Slovenian households manage their finances, particularly those households that suffer from economic hardship or a drop in their standard of living. Finally, with regard to the findings about the increasing importance of household budgeting in times of economic recession (Carnagie and Walker, 2007a) and the low level of budgeting in the observed households, it would be especially worthwhile to promote simple, user-friendly budgeting and planning software for household accounting.

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Računovodstvo gospodinjstev – primer subvencionirano samozaposlenih podjetnikov v Sloveniji

Izvleček

Prispevek predstavlja rezultate prve empirične raziskave računovodstva gospodinjstev v Sloveniji, ki je bila izvedena na vzorcu gospodinjstev subvencionirano samozaposlenih podjetnikov. Na podlagi izvirnega merjenja ravni računovodenja raziskava razkriva obseg različnih sestavin računovodenja v teh gospodinjstvih in rezultate primerjave, izvedene med tistimi slovenskimi subvencionirano samozaposlenimi podjetniki, ki jim je uspelo obdržati svoje podjetje, in tistimi, ki jim svojega podjetja ni uspelo obdržati. Primerjava je pokazala statistično značilno razliko med obema skupinama podjetnikov le na ravni nadziranja stroškov in izdatkov gospodinjstev.

Ključne besede: računovodstvo gospodinjstev, samozaposleni podjetniki, podjetniški uspeh.

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The Influence of One's Own Database on the Accuracy of Forecasting Future Movements of Investment Portfolio Value

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Abstract

The main purpose of this article is to present the test results of the hypothesis that the use of one's own (and foreign) database (used by investment portfolio managers to create indicators of individual stock analyses) has an effect on the accuracy of forecasting future movements of investment portfolio value. In addition to the use of different indicators and methods of stock analysis, the creation of an optimal investment portfolio requires assessment of the suitability and adequacy of the database used in investment portfolio managers' decision-making process; in other words, it is necessary to determine which stocks are to be included in the specific investment portfolio and which are not. The problem of the selection and use of different databases is linked to the question of determining the importance of numerous relevant elements when creating an optimal investment portfolio.

Keywords: Database, investment portfolio, investment portfolio managers, stocks

Introduction

The job of stock market analysts and portfolio managers is to try to find the best method or the best model to forecast future stock prices during a certain period of time, since such methods and models are continuously updated and supplemented (Murg, 2015). On the stock market, one can find many portfolio managers who have tried to predict the long-term stock price trend by implementing new trading strategies and models on the stocks, which, in turn, significantly outran the stock performance itself (Yuqing & Yuning, 2016; Larsen, 2010; Sarno & Valente, 2005; Verdickt, 2016). Of course, it would be irrational for stock analysts to continuously use the current "safest" methods and databases.

Based on numerous pieces of information provided by the financial market, the main purpose of financial analysts and portfolio managers is to single out relevant pieces of information and come to the right conclusions about optimal investment possibilities (Bizer, Scheier, & Spiwoks, 2013), as well as to create additional value for the investor by means of active investment management (Saunders & Cornett, 2013; Budelmann, 2013). For this reason, this article examines the question of whether the accuracy of the future movement of investment portfolio value is influenced by the use of the database, or whether the of a foreign general database contributes to the success of foretelling the future movement of investment portfolio value to the

NG
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**NAŠE GOSPODARSTVO
OUR ECONOMY**

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same extent as the use of one's own (and a foreign) database. Therefore, our main task was to determine whether investment portfolio managers use their own database to ascertain the future movement of their portfolio values and whether they also use the same database to calculate their own indicators for analysis and future stock selection for portfolios.

History shows that traditional active management does not work. The majority of actively managed funds do not beat the S&P 500. Passive index fund managers have seen their assets rise as a result, from $10 billion in 1980 to more than $250 billion in 1990 (O'Shaughnessy, 1999).

There is no product similar or identical to the method or apparatus of the present invention. Due to the magnitude of the sums involved and the complexity of the relevant investment information, it is very desirable to use an objective rule-based strategy and system for automating, to the extent practicable, the conduct of this decision-making (O'Shaughnessy, 1999).

Financial institutions such as stock markets produce huge datasets that build a foundation for approaching these enormously complex and dynamic problems using data mining tools. Potential significant benefits of solving these problems have motivated extensive research for years. The research in data mining has gained high attention due to the importance of its applications and the increasing generated information (Davari, 2010).

Proper data selection enables us to estimate and foresee what will happen with regard to the prices of stocks in the future (Baker & Nofsinger, 2010; Goldberg & Nitzsche, 2000; Braun, 2007). When studying the use of databases, it is important to emphasize that investment portfolio managers most frequently use previously analyzed data, which are acquired from foreign sources such as Deutsche Bank, Bloomberg, Telekurs, Financial Times, Reuters, and the like. Marc (2013) emphasizes the use of the Bloomberg database and the retrieval of annual financial reports in order to collect data for financial analysis and portfolio optimization.

On the other hand, investment portfolio managers rarely undertake the process of data acquisition and analysis on their own; consequently, investment portfolio managers are seldom used in deciding about the composition and structure of their portfolios.

With regard to the above statement, the question arises whether such behavior of portfolio managers truly helps to achieve their primary goal – that is, the ennoblement of investor capital while optimizing the relationship between risk-taking and profitability. The only way to create unique portfolios is to create an effective database. Unique portfolios[1] with market potential symbolize a type of reward for one's prudence, enterprise, knowledge used and efforts made in the detailed analysis of the market situation, stock analysis, correct selection of indicators and the use of one's own database.

Since success is achieved only by those who plan and act deliberately and thoughtfully (Born, 2009; Budelmann, 2013; Buffett, 2008; Daeubner, 2014; Graham, 2009; Heese, 2011), occasionally we are able to witness the birth of the so-called "stars" among investment portfolio managers. Due to their consistent market assessment and accurate company analysis, these individuals have been able to surpass the value of the stock market index at least once (Jurczyk, 2011). However, the period of such success, which lasts for about a year, is often followed by a period of failure. As a consequence, investors are entitled to ask the following questions: Can investment portfolio managers achieve better results by using passive investments in the amount of the stock index? Where can they find the best financial information possible?

The research question that was used as the basis for the hypothesis is whether the awareness of portfolio managers about the use of their own database (which is used to create indicators of individual stock analyses) influences the accuracy of forecasting future movements of investment portfolio value, and whether it consequently changes their attitude towards the creation and use of their own database to such an extent that the expenses of their own database become irrelevant.

By analyzing the behavior of investment portfolio managers, our goal was to determine whether investment portfolio managers are aware that the use of one's own database (together with the foreign ones) influences the accuracy of forecasting future movements of investment portfolio value and is thus, with the help of a foreign database, one of the key components of quality investment products and services.

Verification of Hypothesis

To test the hypothesis, we used an online questionnaire and conducted an interview with randomly selected investment portfolio managers. In this way, information about different

[1] A unique investment portfolio is an individual investment portfolio designed by an individual analyst or portfolio manager with specific, individual methods and techniques of fundamental and technical stock analysis and the proper selection of information databases. Stock market success means that the portfolio manager stands out from the crowd and with the help of the proper selection of owned and foreign databases designs his own model or principle of stock selection, which enables him to create an optimum portfolio.

types of databases used by investment portfolio managers to acquire information about the financial market was obtained.

The questionnaire enabled us to obtain opinions and assessments on the use of fundamental and technical analysis of stocks, the influence of *database type* used in the stock analysis on the profitability of the portfolio and the effects correlation of selected information databases on the accuracy of forecasting value movements of the investment portfolio.

The acquired information about the databases used by investment portfolio managers for stock selection was used, along with calculation of the indicators of individual stock analyses, to determine the effect of the chosen database on the accurate forecasting of the future movement of portfolio value. The aforementioned verification also demonstrates the efficiency, enterprise and creativity of investment portfolio managers in the process of data searching and processing in the context of combining their own and foreign databases to create their own indicators.

In order to examine the effect of one's own database on the accuracy of forecasting the future movement of investment portfolio value, we first transformed the primary variable of the database into a dichotomous variable, which is equivalent to the independent variable in regression analysis. The dependent variable was obtained through the following task: "Estimate your own database's accuracy in forecasting the movement of portfolio value." Our aim was to establish whether the accuracy of forecasting future movements of portfolio value is greater if the investment portfolio managers use their own or a combination of both their own and foreign databases compared to using only the foreign one(s).

Due to smaller frequencies in the category *one's own database* and *one's own and foreign database*, the primary variable of the information database was merged into a new category called *one's own (and foreign) database*. The dependent variable *the accuracy of forecasting value movements of investment portfolio* was measured on an ordinal scale: 1 – "very bad", 2 – "bad", 3 – "good" and 4 – "very good". The non-parametric Mann-Whitney U test was used to verify whether there are significant differences between the two groups of database users in the accuracy of forecasting future movement of investment portfolio. The descriptive statistics was also applied to analyse the research problem.

Limitations and Hypotheses

The research was based on the assumptions that investment portfolio managers' use of their own and foreign databases differs depending on the organizational policy of the individual investment portfolio manager; that the choice of database influences the decision-making about the creation of the portfolio. We verified the hypothesis that the choice of database influences the accuracy of forecasting future portfolio movements. Two major limitations of our research were the closed and inaccessible information system of investment portfolio managers and the lack of knowledge about the respondents' environment while filling in the questionnaire.

Database Characteristics

To test the hypothesis, we used a database comprising answers obtained in the online questionnaire and the interviews carried out with investment portfolio managers.

To ensure the representativeness of the research sample, the online questionnaire was sent to randomly selected portfolio managers who are active members of stock exchanges from different countries: the Nordic Market (Denmark, Finland, the Faroe Islands, Iceland, Norway and Sweden), West Europe (Germany, Italy, Ireland, Great Britain and France), East Europe (Bulgaria, Bosnia and Hercegovina, Serbia, Croatia, Hungary, Albania, Austria, Slovenia), East Asia (Hong Kong, Japan) and North America (NYSE, NASDAQ).

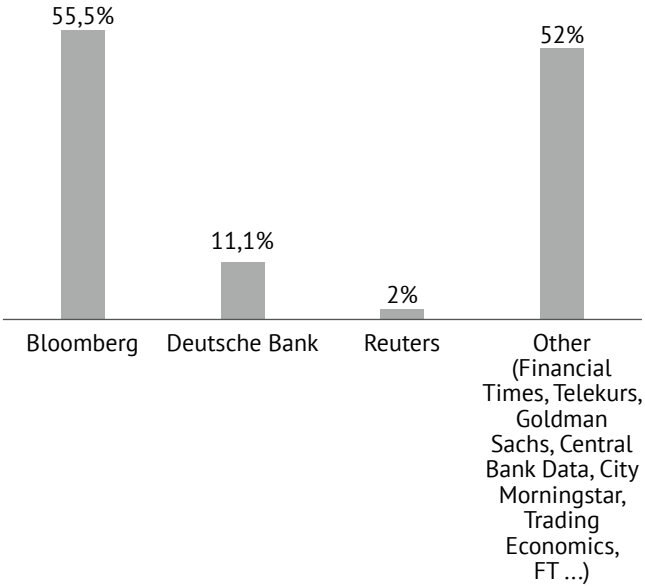
A total of 72 properly completed questionnaires were received. The data collected from portfolio managers from different countries were treated collectively as a whole in the process of preparing descriptive statistics on the basis of the sample.

The results show that 52.9% of all portfolio managers use their own and foreign databases, whereas 44.4% use only a foreign database, and only 3% use only their own database (Graph 2).

Regarding the choice of foreign databases, investment portfolio managers prefer Bloomberg (55.5%), Deutsche Bank (11.1%) and Reuters (2%), followed by Financial Times, Telekurs, Goldman Sachs, Central Bank Data, City Morningstar, Trading Economics, and company websites, as shown in Figure 1.

The following reasons were listed by the investment portfolio managers to explain why they prefer the use of foreign databases over their own: 1) 23.6% believe that the outcomes of one's own database are similar to those of foreign databases; 2) 63.9% believe that the accuracy of forecasting future value movements of investment portfolios

Figure 1. The Most Commonly Used Foreign Information Databases for Stock Analysis



Source: author's

based on foreign databases is good; 62.5% claim that one's own database requires the help and knowledge of more professionals and analysts; and 48.6% say that the creation of one's own database is more expensive and more complex. In addition to this, 38.9% respondents agree completely that the accuracy of forecasting future movements of portfolio value is influenced by the correct choice of database, and 44.5% believe that the most successful method is to combine both databases, as shown in Table 1. Figure 3 shows that the accuracy of forecasting future movements of investment portfolio value based on one's own database is good (61.1%) or very good (32%).

Analysis and Results

To test the hypothesis, we first transformed the primary variable *database type* into a dichotomous variable. Value 1 was represented by the category *one's own (and foreign) database*, and Value 0 was represented by the category *foreign database*.

The primary variable *database type* was, due to smaller frequencies in the category *one's own database* and *one's own and foreign database*, merged into a new category called *one's own (and foreign) database*.

Figure 2 show that more than half of investment portfolio managers use a combination of their own and foreign databases.

Figure 2 also shows that barely 2.7% of respondents use one their own database, 52.9% use their own and foreign databases, and 44.4% use only a foreign database.

The primary variable *the accuracy of forecasting value movements of investment portfolio* was, due to smaller frequencies in the categories "very bad" and "bad", transformed in such a way that the aforementioned categories were merged into a new category called "(very) bad".

Figure 3 shows that the majority of investment portfolio managers believe that the accuracy of forecasting value movements of the investment portfolio by using one's own database is good (61.1%), very good (31.9%), bad (5.6%) and very bad (1.4%).

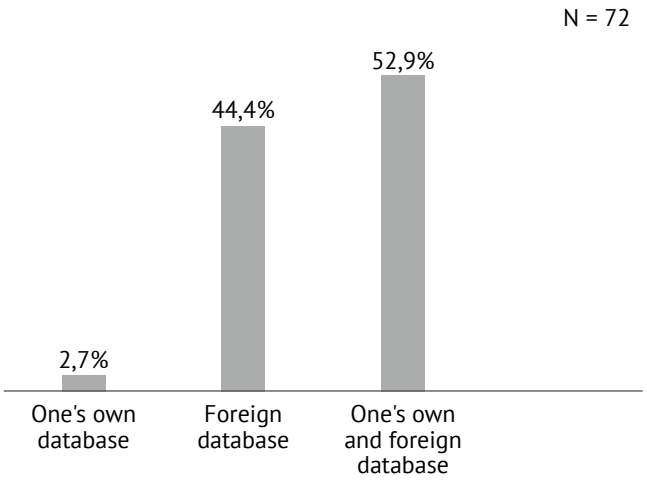
Before continuing with the statistical analysis, we also examined the accuracy of forecasting based on both types of database.

Table 1: Effects of Proper Selection of the Information Database

N = 72	I strongly disagree	I partially agree	I mostly agree	I totally agree
The creation of your own information database is more expensive and complex	6.9%	30.6%	13.9%	48.6%
Having one's information database requires more experts and analysts	6.9%	5.6%	25.0%	62.5%
Having one's information database requires more time	4.1%	4.3%	22.2%	69.4%
One's one information database gives similar results as a foreign information database	15.3%	22.2%	38.9%	23.6%
The use of foreign data databases is simpler	5.6%	4.2%	36.1%	54.1%
Proper selection of the information database affects the accuracy of forecasting trends in portfolio value	5.6%	20.8%	34.7%	38.9%
For a more detailed forecast of the value of the portfolio, the combination of the both information databases is best	9.7%	20.8%	25.0%	44.5%

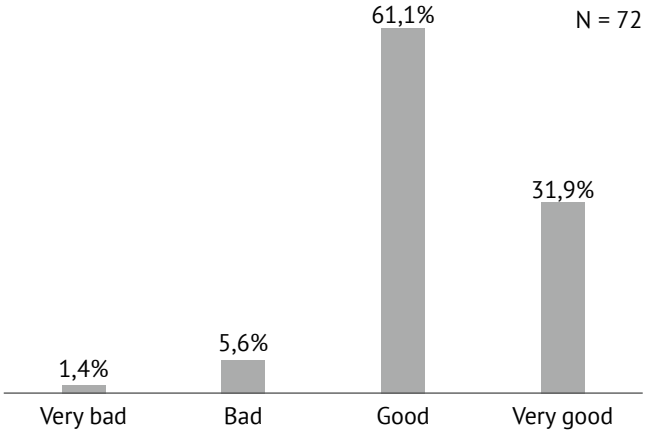
Source: author's

Figure 2. Information Databases Used for Stock Analysis



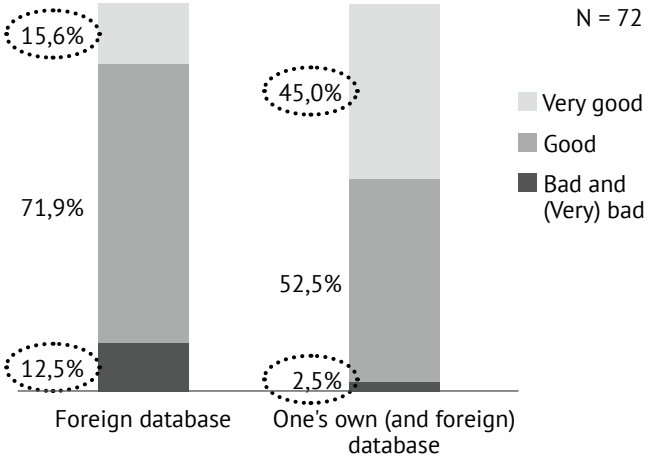
Source: author's

Figure 3. Transformed Variable – The Accuracy of Forecasting Value Movements of Investment Portfolio Using One's Own Database



Source: author's

Figure 4. The Accuracy of Forecasting Future Value Movements of Investment Portfolio Using Database



Source: author's

Figure 4 shows that the proportion of "bad and (very) bad" forecasting of investment portfolio movement is at least 10% bigger when using only a foreign database in comparison with one's own (and foreign) database. Of the respondents, 45% who use their own (and foreign) databases believe that the chosen database is very good; on the other hand, only 15.6% of those who use only a foreign database share the same opinion.

The results of the Mann-Whitney U test (Tables 2, 3) show that there are statistically significant differences in the accuracy of forecasting value movements of investment portfolio between the two groups.

Based on the acquired results, the hypothesis in question is confirmed, since the use of one's own (and foreign) database truly influences the accuracy of forecasting future movements of investment portfolio values.

Table 2: Mann Whitney U test: Ranks

Category	N	Mean Rank	Sum of Ranks
Foreign database	32	29,66	949,00
One's own (and foreign) database	40	41,98	1679,00

Source: author's

Table 3: The results of the Mann-Whitney U test

Null Hypothesis	Test	Significance	Decision
The distribution of accuracy is the same across categories of database.	Independent Samples Mann-Whitney U Test	0.004	Reject the null hypothesis.

Note: Asymptotic significances are displayed. The significance level is 0.05. Test statistics: Mann-Whitney U: 421.000, Wilcoxon W: 949.000, Z: -2.887.

Source: author's

Conclusion

Our research was based on statistical analysis of results acquired from an online questionnaire and interview with randomly chosen investment portfolio managers who are members of stock markets from different countries. The aim of this research was to determine whether or not the chosen database has an influence on the accuracy of forecasting future movements of portfolio values.

We proved that using one's own (and foreign) database influences the accuracy of forecasting future movements of portfolio values in comparison with using only a foreign database, thus verifying our hypothesis.

The acquired data showed that the majority of respondents (52.9%) use foreign databases, 2.9% use only their own database, and 44.4% use only foreign databases. The most commonly used foreign databases are Bloomberg and Deutsche Bank, followed by Reuters, Financial Times, Telekurs, Goldman Sachs, Central Bank Data, City Morningstar and Trading Economics. The majority of investment portfolio managers (70.8%) agree that the correct choice of database has an important effect on the accuracy of forecasting future movements of investment portfolio values.

Nowadays, there are many possibilities available to portfolio managers for effective portfolio management. In addition to the right combination of stock analyses (fundamental and technical), one also needs to choose the right information database, since it minimizes the risk of assets management. In this light, the proverb "Never put all your eggs in one basket" is true not only for investors but also for portfolio managers. The responsibility of achieving the optimum proportion between profitability and risk of investments is in the hands of portfolio managers themselves, since the use of the right methodology and computer-assisted systems enables them to design a unique model, which can be created through a varied selection of different models of stock analyses and by using a combination of information databases (i.e., one's own and foreign databases).

In this light, the article presents one of the many alternatives for achieving a better relationship between risk-taking and anticipated profit in the area of intelligent investment and investment portfolio management, which can be immediately implemented in practice in order to increase the value of capital.

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Vpliv lastne informacijske baze na natančnost napovedovanja prihodnjega gibanja vrednosti naložbenega portfelja

Izvleček

V prispevku predstavljamo rezultate testiranja hipoteze, da uporaba lastne informacijske baze, na osnovi katere upravljavci naložbenih portfeljev oblikujejo kazalnike posameznih analiz delnic, vpliva na natančnost napovedovanja prihodnjega gibanja vrednosti naložbenega portfelja. Pri oblikovanju optimalnega naložbenega portfelja je treba upoštevati oceno primernosti in zadostnosti informacijske baze, ki se uporablja v procesu odločanja upravljavcev naložbenih portfeljev, katere delnice vključiti v določen naložbeni portfelj in katere ne. Razumevanje problema izbora in uporabe različnih informacijskih baz se navezuje tudi na vprašanje določitve pomena številnih pomembnih elementov upravljavcev portfeljev v trenutku oblikovanja optimalnega naložbenega portfelja.

Ključne besede: informacijska baza, naložbeni portfelj, upravljavci naložbenih portfeljev, delnice.

Economic Effects of Renewable Energy Technologies

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Abstract

Rapid economic development has resulted in the more frequent use of renewable energy technologies. On the other hand, the production and use of renewables fosters the development of new technologies, creating many new opportunities for entrepreneurial-minded individuals and, consequently, the economy in general. Renewable energy technologies have a multiplier effect in spurring the economy and the development of not only the energy sector but also all the supporting activities related to such industry. The purpose of this research is to analyse both the positive and the negative economic effects of investing in various renewable technologies, as well as to confirm, by means of the energy-economy model, the benefit of such technologies in boosting the economy.

Keywords: renewable energy sources, new technologies, boosting the economy

Introduction

Energy is essential in the economy and in modern society in general. As the main resource and an integral part of almost every production process, energy is important for the use of other resources in the business cycle, the creation of new values, and the fulfillment of needs. Thus, energy or the energy sector has a dual function in the economy: energy production (output) is an essential sector of the economy, while its participation in economic processes affects economic activity (i.e., supports other parts of the economy). An efficient and developed energy sector, with a secure energy supply and stable and reasonable prices of energy resources, enhances the development of economy and the realization of many other economic effects, such as economic competitiveness.

In the production of energy, especially electricity, alongside the problems of affordability of fossil fuels and the dramatic growth in the demand for energy over the last few decades, renewable resources have become an important additional source of energy and further enhance the functioning of the (electrical) energy sector. Renewable energy refers to all energy resources that are naturally replenished at a rate that is equal to or faster than the rate of their consumption or permanent resources that

NG
OE

**NAŠE GOSPODARSTVO
OUR ECONOMY**

Vol. 63 No. 2 2017

pp. 49 – 59

are available in nature in abundance (van Vliet, 2012). Renewable resources include solar energy, wind energy, hydropower, energy produced from biomass, geothermal energy, and ocean energy, which includes wave power, tidal energy and ocean currents (Armstrong, Hamrin, 2000). Renewable resources are inexhaustible sources of energy; this means that, although they are consumed in the process of energy conversion, their amount is only temporarily exhausted (i.e., they can always be replaced or restored) (Labudović et al., 2002). The use of renewable energy resources preserves the environment and contributes to the environmental aspect of sustainability. Renewable energy produces little or no waste (resulting in minimal impact on the environment) and allows the use of limited fossil fuels in the future. This is one of the major advantages of the rising investments in the renewable resources technology and its application. It must be pointed out that, alongside the production of electricity, renewable energy technologies play a significant role in the production of heat energy as well.

Therefore, the purpose of this research is to analyse both the positive and the negative economic effects of investing in various renewable technologies, as well as to confirm, by means of the energy-economy model, the benefit such technologies have in boosting the economy.

Literature Review of "Green" Economy

Analyzing the economic influence of renewable energy technologies (i.e., investments and their use), the literature underlines the direct and indirect benefits of including renewables in the economy.

It is pointed out by Nanda (2015) that investments in the renewable energy sector can stimulate high capital spending flow through the economy and, consequently, can stimulate direct and indirect growth in other related sectors. Clearly, such direct and indirect economic growth in other sectors promotes employment as well (Nanda et al., 2015). Omri, Chtourou and Bazin (2015) argue that the global economic crisis of 2007-2008 was essentially an opportunity to accelerate the spread of renewable energy technologies and that the renewable energy sector plays a crucial role on the path towards a "green" recovery. Furthermore, many international institutions emphasize the need for a "green" recovery, a "green" growth, or a "green new deal", which consists of strategies for economic recovery and environmental protection (cf. OECD, 2009, 2011b, 2011c; UNEP, 2009, 2011; the World Bank, 2012). Technological breakthroughs or innovations are vital in accomplishing this "green" growth. The supports in the form of "green" incentives are specifically pointed out (e.g., investment subsidies, low-interest loans, tax deductions, etc.), and are allocated to renewable energy, energy efficiency, smart power grid, transport, and other clean energy technologies. These grants and other strategies, initiatives, measures and activities have been undertaken by various international organizations, European Union bodies and government bodies at different political levels in order to ensure economic growth and sustainable development (i.e., deployment towards a "greener" economy) (cf. Sedlacko & Gjoksi, 2009). The "green" economy initiative is not a replacement for sustainable development but, rather, a path to its achievement at the national, regional and global levels (Omri, Chtourou, & Bazin, 2015).

"Green" policies can contribute to growth through four effects (World Bank, 2012): an input effect (increasing production factors), an efficiency effect (bringing production closer to the production possibility frontier), a stimulus effect (stimulating the economy in times of crisis), and an innovation effect (accelerating development and the adoption and dissemination of renewable energy technologies). Taking into account the economic effects of renewable energy technologies, great importance is given to the innovation effect, which can be illustrated through investments in R&D, for instance, on photovoltaic power motivated by the desire to mitigate greenhouse gas emissions. Success could make photovoltaics competitive with fossil fuels, increase the supply of electric power, and reduce the cost of providing electric power to remote off-grid communities. "Green" innovation is one of the most significant factors in the efficient functioning and application of renewable energy technologies, and it undoubtedly plays a dominant role in the growth and development of a "green" economy. According to the World Bank (2012), "green" innovation is the creation, development and commercialization of new ways to solve environmental and economic problems through improvements in technology, with a wide interpretation of technology as encompassing product, process, organizational, and marketing improvements. Thereby, "green" innovation includes both "new-to-the-world" innovations and "new-to-the-firm" innovations, also known as absorption, which covers the diffusion (both across and within countries), adoption, adaptation (to local contexts), and use of "green" technologies. "Green" innovation, R&D investments and deployment of renewable energy may be viewed as an important driver in the shaping of economic systems, especially in a "green" growth concept (EEA, 2014).

Creating and increasing employment emerges as a crucial economic and social factor of the development of renewable energy technologies. Alongside continued growth in energy demand and progressive decrease in renewable energy costs and climate change, Omri, Chtourou and Bazin (2015) stress employment creation as a driving force in the development of the renewable energy market. It is estimated that

8.1 million people were employed in the global renewable energy sector, directly and indirectly, in 2015, at an annual rate of 5% (IRENA, 2016). The solar photovoltaic industry was the largest renewable energy employer, with 2.8 million jobs worldwide, while the wind power sector recorded a record year of growth. An additional 1.3 million people were employed in large hydropower plants, although, in theory, they are not referred to as "newer" renewable energy sources due to their harmful environmental impact and degradation of the natural ecosystem. While the growth in jobs dropped from a 5% rate compared to previous years, the total number of jobs in renewables worldwide continued to rise, which is in stark contrast with depressed labor markets in the broader energy sector (IRENA, 2016). An EU-wide study carried out in 1999 estimated that renewable energy has the potential to create over 900,000 new jobs by 2020, including 515,000 jobs in agriculture and biomass fuel supply. Industry estimates endorse these levels of job creation. Already, a number of countries are achieving high employment levels from renewable energy activities, particularly in the wind energy industry (Ecotec, 2002). This confirms the thesis that renewable energy technologies occupy a crucial role in increasing employment and positively contribute to economic effects in the "green" economy.

Among numerous studies on the effects of renewable energy technologies on employment, the study by Meyer and Sommer (2014), which is based on an evaluation of 23 selected impact studies from peer-reviewed journals, should be highlighted. The authors explore whether there is scientific evidence that transitioning to a low-carbon economy may create net employment effects. Given the heterogeneity of assumptions, the results of the different studies are hardly comparable, although they find that a majority of the investigated scenarios show positive net employment effects.

Even though renewable energy technologies have a strong impact on employment, inducing different types of employment effects (direct, indirect, induced, gross or net), previous studies reached different findings. Besides creating new jobs in the "green" economy, a change of employment is also possible, for example, from conventional energy-related activities to renewable energy technologies, or the shed of certain jobs without alternatives, or redefinition of existing jobs in terms of "green" skills, methods and profiles (Meyer & Sommer, 2014). Furthermore, depending on the level of activity of a technology life cycle or a plant that exploits a renewable energy source, there are various effects on employment. Despite specific characteristics of each renewable energy technology, they all share a life cycle of five stages (Llera et al., 2010):

1. Research and design;
2. Development and manufacture;
3. Construction and installation;
4. Operation and maintenance or service;
5. Updating and/or dismantling.

In order to adequately show the impact of a power plant/technology life cycle on the quantity and quality of employment, the place and duration of employment, and the indirect development of the "green" economy, the abovementioned five stages are modified into three main phases: (1) technological development, (2) installation/uninstallation of a power plant and (3) operation or managing and maintenance of technological plants. The first two phases (i.e., research and design and development and manufacture) are commonly seen as a separate whole, due to their complementary work areas and identical generated employment. This creates a new starting phase of a life cycle, called technological development. Despite the third and the fifth stage being distant in time (i.e., construction and installation and updating or dismantling), they create a single phase of installation/uninstallation, since there is no difference in terms of the types of activities and characteristics of engaged employment. Activities related to the maintenance of power plant operations comprise the third and the last phase of the life cycle. For example, some of these activities include management and maintenance of a wind energy plant; the collection, supply and logistics of work of a biomass plant; and other activities related to the normal functioning of renewable energy technologies. This division of power plants' life cycle into phases could be useful for determining the need for a strategy that generates employment opportunities in one of the three phases, such as encouraging technological innovation (which increases the

Table 1: Stages of the Life Cycle of the Exploitation of RES and Influence on Employment

Phase	Volume of employment	Location of employment	Duration of employment	Level of specialisation
Technological development	Medium	From foreign to local	Stable	Very high
Installation / uninstallation	High	From local to foreign	Temporary	High
Operation and maintenance	Low	Local	Stable	Medium

Source: Llera et al. (2010)

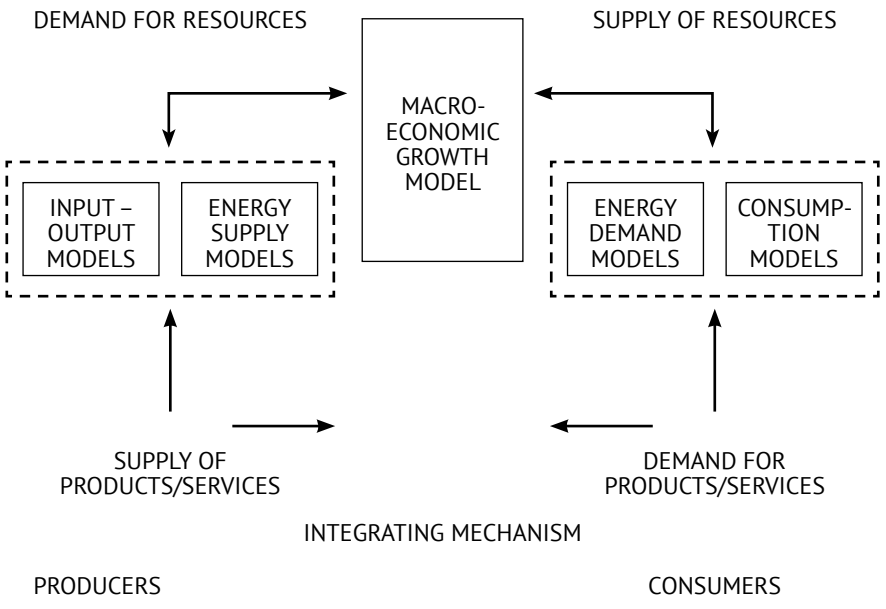
impact on local employment in the first phase) or vocational training (which reduces the need for foreign engineers and technology installers). The impact of the three aforementioned life cycle phases of renewable energy technology on the previously mentioned elements of employment is shown in Table 1.

Table 1 shows the main characteristics of the elements of employment that appear in all three phases of power plant/technology operations. The amount of employment is particularly high in the installation/uninstallation phase, due to the workforce needed in the process of construction and installation, modernization and/or dismantling of the power plant. The adverse economic effect in this phase is temporary employment, because once the plant is built or dismantled, there is no more need for such specialized workforce. On the other hand, the management and maintenance of renewable energy power plants does not require much workforce, particularly in the case of the wind power industry. The level of expertise and specialization in the technical maintenance and repair of faulty components does not need to be particularly high, since the case is of mid-level complexity, so this job permanently employs mainly local workforce, which is certainly an advantage in exploiting renewable resources. Every national economy aspires to achieve the phase of technological development, which ensures the greatest economic effects of renewable energy technologies. Although the quantity of employment in this phase is of mid-level complexity, the quality of employment is very high, because many technical and technological achievements and improvements are applied; research and development influence the innovation and so on. The substantial benefit of this phase is permanent employment, as well as technology transfer, wherein foreign workforce is transferred in favor of the local workforce. Taking into consideration this literature overview, the positive effects of renewable energy technologies are confirmed.

Energy-economy Model as a Function of Analyzing the Relationship of Energy and Economy

In a modern business environment, an energy system does not exist "for itself"; rather, it has to be viewed in the context of the entire economic system, to support the economy in the manufacturing of products and the provision of services, but also as a driver of broader economic processes. The literature cites a large number of different surveys of energy-economy interactions (Energy Modeling Forum, 1977; Manne, Richels, &Weyant, 1979; Ormerod, 1980; Kavrakoğlu, 1987; DeCarolis, Hunter, & Sreepathi, 2012). Given the challenges that the modern world faces, energy-economy interactions can be improved and then, for example, energy-economy-environment models (Nakata, 2004; Dong, et al., 2014) or energy-economy-climate models (Turton, 2008; Hedenus, Johansson, Lindgren, 2013) can be discussed. In this study, the energy-economy model shown in Figure 1 is selected as a framework and theoretical starting point in understanding the interaction and the realization of synergies between energy activities and the economy.

Figure 1. Energy-economy model



Source: Samouilidis & Mitropoulos (1982)

The proposed energy-economy model includes the entire national economy, and its supply side and demand side of both energy and economic perspectives; as such, it points to possible models of economic growth. Also, the energy-economy model is presumed to be a dynamic operator of the system, in the sense that it relates the present with the future states of the system. In the creation of macroeconomic growth, the energy-economy model aims to point out the role of supply and demand of resources (especially energy technologies) on the input side and energy products/services on the output side. The model simultaneously takes into account the requirements of consumers and producers as the main initiators of growth in energy and related industries.

The energy-economy model consists of some basic elements, as follows: a macroeconomic growth model, input-output (or supply) models and energy supply models on the side of producers, and consumption models and energy demand models on the side of consumers. It should be noted that the macroeconomic growth model is the integrating mechanism that brings all other models together through the classical notion of economic equilibrium (supply = demand). Input-output models represent intersectoral flows and producers' behavioral patterns. Energy supply models analyze the impact of new energy technologies and the optimal structure of the energy system, thus making them the most important starting point in generating economic growth driven by energy (due to the subject matter of this paper). While it is necessary to take into account the overall energy-economy model as the basis of the macroeconomic growth, the authors nonetheless emphasize the energy supply models that significantly contribute to economic activities and boosting the economy through the new energy technologies, especially renewable energy technologies. On the demand side, consumption models investigate consumers' behavioral patterns (i.e., allocation of aggregate demand to products and services). Finally, in energy demand models, numerous research questions are analyzed (e.g., energy conservation, price effects, tax and tariff effects, energy efficiency, etc).

Finally, the proposed energy-economy model, as a theoretical model, is considered to be an appropriate framework to accompany the study, particularly due to the overall equilibrium of producers and consumers in meeting the needs for energy/economic resources/products/services as a way of opening up a real possibility for economic growth. On such foundations of the equilibrium between producers and consumers, with full capacity utilization, or utilization of resources and assets, it is possible to analyze the impact of renewable energy technologies on economic growth and development.

Based on the above discussion, the sequel shows the most important part of this study, which analyzes the positive and negative economic effects of renewable energy technologies.

Positive and Negative Economic Effects of Renewable Energy Technologies

Although the starting point in the analysis of positive and negative economic effects of renewable energy technologies is the macroeconomic model known as the energy-economy model, in which economic effects are mainly studied at the macro level, it is possible to identify them at the sectoral level, the micro level and the enterprise level.

Firstly, investments and the application of renewable energy technologies contribute significantly to economic growth and development, gradually transforming the economy towards the sustainable "green" economy (OECD, 2011a), which directly confirms the impact of the previously described energy supply models on macroeconomic growth. Economic growth based on "green" technologies creates a new impetus in the creation of new business processes and economic flows, wherein the emphasis is placed on sustainability, economic and energy efficiency, the use of clean technologies, optimal utilization of capacities, both natural and physical, environmental issues, and the like. One of the main advantages of using renewable energy technologies is their sustainability. In promoting renewable energy technologies, the benefits include not only direct economic benefits, like the creation of jobs, but also the establishment of related new businesses. New jobs and business opportunities include research, local manufacture, logistics, maintenance engineers, consultants, business developers and designers, and lawyers, among others. New business opportunities represent an additional supply of goods and services to the economy, in which growth is generated by input-output (or supply) models. In this way, renewable energy technologies certainly foster the development and revitalization of local economies (cf. IEA RETD TCP, 2016). In that sense, renewable energy technologies represent a vital stimulus for local economies, particularly those facing the challenges of economic readjustment or geographic isolation.

Furthermore, the innovation that promotes technical and technological changes in new market structures has been indentified as the most important benefit of renewables (Frankhauser, Sehlleier, & Stern, 2008). Innovations are, in fact, related to new technologies/technological processes in the energy sector that lead to the improvement of business processes and economic growth driven by the energy supply models. In the same way, considering the long-term period, technological changes and innovation, as well as the gradual development of renewable energy technologies, create the need for qualified workforce, thus directly boosting employment. The creation of new opportunities for investments into "green" energy, research, technological innovation, and, consequently, economic growth, is spurred by, among other things, climate change and environmental protection policies.

The important role of deliberate policies aimed at motivating energy-technological innovation is underlined (Simas & Pacca, 2013). The policies should lower institutional and market barriers and remove the limitations for new technologies and markets. One such measure is the so-called energy-based economic development, which integrates economic development and energy policy and planning into a new field of managing national economies. Economic growth based on energy is defined as the process in which decision makers in economic and energy planning and development, government officials and other public authorities, energy regulators, industry and municipal services, their managers and executives, and other market participants tend to increase energy efficiency and/or diversification of energy resources in a way that creates new jobs, maintains employment, and encourages the prosperity of the region (Carley et al., 2001). The essence of the concept of economic growth based on energy lies in fulfilling economic and energy development needs. Thus, the fundamental objectives relate to the increase of energy efficiency, diversification of resources and self-sufficiency, improvement of industry and economic growth and development, development of entrepreneurship, encouragement of technological innovation, increase in the level of employment and training, and so on. Thus, energy-based economic development is closely related to the overall energy-economy model, where the economic and energy potentials are intertwined in the economic development and the creation of new added value. Energy diversification, energy self-sufficiency and the improvement of technological innovation are the factors that develop regional competitiveness and provide opportunities to create new jobs, especially when the focus is on renewables. In that sense, the pioneers in the development of clean "green" technologies have an opportunity to become regional or even global leaders in the industry. The example of Germany must be pointed out here, as this country is the leader in the export of renewable energy technologies (Fankhauser, Sehlleier, & Stern, 2008; Simas & Pacca, 2013).

Given that environmentally friendly renewable energy sources in the production of energy function only as an addition to conventional power plants in the energy system, the substantial financial benefit of renewable energy technologies lies in the reduction of fossil fuels that would otherwise be used in conventional power plants to produce the same amount of energy. Moreover, renewable energy technologies reduce imports, especially the import of electricity and fossil energy resources (i.e., fuels for the production of energy). The above causes a reduction in demand for fossil energy resources, raising the possibility of their use in the future together with the use of inexhaustible sources of renewable energy (result of energy supply models). This directly influences the improvement of the balance of trade of individual national economies.

The application of renewable energy technologies in rural areas, especially in underdeveloped rural areas, could foster their economic growth and civilization's need for energy in general. This environment is particularly suitable for investments in renewable energy technologies, mostly due to the lack of alternative development projects in that area, appropriate spatial and temporal conditions and the opportunities for employment of local people coming from the assumed high unemployment rate, and so on. In this way, in addition to being an additional source of energy in the conventional electro-industry, renewable energy resources provide much-needed electricity in areas where the electrical grid is underdeveloped or does not exist, such as remote villages or islands. If based on coherent policies, renewable energy technologies could be considered a cost-effective tool in reducing electricity shortages. Not being connected to the national power grid, separate power systems using hybrid systems of renewable energy technologies are installed in areas where grid extension is technically and/or economically unfeasible, such as remote or inaccessible areas (Sreeraj, Chatterjee, & Bandyopadhyay, 2010). Likewise, the extension of the power grid in rural areas is not economically viable due to the high costs of electricity distribution and the related energy losses in the transmission network. Therefore, electricity off the grid, produced in the hybrid system of renewable energy resources (i.e., in a power system with the ability to store energy or produce it from multiple renewable resources) enables the process of rural electrification and brings benefits for the community, thus being a cost-appropriate strategy of electricity usage (Borhanazad et al., 2013). It is of exceptional importance to consumers that such hybrid systems of renewable energy technologies are price acceptable, or cost efficient, with continuous consumption of sufficient amounts of energy. The conclusion is that economic growth and development with (energy) supply models can be achieved through models of energy demand, as shown in the example of renewable energy technologies in rural areas.

Both directly and indirectly, renewable energy technologies affect sectoral activities as well. Although energy production, or electricity generation, is considered the primary purpose of renewable energy technologies, this is only one segment of the positive economic effects of renewable energy technologies, which need further elaboration. In the total production of "green" electricity, renewable resources hold a negligible share (unlike big conventional power plants that can have a few dozens to several hundred MW of installed capacity and generate huge amounts of energy). Taking into account only "new" renewable energy resources, the world production of "green" electricity is as low as 2%. If heat energy generated from "modern" biomass, solar and geothermal sources is added to this, the share of energy rises to 6% (REN21, 2013). In the production of energy,

renewable energy technologies ensure a secure supply in the energy sector, making the entire energy system sustainable. The previous discussion results in a conclusion that renewable energy technologies have a far-reaching and significant impact on the development of related branches of industry, primarily the manufacturing industry. The manufacturing industry has been identified as the crucial end-use sector that must be engaged in order to achieve a higher share of renewable energy technologies (IRENA, 2015). Moreover, the share of renewable energy is likely to rise, since it has a great potential to substitute fossil-fuel-based energy in the production of heat energy and feedstock used in material production. The potential to substitute fossil-fuel-based energy with renewable energy technologies ranges from 8% (in the iron and steel sector) to as high as 30% (in the non-metallic minerals sector) for different energy-intensive sectors (IRENA, 2014). Currently, among the renewable technology options, biomass offers the greatest potential to provide high-temperature process heat for energy-intensive sectors and to replace fossil fuels that are used for chemical and polymer production. Furthermore, biomass can also be easily integrated into existing plants for cement or brick production, as well as into the production processes of iron and steel making. To a certain extent, solar thermal systems could also provide high-temperature heat, but more research and development is required to make those technologies available. Solar thermal systems is technically and economically feasible in the small-scale plants and less energy-intensive industries, like the textile and food sectors, but the high initial capital costs and low deployment rates make the use of this technology impractical. In addition to the manufacturing industry, renewable energy technologies are closely related to the construction sector, as well as agriculture and forestry in the case of biomass energy, while an indirect influence is seen in the financial sector and the insurance sector.

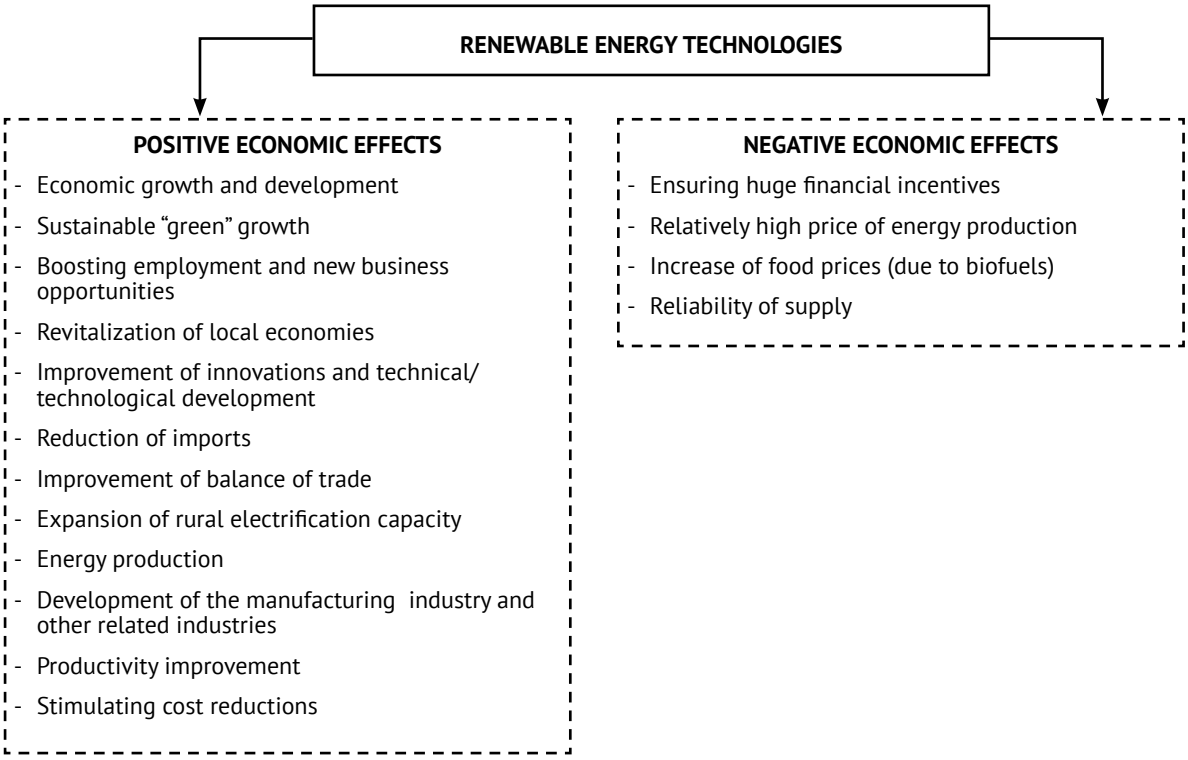
At the microeconomic level, the application of renewable energy technologies increases productivity not only in the energy sector but also in all related activities in which renewable technologies are developed. Productivity is closely related to, and contributes to, the strengthening of entrepreneurship and the creation of competitive market relations. It has been found small and medium-sized enterprises, in more than 90% of all manufacturing businesses, play a crucial role in increasing the deployment rate of renewable energy technologies, providing local manufacturing opportunities and stimulating cost reductions (IRENA, 2014). This leads to the improvement of technical and technological development, with an increase in technical efficiency as well as economic efficiency in terms of management of the organizational unit.

In addition to the multiple benefits of renewable energy technologies, there are also certain disadvantages and limitations of their investment and application. The research and development of renewable energy technologies demands considerable financial resources. With the exception of highly developed countries, public authorities are unable to provide the necessary funds to develop the industry and the market of renewable resources. On the other hand, if there are insufficient investments into renewable energy technologies, these will need to be imported (Rader & Norgaard, 1996), as is the case in Croatia, for example, where most investments are made in the development of foreign economies. The serious disadvantage of greater use of renewable energy technologies is certainly their relatively high cost of electricity production. The literature highlights the higher cost of construction of renewable energy plants compared to fossil fuel plants. However, if the cost of CO*2* emission trading is added to the total costs, it becomes clear that renewable energy technologies are cost-competitive with conventional power plants (cf. Tarjanne & Kivistö, 2008). Furthermore, renewable energy resources, such as biomass, also increase food prices, because more and more crops are produced as biofuels, which leads to a shortage of food in the market and consequently increased food prices. One of the major limitations of the daily use of renewable energy technologies is the reliability of the renewable energy supply. Because of their natural characteristics, renewable sources depend entirely on the geographical deployment and weather conditions; therefore, the volatility and unpredictability of renewable sources represent a significant restriction and difficulty in the production of energy. Due to the intermittent characteristics of renewable energy resources, assessing the reliability of power systems with renewables is challenging and has been widely studied for the past several decades (Zhou, Jin, & Fan, 2016). This limitation may be reduced by quality planning and carefully choosing the location for the renewable energy technology, as well as by appropriate measurements and preparation of environmental studies. Also, due to large daily fluctuations in the availability of renewable energy sources based on which energy is created, it is necessary to consider possibilities of integrating the renewable energy in the energy system. The energy system grid must always include sufficient reserves in the form of available installed capacity of power plants that can eliminate disadvantages that occur when certain renewable energy sources are not available.

Figure 2 shows a clear summary of the overall positive and negative economic effects of the application of the renewable energy technologies that were presented in this section.

Based on the above discussion, it can be concluded that renewable energy technologies have numerous benefits but also certain disadvantages in generating additional amounts of energy, and their application should primarily be considered in the context of the improvement of the energy sector and the development of national economies.

Figure 2. Positive and negative economic effects of renewable energy technologies



Conclusion

This paper presents a number of positive and negative effects of investments and use of renewable energy technologies. Economic effects are analyzed at the macro level, based on the energy-economy model, as well as at the sectoral level and at the micro level. The fact that renewable energy technologies stimulate economic growth and sustainable development (i.e., deployment towards a "greener" economy) is identified as the most significant positive effect. In this way, renewable energy technologies directly influence the creation of "green" jobs and boost employment. Many authors analyze employment effects of renewable energy technologies, and nearly all studies conclude that there are positive net employment effects. In addition to multiple positive aspects of using renewable energy technologies, there are negative aspects as well, such as the relatively high cost of production of electricity from renewable energy resources, or the lack of substantial financial resources with the aim of promoting research and development on renewable energy technologies.

Considering primarily the economic benefits, but also the environmental and social benefits, of renewable energy technologies and their role in the growing energy security issues, the governments of certain national economies have issued many policies to boost the deployment of renewable energy. The role of public authorities is emphasized in creating a "favorable climate" for renewable energy technologies. Also, economic growth and development resulting from the application of renewable energy technologies depends not only on economic policy measures at the national level but also at sub-national and local levels, as well as on the accompanying institutional framework and generally accepted social consensus on renewable energy technologies. Therefore, there is a need to analyze concrete economic policy measures in further research, as well as a need for renewable energy incentive programs to contribute to the achievement of maximum usability of renewable energy technologies, with the aim of further growth and development of the national economy. In addition, there is also a possibility in future research for further adaptation and extension of the applied general energy-economy model in relation to renewable energy technologies, as well as to base conclusions regarding the economic effects of these technologies on a quantitative analysis of real-life data.

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Ekonomski učinki tehnologij obnovljive energije

Izvleček

Rezultat hitro razvijajočega se gospodarstva je pogostejša uporaba tehnologij obnovljive energije. Po drugi strani pa proizvodnja in uporaba obnovljive energije spodbujata razvoj novih tehnologij, kar ustvarja mnoge nove priložnosti za posameznike, zainteresirane za podjetništvo, in posledično za gospodarstvo nasploh. Tehnologije obnovljive energije imajo multiplikativni učinek na spodbujanje ekonomije in razvoja ne samo energetskega sektorja, temveč tudi vseh podpornih aktivnosti takšne industrije. Namen te raziskave je analizirati pozitivne in negativne ekonomske učinke investiranja v različne obnovljive tehnologije ter z modelom ekonomije energije potrditi koristi takšnih tehnologij pri krepitvi gospodarstva.

Ključne besede: viri obnovljive energije, nove tehnologije, krepitev gospodarstva.

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