Advances in Business-Related Scientific Research Journal (ABSRJ)
Volume 3 (2012), Number 1

OVERVIEW AND COMPARISON OF DATASETS ON ENTREPRENEURSHIP

Tanja Kosi

University of Primorska, Faculty of Management Koper

Slovenia

tanja.kosi@fm-kp.si

Štefan Bojnec

University of Primorska, Faculty of Management Koper

Slovenia

stefan.bojnec@fm-kp.si

Abstract

Measuring entrepreneurship is a starting point for empirical studies investigating determinants of entrepreneurship or/and the impact of entrepreneurship on the economy. The article provides an overview of currently available harmonized cross-country time-series datasets on entrepreneurship and examines correlations between data for alternative indicators. Each indicator is related to the closest theoretical concept of entrepreneurship that exposes a specific dimension of entrepreneurship. The results confirm that entrepreneurship is a multi-dimensional phenomenon and indicate that conceptually and methodologically studies should focus on a specific dimension of entrepreneurship rather than trying to be too general in investigation and interpretation. Moreover, when investigating a certain dimension of entrepreneurship, the outcome of the analysis may be importantly influenced by the choice of the indicator related to this conceptual dimension and its data source.

Key words: entrepreneurship, international datasets, theoretical concepts, correlations, country ranking

INTRODUCTION

It is widely recognized that entrepreneurship is beneficial for modern economies since it creates jobs, enhances productivity and drives economic growth. Formation of strategies for

stimulating entrepreneurship ranks high on supranational1, national and local government agendas. However, empirical evidence on the impact of entrepreneurship on economic performance is limited. Studies addressing the link between entrepreneurship and economic performance mostly focus on a single country (employing time-series data on entrepreneurship across industries and/or across regions)2. There are rather few cross-country studies investigating the importance of entrepreneurship for the economy and its determinants. They mostly employ data on self-employment or business ownership (e.g. Thurik et al., 2008; Carree et al., 2007 and 2002; van Stel and Carree, 2004; Blanchflower, 2000) or data from Global Entrepreneurship Monitor (Thurik, 2008; van Stel et al., 2005). Another group of international studies employs indicators of business dynamics. Scarpetta et al. (2002) and Bartelsman et al. (2004), for example, use firm entry rates from the OECD firm-level project, van Stel and Diephuis (2004) use business volatility data from EIM's international benchmark study on entrepreneurship, and Klapper et al. (2008) employ incorporated business entry data from the World Bank Group Entrepreneurship Survey. The studies in general confirm positive impacts of entrepreneurship on economic performance, but the findings are not very robust and conclusive about the size of the impact and about the mechanisms through which entrepreneurship affects real economic variables. Advances in this field of research are impeded by a lack of internationally comparable data series related to entrepreneurship.

The article presents an overview of alternative macroeconomic indicators of entrepreneurship employed in economic literature and possible sources of internationally comparable data. The aim is to draw attention to the empirical results of the variable and data source selection. The starting point of our research are Iversen et al. (2008), who review macroeconomic measures of entrepreneurship and relate them to theoretical concepts, Godin et al. (2008), who present a digest of indicators to compare entrepreneurship in the United States and Canada, and Vale (2006), who analyzes the consistency of business dynamics data coming from different sources. The article supplements the list of measures of entrepreneurship provided by aforementioned studies. The article also highlights the multi-dimensional and multidisciplinary nature of entrepreneurship, which should be taken into account in any research focusing on the impact of entrepreneurship on economic performance. Moreover, it shows that the outcome of empirical research might be sensitive to the choice of the indicator of entrepreneurship (related to the dimension we investigate) and its data source.

The article is structured as follows. In section 2, we present benchmark theoretical concepts of entrepreneurship and describe issues related to the selection of indicators. In section 3, we provide a brief overview of entrepreneurship indicators that are commonly employed in economic literature and the corresponding international databases. Section 4 compares indicators along the benchmark concepts of entrepreneurship and checks the concordance of country rankings based on different indicators related to the same concept. Section 5 concludes.

THE CONCEPTS OF ENTREPRENEURSHIP AND THEIR MEASUREMENT

The first step in measuring entrepreneurship is a choice or elaboration of a definition of the entrepreneur and trying to find its best empirical counterpart. However, no broad consensus about the concept of entrepreneurship has been reached in economic literature so far. There

[1] See, for example, European Commission's (2003) Green Paper on Entrepreneurship, which recognizes the importance of entrepreneurship for economic performance and suggests actions for promoting entrepreneurship.
[2] To our best knowledge, van Praag and Versloot (2007) provide the most exhaustive review of the literature investigating the impact of entrepreneurship on economic performance.

are several more or less complementary concepts and definitions describing some aspect(s) of entrepreneurship. Joseph A. Schumpeter (1911[2002]), Frank H. Knight (1921), and Izrael Kirzner (1973) have developed perhaps the most comprehensive and from certain aspects alternative theories of entrepreneurship. Due to integrity of their approach, theoretical and empirical literature sometimes takes these theories as benchmarks (e.g. Godin et al. 2008). Even though Schumpeter (1911 [2002]) and Knight (1921) attribute the entrepreneur similar day-to-day tasks they seem to diverge with respect to the strategic role of the entrepreneur in society. Concisely and fairly simplified, Knightian entrepreneur is primary an uncertainty-bearer who undertakes uncertain projects and partly insures the rest of the society against potential consequences of uncertainty. Schumpeterian entrepreneur is every person that carries out new combinations (i.e. innovates) and operates by a rule in a new firm; he loses entrepreneurial character as he settles down and commits to running an established business. According to Kirzner (1973), the main function of the entrepreneur is to discover information that is valuable in satisfaction of wants, i.e. to detect business opportunities. Summing up, prominent dimensions of the Knightian entrepreneur are uncertainty bearing and managing while the crucial dimension of the Schumpeterian entrepreneur is innovativeness, which in waves (through the process of creative destruction) distorts market equilibrium that is then re-established at a higher level of economic development. Distinctive dimension of Kirznerian entrepreneurship is sensitivity or alertness to new business opportunity.

While it seems difficult to capture all entrepreneurial activity and all its aspects into a single definition, it is even harder to construct a corresponding empirical measure or its proxy for empirical analysis. Even if we managed to succeed in both, we confront practical limitations related to data collection in different countries and across time. Considering these limitations, we first draw attention to a review of the existing indicators (with corresponding international databases) describing at least some aspect of entrepreneurship and then draw parallels to the benchmark theoretical concepts. For this purpose, we restrict our attention to the Knightian, Schumpeterian and Kirznerian concepts of entrepreneurship.

In the article, we consider four broad groups of empirical indicators of entrepreneurship for which recent cross-country data are available:

Self-employment rate from Organisation for Economic Cooperation and Development (OECD) and Statistical Office of the European Communities (Eurostat) and businesses ownership rate from COMPENDIA database compiled by EIM;

Entrepreneurial activity indices from Global Entrepreneurship Monitor (GEM);

Business creation rates compiled by EIM, World Bank, OECD, and Eurostat;

Indicators of innovative aspect of entrepreneurship: expenditures for research and development in GDP from OECD, triadic patent families from OECD, summary innovation index from European Innovation Scoreboard (EIS).

Our aim is to briefly introduce each of the indicators, relate it to the theoretical concept, posit its most apparent strengths and weaknesses and examine the current coverage of the corresponding database(s). We then examine correlations between data for alternative indicators (or data for the same indicator coming from different sources) and analyze the concordance of country rankings with respect to: i) different measures of Schumpeterian entrepreneurship, ii) different measures of Knightian entrepreneurship, and iii) measures of Kirznerian entrepreneurship.

REVIEW OF ENTREPRENERSHIP INDICATORS

Self-employment and business ownership rate

The measure most often employed in international studies to analyze the amount of entrepreneurship is the self-employment rate, largely because it is measured in most countries. In line with the ILO Guidelines for measuring employment, self-employment jobs are jobs where the remuneration directly depends upon the business profits. The self-employed makes the operational decisions affecting the enterprise (including one-person operations), or delegates such decisions while retaining responsibility for the welfare of the enterprise. Self-employed are all workers who are not treated as employees and are, according to the ILO classification, categorized in four groups: employers, own-account workers, members of producers' cooperatives, and contributing family workers. This classification indicates that unpaid family workers should be treated as self-employed because they work for family gain. OECD (2000) and van Stel (2005), for example, exclude them from the category of self-employed, which may importantly affect the results of self-employment analysis across countries as argued by Blanchflower (2000).

The OECD Labour Force Survey (henceforth OECD LFS) follows the ILO guidelines, while Eurostat Labour Force Survey (henceforth Eurostat LFS) distinguishes the following professional statuses of workers: employees, employers, self-employed, and family workers (Eurostat, 2009). Both, employers and self-employed are persons who work in their own business, but the former at the same time employ other people. Eurostat's definition of self-employment thus excludes not only family-workers but also employers. This is considered as self-employment in the narrow sense.

OECD Factbook 2009 defines self-employment rate as the share of self-employment in total civilian employment (i.e. total employment fewer members of the armed forces). It provides data for 30 OECD member states for the period 1990-2007 with shorter series for few countries. Since, according to the standard ILO definition, any person aged 15 or over who works for more than one hour per week is counted as being employed, self-employment rates are very high in countries with many small farms or family businesses (e.g. in Greece, Italy, and Poland). We confront the OECD self-employment rates with self-employment rates calculated using Eurostat LFS data (in line with the Eurostat LFS classification), in particular:

1. Self-employed in the narrow sense as percentage of total employment;
2. Self-employed plus employers as percentage of total employment;
3. Self-employed plus employers plus family members as percentage of total employment, which is by definition close to the OECD self-employment rate.

Our calculations show that two broader self-employment rates based on the Eurostat LFS data (outlined in points 2 and 3) roughly coincide with the OECD figures or (especially for the indicator under point 2) fall below the OECD figure. A comparison of Eurostat figures for all the three indicators (under points 1, 2 and 3) reveals that the ranking of countries based on the most narrow measure (outlined under point 1) stays very close to the rankings based in the broader measures. Spearman rank order correlation coefficient (ρ) between most narrow self-employment rate (point 1) and the OECD self-employment rate equals 0.95 ($t = 12.10$). We conclude that in most OECD countries the ranking is largely determined by the numbers of self-employed who do not employ other people.

The OECD self-employment rate can be considered as a proxy for Knightian entrepreneurship, since the crucial difference between self-employment and paid

employment lies in the type of remuneration received, where the remuneration of self-employed as defined by ILO is uncertain (Iversen et al., 2008: 22).

Van Stel (2005) addresses inconsistencies in the OECD's data on self-employment. The main problem he detects is varying statistical treatment of owners and managers of incorporated3 businesses (incorporated self-employed), as this category of workers is classified as wage-and-salary workers in some countries, and as self-employed workers in other countries. EIM Business and Policy Research (EIM) made corrections to the OECD's self-employment estimates: it included owners-managers of incorporated small businesses and excluded unpaid family workers, self-employed in the agriculture, hunting, forestry and fishing sectors, and individuals who are self-employed as a secondary occupation. A harmonized dataset is called COMPENDIA (COMParative ENtrepreneurship Data for International Analysis) and the indicator is named the business ownership rate. It is calculated as a share of business owners in total labour force. COMPENDIA is based on the following definition of business ownership (Vale, 2005: 7): "the total number of incorporated and unincorporated self-employed outside the agriculture, hunting, forestry and fishing industries who carry out self-employment as their primary employment activity". In other words, business owners are unincorporated self-employed (sole proprietors and partners) as well as incorporated self-employed with less than 50 employees (owners-managers of incorporated businesses) in the non-agricultural sector where contributing family members are excluded. COMPENDIA database covers 23 countries over the period 1970-2007 (EIM, 2010a).

Small business ownership rate seem to be a good proxy for Knightian entrepreneurship. We do not completely follow the Iversen et al. (2008: 26) who posit that including owners and managers may overestimate Knightian entrepreneurship arguing that not all managers bear uncertainty. The EIM's assumption that the number of enterprises with less than 50 employees should approximately equal the number of business owners seems reasonable to us (for a discussion see van Stel (2005)). While small business ownership rate might not say much about innovativeness of entrepreneurial persons as understood by Schumpeter4, it is partly related to Kirznerian entrepreneurship. Namely, self-employed and small incorporated businesses need to perceive (and then exploit) new market opportunities to be able to survive. Even better indicator of Kirznerian entrepreneurship would perhaps be the number of high-growth businesses per capita or per active person. Namely, businesses that perceive business opportunities may explore their niche and expand; other businesses stagnate, shrink or decay. To our knowledge, harmonized cross-country database on the number of high-growth businesses per capita or per active person is not yet available5.

Global Entrepreneurship Monitor indices

Another set of indicators of entrepreneurship is provided by Global Entrepreneurship Monitor (GEM). GEM was launched in 1999, when it covered 10 countries, and has been extended to 54 countries in 2009. Under the GEM survey, national teams through questionnaires collect individual-level data on different aspects of entrepreneurship. Different entrepreneurship indexes are built based on collected data, which measure different aspects of entrepreneurship (Bosma and Levie, 2010: 61; EIM, 2010b):

[3] Throughout the paper, we use the term incorporated to denote registered legal persons. Unincorporated businesses are officially recognized natural persons.

[4] In *The Theory of Economic Development* (1911 [2002, 66]), Schumpeter interprets innovations broadly as: i) the introduction of a new good, ii) the introduction of a new method of production, iii) the opening of a new market, iv) a new source of supply of inputs, and v) a new organization of (monopolistic) industry.

[5] Eurostat-OECD Entrepreneurship Indicators Programme provides recent data for the share of high-growth enterprises (employment and sales definition) in all enterprises. Since countries with the same share of high-growth enterprises may show different number of high-growth firms per capita or per active person, we do not find it a good proxy for Kirznerian entrepreneurship.

1. *Total (early-stage) entrepreneurial activity (TEA) index*, which measures the relative number of people currently setting up a business or owning and managing a business existing (paying salaries) up to 42 months. It can be broken down into:
    - *Nascent entrepreneurial activity index* measuring the relative number of people currently setting up a business (salaries are paid from 0 to 3 months);
    - *Young firm entrepreneurial activity index* measuring the relative number of people owning and managing a business that exists (i.e. pays salaries) from 3 to 42 months;
2. *Established businesses activity index*, which measures the relative number of people owning and managing a business that exists more than 42 months;
3. *Necessity entrepreneurial activity index*, which measures the relative number of people involved in total early-stage entrepreneurial activity (TEA) out of necessity;
4. *Opportunity entrepreneurial activity index*, which measures the relative number of people involved in total early-stage entrepreneurial activity (TEA) out of opportunity.

These indices are calculated as the respective number of people relative to the population aged from 18 to 64 years.

Among the enumerated GEM indices, Knightian entrepreneurship is best described by the young firm entrepreneurial activity index and the established businesses activity index; they together measure the relative number of people owning and managing a business, which all bear some uncertainty (though young firms are usually more exposed to uncertainty). On the other hand, nascent entrepreneurial activity index is probably the most appropriate proxy for Schumpeterian entrepreneurship, while opportunity entrepreneurial activity index reflects Kirznerian entrepreneurship.

Business dynamics indicators

Business demography (or business dynamics) data describe changes in the number (and structure) of businesses, more particularly business creation and business destruction. Commonly used (relative) business demography indicators are business entry/birth rate, business exit/death rate, turnover/turbulence/churn rate (the sum of the previous two), net entry/birth rate (entry/birth rate less exit/death rate), and volatility rate (turbulence rate less net entry/birth rate)6. Business entry reflects the appearance of a new business within the economy, whatever the demographic event. It may be a birth of a new business, or a merger, renaming, spin-off and similar. Business exit reflects the abolishment of the existing business; let it be due to its death (from financial or other reason) or a takeover, a merger, renaming etc. Thus, the business birth and business death are narrower terms than the business entry and exit, respectively. In this section, we present the existing international databases of business dynamics indicators.

EIM Business and Policy Research (henceforth EIM) constructed a dataset called International Benchmark of Entrepreneurs, which contains data on business (more particularly, enterprise7) dynamics. The database provides figures for nine EU countries, the United States, and Japan for the period 1995-2007. It includes all non-agricultural incorporated and unincorporated enterprises and provides no size-class and no sector distributions. Data come from national business registers, national statistical offices,

[6] Definitions of the turnover/turbulence/churn rate, net entry/birth rate, and volatility rate are approximate; the exact definitions depend on the specific case and may differ between studies.
[7] We use the term *business* as a general term denoting either *enterprise* or *establishment*. For a distinction between the latter two terms, refer to Eurostat-OECD, 2008.

Eurostat, Amadeus (Bureau van Dijk), and Compustat and are made comparable across countries and over time. EIM (2010c) calculates entry (exit) rate as the number of enterprise entries (exits) in a certain period divided by the total number of enterprises at the beginning of a certain period.

Data on business entry rates are provided also by the World Bank Group Entrepreneurship Survey (henceforth the WBGES). Entry rates are calculated as newly registered enterprises as a percentage of total lagged (previous year) registered businesses (Klapper et al., 2008: 16). The WBGES defines its unit of measurement "any economic unit of the formal sector incorporated as a legal entity and registered in a public registry, which is capable, in its own right, of incurring liabilities and of engaging in economic activities and transactions with other entities" (Klapper et al., 2008: 4). Database includes all incorporated businesses regardless of their size in terms of employment or sales. The WBGES data on firm entry are currently available for 82 countries and cover the period 2000-2007 (data series is, however, shorter for several countries). Data come from the Amadeus database, Dun and Bradstreet (for the United States), and other sources. As exposed by Vale (2006: 11), the restriction of WBGES to corporate businesses raises additional comparability issues related to variations in the propensity of businesses to incorporate. This will differ between countries depending on the cost and complexity of registration procedures, tax incentives, reporting burdens and possibly even cultural factors.

Following the European Council meeting in March 2000 in Lisbon, which recognized the importance of entrepreneurship for a more competitive and dynamic Europe, Eurostat launched its business demography project with an aim to start systematically collecting harmonized data on business dynamics from national business registries of the EU member states (Eurostat, 2004). Eurostat followed methodology at the national level in detail and tested its results using pilot studies (Vale, 2006: 11). The statistical unit used in the Eurostat Business Demography project is the enterprise as defined by the Council Regulation (EEC) 696/93. The project focuses on enterprise births and deaths rather than entries and exits, since they reflect the creation of a genuinely new businesses and the actual decay of businesses. Another advantage of Eurostat data sets is the availability of a relatively detailed sectoral breakdown of the data on births and deaths of enterprises. Enterprise birth (death) rates are calculated as the ratio of the number of enterprise births (deaths) to the total number of active enterprises in the year in question. The Eurostat database on enterprise births and deaths currently covers 22 countries over the period 1997-2006 but is incomplete with very short-time series for several countries and some missing values in the series. However, its methodology is probably more exact that the methodology of alternative databases.

Another data source for business (more particularly, enterprise) birth and death rates is the OECD Business Demography database. The OECD birth rates are in general close to the Eurostat data on birth rates of enterprises. Whereas the OECD Business Demography database covers some most developed non-European countries (which are not covered by Eurostat), it provides somewhat shorter data series than the Eurostat Business Demography database. Since the data for different countries are not fully harmonized, international comparisons may not provide completely reliable picture. In 2006, the OECD launched the Entrepreneurship Indicators Project (EIP) with an aim to build internationally comparable statistics on entrepreneurship and its determinants. In the following year, Eurostat joined the project and since 2007, we talk about a joint OECD-Eurostat EIP. Currently, results of the first two rounds of data collections under the EIP are available, which contain employer birth and death rates for 22 countries for few years only (the length of the series depends on the country).

Indicators related to innovative entrepreneurship

The Schumpeterian concept of entrepreneurship exposes innovativeness as the key aspect of entrepreneurship. Measurement of innovation has played an important role in the investigation of the link between entrepreneurship and innovation and their effect on economic performance. Data on innovation activities are incomplete and presented by proxy measures that reflect only certain aspect of the respective phenomenon.

Effort of a country (its government and private sector) to make advances in science and technology is commonly measured in terms of the share of gross domestic product (GDP) devoted to research and development (R&D) activities. The term R&D activity in this context covers basic research, applied research, and experimental development. The disadvantage of the expenditure on R&D is that it measures only the resources devoted to R&D activities and not the amount of innovative activity actually realized; another disadvantage is that a considerable extent of R&D is informal. OECD Factbook 2009 provides data for 30 OECD countries and 9 other countries for the period 1981-2007 (with data series being shorter for some countries).

The output of a country's R&D activities is partly captured by patent-based indicators that count the number of inventions registered by businesses and individuals from a certain country. The patent-based indicators of the European Patent Office (EPO), the Japan Patent Office (JPO) and the United States Patent and Trademark Office (USPTO) give considerably different results, since not all inventions are patented at all the three offices. To provide an internationally comparable patent-based indicator, the OECD has developed the triadic patent families. OECD defines a patent family as a set of inventions patented at all three of these major patent offices. It attributes patents to the country of residence of the inventor and to the date when the patent was first registered. It includes only patents applied in the same set of countries and thus eliminates home advantage and influence of geographical location. OECD Factbook 2009 calculates a number of triadic patent families for 30 OECD member states and 10 other countries for the period 1990-2006. For the purpose of international comparisons, OECD recommends expressing the number of triadic patent families per million inhabitants. The disadvantage of the patented inventions is that they may show the stock of new technical knowledge but not the economic value it generates, since invention does not always result in innovation. Since the process for registering an invention might be lengthy and expensive, many inventions are not patented -especially not at all three international offices and particularly not those of small firms.

Since 2001, Eurostat's European Innovation Scoreboard (EIS) collects and annually publishes a wide range of innovation indicators that are calculated using the statistics from Eurostat and other internationally recognised sources. EIS has been evolving over time and more indicators have been added to the study and included into the summary innovation index (SII). The last edition of the EIS (2009) includes 31 innovation indicators (traditionally) divided into three groups: enablers, firm activities, and output. Due to changes in methodology and the number of indicators included, SII scores for different years in the period 2001-2009 are not directly comparable. In the empirical part, we employ harmonized SII scores for 37 countries (31 European and 6 non-European) for the period 2003-2007 taken from the EIS (2007). The SII, which for the observed period covers 25 innovation indicators, takes the value from a lowest possible performance of 0 to maximum possible performance of 1.

EMPIRICAL ANALYSIS AND THE RESULTS

For the purpose of empirical analysis, we organize the indicators presented in the preceding section (a concise tabular overview is provided in Appendix 1) along the three theoretical concepts: Knightian, Schumpeterian, and Kirznerian. We use country-level annual data for the period 2000-2007 but the actual coverage across countries and time depends on availability of data for each of the indicators.

Table 1 presents the correlation coefficients between indicators related to the Knightian concept of entrepreneurship. All three indicators are significantly positively correlated with each other. Using the Friedman's nonparametric test, we test the null hypothesis that there is no difference in countries' relative performance regarding the alternative indicators. Based on these results (chi-square of 72.031 with significance of 0.000, where the sample size is 113) we reject the null-hypothesis and conclude that the three indicators lead to different countries' relative performance (rankings). The choice of the indicator in empirical research might therefore importantly affect the results of analysis.

Table 1: Correlation coefficients between indicators of Knightian entrepreneurship

Indicators of Knightian entrepreneurship		Self-employment rate (OECD)	Business ownership rate (EIM)	Young and established business entrepreneurial activity (GEM)
Self-employment rate (OECD)	rho	1.000	.770**	.208*
	N	184	184	113
Business ownership rate (EIM)	rho	.770**	1.000	.244**
	N	184	200	115
Young and established business entrepreneurial activity (GEM)	rho	.208*	.244**	1.000
	N	113	115	130

* Correlation coefficient is significant at the 5% (2-tailed).
** Correlation coefficient is significant at the 1% (2-tailed).

Measures that can be considered as proxies for Schumpeterian entrepreneurship show surprisingly various patterns across countries (Table 2). It is important to mention that even though there is highly significantly positive relationship between the four indicators of business creation, the country rankings are significantly sensitive to the choice of the business creation indicator or the source of data (the Friedman's test yields chi-square of 20.000 with significance of 0.000, where the sample size is 30). Similar holds for EIS summary innovation index, triadic patent families per million inhabitants, and R&D expenditures in GDP. Disconcordance of country rankings with respect to these three indicators is confirmed by the Friedman's test yielding chi-square of 174.200 with significance of 0.000, where the sample size is 90.

In addition, the principal component analysis (PCA), which has been conducted8, extracts two significant components of Schumpeterian entrepreneurship that together explain about 75 percent of total variation in Schumpeterian entrepreneurship (see Appendix 2). The first component is mainly represented by the EIS innovation summary index, triadic patent families per million inhabitants and R&D expenditures. The second component is represented

[8] The results and the full sets of data for entrepreneurship indicators are available from the authors upon request.

by the GEM nascent entrepreneurial index, WBGES entry rate and EIM's entry rate9. Since entering businesses are in general smaller than the incumbents are, and since big firms and/or incumbents are in relatively favourable position regarding investments into R&D and patents, the dimensions might have to something with the size of businesses.

An indicator that is closest to the Kirzner's concept of entrepreneurship is GEM's opportunity entrepreneurial activity index. Since this is the only indicator clearly related to the Kirzner's concept, the analysis of correlations is not being taken into account. Anyway, Table 3 presents the correlation coefficients of this index with other indicators of entrepreneurship. Somewhat surprisingly, the index is not significantly correlated with the OECD self-employment rate and EIM's business ownership rate, while it is expectedly significantly positively correlated with all other GEM's indices described in section 4. It is also positively correlated with all four measures of business creation where only the correlations with the World Bank's entry rate and EIM's entry rate are statistically significant. The reasoning behind could be that alertness to business opportunities leads to their exploitation mainly by new firms. Since new solutions/ideas drive the obsolete solutions of incumbents out of the market, the stock of entrepreneurship as measured by the self-employment rate does not significantly change. Perceiving and exploiting business opportunities do not necessary involve patenting of technical inventions, which allows that the GEM's opportunity entrepreneurial activity index is significantly negatively correlated with triadic patent families per million inhabitants.

[9] We kept the latter two indicators of business creation because they contain longer data sets.

Table 2: Correlation coefficients between indicators of Schumpeterian entrepreneurship

Indicators of Schumpeterian entrepreneurship		Nascent entrepreneurial activity index (GEM)	Birth rate (Eurostat)	Birth rate (OECD)	Entry rate (WBGES)	Entry rate (EIM)	Summary innovation index (EIS)	Triadic patent families per million inhabitants (OECD)	R&D expenditures in GDP (OECD)
Nascent entrepreneurial activity index (GEM=	rho	1.000	.282*	.284	.371**	.410**	-.148	-.276**	-.147
	N	129	55	22	111	61	105	107	101
Birth rate (Eurostat)	rho	.282*	1.000	.896**	.323**	.691**	-.436**	-.405**	-.248*
	N	55	135	31	111	33	88	99	76
Birth rate (OECD)	rho	.284	.896**	1.000	.319*	.715**	.095	-.107	-.190
	N	22	31	68	51	25	12	68	45
Entry rate (WBGES)	rho	.371**	.323**	.319*	1.000	.551**	.132	.167*	-.039
	N	111	111	51	208	67	135	164	131
Entry rate (EIM)	rho	.410**	.691**	.715**	.551**	1.000	.236	-.269*	-.217*
	N	61	33	25	67	87	54	77	83
Summary innovation index (EIS)	rho	-.148	-.436**	.095	.132	.236	1.000	.906**	.834**
	N	105	88	12	135	54	170	115	106
Triadic patent families per mio inhabitants (OECD)	rho	-.276**	-.405**	-.107	.167*	-.269*	.906**	1.000	.852**
	N	107	99	68	164	77	115	203	153
R&D expenditures in GDP (OECD)	rho	-.147	-.248*	-.190	-.039	-.217*	.834**	.852**	1.000
	N	101	76	45	131	83	106	153	170

*. Correlation coefficient is significant at the 5% (2-tailed).
**. Correlation coefficient is significant at the 1% (2-tailed).

Table 3: Correlation coefficients between GEM's opportunity entrepreneurial activity index and other indicators of entrepreneurship

Kirznerian entrepreneurship: opportunity entrepreneurial activity index (GEM)	Self-employment rate (OECD)	Business ownership rate (EIM)	Nascent entrepreneurial activity index (GEM)	Young and established business entrepreneurial activity index (GEM)	Birth rate (Eurostat)	Birth rate (OECD)	Entry rate (World Bank)	Entry rate (EIM)	Summary innovation index (EIS)
rho	-.068	.213*	.865**	.781**	.415**	.327	.372**	.730**	-.044
N	115	118	128	129	55	22	112	64	108

** Correlation coefficient is significant at the 1% (2-tailed).
* Correlation coefficient is significant at the 5% (2-tailed).

CONCLUSIONS

In empirical research, various measures are used as proxy variables for entrepreneurship. The results of empirical studies investigating the impact of entrepreneurship on economic performance should be compared with a great care, since different types of indicators of entrepreneurship seem to highlight its different dimensions and may not provide consistent results and implications about the same phenomenon.

The article investigates the relationship between empirical indicators of entrepreneurship, for which harmonized cross-country databases are available, and conceptual definitions of entrepreneurship. It provides empirical support for the assertion that entrepreneurship is a complex and multi-dimensional phenomenon. In line with the results of the analysis, we suggest that studies should focus on a specific aspect of entrepreneurship rather than trying to be too general in interpretation. One should be very explicit in describing the investigated aspect of entrepreneurship or very precise about the theoretical concept of entrepreneurship that is closely related to investigated phenomenon.

The article organizes indicators along the benchmark theoretical concepts of entrepreneurship:

Knightian, Schumpeterian and Kirznerian. While alternative indicators of Knightian entrepreneurship exhibit significantly positive bivariate correlations, country rankings turn out to be sensitive to the choice of the indicator related to this concept. Indicators of Schumpeterian entrepreneurship show surprisingly various patterns across countries. Despite highly significant positive relationship between the four indicators of business creation, the country rankings are significantly sensitive to the choice of the business creation indicator or to the source of data. Similar holds for EIS summary innovation index, triadic patent families per million inhabitants, and R&D expenditures in GDP. Principal component analysis extracts two main components of Schumpeterian entrepreneurship. The first seem to be related to innovative activities in larger or/and incumbent businesses, while the second relates to new businesses. GEM's opportunity entrepreneurial activity index, which is closest to Kirzner's concept of entrepreneurship, shows no significant correlation with the self-employment rate and business ownership rate. On the other hand, it is positively correlated with all four measures of business creation and significantly negatively correlated with triadic patent families per million inhabitants. This could indicate that alertness to business opportunities leads to their exploitation mainly by new businesses, which drive incumbents with obsolete solutions out of the market (such that the stock of entrepreneurship does not significantly change). Perception and exploitation of business opportunities do not necessary involve patenting of technical inventions, which allows for the negative correlation between GEM's opportunity entrepreneurial activity index and triadic patent families per million inhabitants. Summing up, the results indicate that regardless which dimension of entrepreneurship we investigate, the outcome and implications of analysis might importantly depend on the choice of entrepreneurship indicator and its data source.

The presented study can be extended and further developed in different directions. One of them is to include multidisciplinary dimensions (e.g. sociological) and associated indicators of entrepreneurship that tend to enrich the interpretation of the results and perhaps highlight additional dimensions of entrepreneurship. This is one of the challenges for our future research.

REFERENCES

Bartelsman, E., Haltiwanger, J., & Scarpetta, S. (2004). Microeconomic evidence of creative destruction in industrial and developing countries, Policy Research Working Paper Series 3464, The World Bank.

Blanchflower, D. G. (2000). Self-employment in OECD countries. Labor Economics, 7, 471-505.

Bosma N., & Levie J. (2010). Global Entrepreneurship Monitor (GEM) 2009 Executive Report, Babson College / Universidad del Desarollo / Global Entrepreneurship Research Association.

Carree, M., van Stel, A., Thurik, R., & Wennekers, S. (2007). The Relationship between Economic Development and Business Ownership revisited. Tinbergen Institute Discussion Paper, 2007-022/3, 14 pages.

Carree, M., van Stel, A., Thurik, R., & Wennekers, S. (2002). Economic Development and Business Ownership: An Analysis Using Data of 23 OECD Countries in the Period 1976–1996. Small Business Economics, 19, 271–290.

EIM. (2010a). COMPENDIA - COMParative ENtrepreneurship Data for International Analysis. [Accessed in April 2010 at: http://www.entrepreneurship-sme.eu/index.cfm/1,76,0,0,html/Datasets].

EIM. (2010b). Aggregate data from the Global Entrepreneurship Monitor (GEM). [Accessed in April 2010 at: http://www.entrepreneurship-sme.eu/index.cfm/1,76,0,0,html/Datasets].

EIM. (2010c). International benchmark of entrepreneurship. [Accessed in April 2010 at: http://www.entrepreneurship-sme.eu/index.cfm/1,76,0,0,html/Datasets].

EIS (2007, 2009). European Innovation Scoreboard, reports for different years. [Accessed in April 2010 at: http://www.eis.eu/].

European Commission. (2003). Green Paper "Entrepreneurship in Europe", COM (2003) 27, 24 pages. [Accessed in March 2010 at: http://europa.eu.int/comm/enterprise/entrepreneurship/green_paper/index.htm].

Eurostat (2009). The European Union Labour Force Survey. [Accessed in April 2010 at: http://circa.europa.eu/irc/dsis/employment/info/data/eu_lfs/].

Eurostat. (2004). Business demography in Europe Results for 10 Member States and Norway. Data 1997-2001. Luxembourg: European Communities, 136 pages.

Eurostat-OECD. (2008). Eurostat-OECD Manual on Business Demography Statistics 2007. OECD Publishing.

Godin, K., Clemens, J., & Veldhuis, N. (2008). Measuring Entrepreneurship, Conceptual Frameworks and Empirical Indicators. Studies in Entrepreneurship & Markets 7 (June 2008). A publication of The Fraser Institute, 66 pages.

ILO Guidelines for measuring employment, self-employment [Accessed in February 2010 at: http://www.ilo.org/public/english/bureau/stat/class/icse.htm].

Iversen, J., Jørgensen, R., & Malchow-Møller, N. (2008). Defining and Measuring Entrepreneurship. Now Publishers Inc.

Kirzner Israel M. (1973). Competition and entrepreneurship. Chicago, University of Chicago Press.

Klapper, L., Amit, R., & Guillén, M. F. (2008). Entrepreneurship and Firm Formation across Countries, NBER Chapters, in: International Differences in Entrepreneurship, pages 129-158 National Bureau of Economic Research, Inc.

Knight, Frank H. (1942). Profit and Entrepreneurial Functions. The Journal of Economic History 2 (supplement), 126-132.

OECD (2000). Employment Outlook June 2000, Paris.

OECD. (2009). OECD Factbook 2009. Organisation for Economic Co-operation and Development, Paris [Accessed in April 2010 at: http://puck.sourceoecd.org/vl=4259413/cl=52/nw=1/rpsv/factbook2009/index.htm].

Scarpetta, S., Hemmings, P., Tressel, T. & Woo, J. (2002). The Role of Policy and Institutions for Productivity and Firm Dynamics: Evidence from Micro and Industry Data, OECD Economics Department Working Papers 329, OECD, Economics Department.

Schumpeter, J. A. (2002). The Theory of Economic Development. Transaction Publishers, 7th ed. Originally published Cambride: Harvard University Press, 1934. First published in German, 1911.

Stel, A., Carree, M., & Thurik, R. (2005). The Effect of Entrepreneurial Activity on National Economic Growth. Small Business Economics, 24 (3), 311-321.

Thurik, R., Carree, M, van Stel, A., & Audretsch, D. B. (2008). Does self-employment reduces unemployment? Discussion Papers on Entrepreneurship, Growth and Public Policy No. 0705, Germany: MPI Jena, 19 pages.

Vale, S. (2006). The International Comparability of Business Start-Up Rates Final Report. Oecd Statistics Working Paper STD/DOC(2006)4. Organization for Economic Co-Operation and Development - Statistics Directorate, November 2006, 144 pages.

van Praag, C. M., & Versloot, P. H. (2007). What Is the Value of Entrepreneurship? A Review of Recent Research. IZA Discussion Paper, (3014), 43 pages.

van Stel, A., & Carree, M. (2004). Business Ownership and Sectoral Growth: An Empirical Analysis of 21 OECD Countries. International Small Business Journal, 22 (4), 389–419.

van Stel, A., & Diephuis, B. (2004). Business dynamics and employment growth: a cross-country analysis, Papers on Entrepreneurship, Growth and Public Policy 2004-32, Max Planck Institute of Economics, Entrepreneurship, Growth and Public Policy Group, 19 pages.

van Stel, André 2005. COMPENDIA: Harmonizing business ownership data across countries and over time. International Entrepreneurship and Management Journal 1, 105-123.

APPENDIX 1

Indicator	Source	Coverage	Theoretical concept
SELF-EMPLOYMENT INDICATORS			
Standard self-employment rate	OECD Factbook 2009	30 OECD countries, 1990-2007	Knightian
Business ownership rate	COMPENDIA (by EIM)	23 OECD countries, 1970-2007	Knightian
ENTREPRENEURIAL ACTIVITY INDICES			
Nascent	Global Entrepreneurship Monitor (GEM)	1999 (10 countries)-2009 (53 countries)	Schumpeterian
Young firm			Knightian
Established business			Knightian
Opportunity			Kirznerian
Necessity			
BUSINESS CREATION INDICATORS			
Enterprise birth rate	Eurostat	22 EU countries, 1997-2006 (incomplete)	Schumpeterian
Enterprise birth rate	OECD	1995 (3 countries) - 2001 (20 countries)-2004 (4 countries)	Schumpeterian
Enterprise entry rate	International Benchmark of Entrepreneurs (by EIM)	1995-2007, 9 EU countries, US, Japan	Schumpeterian
Corporate business entry rate	World Bank Group Entrepreneurship Survey	2000 (39 countries) – 2007 (37 countries)	Schumpeterian
INDICATORS OD INNOVATIVENESS			
R&D expenditures in GDP	OECD Factbook 2009	30 OECD and 9 other countries, 1981-2007	Schumpeterian
Triadic patent families per mio inhabitants	OECD Factbook 2009	30 OECD and 10 other countries, 1990-2006	Schumpeterian
Summary innovation index	European Innovation Scoreboard	2001 (15 EU countries, US, Japan)-2009 (37 countries)	Schumpeterian

APPENDIX 2: The results of principal component analysis

Communalities

	Initial	Extraction
Nascent entrepreneurial activity index	1.000	0.402
Entry rate (World Bank)	1.000	0.640
Entry rate (EIM)	1.000	0.763
European innovation scoreboard - SII scores	1.000	0.936
Triadic patent families per mio inhabitants	1.000	0.845
R&D expenditures in GDP	1.000	0.928

Total variance explained

Component	Initial eigenvalues			Extraction sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	2.673	44.552	44.552	2.673	44.552	44.552
2	1.842	30.692	75.244	1.842	30.692	75.244
3	0.766	12.761	88.005			
4	0.498	8.304	96.308			
5	0.166	2.766	99.074			
6	0.056	0.926	100.000			

Component matrix

	Component 1	Component 2
Nascent entrepreneurial activity index	-0.263	0.577
Entry rate (World Bank)	-0.555	0.576
Entry rate (EIM)	-0.355	0.798
European innovation scoreboard - SII scores	0.697	0.671
Triadic patent families per mio inhabitants	0.919	0.016
R&D expenditures in GDP	0.916	0.298

Extraction method: principal component analysis.