

Towards a More Knowledge-Intensive Economy: The Role of the Education System

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Abstract

Economic development is fueled by the accumulation of productive knowledge and its usage for moving towards more complex industries. The complexity of an economy is given by the combination of inputs, technologies, and ideas that enables economic production. In this respect, public policies and investments should target the creation of environments and conditions favorable for allowing more complex economic structures to emerge and develop. More complex economies are those based on knowledge-intensive activities. This paper aims to highlight the role that the education system plays in supporting a more knowledge-intensive economy. We analyze data collected from experts from 5 emerging and developing economies in Europe and Southeast Asia. Evidence based on the views of the representatives of the academic sector and business environment is analyzed by statistical methods to highlight links between various characteristics of the economy and the role of the education system. We explore both the features of the present situation, as well as expectations on possible future developments. Our results confirm the fact that the education system plays a central role in the creation of conditions favorable for the emergence of more knowledge-intensive economic structures.

Keywords

Complex economy; knowledge-intensive economy; education; skills; innovation.

Introduction

Hausmann and Hidalgo (2009) have developed a theory concerning the pivotal role of the complexity of the economy in the process of economic growth. From their perspective, the amount of income obtained by countries is determined by the complexity of their economic structures. Accumulation of productive knowledge and how it is used give the level of economic complexity. Differences in countries' productivity and income are related to differences in non-tradable capabilities. Such capabilities that are locally available and their interactions give the level of economic

complexity. Institutions, regulations, property rights, infrastructure, and specific skills are among the most important such capabilities (Hausmann & Hidalgo, 2009).

More complex economies are those that rely on innovation and knowledge-intensive activities. They are in close connections with property rights and productive knowledge available at a country level and influence the level of economic complexity. Knowledge-intensive activities fuel technological progress and innovation. They rely on the value generated by human capital and intellectual property while depending less on physical capital and natural resources. An economic system based on knowledge relies mostly on intangible assets of organizations such as specialized skills, innovation capacity, and cultural practices.

While a more knowledge-intensive economy is considered a desired structural change (European Commission, 2011; Vertesy & Van Roy, 2013), several elements have been found to reflect this transition: enablers, compositional, and Schumpeterian structural change (Vertesy & Van Roy, 2013). Enablers include the context factors that enable or hinder innovation within companies. Compositional structural change is given by the magnitude of shifts in the sectoral composition with respect to output, exports, labor skills, research and development, foreign direct investment, and technologies. Schumpeterian structural change refers to innovation and entrepreneurship manifested at the micro-level, among companies and markets. The present paper is focused on enablers' level by studying the context factors that favor more knowledge-intensive activities, with a focus on the role of the education system.

To boost innovation and knowledge-intensive activities in companies, context conditions and eco-innovation systems have to be more favorable for innovative and knowledge-oriented companies (European Commission, 2011; Davidescu et al., 2015). Within eco-innovation systems, education institutions play an important role as they provide specialized skills and transfer knowledge for the economy.

This paper aims to assess the extent to which features of the education system are relevant for allowing more knowledge-intensive activities to emerge and consolidate their role within the economic system. Our study is relevant for improving the policy design in the view of enabling a more knowledge-intensive economy and more complex economic structures. In the long term, such structural change will improve productivity and economic growth.

Literature review

Evolutionary economics argue that important variations exist in terms of innovation dynamics and productive knowledge between sectors (Malerba & Orsenigo, 1997; Breschi et al., 2000). Co-evolutionary processes in relation to knowledge, the structure of the organizations and institutions appear in the economy and determine the emergence of new industries or economic niches (Nelson, 1994; Metcalfe, 2001; Murmann, 2013).

On the other hand, according to the innovation system approach, companies interact with other actors, including education institutions, within their institutional

environment (Edquist & McKelvey, 2000). There are national, regional, and sectoral innovation systems that determine variations in knowledge and institutions that support innovation across countries, regions, and sectors (Malerba, 2002; Malerba & McKelvey, 2020; Doloreux & Frigon, 2020).

Previous research has shown that access to quality education is an important determinant of innovation (Nelson & Phelps, 1966; Schultz, 1961; Aghion & Howitt, 1992). The knowledge society is one based on complexity, creativity, interpretation, and integration. From this perspective, the education system is called to support this structural change that allows actors and structures to access, produce and use ideas and technologies. In this view, a more knowledge-intensive society depends on the production of knowledge, on its spreading in the economy, including through education (Pargaru, Gherghina, & Duca, 2009). Also, education aims to contribute to the generation of collective and individual knowledge or know-how that is needed to manage today's complex world that is characterized by a more knowledge-intensive society (Cedefop, 2002).

Data and methodology

Data were collected under the activities of the project School of Knowledge Production and Transfer for Global Economy and Governance, funded by Iceland, Liechtenstein, and Norway through the EEA Grants 2014-2021. An experts' consultation on the way different challenges affect the dynamics of economic growth in emerging economies took place in the last three months of 2020 year through an online questionnaire.

77 experts from Romania, Moldova, Philippines, Indonesia, and Vietnam representing academic and business sectors were consulted on the evolution of economic growth, development of knowledge-based sectors and innovation, as well as on the role of higher education in supporting these dynamics.

The paper aims to explore the perceived role of education in fostering economic growth and diversification as well as the challenges that it will have to face in these developmental processes. On the one hand, we will analyze the role of education for the future, with a focus on higher education, and then the links between different characteristics of emerging economies and the capacity of the education system to support them by providing adequate skills. We are addressing the role of higher education as perceived or considered desired by the consulted experts. While it could be considered as expected to have a high premium put on education from the part of experts representing the academic sector, we will also try to explore differences between academia and the business environment.

The methodological approach employed to respond to our aims consists of a mix of quantitative techniques. Data collected among the experts from developing economies are analyzed using descriptive statistics, Cronbach alpha, and simple and multiple correspondence analyses. For assessing multidimensional phenomena, we construct composite indexes via simple aggregation, using the additive method by summing up unit ranking in each indicator (Mazziotta & Pareto, 2013).

Results

Role of higher education in the near future

Experts were consulted on the perceived role of higher education for the decade to come with respect to providing adequate skills, supporting the RDI activities and entrepreneurial ecosystem, contributing to economic development, and closing regional development gaps. As expected, most of the experts consider that the role of education will increase to a higher or a similar pace as happened in the last decade in relation to all aspects investigated within the consultation process.

Experts anticipate that in emerging economies the role of the educational system to provide technical and entrepreneurial skills will increase with a higher pace as against the last decade, while transversal skills tend to keep their importance as before. These opinions are consistent with the paradigm shift towards a competency-based approach in higher education (Bratianu, Hadad, & Bejinaru, 2020). Economic growth and knowledge production tend to become more individualized, while the role of entrepreneurial skills, as well as the role of universities in the entrepreneurial system, seem to become more and more important. Apace from the individualization of knowledge production, the role of universities in assuring cooperation and social innovation as to close the gaps of inequality and economic wealth will increase similarly or to a higher extent as compared with the last decade. In other words, high and adequate skills are at the core of economic and entrepreneurial development, while cooperation and social innovation will have the role to harness all the benefits of economic growth (Figure 1).

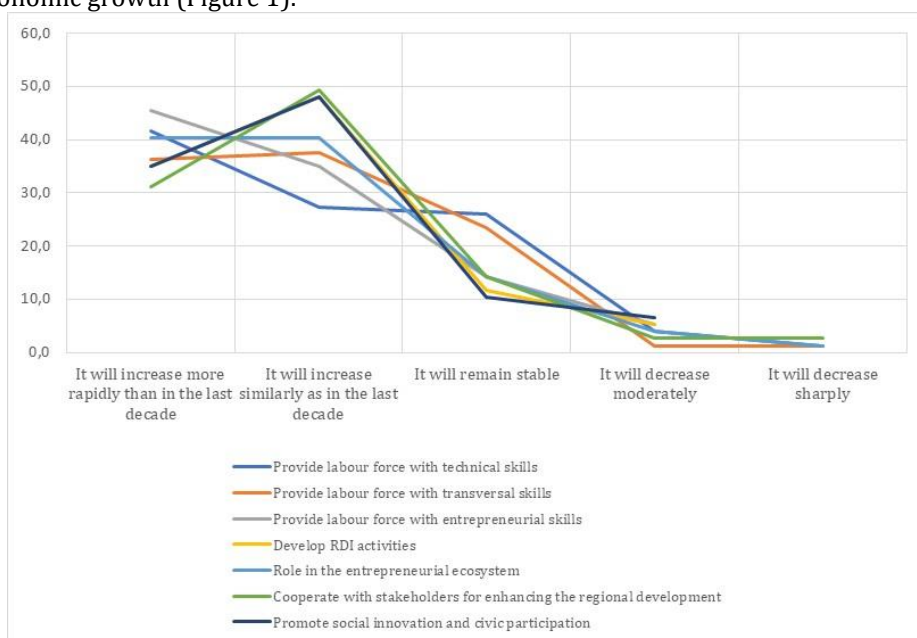


Figure 1. Experts' views on how the role of higher education will change in the decade to come (authors' analyses on the dataset)

Constructing an index on the perceived role of higher education for the future

To better evidence the role of higher education for the decade to come we constructed an index aiming to integrate all the diversity of the answers provided by the experts for all the dimensions considered relevant for the topic. First, the Cronbach Alpha coefficient was used to investigate the internal consistency in the set of items analyzing the perceived role of higher education for the future, as well as how well a single-dimensional object is measured. All seven items presented above were included in the reliability test. The results for applying the Cronbach Alpha are presented in Table 1, its value being above the cut-off value of 0.7 that is usually accepted as the cut-off value.

Table 1. The empirical results of Cronbach Alpha (authors' analyses on the dataset)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No. of Items
0,937	0,938	7

The results are pointing to a high consistency in the set of items, allowing us to construct a composite index on the perceived role of education for the future. We assign the following values for the scale points: 0=sharply decrease, 1=moderate decrease, 2=remaining stable, 3=increase to a pace similar to the last decade, and 4=increase more rapidly than in the last decade. Then, we constructed the index by simply summing the scores for all the answers provided by respondents. So, theoretically, the newly defined index will take values between 0 and 24.

The new created index on the perceived role of higher education for the future takes values between 5 and 28, mean and median values having a similar score around 22 (Table 2).

Table 2. Descriptive statistics for the Index of the perceived role of education for the future (authors' analyses on the dataset – items assessing the role of education)

Min	Max	Mean	Median
5	28	21,74	22

Even if experts representing the academic sector score higher with respect to the perceived role of education for the future, we could see that there are no significant differences between academic and business sectors. So, all actors share a common view on the increasing role of education for the future in providing adequate skills and fostering economic growth (Table 3).

Table 3. Variation of the Index on the perceived role of education for the future, according to the type of expert (authors' analyses on the dataset)

Academic respondent	Business environment respondent	Total
21,87	20,43	21,74

Anticipating the evolution of skills needs for the decade to come

Rapidly changing economies need an adequate and adaptable workforce, able to respond to all the changes affecting economic development. When it comes to emerging economies, it is expected that changes are even deeper and more frequent as compared with developed economies, and consequently, the pressure on the labor force and educational and training institutions to provide adequate skills is expected to increase.

Experts were required to assess against similar scenarios the rhythm of change in the area of skills needs, taking into account three dimensions at the country level: skill needs in knowledge-intensive sectors, reskilling needs of the labor force, and demand of highly skilled labor force. As Figure 2 evidences, the skills needs for the decade to come are expected to increase. Responses are quite homogenous, the large majority of consulted experts pointing to increasing skills needs. Demand in knowledge-intensive sectors is expected to increase more rapidly than ever happened in human history. The development of knowledge-intensive sectors, the only way in which economies will succeed to remain competitive at the international level will lead to increase demand for a highly-skilled workforce. But rapid changes are also associated with obsolete skills, so also the need for reskilling workforce will increase. These results are consistent with projections from other international reports (World Economic Forum, 2018) Only a minority of 15-20% of interviewed experts consider that skills needs will not be a pressing policy issue for the decade to come. The rhythm and sustainability of economic growth and all social systems depend on how educational and training policies in emerging economies will respond and mitigate increasing skills needs.

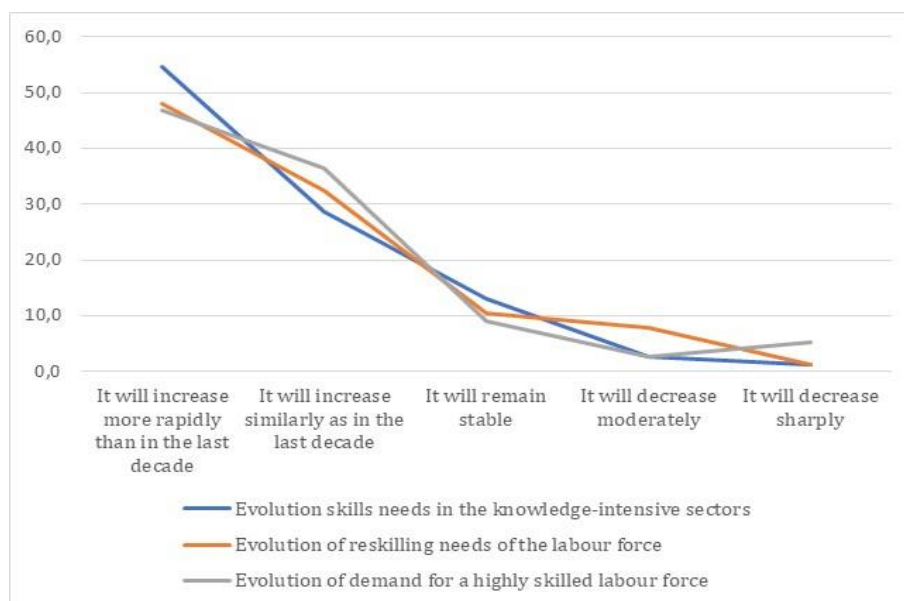


Figure 2. Experts' views on how skills needs will evolve in the decade to come
(authors' analyses on the dataset)

Constructing an index on the perceived evolution of skills needs for the future

As carried out for the previous sub-section, to better evidence the evolution rhythm of skills needs for the future we will construct a composite measure, integrating all three dimensions of skills needs investigated in the consultation process. Cronbach Alpha coefficient was used again to investigate the internal consistency in the set of items, the results presented in Table 4 evidencing a high consistency for a set of three items. The results allow us to define a composite measure with all three dimensions included in the consultation.

Table 4. The empirical results of Cronbach Alpha (authors' analyses on the dataset – items assessing the evolution of skills needs)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0,730	0,740	3

We proceed as before and we constructed the index by simply summing the scores for all the answers provided by respondents. So, theoretically, the new defined index will take values between 0 and 12.

The new created index on the perceived rhythm of skills needs for the future takes values in between 2 and 12, mean and median values having a similar score around 10, this pointing again to a high incidence of responses anticipating increasing skills needs in the decade to come (Table 5).

Table 5. Descriptive statistics of the Index for the perceived evolution of skills needs for the future (authors' analyses on the dataset)

Min	Max	Mean	Median
5	28	21,74	22

Links between the increasing role of education and the evolution of skills needs for the decade to come

We will continue the analysis by evidencing patterns of association between the two indexes. We considered that a composite measure would better synthesize different dimensions considered in the consultation process. So, we used for our exploratory endeavor the correspondence analyses aiming to evidence links in between the perceived rhythm on change for the skills need and the perceived role of higher education in the decade to come.

First, both created indexes are transformed from continuous variables into categorical ones. Based on the distribution of the scores of the two indexes, their values are classified into three categories: increase importance in the decade to come, having the same importance or a slight increase, and witnessing a decrease in importance for the decade to come.

The biplot provided in Figure 3 presents clear patterns of association between the two measures created. Experts anticipating increasing skills needs for the decade to come will also point to the increasing role of education in providing technical, soft, R&D, or social skills. On the other hand, experts considering that the skills needs will not be a pressing issue for the decade to come will also point to a decreasing role of education in providing different types of skills for the economy and society. And similarly, there is a clear association between the moderate values.

So, the importance and awareness of the evolution of skills need also increase the pressure and expectations from higher education to meet the needs of changing economies and societies. Higher education will have to prepare younger generations for knowledge-intensive sectors, supporting innovation and knowledge production and transfer, confirming previous findings of Prelipcean and Bejinaru (2018).

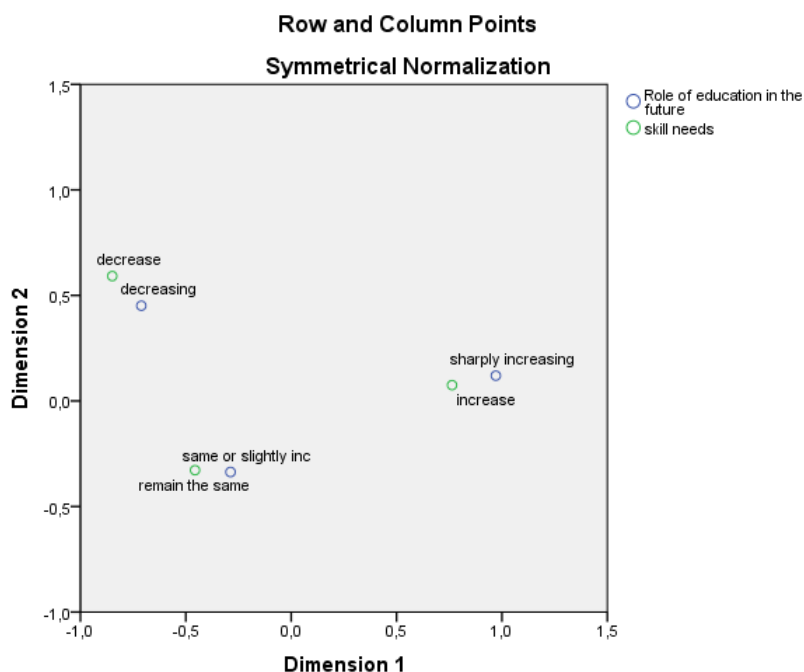


Figure 3. Correspondence analyses between the role of education and the dynamics of skills needs in the future (authors' analyses on the dataset)

To meet the challenges of the decade to come, universities have to be already prepared to provide skills and knowledge supporting the anticipated needs and challenges. So, are universities ready to provide adequate skills and knowledge?

Assessing the current capabilities of universities to offer proper courses

Experts were also asked to assess the present readiness of universities from their countries to support economic growth and diversification by offering proper courses for fostering creativity and innovation, as well as knowledge production and transfer.

They were asked to evaluate different dimensions on a scale varying in between 1=not at all and 5=to a high extent.

Most of the respondents consider that universities are moderately prepared for the challenges to come, the average scores for all dimensions varying around the value of 3,3.

Worth mentioning that the average scores are slightly higher among respondents from Asian countries, compared with those from Eastern European countries for all the dimensions included in the analysis. So, at least according to the respondents included in the consultation process, Asian universities are better prepared to respond to the challenges to come (Figure 4).

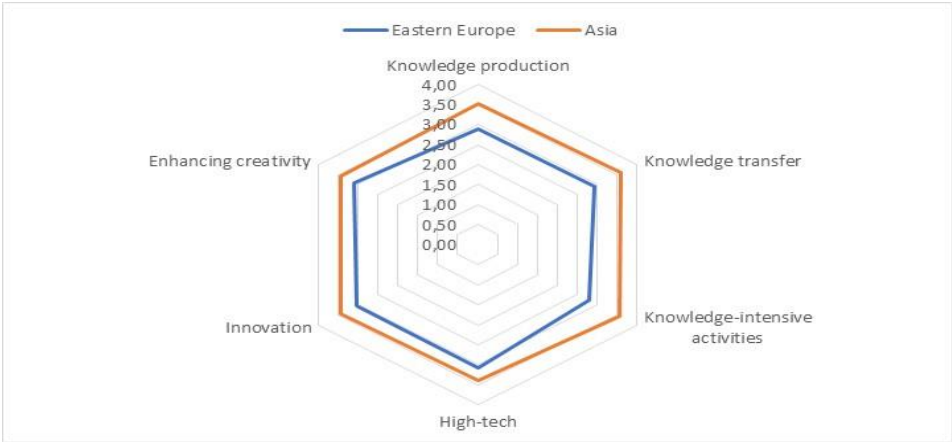


Figure 4. Experts' views on how prepared are universities in their home countries to provide proper courses for the challenges to come, by region (authors' analyses on the dataset)

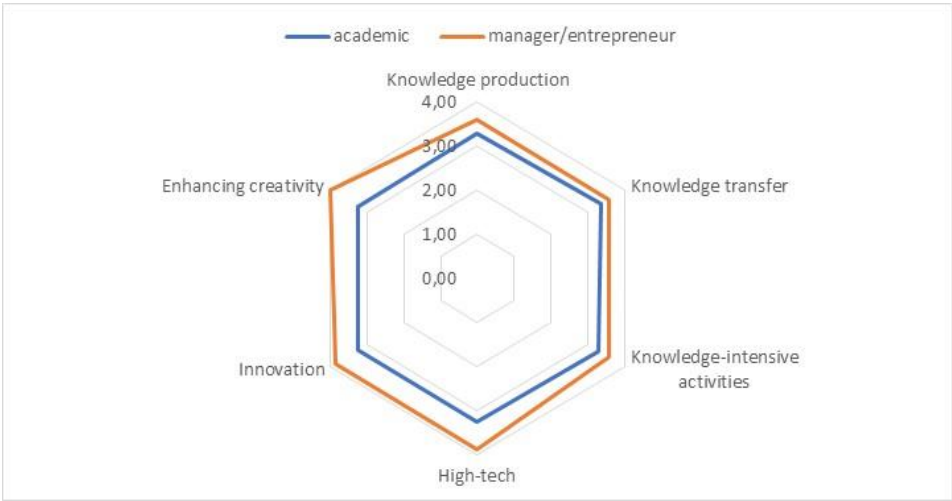


Figure 5. Experts' views on how prepared are universities in their home countries to provide proper courses for the challenges to come, by type of expert (authors' analyses on the dataset)

Also, the business environment seems to be slightly more optimistic with respect to how well-prepared are universities to provide their students with the skills required by knowledge-intensive sectors (Figure 5). In other words, the business environment assumes that universities hold and cultivate the needed skills, creativity, and resilience, while academia has a more reserved view on the same subject. The explanation could reside in the need to develop adequate pathways to support knowledge transfer between universities and the business environment. Also, knowledge-intensive sectors are characterized by higher levels of specialization, where the role of the business environment in developing adequate skills is also important. So, if universities succeed to develop high-level general skills, the business environment will succeed to develop highly specialized workers.

Constructing an index on the readiness of universities to offer proper courses

Taking into account multiple areas in which universities are expected to provide proper courses for addressing challenges to come, we considered that an aggregated measure would be beneficial for further exploring links between the role of the education system and the economic environment. To obtain a composite measure that will better evidence the readiness of universities to prepare students for the challenges to come, we test the relevance of such a composite measure, integrating all six dimensions assessed in the consultation process. Cronbach Alpha coefficient was used again to investigate the internal consistency in the set of items, the results evidencing a high consistency of the set of items and high reliability for defining a composite index (Table 6). The new index is defined as in the previous cases by simply adding the scores for all the answers provided by the experts, and its values could vary between 0 and 24. Higher the value, higher the readiness of universities to offer courses adequate for the challenges to come.

Table 6. The empirical results of Cronbach Alpha (authors' analyses on the dataset - items assessing the readiness of universities to offer proper courses)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0,951	0,951	6

The new created index on the readiness of universities to offer proper courses takes values in between 2 and 24, mean and median values having a similar score around 14-15. So, the new created measure better evidence the partial readiness of the higher education system to prepare for knowledge-intensive sectors and challenges associated with the new paradigm of economic development (Table 7).

Table 7. Descriptive statistics of the index on the readiness of universities to offer proper courses (authors' analyses on the dataset)

Min	Max	Mean	Median
2	24	13,92	15

Links between the readiness of universities to offer proper courses and different features of the business environment

Finally, we are using multiple correspondence analyses to evidence patterns of association between the readiness of universities and different characteristics of the business environment. We post-coded the values of the index in a categorical variable having three categories: to a low extent, to some extent, and a high extent.

Dimensions considered to assess the business environment were: the extent to which companies are knowledge-oriented, innovation-oriented, ready to face changes, if they could shift on crises or if they are on stream with ICT and high tech.

The biplot in Figure 6 presents clear patterns of association between all the dimensions included in the consultation process. Experts considering that universities are only to a low extent offering proper courses also consider that companies are not ready to face the challenges of the decade to come. Contrary, experts considering that companies in their countries are somehow moving towards a more complex and diverse economy also consider that universities are offering to some extent the skills and courses needed. Also, there is a clear association between the assessment of the readiness of the business environment and the capability of universities to provide proper courses.

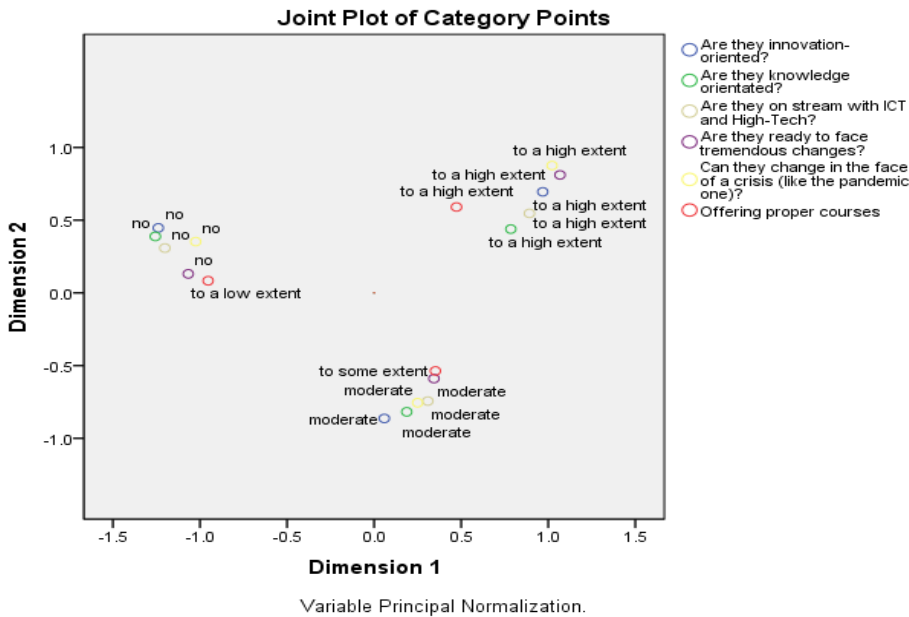


Figure 6. Multiple correspondence analyses between characteristics of the economic features and quality of education provided by the educational system (authors' analyses on the dataset)

In other words, there is a bidirectional relation between education institutions and economic structure, the most important issue being how to support both companies

and universities to move in the desired directions without unbalancing skills match or economic development.

Conclusions

A more knowledge-intensive economy is a key source for economic growth and development. The productivity of economies is correlated with their level of complexity and diversification. In this respect, our paper has explored the role of the education system in supporting complex and knowledge-based activities to develop in emerging economies. We base our analysis on data collected from an important number of experts representing the academic sector and business environment from several countries from Asia and Eastern Europe.

Our results confirmed the theoretical frameworks regarding the importance of human capital development for the emergence of a knowledge-based economy. In the decade to come, education institutions are very important for providing the needed skills that will support innovative, knowledge-oriented, and highly adaptable companies. A highly skilled labor force will be the base of the future economy which will provide competitive advantages to companies and countries. Education institutions are called to make this future happen.

The findings of this paper may contribute to the improvement of policy and practices in higher education institutions. Along with a paradigm shift towards a competency-based approach, tertiary education is called to improve its role in supporting entrepreneurship and knowledge-intensive activities in the decade to come. The main limitation of the study relies on the fact that the consulted experts represent a limited number of countries and the authors plan to extend the research by covering as many countries as possible.

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