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# On the Knowledge Economy

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Interest in the knowledge economy has increased considerably in the last decade both among social scientists and as a part of political processes across the globe. One striking milestone on the political scene in Europe is the Lisbon decision where the development of a competitive economic policy for the European Union was linked to the success of the development of the knowledge economy. Similar trends are easily observable in other parts of the world and are becoming an increasingly important part of industrial policy.

Academically, the concept of the knowledge economy is among the fastest growing areas of published literature; accelerating rapidly during the last decade. This story is, in a way, as old as the concept of organized production because the key to understanding this phenomenon is to understand how people learn from each other in a production situation. In economic science we can track this back to Marshall (at least). Indeed, this Special Issue on the Knowledge Economy builds on topics found elsewhere. A thorough and recent review of this literature can be found in Döring and Schnellenbach (2006). In the articles of this Special Issue, we extend key knowledge economy concepts that include:

- The concept of the knowledge economy – from theoretical formulations to operationalization
- The knowledge economy at the business level
- Knowledge – regional development and policy formulations

Many of these articles were first presented at the Presidential Symposium at the Mid-Continent Regional Science Association 38th Annual Conference, Kansas City June 7 – 9, 2007. The articles by Raspe & van Oort and Trippl & Tödtling were added because of their thematic focus and their extension of arguments put forward in originally selected articles. With this issue, our intent is to go one step further in analyses of the knowledge economy by forwarding conceptual developments combined with empirical assessments.

## 1. The concept of the knowledge economy: From theoretical to operational

In the article by Otto Raspe and Frank van Oort entitled "Localized Knowledge Externalities in Regional Economic Development and Firm Growth," knowledge is defined as the ability to recognize and solve problems by collecting, selecting and interpreting relevant information. Hence, a basic feature of the knowledge economy is the use of knowledge in interrelationships among market actors to produce goods and services, from the first idea to final products. Raspe and van Oort develop eight measurable indicators and analyze spatial patterns of the Dutch knowledge economy by grouping the indicators into three factors:

1. 'Knowledge workers' with indicators: ICT sensitivity, educational level, creative economy, and communicative skills
2. 'Research and Development' ('R&D') with indicators: the density of high and medium tech firms and the share of R&D employees
3. 'Innovativeness' with indicators: technical and non-technical innovations.

Spatial analysis of the Netherlands highlights knowledge intensity of Dutch regions (municipalities) from statistical scores of these three factors. This empirical analysis extends the current literature by utilizing a theory-driven conceptualization of the knowledge economy with regional analysis based on statistical data.

In addition, the authors applied employment data for manufacturing and business services firms stemming from a micro dataset of approximately 62.000 firms in the Netherlands during the period 2001-2006. They analyzed how firm-level economic growth was dependent on characteristics of the knowledge economy.

Results of the authors' work suggest that firms experienced higher growth rates when located in a region with a higher intensity of successfully innovative firms or with a higher intensity of research and development activities. Splitting the analysis into models of manufacturing and business services allows the authors to differentiate impacts. Results further suggest that as 'knowledge workers' had no significant impact on firm growth in general, they did foster growth in business services. The authors also found that spillover advantages were not related to specific industries, but rather, were firm specific. Indeed, in some cases, cluster regions grew faster than knowledge regions

In Hanas Cader's article entitled "The Evolution of the Knowledge Economy", the author builds from the standard OECD definition of the knowledge economy (like many of the other articles in this issue) and extends illustrative elements that improve its focus. Cader discusses the distinction between two ways of defining the knowledge economy:

- Data-driven: Using the data that are available (across regions/countries)
- Conceptually-driven: For example, being based on a model of knowledge acquisition and use, and relationships to innovation and economic performance

Cader examines industries in the U.S. economy to assess their level of knowledge using, as an indicator, the knowledge level of workers' occupations. He estimates knowledge ratios for industries using data for 1991 and 2001. In this study, ten occupational types were identified as representative of knowledge workers. Results of this analysis suggest that some supposedly professional industries have been classified downward with respect to knowledge level (e. g. smelting and refining of nonferrous metals). Further, many service industries have shifted upward on the knowledge-intensity scale. Other industries that were traditionally considered to be non-knowledge-intensive industries were found to be knowledge-intensive (e.g. child day care service and some personal care industries). While the data give few clear conclusions to what may be occurring, Cader's analysis suggests that information technologies have helped to routinize many functions previously preformed by more highly-skilled professionals. The IT revolution is often used as an exemplary argument for the rapid growth of the knowledge economy. While in many cases, this is realistic, its use also tracks effects related to how knowledge is used in production processes. The Cader study suggests that this effect can go in both directions.

The article highlights the fact that we have experienced significant changes in the occupational structure of industries in recent years and that this is reflective of changes in the knowledge level. On the other hand some industries have, relatively speaking, not changed their position very much regarding occupational structure (e.g. different part of the machinery industry). In such industries we see examples of successful knowledge creating policies which strengthen the firms' competitive position. This is just a reminder that when conducting analyses which are data intensive, one must be careful that the interpretations follow the definitions.

## 2. The knowledge economy at the business level

In the article entitled "Management and Learning in the Knowledge Society," Hans Siggaard Jensen raises an important question: What are the main challenges for management of firms in the knowledge economy? In response, Jensen discusses the new forms of management, based on a central role for knowledge production and finds that they are different from to the conception of strategic management. Knowledge management seeks to maximize the potential of the company to meet challenges and remain flexible enough to foster relevant innovations.

Jensen also points out that the knowledge economy is often led by researchers, innovators and designers. In a sense, management and the strategies pursued by managers are adapted to those who develop innovative products. The knowledge creating capability is the central resource of the company, its intellectual capital.

When it comes to knowledge and learning, firms involved in knowledge based operations need to be mindful that success hinges on:

- Doing the task efficiently
- Learning from the process of doing the task efficiently

Successful knowledge-based firms develop new knowledge based on research, innovation and design that actually secures the value creation of the company. This runs counter to traditional thinking. In earlier

industrial systems, authority flowed downwards from management. In the knowledge economy, a reverse form of authority exists because firms will not survive if workers subjugate their knowledge for that of management. While management may possess specialist knowledge, it often lacks the innovative knowledge of the employees. In the knowledge economy we have what we could call an inversion of authority.

My own article entitled "How to Define and Measure Knowledge for the Analysis of Competitiveness" stems from discussions three years ago with a manager of an oil rig company in Norway (Aker) who recognized that the primary competitor in Spain (Dragados) paid a 50% lower wage rate than at Aker. Despite this, Aker won contracts in a highly competitive international market. The manager was convinced that this was due to the fact that Aker produced using a smarter process; one driven by the development and application of new knowledge. In the resulting applied research, I developed a conceptual and empirical linkage between knowledge and competitiveness.

As a basis for the analysis, the company's knowledge capital was assessed using the following categories:

- Human capital: Defined as the knowledge the employee has and uses in the operations of the company. Often looked at as the employees' level of education and expertise in the company.
- Structural capital: Defined as the knowledge that is left in the company when the employees have left, e.g. patent rights, company routines, databases and so on.
- Relational capital: Defined as all human capital and structural capital that are linked in networks with all external relations the company has, for example contracts with other companies to market channels and so on.

Then the task was to determine the value of the firm's knowledge capital accomplished in the following way:

- Identification: Here one must look at knowledge in relation to the processes that are central for value creation in the company.
- Measurement: Here one must find a useful and operational set of indicators of which to measure knowledge capital.
- Management: Here one must develop a management system for the company that incorporates the effect that knowledge capital has on achieving the company's objectives: maximization of profits.

How indicators measure knowledge and how these metrics can be extended to bridge the link between knowledge and competitiveness provide focus for the assessment. Included are several statements about how important knowledge is for competitiveness yet how limited the existing literature is with respect to empirical examples; hence this article intends to contribute just such an example and thus help fill the gap.

In the final article of this section entitled "Community Knowledge: A Catalyst for Innovation", Kjell-Åge Gotvassli ties this into the community development and tourism literature by examining three different models that help in understanding entrepreneurial activity and innovation. These include:

1. The individual/cognitive model
2. The "community" model
3. The system/network model.

Gotvassli extends knowledge-based concepts into rural tourism development. Specifically, this case study focuses on a Norwegian mountain setting as a knowledge-based example in which a visit to the region is built around the wilderness experience-scape. Interestingly, the keys to success of this hostel lie within three knowledge-based factors:

1. *Knowledge as a foundation for innovation*. A good learning environment forms the foundation for interplay between theory and practice, material artifacts, senses, aesthetic signals, individual experience and social interplay.
2. *A successful operation of networks*. In addition to a close and tight network of family, friends and colleagues, the manager has also developed a network of external resource people, customers and public institutions. These networks are characterised by trust and interpersonal relationships. Long-term relationships are important for creating a good learning environment.
3. *The individual approach*. Local community managers act as self-realisation entrepreneur.

Results of this case study suggest, in an interesting fashion, that the emergence of the knowledge economy is not solely a high tech urban phenomenon, but exists in remote rural regions as well. Successful knowledge management can be regionally generic and extend to personal service sectors such as tourism.

## 3. Knowledge – regional development and policy formulations

The three papers in this section highlight studies that focus on knowledge, regional development and policy formulations. Characteristics of these three case studies link knowledge creation and diffusion within the contexts of:

- Climate (as an amenity)
- Culture
- Clusters

In the article by Michaela Trippl and Franz Tödtling entitled "From the Ivory Tower to the Marketplace: Knowledge Organizations in the Development of Biotechnology Clusters" the authors examine the recent trends of Austrian universities to move from acting solely as academic institutions to serving as regional economic engines. The authors reflect on the variety of knowledge interactions that exist in the Austrian economy, many of them in traditional sectors

Austrian universities play a key role in knowledge intensive biotechnology clusters which have direct and interactive forms of knowledge linkages. These linkages are brought about by strong and formal university-industry partnerships and academic spin-offs in biotechnology.

At the national and regional levels, interaction within the scientific system is found, indicating a rather intense local and national circulation of academic knowledge. Policy interventions have been significant for promoting closer relations between academic faculties and firms. These policies act to foster a transformation of scientific knowledge into marketable products by forming academic spin-offs.

Dennis Hoffman and Timothy Hogan present an article entitled "Sunbelt Growth and the Knowledge Economy" in which they explore whether a knowledge economy drives economic growth. Empirically, the authors develop explanatory growth models for the portion of the Southwestern United States known as "The Sunbelt. This region possesses what some consider an ideal climate which serves as a built in natural amenity. In this study, the authors search for a link between college educated workforce and economic growth.

Their results suggest mixed results with simple correlation statistics showing strong relationships between the share of college graduates and per capita personal income. Further, they found a modest link with employment growth but no statistically significant correlation with income growth. Results further suggested that expanding the ranks of college educated workers alone was insufficient to insure economic success as some proponents of the knowledge economy seem to believe.

Finally, the article by Meir Russ and Jeanette Jones entitled "Regional Economic Development Indicators for a Knowledge-Based Economy" takes up the discussion about creating and managing intellectual capital (IC) for regional economic development initiatives. The unique aspect of this case is the development of a framework and set of indicators for Northeast Wisconsin; an economically peripheral region thought to be knowledge deprived.

Russ and Jones provide results that suggest:

- the importance of cultural change as a prerequisite for accumulating intellectual capital in a knowledge deprived region.
- that cluster councils can be effective in developing an agreed upon set of indicators for their industry cluster.
- that policy should compensate for the lack of the critical mass of knowledge assets through interregional collaboration.

The stories presented in this special issue are, by themselves, interesting. But viewing them collectively, there are some common lessons to learn. Extending OECD definitions related to the knowledge economy in a more explicit and operational manner helps us understand how creation and diffusion of knowledge interacts with economic systems and other societal phenomena. The empirical case studies that incorporate "knowledge policies", knowledge process, and variability in geographic and sector applications provide a deeper understanding of how knowledge is involved in economic change. Overall, the intent behind organizing this special issue of the *Journal of Regional Analysis and Policy* was to contribute to a more explicit understanding of the knowledge economy and providing better operational applications. Enjoy!

## References

Döring, T. and J. Schnellenbach. 2006. What do we know about geographical knowledge spillovers and regional growth?: A survey of the literature, *Regional Studies* 40: 375-395.