

**Renewable energy sources as explicit factors in growth models
– environmental implications and economic growth**

Author,
RONCZ, Judit
Faculty of Economics, Institute of World and Regional Economics
University of Miskolc
H-3515, Miskolc
Egyetemváros

Contacts,
0036-46-565200
regroncz@uni-miskolc.hu

Supervisor,
Dr. Szita Klára Tóth
regszita@uni-miskolc.hu

**18th EDAMBA Summer Academy
Soreze, France
July 2009**

I. Abstract

By now we can surely state that the appearance of the environmental thinking and attitude has become one of the most determinative theoretical streams by the end of the 20th Century. It is also recognized that this trend expands and sooner or later can become one of the most dominant mobilizing – strengthened by its multidisciplinary dimension - factor of the world's economy and politics. In the midpoint of the growing concern for the environment stays the energy; so the biggest ones of the relating questions are the following: how can we utilize it more efficiency and in a renewable way, but most of all what impact it has on the environment and on economic growth? In my research I would like to find the answers for the last two questions but we have to mention also that it is a really complex but a controversial topic as well and it is exposed to too many interests. So environmental thinking had to fight its battle: it takes long time to worth being green and to reach the real path to sustainable development. And to support this, my object is to suggest or to offer a way from a factual, academic approach combining the economic-environmental points of view to get a real picture on these questions.

II. Research aims and motivation

In economic theory the role of environmental factors is not outlined properly. These factors are built in a number of theories and theoretical models, but mostly they are examined as an element having only secondary significance. The problems of such an analysis, on the one hand, come from the fact that the abundance of resources does not cause a swift growth automatically and, on the other hand, the numerical analysis is fraught with difficulties (Anderson 1992; Arrow – et al. 1995). Because of these problems in the early stages of the research process it is worth defining the concept of *resource*. A definition has to be found which is suitable to be the base of the numerical measurement of availability of resources on the one hand and, following from it, to be an explicit factor in economic growth models on the other hand. However, the primary purpose of this research is to outline the economic and environmental impacts of energy, notably renewable energy, which is a narrower concept than the former one (Goldemberg 2004). Environmental implications give a crucial issue when talking and thinking about energy, since, as it is well-known, energy sector – as a national economic

branch – causes the greatest amount of emission burdening our environment. Sustainability became one of the most common concept of our everyday life, so today the purpose of growth is the same as creating the possibilities to go on a road of sustainable economic growth ahead. A sustainable exploitation of energy resources makes one of the conditions to this.

The purpose of the research is manifold. On the one hand it addresses to find the most proper role of environmental factors in economic growth, and on the other hand to formulate and to calibrate a growth model specified to a regional level (Bergh – Hofkes 1997). Intuitively, it may be presumed that energy resources can act as the engine of economic growth, but a complete solution is fraught with difficulties because of the problems mentioned above.

III. Theoretical framework

From a theoretical point of view, resources and environment can play a manifold role in growth models. Environment is approached from two directions by current theories. Environment can be an encouraging as well as a limiting factor considering the issue of economic growth. The better an area (a country or a region) is provided with resources, the higher the growth potential is that can be realized. However, the concept of sustainability called the attention to several new aspects of the interdependencies lying between economic growth and the environment (Bartz – Kelly 2007; Brock – Taylor 2003): within the new conceptual framework environment is tending to become an effective limit standing in the way of economic growth, since – according to the very essence of this concept – extensive exploitation of the environment is to be avoided. That's why these two roles of environment is deeply controversial, and it may be necessary and unavoidable to create a new attitude mixing these two points of view mentioned above (Butter – Hofkes 1993). *Can we find a point beyond that the exploitation of resources and energy become wasteful and damaging? Can we find a point beyond that environment becomes a limiting factor of economic growth though it was an encouraging element before reaching that phase?*

Literature itself is divided along this line. Some of the authors concentrate exclusively on emission problems putting the greatest emphasis on the dangers caused by global warming and increasing population. Others focus on possible advantages not

forgetting about the damages, of course: according to their point of view, there are also definitely positive consequences following from extensive exploitation of resources and the intensifying burden on environment when taking the life and the conditions of societies into account. They state that the improvement of living standards and technological advances can pay a very generous compensation for the damages suffered by our environment. Over and above these approaches the concept and significance of sustainability has not to be forget as well (Ayres – et al. 1998).

Using models is also necessary when walking on these theoretical fields. A high degree of complexity relating to the actors and the relationships between them describes the whole issue. Models can help us in dealing with such complexity. Such models can address questions like: what net or synergetic effect on economic development results from diminishing returns of resources in production, new resource discoveries and the exploitation of them, or technical progress and substitution processes on the level of production and consumption.

Possible outputs of such a model examination hold out promises of great successes: it can be feasible to model growth possibilities and the actual growth process in a proper way, or to describe exactly all the environment implications of any growth process (or, at least, more implications and consequences than before). The mix of these two outputs can help us in a numerical formulation and setting of a *sustainable regional growth path*.

Up to now, the relationship, and, moreover, the interdependencies between economic growth and the environment have been caught mainly at a global and a national level. This issue is crucial even because of the fact that environmental implications coming in the frontline of interest recently triggered a significant modification within the topic structure of economic policy conversations and debates, adding new aspects and problems. As regional planning and growth came in focus, it becomes more and more urgent to describe and to measure numerically the environment consequences and implications of economic growth at a regional level as well. However, it has not to be forgotten to consider the regional conditions and factors of this growth process.

IV. Research methods

Theoretical research is strongly based on the results of former investigations, the very rich literature fundaments available. Despite the obvious shortcomings of the previous researches it is not necessary to set aside the theoretical canon completely. Clarification of the confusions becomes possible only if the terminology currently in use is known well and profoundly. As mentioned above, the primary aim of the first sections of the dissertation is to establish proper definitions and concepts. Its method is to survey and to revise literature in a painstaking but critical way. Only scepticism can result in concepts which are more complex, defined more precisely and properly operationalizable than the previous ones. *Which is the accurate sense of resources, energy, renewable energy and environment implications? What are the relations like between these concepts?*

In the second phase of the research numerical analysis plays the primary role. Methodological difficulties following from the usage of new concepts are to be overcome here. Using new concepts affects possibilities of measurement as well. Alternative ways of measuring the degree of supply of energy resources are also to be taken into account. *Can the degree of supply of renewable resources be described properly on the basis of data from energy utilization?* Such a question is justifiable since, according to the standpoint of standard macroeconomics, energy resources being present only passively (i.e. resources that are not exploited, so that cannot be utilized) cannot create an engine of economic growth.

Empirical parts raise more conceptual issues. *How can be the fact treated that energy utilized locally creates different economic and environmental effects? The place of generation and utilization of energy is not necessarily the same, so energy resources of a location can contribute to the economic growth of other areas. How does this fact effect the relationship between energy resources and economic growth that seems so unambiguous?*

It is necessary to measure the environmental implications of energy resources numerically in order to create a suitable model. Any environmental factor can act as a model input only if it is based on an exact measurement process. These variables can be created by adapting previous researches on the one hand, and by using admitted

methods such as life cycle analysis and eco-efficiency calculation utilized in international literature. Using these methodologies, the environmental effects of the renewable energy can be estimated objectively concerning a given period, and, by creating scenarios, we can prognosticate not only short, but also long run – even economical or environmental – benefits and damages. The inquiry will concentrate on the energetic exploitation of biomass as a renewable energy resource. The reason why is in Hungary most projects marked as "renewable" make efforts to exploit this energy resource, and, however, this is the energy resource discovered recently that is standing in the crossfire of public debates concerning its short and long run environmental effects. So, collecting primer data and processing them by using methodologies mentioned above give the content elements of this research phase.

In the fourth phase of the research process international, home and regional data will be collected and processed by using SPSS. It makes possible to analyze home and international energy generating and utilization tendencies, to register renewable energy potentials and to take relating environmental burdens into account. It has to be noted that regional data will be to derived from national data by building suitable methodological routines in.

V. Conclusions

There are different questions to be answered in different phases of the research process. Theoretical sections address conceptual issues by forming several new definitions. Standing on the basis of this conceptual outfit, empirical parts may result in numerical outcomes having new aspects. As an overall result of this research, our knowledge on energy, especially renewable energy, may increase, and the role that is played by energy in economic growth process may be better understood.

VI. References

- ANDERSON, Dennis (1992): *Economic Growth and the Environment*. Washington, DC: The World Bank.
- ARROW, Kenneth – et al. (1995): *Economic Growth, Carrying Capacity, and the Environment*. In: *Science* (268), 28th April, pp. 520–521.
- AYRES, Robert U. – et al. (1998): *Viewpoint – Weak versus Strong Sustainability*. Amsterdam: The Tinbergen Institute.

- BARTZ, Sherry – KELLY, David L. (2007): *Economic Growth and the Environment – Theory and Facts*. Miami: The University of Miami.
- van den BERGH, Jeroen C.J.M. – HOFKES, Marjan W. (1997): *A Survey of Economic Modelling of Sustainable Development*. Amsterdam: The Tinbergen Institute.
- BROCK, William – TAYLOR, M. Scott (2003): *Economic Growth and Environment*. Madison: University of Wisconsin-Madison.
- den BUTTER, F.A.G. – HOFKES, M.W. (1993): *Sustainable Development with Extractive and Non-Extractive Use of the Environment in Production*. Amsterdam: Vrije Universiteit.
- GOLDEMBERG, José (2004): *The Case for Renewable Energies*. Bonn: Secretariat of the International Conference for Renewable Energies.