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Global competitiveness in the EU through green innovation technologies and knowledge production

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Abstract

In information age,technological innovation rather than investment per se become the main source of increased productivity,the major tool of economic competition in the world market.From the public perspective ,government programs can rely on technological innovation in order to increase the quality of goods produced.However this introduces another types of market failure since the distribution of production costs is not efficient.Thus, a public firm may be a useful policy instrument,although with certain limitations**.**

On the other hand;knowledge can be created by individual or group action.Technological knowledge accumulation is commonly accepted as a vital force of economic development**.** This paper presents a research related to the knowledge production processe as the basic requirements of the green innovation activities especially and the international competitiveness. Quality of products is considered as the best guarantee for long-term competitiveness of firms and countries. Innovations are much more regionally concentrated than other economic activities and they are clustered within certain sectors and locations.

The main aim of the work is to draw a picture of the EU countries performances at the sector level in terms of innovative green technology , economic productivity and environmental efficiency. In addition,the paper draws a conclusion that competitiveness factors change according to type of sectors or economic structures of the EU countries. This gives us some clues; why the green innovation and technologies considered as the important stages for the companies that seek to gain international the competitiveness in global markets. Now that EU integration is entering its ultimate economic and monetary union phase, we conclude that EU policy should start to reassess the needs for a green technology policy institutional framework more directly aimed at removing the remaining European barriers to knowledge distribution.
Finally,specific sector performances such as innovative, environmental, and economic, are crucial to the future competitiveness and achievement of environmental targets in the EU

*Key Words***:** Green Innovation**,** Knowledge Production, Global Competitiveness, The EU

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1.Introduction

Innovation continues to be the salvation term and strategy of the decade. Countries are innovating for economic prosperity.At the same time, companies are innovating for competitive advantage. Individuals are mastering also the science of innovation for personal and professional success. For the institutions , knowledge means institutional harmony ,rules,experiences and practices and it is not receivable from the data bases,but created through common mind.

In this context, prior studies of innovation have shown that integration contributes to firm development through combining diverse knowledge, narrowing the gap between functionally different work units such as marketing, production and R&D groups, and reduces project completion time producing higher quality products and satisfying their customers more than the less integrated system.(See. Lee:2011)

In addition,creation of the knowledge-based economy in the worlwide is very complex and takes long-term.On the other hand , both knowledge spillovers and innovation take place among new identifiers of growth and competitive atmosphere in the world economy.In this regard,technological knowledge spillovers are widely accepted as spatially bounded within global economic innovation.

Therefore,the end of 2011 saw the publication by the EC of its Energy roadmap 2050 illustrating ambitious decarbonisation scenarios.A few months later,in June 2012, the Commission published a communication highlighting the crucial role that renewables will play in diversifying the EU energy mix beyond 2020,and in securing energy supplies and contributing to creating jobs, new industries and reducing GHG emissions.(EC:2012: 6)

On the other hand, it could be said that the EU's efforts alone are not enough to tackle global environment problems like climate change. Green technology investments will happen sooner if global green innovation networks are mobilized. The EU will not always be able to compete in mass-producing standardized green products. It will need to retain its strength in knowledge-intensive green services and technology.

On the methodological side, this paper is related with the literature that studies the transmission of knowledge spillovers from research and development (R&D) expenditures in the field of green innovation technologies for competitive pressure at the firm level.

After the introduction the rest of this paper is structured as follows. In Section 2 presents knowledge economy and knowledge production. As we have already emphasized before in Section 3 we will discuss green innovation and technologies.Next section belongs to the EU's knowledge distribution and innovative green technology policy.Last section is conclusion.

2 - Knowledge Production Economics

Knowledge production has become a central concern for firms and policy makers alike.In particular, the transformation towards a 'European knowledge society' rendered science and technology of particular importance to ensure the competitiveness of Europe. Against the background of this process, the 'Lisbon agenda' of the European Union can be considered an attempt to reorient Europe's main rationale from one based on economic integration alone towards one based on the concept of a common knowledge society. (Hoekman:2009:722)

Generally, knowledge in all its forms plays a crucial role in economic processes.Nations which develop and manage effectively their knowledge assets perform better.Firms with more knowledge get better paid jobs. (OECD:2007:15)
During the last 20 years developed economies have evidenced an important increase in their expenditures on information and communication technologies (ICT), and there is ample evidence indicating that the diffusion of ICT has contributed significantly to their productivity growth. (Draca:2007.397)

In this context, the process of adoption, implementation and diffusion of GPT (*general purpose technologies*) in general,and ICT in particular, is a knowledge-intensive and costly process, whose success depends on a firm's own efforts, as well as on the nature of its interactions with other firms. (Cerquera:2007:1)

Knowledge economy is a new economic paradigm and thus paradigm appears while knowledge,context,process,social capital and mental production to take physical input such as the raw material,labor and machine.

The appreciation of the recombinant character of the generation of technological knowledge and of the essential role of external knowledge as a necessary input enables to better appreciate the specific quality of the knowledge interactions that accompany and qualify market transactions. Knowledge interactions complement and enrich market transactions. Market transactions are effective carriers of knowledge spillovers. The higher are the levels of knowledge advance of the suppliers of inputs and the larger are the chances that creative customers can fasten their recombinant generation of new knowledge and fasten their rates of introduction of new technologies. (Antonelli:2013:29)

Technological knowledge,technology for short is the set of ideas spesifying all activities that create economic value.It comprises;

1) Knowledge about product technologies,the specifications of every think that is produced;

2) Knowledge about process technologies,the specifications of all processes by which goods and services are produced;

3) Knowledge about organizational technologies, the specification of how productivite activity is organised in productive and administrative units for producing present and future goods and services.(Including knowledge about how to conduct R&D) (Lipsey :2005:58)

Therefore, integrating different pieces of information separately belonging to individuals or units (as aresult of an effort for protecting knowledge or specialization) is imperative for innovation,but at the same time, enables those involved to identify the final integrated knowledge, and increasing the risk of knowledge spillovers and the potential loss of competitive advantage (Rønde, 2001:398).

On the other hand,government programs can rely on technological innovation in order to increase the quality of goods produced.However this introduces another types of market failure since the distribution of production costs is not efficient.Thus, a public firm may be a useful policy instrument,although with certain limitations. (Zikos: 2008 : 22)

In sum ,improving knowledge governance in firms and clusters of firms becomes a key issue .Policies need to "open borders": between: traditional fields of policy intervention, industries traditionally defined, various forms of knowledge production and diffusion, More efficiency through "Policy packages" rather than isolated instruments – Consider Policy Mix ,and finally demand oriented innovation policies: a "set of public measures to induce innovations and / or speed up diffusion of innovations through increasing the demand for innovations, defining new functional requirement for products and services or better articulating demand." (Vaezi : 2009:870)

3 – Global Green Innovation and Technologies in developing and developed countries

It is generally acknowledged that ,innovation can depend on specific knowledge and human capital built up over the course of past innovation. Adoption cost likewise will depend on past experience, both aggregate and investor-specific, leading to preferences for further improvement on the status quo versus a sharp departure from it.

Green energy is a term describing what is considered to be environmentally friendly, typically non-polluting, sources of energy, some sources may use it interchangeably with renewable energy. Green energy has mass appael among consumers, investors,and manufacturers.(Bohn:2010:36)

For the countries which can not head to the innovative development strategies, the crises of today turns out to be a continuous crisis; the countries which can be refreshed will turn the crisis to the opportunity to seize a more effective place in the global arena by restructuring. (Erkan:2009.702)

According to the OECD study definition of innovation is that '' Technological product and process (TPP) innovations comprise implemented technologically new products and processes and significant technological improvements in products and processes. (OECD:2007:31)

It is often difficult for innovative environmental technologies to gain acceptance. Reasons for this include uncertainty about the performance of the new technologies and reluctance of users to invest in approaches that may not pass muster with regulations (Herdman:1996:36).

As we move into the ''Knowledge Economy'' just as the new technologies provide greater scope for the suppression of competition,the consequences may be more adverse.I argued early that the kind of creativity that is essential for the knowledge economy requires the engagement of the mind.Organizationally,small new enterprises often have provided more fertile ground for this kind of creative engagement than do large established bureaucracies.These firms typically begin with a number of disadvantages,such as lack of access to innovative capital.If,in additon,there are artificially created marked (anti-competitive) barriers then the pace of innovation may well be slowed. (Stiglitz:1999:12)

In order to understand the underlying mechanisms through which green technology use—especially if introduced to cope with governmental regulation—interacts with the firms' organization of production processes will be important to understand the impact of green technologies on competitiveness. In other words, firms that adopted green technologies jointly with changes to their organizational structure can make better use of green technologies and hence more than offset productivity losses compared to firms having only adopted green technology. (Hottenrott,H et al :2012:1-20)

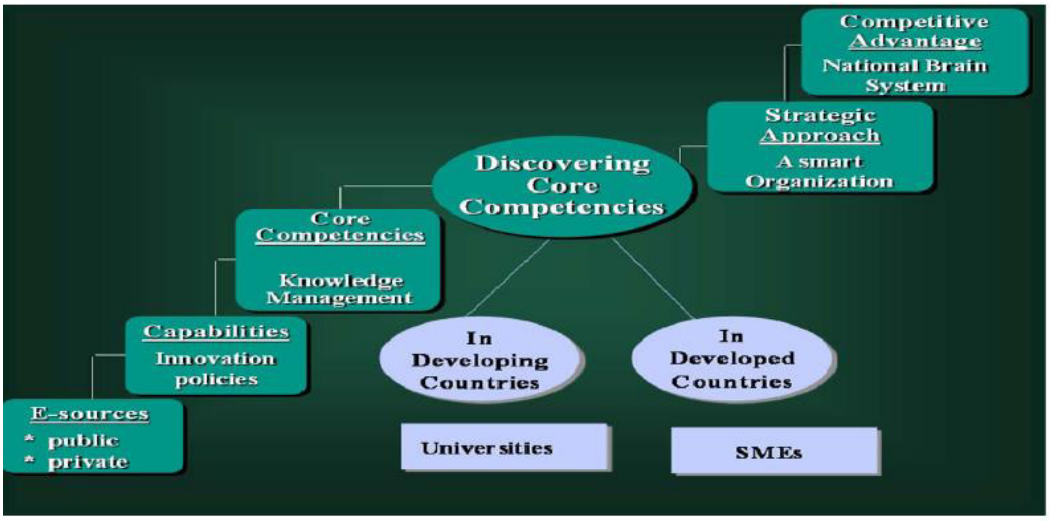

Figure 1: Innovation policy in developing and developed countries.
Source. Vaezi : 2009.

Although improving technology increased the sum of the game, exchange of low value added labor-intensive goods from the developing countries with more value added capital-intensive goods from the developed countries distorted income distribution among the nations. This flow (transfer) of resources made it more difficult to break the chains for the less developed countries. By the eighties, the process including enormous improvements in the information technologies and financial liberalization, *globalization*, strengthen the bounds between technological capabilities and competitive power of a nation in global markets. (Tunalı:2006:2)

On the other hand, international innovation activities are likely to be associated with higher costs, higher uncertainity and higher failure rate since firms will have to deal with different environments they are often not familiar with ,and carry higher transaction costs.(Rammer.2008:8)

The development of comparative advantage in international trade through environmental policy is obviously not something which can be replicated by all countries. In this sense it cannot be a means to generalised global green growth. In doing so they offer a sharp reminder that in the end the validity of green growth as a concept will depend not on whether, by creating demand for environmental products, correcting market failures and stimulating innovation, economic growth can be greener over the short to medium term. Ultimately the question will be whether such improvements in the productivity of environmental use can be sustained indefinitely (Jacobs:2012:15-19)

There does not seem to be a clear tendency for activities that improve the productivity of environmental services also to affect the productivity of built capital itself, positively or negatively. We can in that context consider innovation in non-carbon renewable energy as a particular form of innovation in different forms of built capital (generation units, "smart grids") that in turn allow greater value of national output to be captured from the same or lower utilization of primary fossil energy (Toman:2012:9)

Where market-based incentive schemes are used, renewable-energy generators are fully or partly exposed to market prices. They usually bid in the wholesale electricity market along with all other generators, and receive the market price for the electricity they generate in addition to the value of green certificates or premiums. Although these schemes may increase investment risk for investors due to price volatility in both the electricity and the green-certificate markets, and thus may have an impact on the deployment of renewable-energy technologies, they facilitate the integration of renewables into wholesale electricity markets.(Bahar, H. and J. Sauvage 2013:21)

In sum,a rough distinction can be made between product innovation (including both new product innovation and modification of an existing product) and process innovation.Process innovations are a way to improve productivity and reduce production costs,while product innovation gives the innovating companies a competitive advantages.We could hypothesize that product innovations and process innovations have a different effect on export performance. (Nguyen:2008:4)

4 – The EU's Knowledge Distribution and Innovative Green Technology Policy

Green energy projects are the beneficiaries of large amounts of economic recovery spending by government. Deutsche bank estimates that governments worldwide have allocated more than $ 200 billion in direct spending, subsidies, and tax credits for green investments.(DB Climate:2008:2)

Since the energy crisis in the 1970s and later the growing concern for climate change in the 1990s, policymakers at all levels of government and around the world have been enthusiastically supporting a wide range of incentive mechanisms for electricity from renewable energy sources (RES-E). They express a variety of motivations for promoting RES-E, from energy security to environmental preservation to green jobs and innovation. They also bring a variety of policy measures to the table, from an array of subsidies to mandates to emissions trading.(Fisher:2010:3)

Among the European countries considered, Germany has the strongest record on green innovation, second only to Japan's. In contrast, the other European countries appear to fall behind. Italy in particular has the poorest record of all eight countries, but there are also some alarming results for the UK, and to a lesser extent France.Fankhauser et al . (2012:17) In the case of motor vehicles, car manufacturers in France (e.g., Renault) and Japan (e.g., Toyota) have been at the forefront of electric and hybrid car developments, while German manufacturers have pushed conventional technologies..(Fankhauser et al . (2012:23)

Since the publication of the White Paper "Energy for the future" and the adoption of the RES-E2 Directive3 the European market has developed in a dynamic way. All EU member states have implemented policies to support the market introduction of RES-E and most of them have started to improve the corresponding administrative framework conditions. With solid support frameworks (being) set up to meet 2010 targets the current discussion process among others concentrates on securing an increasing use of RES for the period post 2010. The importance of providing such a longer term perspective for RES has been well acknowledged by the (EC) – as stated in the Commission's Communication 'The share of renewable energy' at least for the following reasons:

- considering in particular the infant nature of the renewable energy industry
- the need to ensure sufficient investors security (Ragwitz:2006:1)

Through EU directives and national policies, European countries have made credible commitments to support clean growth. These commitments should encourage investors to risk funding new products that are not profitable according to current market prices. Generous subsidies and tariff guarantees have been effective, helping European leaders emerge in many gren technology areas. By the late 2000s, environmental technologies accounted for almost 10 percent of GDP in Germany, and German firms held global market shares of 6–30 percent in key green markets (BMU: 2009:9).

Moreover, the effects of environmental policy on the innovation system should take into account that increasing share of imported intermediate inputs implies that emissions associated to domestic output are partly leaked abroad through trade. By itself this can improve sectorial direct resource efficiency (RE) indicators.The 'technology effect' in this trade related perspective is important since it makes necessary to study both sides of the coin: how emissions are relocated abroad, but also how trade drives technology shifts/spillovers and how green technology can enhance the competitiveness of the EU.(Gilli:2012:2)

Up to now, it could be argued that the European institutions have been primarily developed in support of an emerging 'knowledge-producing' national European innovation system. In doing so they have focussed on the realisation of essential complementarities with respect to more traditional EU economies of scale or harmonisation aims:

(i) the Single Market,
(ii) liberalisation,transparency and establishment of common competition rules,
(iii) targeting of strategic industries considered crucial for competitiveness, and
(iv)support for ***R&D*** activities of large EU multinationals. (Soete:1999:6)

According to the Table 1 below; public support to ***R&D*** for environmental and energy objectives was around €12 p.c. in the EU27 in 2008, up from €8 p.c. in 2004-2005. This is more than 50% higher than the equivalent figure for the US, but less than the figure for Norway and,especially, Japan . (Conte A et al 2010:10)

Table 1:Intensity of public support to total R&D and green R&D

	Euro per capita			Share in GBOARD	
	Energy	Environment	Total R&D	Energy	Environment
EU27	6.30	5.30	180.40	3.49%	2.94%
Non-EU average	12.70	4.38	271.58	4.68%	1.61%
Norway	13.70	9.10	474.90	2.88%	1.92%
Japan	25.20	1.70	183.40	13.74%	0.93%
South Korea	6.40	5.10	109.90	5.82%	4.64%
US	5.50	1.60	318.10	1.73%	0.50%

Source:Conte A et al 2010.

Taking into account the previous total R&D and green R&D statements, we can say that there are many different ways through which innovation can be deployed:the value created through innovation and its impact on competitiveness is rooted in the variety forms and processes of the innovation each firm able to design in its own original way. Following this approach,recently EU has upgraded its framework of analysis by creating **''Innovation Diversity Index '',**which is measure oriented to capture the alternative forms of innovation characterizing countries and region. Such an index is influenced not only by innovative firms that invest in ***R&D*** and patents,but also firms that have positive performances based on green innovation and innovation in such an index is influenced not only by innovative firms that invest in *R&D* and patents,but also firms that have positive performances based on organizational innovation and innovation in green marketing. . (Maria:2008:4)

Many incumbent country-sectors with strong comparative advantages today lag behind in terms of green conversion, suggesting that they could lose their competitive edge. Japan, and to a lesser extent Germany, appear best placed to benefit from the green economy, while other European countries (Italy in particular) could fall behind. However, the green economy is much broader than the few flagship sectors on which the debate tends to focus, and each country has its niches of green competitiveness. In iron and steel and for steam generators, there is little variation in comparative advantage,but there are marked differences in green innovation. Especially intriguing is the dichotomy in steam generators, where green innovation is concentrated in just two countries, Germany and France. In iron and steel, two relatively small producers, France and the UK, are leading the field. (Fankhauser et al . (2012:24)

5 –Conclusion

The EU countries must adhere to the same environmental standards and carbon policy. While all the EU countries bear the costs of green growth policies, not all have the structural endowments to take advantage of the opportunities these policies generate.

From our point of view, the known limited reserves of fosil-based energy resources and petroleum crises and increasing emissions pollution lead to search renewable energy sources such as solar and wind energy.In this regard,the countries of the EU are currently promoting the use of green energy sources. As we have frequently emphasized before, the EU must make

a series of urgent energy reforms in the field of renewable energy if it is to avoid energy problems in the future.We expect this debate to continue.

According to an IEA 2008 report ; achieving a sustainable energy supply for future generations is one of the major challenges for today's policymakers. Global energy demand is projected to grow by around 45 percent by 2030: more than three-quarters of the increased demand will come from developing and transition countries .

In this short article we cannot go into much detail into the development and formal organization of European green innovation technology policy. Meanwhile, taking all the 27 EU Member States (plus Croatia at next july) together,according to the EU directive on renewable energies, agreed in December 2008, requires each member state to increase its share of renewable energies in the bloc's energy mix to raise the overall share from 8.5% today to 20% by 2020.In order to achieve this objective, every nation in the 27-member bloc is required to increase its share of renewables by 5.5% from 2005 levels.

Finally, We take into account the role of changing specialization to investigate the EU's innovation and environmental performances. We show that vivid divergences in environmental, and innovation performances exist between the EU countries.In this context,green innovative and environmental sector performances are crucial to the future competitiveness of environmental targets all the EU Member States.

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