INNOVATION EFFICIENCY IN SPAIN: AN ANALYSIS BY ACTIVITY BRANCH.

María Auxiliadora de Vicente
María Rocío Guede
Finance Economy and Accounting II Department
Francisco José Blanco
Alberto Romero
Applied Economics Department
Rey Juan Carlos University
Paseo Artilleros s/n. | 28032 Madrid Spain
E-mail: alberto.romero@urjc.es

KEYWORDS

Productivity, Electre Tri, Innovation, Spanish Economy, Activity Branches, and Data Envelopment Analysis.

ABSTRACT

The increase in productivity is an obvious objective for business, moreover with the research and development objectives set out for Barcelona 2010 and the Lisbon Summit. Productivity is linked to efficiency as enterprises have increased productivity when they need less input to achieve certain outputs or when they increase outputs with the same inputs.

The objective for this article is to analyze the innovation efficiency in Spain by activity branch. To this end we will work with the 2006 data from the INE (Spanish National Institute of Statistics) innovation and R&D activities surveys. To this aim, we will use the following methodology for the efficiency analysis: the one based on output oriented DEA (Data Envelopment Analysis) with constant returns to scale.

This technique will be completed in two aspects. Firstly with the introduction of more inputs and outputs without causing an increment of efficient units and, secondly the study will be completed with a robust analysis to improve the DEA discrimination capacity.

MOTIVATION OF THE RESEARCH AND LITERATURE SURVEY

The structure of the Spanish economy is suffering nowadays some very significant changes marked by a double crisis at the same time. On one hand the serious international crisis, and on the other hand a national crisis product of a long term growth model based on exhausted activity branches.

It has been pointed out within the new strategic goals for the next decade set at the Lisbon European Council, in march 2000, that the European Union will become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion. Achieving these goals requires an overall strategy aimed at preparing the transition to a knowledge-based economy and society by better policies for the information society and R&D, as well as by stepping up the process of structural reform for competitiveness and innovation and by completing the internal market. (Lisbon European Council, 2000).

Spain, as a Member State of the European Union, should add value to the Union to become the most competitive, efficient, and dynamic economy in the world based on the knowledge, such as education, innovation, research and development.

In that point the following questions arises:

- Which the strengths and weaknesses of the Spanish economy are?
- In what economic activities should Spain specialize?
- Which is the role of the innovation in the transformation of the economic structure of Spain?
- Which is the efficiency in the innovation of the different branches of activity of the Spanish economy?
- In which branches is obtained the bigger productivity of the investments?
- Which activity branches of the Spanish economy are the most efficient ones?

All these key questions will be studied throughout the present paper to understand the current structure of the Spanish economy and to be able to offer information to economic politics decision makers.

Structural transformations needed to the economic growth and increase of the rent per capita imply changes of certain relevance in the structure of the production, in the role of the trade and in the public sector weight. (García and Myro, 2008).

Proceedings 23rd European Conference on Modelling and Simulation ©ECMS Javier Otamendi, Andrzej Bargiela, José Luis Montes, Luis Miguel Doncel Pedrera (Editors)
ISBN: 978-0-9553018-8-9 / ISBN: 978-0-9553018-9-6 (CD)

These changes leaded by the upward tendency of some activity branches and the decline of others, alter the structure of the whole economy. The research, development and innovation, all of them focused on the increase of productivity, are needed to lead these significant structure changes. Throughout the base of a balanced and sustainable economic growth based on innovation must be designed the nowadays Spanish economy structure change.

We conclude that the first motivation of this paper is to answer all the previous key questions related to the Spanish economy, but the second motivation is the methodological one, because methodologically it has never been applied such a innovative technique to try to answer to the previous questions.

Although there has been carried out very interesting researches on this topic (Buesa *et al*, 2006), (Galende del Canto 2008), (Gómez and Zabala 2008) it has not been applied the methodologically solution to the problem offered in this paper even by the most advanced DEA research methods. (Cooper *et al.* 2004), (Doyle and Green, 1994), (Dyson *et al,* 2001), (Lugones *et al,* 2003), (Madlener *et al,* 2006), (Maystre *et al,* 1994), (Raftery, 1993), (Roy and Bouyssou, 1993), (Zhu and Cook, 2007).

In order to follow the most authorized data analysis methodology it has been developed the study under the Oslo Manual framework and in concordance with the the INNO-policy reports, INNO Metrics (2007) and the European regional innovation scoreboard report (2006).

METHODOLOGY

The objective for this article is to analyze the innovation efficiency in Spain by activity branch. To this end we will work with the 2006 data from the Spanish National Institute of Statistics innovation and R&D activities surveys.

To this aim, we will use the following methodology for the efficiency analysis: the one based on output oriented DEA (Data Envelopment Analysis) with constant returns to scale and without a priori information about weights.

DEA allows each decision making unit (DMU, branches in our study) to specify its own weights so as to obtain a maximum efficiency score for itself.

Without the possibility of introducing weight restrictions, complete weight flexibility is allowed. This may result in identifying a Decision Making Unit (DMU) with an unrealistic weighting behavior to be efficient. Problems arising from the total flexibility of weights in DEA model are often dealt incorporating weight restrictions.

Nevertheless, weight restrictions must be meaningful and justified. Consequently, this poses a new problem to the analyst who should be able to explain why particular weights restrictions were used, especially when there is no full cooperation with the stakeholders or there is a lack of information.

Moreover, weight restrictions can pose as well technical and computational problems in some cases. For example, it is necessary to look for a compromise unique weight bounds suitable for all the units.

Due to these problems, we propose to take a different approach. We are going to proceed in two steps. Firstly, we are going to use cross efficiency analysis to take into account the whole set of weights families to lead each DMU (branches) to reach its maximum efficiency (to appear under the “best possible light”). And secondly, we will use Multicriteria Decision Aid to increase the discrimant power of DEA for the efficient branches.

The multicriteria Decision Aid method chosen will be Electre Tri. Electre Tri is a non compensatory, outranking relations based method and deals with the issue relating to classifying each alternative into a pre-defined category. Reference alternatives are used to segment criteria into categories: each category is limited below and above by two reference alternatives and each reference alternative thus serves as a border for the two categories, one upper and the other one lower.

Electre Tri is therefore a method of assigning action (regions) to pre-defined categories (hypothetical reference regions). The assigning of an action (region) “a” results from the comparing of “a” to the profiles (action – regions- reference) that define the limits of categories. Electre Tri will be applied to the cross-efficiency matrix of the DEA-efficient DMUs/branches.

Branches will be classified into two groups: those branches that are efficient or reach good enough efficiency values over the different set of weights for DMUs, and those ones that are efficient with their optimal weights but that reach bad efficiency values with the rest of weights for the others DMUs. We could also name these classes as the robust efficient branches and the non robust efficient branches.

As a prior step to DEA analysis we will do Principal Components Analysis (PCA) over the set of inputs and, separately, over the set of outputs. This is done due to other of the pitfalls of DEA: when there are many inputs and outputs the number of efficient DMUs increases. In our case if we apply DEA directly to the original set of inputs and outputs all the branches will be efficient.

The result of the study of the efficiency on the activity branches using the total of the original variables indicates that all the activity branches are efficient. For that reason it is necessary to carry out the study of the analysis of efficiency on the main components of the inputs on one hand and of the outputs on the other hand.

This identification of the most innovative efficiency Spanish economy activity branches will be carried out in three steps:

1. Firstly we will obtain the principal components of the inputs and, separately, of the outputs.
2. Secondly it will be identified the efficient and the non efficient activity branches obtained by a output oriented DEA applied over the principal components of the inputs and of the outputs.
3. Thirdly it will be improved the capacity of discrimination of the previous DEA by carrying out an Electre Tri over the cross-efficiency matrix of the efficient activity branches where all the criteria have equal weights. This Electre Tri will create two groups within the efficient activity branches, being fifteen efficient activity branches in the first group and eleven efficient activity branches in the second group.

ACTIVITY BRANCHES OF THE SPANISH ECONOMY

First of all it must be introduced the activity branches in which of research is focused on. How to separate or distinguish the different activity branches from the whole economy it is itself an interesting topic of research.

We follow the international main stream activity branches division, leaded by the OECD Oslo Manual from 1995, improved in 2005. This reference gives the main international standard guidelines, followed as well by the INE (Spanish national institute of statistic).

Last data published about the Spanish activity branches, following the previous methodology, has been published by the INE in 2006 within its technological innovation in the companies in 2006 organized per activity branches and offering main indicators of technological innovation in 2006.

One of the most interesting information offered is the innovation intensity of each activity branch, what means the total expenses in innovation related to the total figure of business. On the next paragraphs the different Spanish economy activity branches are enumerated, and at the same time the percentages of its innovation intensity are showed. All the activity branches has been ordered decreasingly, so it is possible not only to know which one has a bigger percentage of expenses in innovation, but also to understand how efficient these expenses are by checking the further table that classifies activity branches in order to their efficiency.
Obviously the research and development services activity branch leads this ranking, with an outstanding percentages of innovation intensity of 106,59%, followed, with a huge gap behind, by the aerospace activity branch, which has a 24,53% of innovation intensity. As it could be checked later on, both of the previous sectors are efficient.

Nevertheless a significant percentage of innovation intensity doesn´t mean to be efficient, as it happens in the pharmacy activity branch, with a 5,11% of innovation intensity and with an under average efficiency level (it will be shown later).

Mail and telecommunications had in 2006 a 3,67% of innovation intensity, optics instruments and watch-making 3,15%, office, calculation and computer machines 3,12%, electronic components 2,76%, another material of transport 2,53%, automobiles 2,39%, radio, TV and communication devices 2,34%, naval 2,27%, computer programs 1,76%, machinery and mechanical machines 1,65%, edition, impression and reproduction 1,58%, electric machines 1,56%, another manufactures 1,52%, transport and storage 1,40%, chemistry (except pharmacy) 1,34%, metallica manufactures 1,22%, textile 1,19%, rubber and plastic 1,13, other computer activities 1,10%, cardboard and paper 1,08, non metallic minerals 0,93%, recycled 0,88%, services to companies 0,85%, agriculture 0,80%, furniture 0,80%, leather and footwear 0,74%, feeding, drinks and tobacco 0,71%, wood and cork (except furniture) 0,71%, public, social and collective services 0,68%, strong metals 0,65%, extractive 0,63%, making and furrier 0,50%, electricity, gas and water 0,50%, non strong metals 0,47%, financial services 0,31%, construction 0,22%, coke, petroleum and nuclear fuel 0,13%, and trade and hostelry 0,13% respectively.

CORE VARIABLES TO ANALYZE THE INNOVATIVE EFFICIENCY

The set of variables used in our model are divided in two groups: the input and the outputs variables. The available variables that explains better the innovative efficiency input per activity branch in 2006 are:

- Total of innovative companies.
- Expenses in innovation: total in thousands of Euros.
- Expenses in innovation: R&D (internal and external) (%).
- Expenses in innovation: other innovative activities (%).
- Percentage of companies with innovative activities in 2006 over the total number of companies.

- Percentage of companies with innovative activities with internal R&D.
- Percentage of companies with innovative activities with external acquisition of R&D.
- Percentage of companies with innovative activities with acquisition of machinery, tools and software.
- Percentage of companies with innovative activities with acquisition of external knowledge.
- Percentage of companies with formative innovative activities.
- Percentage of companies with innovative activities with introduction of innovation in the market.
- Percentage of companies with innovative activities in design and other applications to production and/or distribution.

On the other hand the available variables that explains better the innovative efficiency input per activity branch in 2006 are:

- Intensity of innovation of the total companies.
- Intensity of innovation of the companies with innovation activities.
- Intensity of innovation of the companies with R&D activities.
- Percentage of companies with innovation in product (improvement of goods or services).
- Percentage of companies with innovation in the processes.
- Percentage of companies with innovation in product and processes.
- Percentage of companies that have introduced products that were a novelty only for the company.
- Percentage of companies that have introduced products that were a novelty for the market.
- Percentage of the company figure of business in 2006 consequence of the goods and/or services that were a novelty only for the company.
- Percentage of the company figure of business in 2006 consequence of the goods and/or services that were a novelty for the market.
- Percentage of the company figure of business in 2006 consequence of the goods and/or services that were a novelty only for the company in companies with innovations in course or not successful.
- Percentage of the company figure of business in 2006 consequence of the goods and/or services that were a novelty for the market in companies with innovations in course or not successful.

IDENTIFICATION OF THE MOST INNOVATIVE EFFICIENCY SPANISH ECONOMY ACTIVITY BRANCHES IN THREE STEPS

As developing the analysis having into consideration the total variables gives as result that all the activity branches are efficient, it has been necessary to improve the method by carring out the efficiency analysis over the principal components of the inputs and outputs.

First step:

Firstly we will obtain the principal components of the inputs and, separately, of the outputs.

We begin with the results for the inputs. It has been identified four main factors over the inputs, which have a global variance explanation power of 80,902%. The explained variance of each component in 2006 could be observed in the following table**.**

Explained total variance: inputs			
Component	Total	Variance Percentage	Accumulated %
1	5,639	31,257	31,257
2	1,582	19,883	51,140
3	1,379	17,112	68,251
4	1,109	12,650	80,902
5	0,782		
6	0,480		
7	0,389		
8	0,275		
9	0,236		
10	0,093		
11	0,037		
12	1,20E-016		

Extraction method: Principal Component Analysis.

Once applied the matrix of rotated component weights, using the rotated method of Varimax normalization with Kaiser, it has been obtained four main factors that explains the most of the variance and oppose some variables to anothers.

The first factor explains the 31,257% of the whole variance. It oppose the "Expenses in innovation: R&D (internal and external) (%)" with a correlation value of 0,928, the "Percentage of companies with innovative activities in 2006 over the total number of companies" with a correlation of 0,545, the "Percentage of companies with innovative activities with internal R&D" with a correlation of 0,629, to the "Expenses in innovation: other innovative activities (%)", with a negative correlation of 0,928, the "Percentage of companies with innovative activities with acquisition of machinery, tools and software", with a negative correlation of 0,793.

The second factor explains the 19,883% of the whole variance. It oppose the "Total of innovative companies", with a negative correlation of 0,865 to "Percentage of companies with innovative activities with introduction of innovation in the market", with a correlation of 0,678 and "Percentage of companies with innovative activities in design and other applications to production and/or distribution", with a correlation of 0,518.

The third factor explains the 17,112% of the whole variance. It includes the "Percentage of companies with innovative activities with external acquisition of R&D", with a correlation of 0,773, and the "Percentage of companies with innovative activities with acquisition of external knowledge" with a correlation of 0,941%.

The fourth factor explains the 12,650% of the whole variance. It includes the "Expenses in innovation: total in thousands of Euros" with a correlation of 0,894, and the "Percentage of companies with formative innovative activities", with a correlation of 0,530.

We move now to the results for the outputs. It has been identified as well four main factors over the outputs, which have bigger global variance explanation power. All the four factors explain the 92,686% of the variance. The explained variance of each component in 2006 could be observed in the following table**.**

Explained total variance: outputs			
Component	Total	Variance Percentage	Accumulated %
1	5,903	35,489	35,489
2	2,727	27,430	62,919
3	1,325	17,282	80,202
4	1,167	12,484	92,686
5	0,615		
6	0,163		
7	0,047		
8	0,032		
9	0,013		
10	0,006		
11	0,001		
12	0,001		

Extraction method: Principal Component Analysis.

As it has been previously done in the inputs case, here it has been as well applied the matrix of rotated component weights, using the rotated method of Varimax normalization with Kaiser, and it has been obtained four main factors that explains the most of the variance and oppose some variables to anothers.

The first factor explains the 35,489% of the whole variance. It includes the "Intensity of innovation of the total companies", with a correlation of 0,954%,, the "Intensity of innovation of the companies with innovation activities" with a correlation of 0,951%, the "Intensity of innovation of the companies with R&D activities" with a correlation of 0,945%, the "Percentage of the company figure of business in 2006 consequence of the goods and/or services that were a novelty for the market" with a correlation of 0,827%, and the "Percentage of the company figure of business in 2006 consequence of the goods and/or services that were a novelty for the market in companies with innovations in course or not successful" with a correlation of 0,802%.

The second factor explains the 27,430% of the whole variance. It includes the "Percentage of companies that have introduced products that were a novelty for the market", with a value of 0,865%, the "Percentage of companies with innovation in product (improvement of goods or services)" with a correlation of 0,833%, and the "Percentage of companies that have introduced products that were a novelty only for the company" with a correlation of 0,793%.

The third factor explains the 17,282% of the whole variance. It includes the "Percentage of the company figure of business in 2006 consequence of the goods and/or services that were a novelty only for the company in companies with innovations in course or not successful", with a correlation of 0,925, and the "Percentage of the company figure of business in 2006 consequence of the goods and/or services that were a novelty only for the company", with a correlation of 0,900.

The fourth factor explains the 12,484 of the whole variance. It is directly linked with the "Percentage of companies with innovation in the processes" and has a negative correlation of 0.960, so it explains the percentage of enterprises with a lower processes innovation.

Second step:

Secondly it has been identified the efficient activity branches obtained by a oriented outputs DEA over the principal components of the inputs and of the outputs. By using this technique it is possible to identify which activity branches are efficient and which one aren´t. The following table shows the activity branches which are no efficient and indicates the differences in efficiency throughout its percentages:

ACTIVITY BRANCH	Efficiency
Chemistry (except pharmacy)	98,23
Optics instruments and watch-making	97,36
Rubber and plastic	96,57
Machinery and mechanical machines	94,97
Public, social and collective services	94,48
Radio, TV and communication devices	94,25
Wood and cork (except furniture)	93,52
Non metallic minerals	93,1
Furniture	90,83
Pharmacy	87,73
Financial Services	84,58
Metallica manufactures	78,86
Trade and hostelry	77,96
Extractive	76,22
Services to companies	75,03
Electricity, gas and water	68,23

By contrast the following table shows all the efficient activity branches having into account both inputs and outputs principal components:

ACTIVITY BRANCH	Efficiency
Making and furrier	100
Textile	100
Agriculture	100
Transport and storage	100
Leather and footwear	100
Edition, impression and reproduction	100
R&D Services	100
Mail and telecommunications	100
Cardboard and paper	100
Another manufactures	100
Naval	100
Feeding, drinks and tobacco	100
Other computer activities	100
Construction	100
Automobiles	100
Strong metals	100
Coke, petroleum and nuclear fuel	100
Electric machines	100
Electronic components	100
Non strong metals	100
Recycled	100
Office, calculation and computer machines	100
Another material of transport	100
Computer programs	100
Aerospace	100
Electric machines	100

Third step:

Once the previous analysis has been carried out, the final and most significance add value of this research has been completed by improving the capacity of discrimination of the DEA method by carrying out Electre Tri over the cross-efficiency matrix of the efficient activity branches where all the criteria have equal weight. Results are the following:

First class group of efficient activity branches (robust efficient activity branches):

- Edition, impression and reproduction
- Mail and telecommunications
- Cardboard and paper
- Another manufactures
- Feeding, drinks and tobacco
- Automobiles
- Coke, petroleum and nuclear fuel
- Electric machines
- Electronic components
- Non strong metals
- Recycled
- Office, calculation and computer machines
- Another material of transport
- Aerospace
- Electric machines.

Second class group of efficient y activity branches (non robust efficient activity branches):

- Making and furrier
- Textile
- Agriculture
- Transport and storage
- Leather and footwear
- R&D Services
- Naval
- Other computer activities
- Construction
- Strong metals
- Computer programs

This Electre Tri created the two groups within the efficient activity branches showed above, being fifteen efficient activity branches within the first group, what means that these activity branches are not only efficient when the optimal weights for this activity branch has been assigned, but with most of the weights consired for the other activity branches. And the eleven efficient activity branches in the second group belongs to a second category because in that case they are no robust enough as they are only efficient with favorable weights.

CONCLUSIONS

As it has been explained the three main conclusions obtained in this paper are:

1. Methodologically it is possible to improve the DEA method by using the Electre Tri over the cross efficiency matrix of the efficient activity branches
2. To obtain a more realistic classification than the previous of the Spanish economy activity branches according to their efficiency.
3. To be able to classify the efficiency activity branches in three levels: non efficient activity branches, non robust efficient activity branches and robust efficient activity branches

REFERENCES

Buesa, M., J. Heijs, M. Martínez Pellitero, and T. Baumert. 2006. Regional systems of innovation and the knowledge production function: The spanish case. *Technovation* 26, (4): 463-72.

Cooper WW., Seiford LM., Zhu J. (eds.) (2004). Handbook of Data Envelopment Analysis. Kluwer Academic Publishers.

Directorate-General, E. INNO-policy TrendChart-policy trends and appraisal report.

Doyle J., Green R., (1994). Efficiency and Cross-efficiency in DEA: Derivations, Meanings and Uses. *Journal of the Operational Research Society*. Vol 45, No. 5, pp. 567-578.

Dyson, R.G. *et al* (2001). Pitfalls and Protocols in DEA. *European Journal of Operational Research* 132 (2001) 245-259.

Galende del Canto, J. 2008. La organización del proceso de innovación en la empresa española. *Economía Industrial*(368): 169-85.

Gómez Uranga, M., and J. M. Zabala Iturriagagoitia. 2008. Panorámica de la innovación en españa a través de la evolución de indicadores regionales. *Economía Industrial*(368): 125-39.

Hollanders, H. 2007. 2006 european regional innovation scoreboard (2006 RIS). *MERIT, Maastricht*.

Hollanders, H., and F. Celikel-Esser. 2007. Measuring innovation efficiency. *INNO Metrics*.

Lugones, G., F. Peirano, M. Giudicatti, and J. Raffo. 2003. Indicadores de innovación tecnológica. *Centro De Estudios Sobre Ciencia, Desarrollo y Educación Superior (REDES), Argentina*.

Madlener R., Henggeler Antunes C., Dias L.C., (2006). Multi-Criteria versus Data Envelopment Analysis for Assesing the Performance of Biogas Plants. *CEPE Working Paper No.* 49, ETH Zurich.

Maystre, L., Pictet, J. and Simos, J.(1994). *"Méthodes Multicritères ELECTRE"*. Presses Polytechniques et Universitaires Romandes.

Raftery, A. (1993). Bayesian model selection in structural equation models. In K. Bollen & J. Long (Eds.), Testing structural equation models (pp. 163-180): Newbury Park, California.

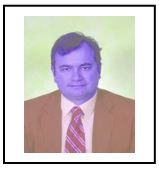
Roy, B. y Bouyssou, D. (1993). *"Aide Multicritère à la Décision: Méthodes et Cas"*. Economica

Zhu, J. and Cook, W.D. (2007). *Modeling Data Irregularities and Structural Complexities in Data Envelopment Analysis.* Springer

AUTHOR BIOGRAPHIES

MARÍA AUXILIADORA DE VICENTE was born in Salamanca, Spain. She studied mathematics in the Complutense University of Madrid (UCM) where she obtained her degree in 1991 and her P.H.D. in Economics in 1999. She began to work teaching statistics in the CESSJ Ramón Carande, an institution depending from UCM. She is professor in the University Rey Juan Carlos since 1998 where she has been doing research in multicriteria decision making and multivariate analysis. In the last years she has been applying the results of her theoretical research to innovation and technology transfer's topics. Her e-mail address is: maria.devicente@urjc.es

MARÍA ROCÍO GUEDE was born in Caracas, Venezuela and went to the University of Vigo, Spain, where she studied Industrial Engineering, specializing in business organization. She worked for four years for several private sector companies and then, in 2005, she moved to the Rey Juan Carlos University, as a lecturer. She is now researching about efficiency in technology transfer and innovation. Her e-mail address is: rocio.guede@urjc.es



FRANCISCO JOSÉ BLANCO has a degree in Economics. Universidad Complutense of Madrid. He is PhD in Business and Economics by Universidad Complutense of Madrid. Qualification gained: Degree with honors (Cum Laude), 1998. Title of the doctoral thesis: "El marco institucional internacional del medio ambiente". Teacher (full-time). Department of Economics, Division of Business and Economics Sciences, CESSJ-UCM. "Ramón Carande" 1994/1998. Assistant teacher at University of Applied Economics (URJC), 1998/2000. Teacher at University of Applied Economics (URJC), 2000. Teaching and researching staff Committee. 2000-2002. Deputy Dean at the Faculty of Social and Legal Sciences, Rey Juan Carlos University. 2003-2004. Deputy vice-Chancellor at Rey Juan Carlos University. 2004- to date. His e-mail address is: francisco.blanco@urjc.es

ALBERTO ROMERO is Master in Business Administration, Master in International Economic Analysis and Graduated with an award for Excellence in the five years Degree Business Administration and Management at Rey Juan Carlos University. He worked at the International Telecommunication Union (United Nations) in Geneva and nowadays he is Lecturer at the Applied Economy Department at Rey Juan Carlos University. In Austria he specialized studying an English program in Export-Oriented Management at the University of Applied Sciences of Krems. He got two grants to participate in two programs about ethnology, declared of universal interest by UNESCO and coordinated by the Complutense University of Madrid. E-mail address: alberto.romero@urjc.es. His web-page can be found at http://spanisheconomy.weebly.com/