

The Signaling Crisis

“The present crisis was also proven to be a crisis of signaling, its proportion being, perhaps, particularly a result of its signaling difficulties, if not the very coarse expression of the working networks applied by the signaling system.”

It is well known that in market theory – as a regulation mechanism – an essential role to the functioning of the economy is given to the signals received by its agents and to the meaning that is attributed to these signals. In time, interest has also grown for the function and behavior of the signal emitter. Something, though, has remained outside of both the explicative model as well as understanding: how are the signals being emitted.

In the context of the sovereign debt crisis, signaling becomes truly problematical, taking forms which exceed the economical and these often being received on a geopolitical note.

The pervading opinion that the market is the direct source of the signals is not only an error which somewhat guiltily perpetuates, but also a way of lessening the epistemic status of Economics. In fact the states of the subjective are illicitly transformed into something objective and the confusion that the objective would have an immanent action is perpetuated. In a curious way, the material option is being asserted according to inverted rules, belonging to an extra-human logic, methodologically instrumented by mechanical perspectives, cancelling any subjective determination, resulting in the space of economicity being emptied of the anthropical.

The depletion of the inter-subjective character of the states of economical rationality is shown to be, paradoxically, the reason for the fact that the signaled trends do not coincide with the market trends. Between what goes on in the market and what is being signaled a widening gap emerges, which is hard to explain in rational terms: the market contains neglected signals, which are falsified and truncated by the signalers right under the shield of objectivity.

There is no doubt that the reality of the market came to be different from the reality represented by the signaling (at least starting with the present crisis), in spite of the fact that the assumption used is wrapped with pretense of rational rigor. And this because, in fact, the signaling function attributed to the market has been institutionally employed in a manner defying the perception of correctitude.

The present constitution of the global economy presents a sui generis model of the signal emitters in the regulation of performance. On one hand, the state of financial rationality is answered for by the Big Four auditing firms, and on the other hand risk evaluation is handled through the exclusive filter of three rating companies – a true oligopoly.

The present crisis was also proven a crisis of signaling, its proportion being, perhaps, particularly a result of its signaling difficulties, if not the very coarse

expression of the working networks applied by the signaling system. Starting with the dot-com crisis, the instances of failure due to signaling are symptomatic with regard to both audit, as well as risk evaluation. The institutional signaling of market trends has minimalized the adverse effects of the arrangements made in order to favor over-profitability. The febrility of speculative innovation for the maximization of short-term gain has been justified by creative accounting and certified by the rating agencies. What was until yesterday a source of risk has become practice, declared as a rule of corporate governance.

The immediate consequence of these evolutions was that the epicenter for the functioning of societal systems through more supple formulas for the balancing of market trends, the goals of government and individual action, was critically destructured. It was all possible as long as government has limited its mission to covering social transfers and to tolerating the practices of the lender-of-last-resort, while the individual was considered as a source for the trust in the system.

Thus, associated with the passion for deregulation, counterfeiting the institutional signaling of the market's trends of failure has led to the creation of a monster of profit at any cost, a type of managing the workings of the economy in accordance with the "the end justifies the means" irrational principle. The mechanisms for moderating the instability of the economy were inactive, or left to idle. The speculative propensity seemed to satisfy the demand for added value, questioning the credibility of the fundamentals of the space of economic rationality by way of extending the informal circuits, off-the-books statements and of virtualizing value. The immediate gain, as an effect of the speculative bubble and of over-stimulating demand through cheap-credit, was considered normal by the signaling system.

The bad part is that after the explosion of the thus-created system, the signaling of market trends did not itself adopt a normal behavior, whose feature would be prudence, but has taken to manipulating information. The occasion arose with the inflammation of a nodule of the bad government: sovereign debt. The alert signals are emitted in such a way that the attention is deflected towards the periphery of the global economy.

The incertitude surrounding the consolidation of the exit from the crisis, equivalent with the risk of a powerful relapse, shows the same attitude of signalers of favoring the instability factors. Overall this means the abandoning of the prevention role which institutional signaling has with regard to the behavioral fluctuations of agents and their influence over the economic cycle.

The system for alerting us of market failures in the global economy has itself opted for speculation.

Contents

Empirical Study on the Financial Reporting of Intangible Assets by Romanian Companies Cristina-Ionela Fădur, Daniela Ciotină, Marilena Mironiuc.....	5
Optimum Repartition of Transport Capacities in the Logistic System using Dynamic Programming Gheorghe Bășanu, Victor Teleașă, Eduard Armeanu.....	17
User Types in Online Applications Ion Ivan, Dragoș Palaghita, Sorin Vinturis	31
Optimality of Fiscal Policy in Romania in Terms of Laffer Curve Adina Trandafir, Petre Brezeanu.....	53
The Causal Relationship between Health and Education Expenditures in Malaysia Chor Foon Tang, Yew Wah Lai.....	61
Law Antimonopoly of China – a Model of European Inspiration Cornelia Lefter, Oana Oprea (Teodorescu).....	75
Work: Social Status and the Role of Work along History – Since Ancient Times to Modern Times Mirela Ionela Aceleanu.....	83
Determination of Import Demand in Pakistan: The Role of Expenditure Components Muhammad Irfan Chani, Zahid Pervaiz, Amatul R. Chaudhary	93
Stock Markets Correlation: before and during the Crisis Analysis Ioana Moldovan.....	111
The Decision to Invest and Economic Growth. Romania's Case Raluca Andreea Popa, Matei Crăciun	123
Economic Crisis Perspective between Current and Forecast Cristina Burghilea.....	137

Note: The authors are responsible for the content of their articles and for obtaining necessary permissions.

Text revision:

Gabriela Ochiană

Computerized drawing up:

Nicoleta Bobocea

Cover:

Nicoleta Bobocea

Subscriptions distribution:

Mircea Dinu

Tel./Fax: 021/210.73.10; 021/210.63.07
021/210.63.08

Data base indexation:

EconLit

<http://www.aeaweb.org>

Research Papers in Economics (RePEc)

<http://www.ideas.repec.org>

<http://econpapers.repec.org>

Directory of Open Access Journals (DOAJ)

<http://www.doaj.org>

EBSCO Publishing

<http://www.ebscohost.com>

International Consortium for the Advancement
of Academic Publication (ICAAP)

<http://www.icaap.org>

CNCIS B+

www.economieteoreticasiaplicata.ro; www.ectap.ro

Reception of texts: economia.ta@edeconomica.com

ISSN 1841-8678 (Print)
ISSN 1844-0029 (Online)

Empirical Study on the Financial Reporting of Intangible Assets by Romanian Companies

Cristina-Ionela FĂDUR

Administration, „Alexandru Ioan Cuza” University, Iași
cristina.fadur@yahoo.com

Daniela CIOTINĂ

Administration, „Alexandru Ioan Cuza” University, Iași
ciotina_daniela@yahoo.com

Marilena MIRONIUC

„Alexandru Ioan Cuza” University, Iași
marilena@uaic.ro

Abstract. *The purpose of this paper is to identify to what extent Romanian companies quoted in the Bucharest Stock Exchange present information concerning intangible assets (IA), what the structure of the assets of the analyzed companies is, and what the difference between the accounting value of companies, computed through the net accounting asset, and their market value is, determined as the product between the number of shares and the average quotation price.*

We have analyzed the annual financial statements corresponding to the fiscal year closed on 31.12.2010 and the annual reports drawn according to the regulation of the National Commission for Mobile Values no. 1/2006 concerning the issuers and mobile operations for 23 companies quoted in the Bucharest Stock Exchange. In the data collection stage, we have resorted to mediated data collection techniques from the annual financial statements and from the management reports, and in the processing and analysis stage we used the empirical comparative analysis in order to identify the resemblances and differences between the information published by companies in various activity fields and the quantitative analysis. The data have been processed using the SPSS software.

Keywords: intangible assets; explanatory notes; administrators' report; accounting net asset; market value.

JEL Code: M41.

REL Code: 14I.

1. Introduction

We are at the beginning of a process of research and discovery. Many of the things we do not know about intangible assets have not yet been discovered and may represent the subject of another scientific study. This unknown part cannot be included in a single article, but what we know today is for certain very little in comparison with what we will know in 10, 30, or 50 years.

In the last two decades, the economies of developed countries dematerialized. They have switched from an economic system where competitive advantages depended on material and financial resources, managed and controlled by companies, to an economic system where reaching performance is mainly conditioned by immaterial, intangible resources created in the prior activity of the companies. The global economic system tends to become a system of “technological ideas and innovations” (Bianchini, 2004, p. 58).

The intensification of the competition, the development of new business sectors and technological progress have determined the expiration of traditional financial statements. Financial-accounting reports provide inaccurate information, irrelevant for making forecasts and for determining risks. In this context, financial analyses stress the need to present non-financial information in the annual reports that would support the decision process. “Achilles’ heel” in the accounting of intangible capital is, therefore, acknowledging it in annual reports: financial statements lose their relevance as the source of value creation in a global economy changes, residing in the intangible part of the asset (Grasenick, Low, 2004, pp. 268-281). It is therefore necessary to modify the traditional accounting model, to include intangible assets into the analysis, with the purpose of obtaining a faithful image of the financial position, of the economic performance, and of their changes.

In this context, a challenge for researchers is to identify the various practices adopted by different countries to the purpose of evaluating and reporting intangible capital and to suggest solutions that would catalyze the accounting harmonization process.

In accounting, the term *intangible capital* is often mistaken for intangible assets, although the latter are just a part of intangible capital. Indeed, intangible assets are elements of intellectual capital that can be acknowledged as assets if the criteria imposed by the International Accounting Standards are met (Meritum Project, 2001, pp. 13-16).

In our approach, we attempted to identify the degree of dissemination in the annual financial statements of the information on intangible assets, with the purpose of determining the extent to which it is included in the analysis of the results obtained by the entities.

2. Current knowledge

In the context of the new economy, the problematics of intangible assets raise the interest of researchers as well as of European and world organizations. For example, the concept of intangible assets has become an important topic in the analysis of the European policy for industrial competitiveness. Starting with 1994, the European Commission has launched a series of studies, actions, and projects with the purpose of understanding the essence of the knowledge economy and the importance of intangible assets as factors of competitiveness. Of the research projects under way, the most noteworthy are the MERITUM project (*MEasuRing Intangibles To Understand and improve innovation Management*) and the MAGIC project (*Measuring and AccountinG Intellectual Capital*). The aim of the MERITUM project is to investigate the measuring and reporting capabilities of intangible assets, and it is achieved through the collaboration of nine universities and research institutes in six European countries: Denmark, Finland, France, Norway, Spain, and Sweden. The general objective of the MAGIC project is to develop an IT solution for measuring and evaluating intellectual capital in the field of engineering and production.

The report issued by the World Bank in 2006 concludes that the wealth of a nation mainly in its intangible capital, which includes human capital, the skills and know-how of the labor force, social capital, that is, the degree of confidence people have in society, as well as their ability to work together for a common purpose, and a series of governance elements that encourage productivity in economy. In over 85% of the analyzed countries, intangible capital accounts for over 50% of the total wealth, which confirms the hypothesis generated by the transformation of the economic environment: human capital and other intangibles play an important role in economic development.

Empirical studies (Brennan, 2001, pp. 18-30, Gröjer, Johanson, 1998, pp. 14-21) have revealed the differences existing between the market value of a company and its net accounting value, as a result of the existence of intangible assets, which has lead to concentrating the efforts in the direction of identifying and quantifyng the “missing assets”. On the other hand, 2004 statistics showed that the Microsoft market value was 286.2 billion dollars, while its financial value was only 57.5 billion dollars, which means a 5:1 ratio in favor of intangible resources. For eBay, the market value was 54.5 billion dollars, and its financial value was 4.9 billion dollars, resulting in a ratio of 11:1 (Dess et al., 2006, p. 119).

In order to meet the needs for information of the various users, some companies draw special reports where they present the nature and value of

intellectual capital, structured into: human capital, structural capital, and relational capital (Castilla, Gallardo, 2008, pp. 353-363). Efficiency and effectiveness in customer relations, the correct management of the providers, obtaining guarantees, as well as gaining the partners' loyalty are more than "trendy" concepts in specialized literature, but make the difference between the success or failure of a business and define the ability of a company to coordinate and combine all the resources, be they endogenous or exogenous, in order to obtain a final positive, sustainable, and increasing result. This set of relations and interactions can be capitalized upon economically and, therefore, is a patrimonial element of the entity.

The following conclusions go in the same direction of revealing the importance of the financial reporting of intangible assets: there is a directly proportional relation between the companies' profitability and the amount of information referring to intangible assets presented in annual reports (García-Meca, Martínez, 2007, pp. 57-81) and the presentation of a large quantity of non-financial information is highly important in the monitoring and control process for the companies (Widener, 2006, pp. 198-221).

In today's economy, intellectual capital is considered a critical resource for insuring a real and sustainable competitive advantage (Steenkamp, Kashyap, 2010, pp. 368-390).

3. Methodology of the research

In our approach, we have analyzed if the companies in the sample meet the minimum information criteria concerning the inclusion in the explanatory notes of significant elements related to the intangible assets, as imposed by OMFP no. 3055/2009 regarding the approval of the Accounting Regulations in compliance with the European norms, modified by OMFP no. 2869/2010 for the completion and amendment of accounting regulations.

In order to meet this objective, we have built a set of six questions:

1. Does the company present the movements, developments, and reductions for the period, providing details that explain the dynamics of intangible assets (IA)?
2. Does the entity present the depreciation adjustments accompanied by a short explanation of the corresponding causes?
3. Is there a mention of whether there are assets under pledge or mortgage and of their value?
4. In case there are assets taken in financial leasing, what period does the leasing cover and what is the value of these assets?
5. Are there details provided on the intangible assets under execution?

6. Does the annual report, drawn according to the provisions of regulation no. 1/2006 of CNVM, present information concerning the intangible assets?

Each answer was subsequently graded with points from 0 to 1, where 1 referred to a complete, detailed answer.

Secondly, we have computed the difference between the market value (MV) and the value of the net accounting asset (NAA), with the purpose of noticing if there is any connection between the computed difference and the degree of dissemination of the information on intangible assets.

The research approach presupposes both a qualitative and a quantitative approach, based on empirical data recorded for a sample of 23 Romanian companies quoted in the Bucharest Stock Exchange. The qualitative side of the research is explained through the fact that the study is based on interpretation, explanation, understanding, and its quantitative side is explained through the use of measurements, quantification, numeric expressions of the phenomena to be studied.

In the data collection stage, we resorted to averaged collection techniques of the data in the annual financial statements and in the management reports published by companies listed in the Bucharest Stock Exchange. In what concerns data processing and analysis, the following methods were used: the empirical comparative analysis – to identify the resemblances and differences in the information published by the companies in various activity fields – and the quantitative analysis.

The procedures circumscribed to the used techniques are: statistical grouping, variance estimation, average estimation, and classification. The indispensable instruments in achieving the research approach were: official statistics, reports, the database, the observation sheet, and statistical and financial indexes.

The sample subject to analysis has the following structure:

Table 1

Structure of the sample and of the analyzed population

Activity branch	No. analyzed companies	No. quoted companies	% Sample	% Population
Pharmaceutics	5	5	21.74	100.00
Metallurgy	11	22	47.83	50.00
Extractive industry	2	7	8.70	28.57
Research & development activities	5	9	21.74	55.56
Total companies	23	43	100.00	-

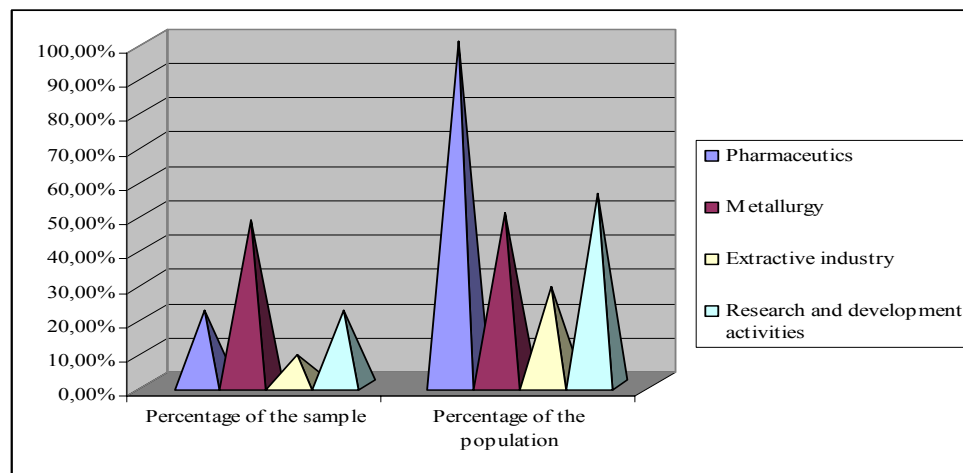


Figure 1. Structure of the sample and of the analyzed population

The sampling was performed according to the principle of random selection. The constraints in creating the sample were represented by the lack of publication of the explanatory notes or the existence of a structure of intangible assets made up exclusively of tangible assets. As a result, of the total of seven companies in extractive industry, code Caen 0811, only two entities were selected, representing 28.57% of the total number of listed companies that perform their activity in the respective sector. On the other hand, the entire population of the companies that perform their activity in the pharmaceutical industry, half of the population of the listed companies in metallurgy, and over 55% of the companies that perform research and development activities and which are present in the Bucharest Stock Exchange have been analyzed.

4. Analysis of the results

In our study, we have analyzed the weight of intangible assets in the fixed assets, the degree of dissemination of the information concerning intangible assets, and the difference between the accounting value (the net accounting assets), determined as the difference between total assets, on the one hand, and total liabilities and assets with no value, on the other, and the market value, represented by the product between the number of shares and the average transaction price.

The stock exchange rate of the shares is considered to be a good indicator for estimating the real wealth of the shareholders, as it includes both

quantitative information and qualitative data referring to the evolution of performance, the company's development potential, the quality of management and of the staff, the company's image on the market, etc. Also, it takes into consideration both past information and the investors' forecast concerning the future evolution of the company's activity. We have used in our analysis the average price of a share, because the average value expresses synthetically and generally what is normal, essential, and typical. The net accounting asset is computed based on the data in the balance sheet, and is therefore based on elements that have been corrected and brought to their real value by stocktaking.

The degree of dissemination has been computed as the arithmetical average of the points given for the answers to each of the six questions. Since after studying the explanatory notes of the companies in the sample it was noticed that none of them referred to questions 3, 4, and 5 mentioned above, they were eliminated. As a result, the degree of dissemination of the information concerning the intangible assets is the arithmetical average of the answers to the questions referring to the dynamics of intangible assets, their value adjustments, and the information presented in the annual reports drawn according to the CNVM regulation no. 1/2006 concerning the issuers and operations with mobile values.

Table 2 "Case Summaries", obtained after processing the data using the SPSS software – *Statistical Package for the Social Sciences* – presents the information obtained at the level of each activity field.

In what concerns the companies in the pharmaceutical industry, the degree of dissemination is 1.5 points out of maximum three possible points, the weight of intangible assets varies from one entity to another, and the market value is higher than the accounting value only in two cases out of five. Companies in the metallurgical industry are characterized by a high degree of dissemination of the information of 64.40%, six companies out of 11 having a market value higher than the accounting value. The entities that perform research and development activities disseminate 48.33% of the information required by the applicable regulations, and only one of the five analyzed companies has a market value higher than that of the net accounting asset. The financial reports of the companies in the extractive industry are more analytical than those of the companies in the other activity fields.

Table 2

Case Summaries

			Weight of IA in fixed assets	Degree of dissemination of the information about IA	Difference between NAA&MV
ACTIVITY BRANCH	Pharmaceutics	1	0.65	50.00	150632556.00
		2	173	50.00	68636817.00
		3	33.98	50.00	-5709275.00
		4	0.28	50.00	-5980588.00
		5	1.18	50.00	-43707793.00
		Total N	5	5	5
	Metallurgy	1	3.07	83.33	1151080256
		2	0.01	58.33	423946616.00
		3	3.11	66.67	72422780.00
		4	0.44	66.67	61554487.00
		5	0.11	53.33	29320322.00
		6	0.06	50.00	27348019.00
		7	0.10	83.33	-18449730.00
		8	0.15	58.33	-44514164.00
		9	0.34	75.00	-49692334.00
		10	0.02	50.00	-106658907
		11	2.55	63.33	-134899467
	Total N	11	11	11	
	Extractive industry	1	1.59	63.33	49052915.00
		2	1.02	78.33	-3361900.00
		Total N	2	2	2
	Research and Development activities	1	5.27	41.67	3401541.00
		2	0.29	58.33	-414999.00
3		4.90	33.33	-505059.00	
4		0.96	41.67	-6641336.00	
5		0.07	66.67	-19130045.00	
Total N		5	5	5	
Total	N	23	23	23	

Centralized information on the financial reporting of intangible assets is presented in Table 3 “Degree of dissemination of the information on intangible assets”.

Table 3

Degree of dissemination of the information on IA			
Activity field	Mean	N	Std.Deviation
Pharmaceutics	50.0000	5	.00000
Metallurgy	64.3939	11	12.04788
Extractive industry	70.8333	2	10.60660
Professional, scientific technical, and research & development activities	48.3333	5	13.69306
Total	58.3333	23	13.27639

At the level of the analyzed sample, we can notice that there are differences concerning the quantity of the presented information on intangible assets. All the companies include in Note 1 “Fixed assets” numerical data on the developments, resignations, and transfers of intangible assets during the fiscal year, but these numbers are rarely accompanied by explanations on the performed operations. The presented values are neither explained nor interpreted. Some companies mention in note 6 “Principles, policies, and accounting methods”, intangible elements, presenting the amortization method and duration.

In what concerns the analysis of the difference between the market and the accounting value, approximately 57% of the analyzed companies have an accounting value higher than the market value. The causes that lie at the basis of this difference are numerous, but they mainly concern subjective factors, related to the investors’ confidence.

Table 4

Sample structure according to the difference between the market value and NAA					
Count		DIF>0(FILTER)		Total	
		Not Selected	Selected		
Degree of dissemination of the information on intangible assets	33.33	1	0	1	
	41.67	1	1	2	
	50.00	4	3	7	
	53.33	0	1	1	
	58.33	2	1	3	
	63.33	1	1	2	
	66.67	1	2	3	
	75.00	1	0	1	
	Total	78.33	1	0	1
		83.33	1	1	2
		13	10	23	

where $DIF = \text{number of shares} \times \text{average price} - NAA$, representing the difference between the market value and the accounting value.

We have tried to identify correlations between the degree of dissemination of the information on intangible assets and their weight in the fixed assets, as well as between the degree of dissemination and the market and accounting value, but statistical tests have shown the lack of such dependences. Apparently, for the analyzed companies, presenting information on intangible assets is not conditioned or influenced by their weight in the fixed assets (actually, their weight is generally low), nor by the differences between the market and the accounting values. Reporting the financial information concerning intangible assets is limited to the minimum requirements of OMFP no. 3055/2009 *concerning the approval of the Accounting Regulations compliant with the European directions*, modified by OMFP no. 2869/2010 *for the completion and amendment of accounting regulations* and CNVM, but without any analyses concerning the importance of intangible assets in performing the activity.

The results have been influenced by the reduced size of the sample, but the study is, in essence, a basis for further research. Are Romanian companies prepared to acknowledge, evaluate, and report elements related to human, relational, and structural capital? To what extent are the costs of identifying, measuring, and reporting the “invisible side” of the business covered by benefits, by increased performance and credibility?

5. Conclusions

In the Romanian accounting system, the main users of the financial statements are the creditors and the revenue authority, unlike in the Anglo-Saxon system, where financial reporting is mainly addressed to investors. Looking at things from this perspective, we can understand why, in financial reporting, the accent falls on the tangible side of the fixed assets. Accounting norms are restrictive in what concerns the acknowledgement and evaluation of the intangible assets, and on the other hand, the identification and measurement of the asset elements that determine the difference between the net accounting value and the market value imply additional costs. Many of the solutions suggested in order to solve the “problem” of intangible assets are based on providing additional information on the intangible assets in the yearly report.

In what concerns the analyzed companies, they comply with the provisions of OMFP no. 3055/2009, as well as of the CNVM regulation, but they present only the information strictly required by accounting norms, without stressing the intangible part of their business. Reports mainly compute the traditional financial and accounting indicators, and the results are interpreted only from their perspective. Romanian companies are characterized

by a low degree of dissemination of the information on intangible assets, and the differences between the market value and the accounting value can be explained based not on the intangible assets recorded in accounting, but starting from extra-financial factors, related to the investors' confidence.

We must also notice that, of the analyzed entities, only SC ALRO SA presents a sales fund as a result of its merger through absorption with SC ALPROM SA. The sales fund is, however, a value non-dissociated with the company, being determined by the quality of management, by the technical competence and the knowledge accumulated by the staff, the industrial know-how, the customer base, the goodwill, studies and research, the reputation and image of the company. All these aspects are included more or less in the reports drawn according to the provisions of CNVM, but not all of them are acknowledged or presented in the explanatory notes. In the end, it is all about prudence.

Acknowledgements

This work was supported by the European Social Fund in Romania, under the responsibility of the Managing Authority for the Sectorial Operational Programme for Human Resources Development 2007-2013 [grant POSDRU/CPP 107/DMI 1.5/S/78342]".

References

- Bianchini, M., 2004, *apud* Mironiuc, M. (2008). "Social Responsibility and Environmental Ethics – Elements of the Ecological Culture in 21st Century Organizations: A study on Romanian companies", Munich Personal RePEc Archive, available at <http://mpa.ub.uni-muenchen.de/9423/>
- Brennan, N., "Reporting intellectual capital in annual reports: evidence from Ireland". *Accounting, Auditing and Accountability Journal*, Vol. 10, No. 2, 2001, pp. 18-30
- Castilla Polo, F., Gallardo Vázquez, D., "Social information within the intellectual capital report", *Journal of International Management*, 14, 2008, pp. 353-363
- Dess, G.G., Lumpkin, G.T., Eisner, A.B. (2006). *Strategic management*, second edition, McGraw-Hill Irwin, Boston, p. 119
- García-Meca, E., Martínez, I., "The use of intellectual capital information in investment decisions. An empirical study using analyst reports", *The International Journal of Accounting*, 42, 2007, pp. 57-81
- Grasenick, K., Low, J., "Shaken, not stirred: defining and connecting indicators for the measurement and valuation of intangibles", *Journal of Intellectual Capital*, Vol. 5, No. 2, 2004, pp. 268-281

- Gröjer, J.E., Johanson, U., “Current development în human resource costing and accounting.” *Accounting, Auditing and Accountability Journal*, Vol. 11, No. 7, 1998, pp. 14-21
- Steenkamp, N., Kashyap V., “Importance and contribution of intangible assets: SME managers' perceptions”, *Journal of Intellectual Capital*, Volume: 11, Issue: 3, 2010, pp. 368-390
- Widener Sally, K., “Human capital, pay structure, and the use of performance measures în bonus compensation”, *Management Accounting Research*, 17, 2006, pp. 198-221
- The MERITUM project, available on its Web page, accessed on 04.07.2011, http://www.pnbukh.com/files/pdf_filer/FINAL_REPORT_MERITUM.pdf
- European Commission work on Intangible Assets, available at: http://www.ll-a.fr/intangibles/ec_work.htm, accessed on 04.07.2011

Optimum Repartition of Transport Capacities in the Logistic System using Dynamic Programming

Gheorghe BĂȘANU

Bucharest Academy of Economic Studies
gheorghe.basanu@man.ase.ro

Victor TELEAȘĂ

Bucharest Academy of Economic Studies
victortelesa@yahoo.com

Eduard ARMEANU

Bucharest Academy of Economic Studies
armeanu@gmail.com

Abstract. *Transportations take an essential role in logistics, interconnecting the majority of processes and operations within logistic system. The efficient use of transportation capacity is a priority whose achievement can diminish logistic costs. This objective is today difficult to achieve due to increasing complexity of transportation monitoring and coordination. This complexity is determined by transportation number and diversity, by the volume and diversity of orders, by increasing the targets to be supplied.*

Dynamic programming represents a highly useful tool for logistic managers, considering that its specific techniques and methods are oriented toward solving problems related to resource optimum allocation and utilization.

The present paper presents briefly a series of theoretical elements of dynamic programming applied in logistics, based on which it is shown a mathematic model to determine the optimum policy for transport capacity repartition for the area attached to a logistic centre, through three distribution centres.

Keywords: distribution centre; logistics; number of customers; stage; dynamic programming.

JEL Code: C61.

REL Codes: 9J, 10F.

A logistic system has as main objective to ensure the circuit of material and product flows to users and consumers. This objective can only be reached in certain conditions, required both by customer demands and by the necessity to efficiently use the available logistic capacities.

The resources required for performing transport operations within logistic system are set based on a detailed analysis of all elements on which the delivery of materials and products to customers, in quantity and of quality they request, is based. Identifying and determining which customers shall be supplied, the transport routes, the characteristics and quantities of materials and products to be supplied, the number of freight carriers and the personnel requested for performing the corresponding logistic operations is a laborious assessment process on which the final decision, oriented toward efficient use of available resources is based.

Within a logistic system, the supplying of consumption centres is made, as usually, through distribution centres equipped with road carriers of various types and capacities. The demand for materials and products varies extremely in time and this is why the main problem of logistic managers is meeting in a more efficient and flexible manner, these demands, by using a lower number of freight carriers. In this context, the efficiency means using the full available transport capacity at the same time with diminishing the distances for freight carriers. This way one sets a balance between the degree of conformity for logistic services and the customer demand and suppliers' costs required for performing these services.

From the flexibility point of view, the transportation within logistics must meet two basic requirements: to ensure, in due time, the capacity required for transporting the entire quantity of products and materials requested by customers, and to ensure the compatibility between the freight carriers which are used and the specific characteristics of materials and products. These requirements are obviously interconnected and only together they guarantee completely, as quantity and quality, the orders of customers.

The level of stocks of materials and products can be drastically diminished, by creating a continuous flow of raw materials and materials within logistic system, in which the transport synchronization has an essential role and is reflected in the rhythm of supply of production lines. The logistic costs can be drastically diminished, by ensuring a rational dispersion of transport capacities within the supplied logistic area. This way, the deliveries of materials and products in small quantities and with high frequency can be performed with low capacity freight carriers, while the deliveries of materials and products in high quantities, to various supplying centres, can be performed in circuit using freight carriers of medium and high capacity.

The dynamic programming is a method for solving the optimization problems which requires that the best policy to be adopted by determining, for each decision composing such a policy, sub-problems to be solved, so that to find an optimum solution for the initial problem, among the optimum solutions of these sub-problems. This thesis is based on the *optimality principle* (Stokey, Lucas, 1989) according to which (Bellman, 1957) *an optimal policy has the propriety that whichever would be the original decision ad status, the following decisions must represent an optimal policy regarding the status resulted from the original decision*. As a consequence, *any optimal policy can only be composed of other optimal sub-policies* (Kaufmann, 1967). This principle shows us that, if a policy contains a sub-policy which is not optimal, then its replacement with an optimal one shall determine the improvement of the original policy.

It worth mentioning that dynamic programming is not offering us a standard mathematic formula for solving all problems. Depending on the available variables and on the set objective, for each case one must identify the corresponding recurrence equation able to lead to the optimal solution. The dynamic programming problems can be deterministic (as the one treated in this paper) or probabilistic, as the result of each decisional step is unique and known, respectively it is a probability distribution.

Having available a resource quantity r for performing n activities, the problem is how to distribute these resources to obtain an optimal result. The mathematic formula of such a general case would be:

$$\text{optimization: } z = \sum_{j=1}^n g_j(x_j), \quad (1)$$

in the following conditions:

$$\sum_{j=1}^n a_j x_j \leq r, \text{ with all variables being non-negative whole} \quad (2)$$

where:

$g_1(x_1), g_2(x_2), \dots, g_n(x_n)$ - utility functions;

x_1, x_2, \dots, x_n - decisional variables;

r and n – whole and non-negative numbers.

We assume that the optimization in our case aims *the maximization* of the function z , and the maximal result obtained subsequently to optimal allocation of r quantity of resources for performing the n activities is represented by the function $f_n(r)$. As a result, we have:

$$f_n(r) = \max z. \quad (3)$$

In case for $n-1$ activities we optimally allocate the quantity r_1 of resources, we can state that the optimal result obtained shall be defined by the function $f_{n-1}(r_1)$. By assigning a quantity x_n of resources to the activity n , with $0 \leq x_n \leq r$, we deduce that, for $n-1$ activities left, we shall have available the following quantity of resources:

$$r_1 = r - x_n. \quad (4)$$

The relation (1) becomes:

$$z = g_n(x_n) + f_{n-1}(r_1) = g_n(x_n) + f_{n-1}(r - x_n). \quad (5)$$

Considering the relation (3), we obtain the recurrence relation (Bellman, 1957, Stokey, Lucas, 1989):

$$f_n(r) = \max_{0 \leq x_n \leq r} [g_n(x_n) + f_{n-1}(r - x_n)], \quad (6)$$

for $n = 2, 3, \dots$ and $r \geq 0$, and $f_1(r) = g_1(r)$.

The relation (6) represents *the fundamental equation* of dynamic programming, which ensures the above mentioned principle of optimality.

For dynamic programming problem solving first one sets the utility functions, the decisional variables, the aimed function, the restrictions and steps to follow, after which one determines the equation of recurrence by which, using successive iterations, one obtains the optimal policy.

In order to increase the efficiency of a logistic centre, one decided to create three types of distribution centres which shall have their own motor vehicle fleet and which shall supply a determined logistic area, defined by a number of supplying centres (customers). The main characteristics that particularize one distribution centre from another are: the number and type of freight carrier with which they shall be equipped (depending on the nature of stored materials and products and by the dimensions of future loading unit), and the number of customers to be supplied within the competent area of the logistic centre. The amount assigned for investments allows the purchase of maximum 42 motor vehicles of various capacities. The logistic managers must identify how many distribution centres of each type can create so that the number of supplied customers (working outlets) to be maximum, considering the data within Table 1.

Table 1

The characteristics of distribution centre types

Distribution centre type	Number of motor vehicles within fleet	Number of supplied customers (α_i)	Motor vehicle capacity
A	15	35	Low
B	20	68	Medium
C	12	47	High

Based on the data within Table 1, the mathematic model includes the relations between the utility functions, respectively resource assignment function,

$$\begin{cases} g_1(x_1) = 35x_1 \\ g_2(x_2) = 68x_2 \\ g_3(x_3) = 47x_3 \end{cases} \quad (7)$$

$$\begin{cases} h_1(x_1) = 15x_1 \\ h_2(x_2) = 20x_2 \\ h_3(x_3) = 12x_3 \end{cases} \quad (8)$$

aimed function,

$$\max z = 35x_1 + 68x_2 + 47x_3 \quad (9)$$

and restrictions:

$$15x_1 + 20x_2 + 12x_3 \leq 42 \quad (10)$$

$$x_j \geq 0, (j = 1, 2, 3)$$

x_j whole numers.

The first restriction sets the maximum number of motor vehicles which can be assigned to all distribution centres, and the second and third restrictions set that the number of created distribution centres must be positive and whole.

Considering that the problem aims to create three type of distribution centres, it results that three steps must be followed, each of them having more statuses, determined by the number of assigned motor vehicles, so that the number of supplied customers to be maximum.

Therefore, during the first step, based on the fundamental equation given by the relation (6), the function defining the maximum number of customers supplied by the A type distribution centre, when assigning an appropriate number of transportation vehicles, shall be:

$$f_A(r_1) = \max_{x_1} [35x_1]. \quad (11)$$

Designing by ξ_i the values of the decisional variables x_j , ($\xi_i \geq 0, \xi_i$ whole), which is in fact the number of distribution centres of each type which shall be created, depending on the available number of motor vehicles for the A type

distribution, considering the expression of the function $h_1(x_1)$, we obtain the relation:

$$f_A(r_1) = 15\xi_1. \quad (12)$$

$$\text{Which must comply with the condition: } 15\xi_1 \leq r_1 \quad (13)$$

where r_1 represents the maximum number of motor vehicles which can be assigned the A type distribution centre, till unknown during this step. As the values of the decisional variables must be positive and whole, the number of the A type distribution centres shall be given by the relation:

$$\xi_1 \leq [r_1/15] \quad (14)$$

of which one shall only consider the obtained whole value immediately inferior.

This way the relation (11) becomes:

$$f_A(r_1) = 35\xi_1 \quad (15)$$

which represents the total number of customers supplied by the created A type distribution centres.

During the second step, by applying the same relation (6) we obtain:

$$f_{AB}(r_2) = \max_{x_2} [g_2(x_2) + f_A(r_1)] = \max_{x_2} [68x_2 + f_A(r_1)]. \quad (16)$$

Considering r_2 as the maximum number of motor vehicles assigned to A type and B type distribution centres, until this step and the expression of the function $h_2(x_2)$, we can rewrite the relation (4), for this step as follows:

$$r_1 = r_2 - 20\xi_2. \quad (17)$$

By replacing the relation (17) within the relation (16) we obtain:

$$f_{AB}(r_2) = \max_{\xi_2} [68\xi_2 + f_A(r_2 - 20\xi_2)]. \quad (18)$$

During the third step, we consider r_3 as the maximum number of motor vehicles to be assigned, for optimization, to the three distribution centres. Considering that it is the last utility function, it results that it is represented by the maximum number of motor vehicles which can be purchased ($r_3 = 42$).

Together with the expression of the function $h_3(x_3)$ we can rewrite the relation (4), for this step as follows:

$$r_2 = r_3 - 12\xi_3 = 42 - 12\xi_3. \tag{19}$$

During this step the relation (6) shall be:

$$f_{ABC}(r_3) = \max_{x_3} [g_3(x_3) + f_{AB}(r_2)] = \max_{x_3} [47x_3 + f_{AB}(r_2)]. \tag{20}$$

By replacing the relation (19) within the relation (20) we obtain the relation:

$$f_{ABC}(r_3) = \max_{\xi_3} [47\xi_3 + f_{AB}(r_3 - 12\xi_3)]. \tag{21}$$

The first step of the iterative determination algorithm for the number of customers which can be supplied by the A type distribution centre is defined by the relations (11) ÷ (15), which together with the data within Table 1 represents the starting point for the calculations within next steps.

During the second step, we designate by x_2^* the maximum number of customers which can be supplied by the created A type and B type distribution centres, the values of calculation variables and the obtained results, after following the iterations within this step, are shown in Table 2.

Table 2
Maximum number of customers which can be supplied by created A type and B type distribution centres, depending on the assigned number of motor vehicles

Iteration no	ξ_3	ξ_2	r_2	r_1	ξ_1	$f_A(r_1)$	x_2^*
1	0	0	42	42	2	70	70
2	0	1	42	22	1	35	103
3	0	2	42	2	0	0	136
4	1	0	30	30	2	70	70
5	1	1	30	10	0	0	68
6	2	0	18	18	1	35	35
7	3	0	6	6	0	0	0

Using the significant of the notations used so far, within a first set of iterations, maintaining $\xi_3 = 0$, we successively assign various values to ξ_2 , starting from 0.

- For $\xi_3 = 0$, $\xi_2 = 0$ and $r_2 = 42$ (determined by the relation (19), for $\xi_3 = 0$), by applying the relation (17) we obtain:

$$r_1 = r_2 - 20\xi_2 = 42 - 20 \cdot 0 = 42,$$

and using the condition (14) we obtain:

$$\xi_1 = [r_1/15] = [42/15] = 2 .$$

By replacing this value in the relation (15) we obtain:

$$f_A(r_1) = 35\xi_1 = 35 \cdot 2 = 70$$

the relation (18) becoming,

$$x_2^* = f_{AB}(r_2) = 68 \cdot \xi_2 + f_A(r_1) = 68 \cdot 0 + 70 = 70$$

The results obtained are shown in Table 2 to iteration 1.

• For $\xi_3 = 0$, $\xi_2 = 1$ and $r_2 = 42$, we obtain:

$$r_1 = r_2 - 20\xi_2 = 42 - 20 \cdot 1 = 22$$

$$\xi_1 = [r_1/15] = [22/15] = 1, \text{ and } f_A(r_1) = 35\xi_1 = 35 \cdot 1 = 35, \text{ resulting,}$$

$$x_2^* = f_{AB}(r_2) = 68 \cdot \xi_2 + f_A(r_1) = 68 \cdot 1 + 35 = 103$$

The results obtained are shown in Table to iteration 2.

• For $\xi_3 = 0$, $\xi_2 = 2$ and $r_2 = 42$, we obtain:

$$r_1 = r_2 - 20\xi_2 = 42 - 20 \cdot 2 = 2$$

$$\xi_1 = [r_1/15] = [2/15] = 0, \text{ and } f_A(r_1) = 35\xi_1 = 35 \cdot 0 = 0, \text{ resulting,}$$

$$x_2^* = f_{AB}(r_2) = 68 \cdot \xi_2 + f_A(r_1) = 68 \cdot 2 + 0 = 136$$

The results obtained are shown in Table 2 to iteration 3.

• For $\xi_3 = 0$, $\xi_2 = 3$ and $r_2 = 42$, we obtain $r_1 = r_2 - 20\xi_2 = 42 - 20 \cdot 3 = -18$. Considering that we have a negative value, this iteration shall be cancelled.

Hereinafter, we shall initiate a second set of iterations, maintain constant $\xi_3 = 1$ and assigning successively values for ξ_2 , starting from 0.

• For $\xi_3 = 1$, $\xi_2 = 0$ and $r_2 = 30$ (determined by the relation (19), for $\xi_3 = 1$), we obtain:

$$r_1 = r_2 - 20\xi_2 = 30 - 20 \cdot 0 = 30$$

$$\xi_1 = [r_1/15] = [30/15] = 2, \text{ and } f_A(r_1) = 35\xi_1 = 35 \cdot 2 = 70, \text{ resulting,}$$

$$x_2^* = f_{AB}(r_2) = 68 \cdot \xi_2 + f_A(r_1) = 68 \cdot 0 + 70 = 70$$

He results obtained are shown in Table 2 to iteration 4.

- For $\xi_3 = 1$, $\xi_2 = 1$ and $r_2 = 30$, we obtain:

$$r_1 = r_2 - 20\xi_2 = 30 - 20 \cdot 1 = 10$$

$$\xi_1 = [r_1/15] = [10/15] = 0, \text{ and } f_A(r_1) = 35\xi_1 = 35 \cdot 0 = 0, \text{ resulting,}$$

$$x_2^* = f_{AB}(r_2) = 68 \cdot \xi_2 + f_A(r_1) = 68 \cdot 1 + 0 = 68$$

The results obtained are shown in Table 2 to iteration 5.

- For $\xi_3 = 1$, $\xi_2 = 2$ and $r_2 = 30$, we obtain:

$r_1 = r_2 - 20\xi_2 = 30 - 20 \cdot 2 = -10$. Considering that we have a negative value, this iteration shall be cancelled.

In the third set of iterations, we maintain constant $\xi_3 = 2$ and we successively assign various values for ξ_2 , starting from 0.

- For $\xi_3 = 2$, $\xi_2 = 0$ and $r_2 = 18$ (determined by the relation (19), for $\xi_3 = 2$), we obtain:

$$r_1 = r_2 - 20\xi_2 = 18 - 20 \cdot 0 = 18$$

$$\xi_1 = [r_1/15] = [18/15] = 1, \text{ and } f_A(r_1) = 35\xi_1 = 35 \cdot 1 = 35, \text{ resulting,}$$

$$x_2^* = f_{AB}(r_2) = 68 \cdot \xi_2 + f_A(r_1) = 68 \cdot 0 + 35 = 35$$

The results obtained are shown in Table 2 to iteration 6.

- For $\xi_3 = 2$, $\xi_2 = 1$ and $r_2 = 18$, we obtain:

$r_1 = r_2 - 20\xi_2 = 18 - 20 \cdot 1 = -2$. Considering that we have a negative value, this iteration shall be cancelled.

In the fourth set of iterations, we maintain constant $\xi_3 = 3$ and we successively assign various values for ξ_2 , starting from 0.

- For $\xi_3 = 3$, $\xi_2 = 0$ and $r_2 = 6$ (determined by the relation (19), for $\xi_3 = 3$), we obtain:

$$r_1 = r_2 - 20\xi_2 = 6 - 20 \cdot 0 = 6$$

$$\xi_1 = [r_1/15] = [6/15] = 0, \text{ and } f_A(r_1) = 35\xi_1 = 35 \cdot 0 = 0, \text{ resulting,}$$

$$x_2^* = f_{AB}(r_2) = 68 \cdot \xi_2 + f_A(r_1) = 68 \cdot 0 + 0 = 0$$

The results obtained are shown in Table 2 to iteration 7.

After analysing the data within Table 2 it notes that the best logistic policy is $p^* = (0, 2, 0)$, respectively the one resulted from the iteration no 3, for which the number of supplied customers is maximum, respectively 136. A such a logistic policy aims to create 2 B type distribution centres, equipped with a total number of 40 medium capacity vehicles.

During the third step, we try to improve this policy by initiating a new analysis, from the perspective of the maximum number of vehicles which can be assigned to each distribution centre, in order to obtain the maximum number of supplied customers during this step, x_3^* . This analysis shall contain a new range of values for ξ_3 .

- First, we consider that we shall not create any C type distribution centre. Using the relation (19), for $\xi_3 = 0$, we obtain the number of vehicles available for being assigned to A type and B type distribution centres, to be created:

$$r_2 = r_3 - 12\xi_3 = 42 - 12\xi_3 = 42 - 12 \cdot 0 = 42$$

The relation (18) becomes in this case:

$f_{AB}(r_2) = \max f_{AB}(42) = 136$, resulted obtained by the iterations 1÷3, within the previous step. By applying the relation (21), we obtain:

$x_3^* = f_{ABC}(r_3) = 47 \cdot \xi_3 + f_{AB}(r_2) = 47 \cdot 0 + 136 = 136$, respectively the maximum number of customers supplied by the maximum number of customers supplied by the 2 B type distribution centres created so far (in Table 2, to this value corresponds $\xi_2 = 2$).

- We consider that we shall create one C type distribution centre. By applying the same relation (19), for $\xi_3 = 1$, we obtain the number of available vehicles to be assigned to created distribution centres :

$$r_2 = r_3 - 12\xi_3 = 42 - 12\xi_3 = 42 - 12 \cdot 1 = 30$$

The relation (18) becomes in this case:

$f_{AB}(r_2) = \max f_{AB}(30) = 70$, result obtained after 4 and 5 iterations, from the previous step. By applying the relation (21), we obtain:

$x_3^* = f_{ABC}(r_3) = 47 \cdot \xi_3 + f_{AB}(r_2) = 47 \cdot 1 + 70 = 117$, respectively the maximum number of customers supplied by all the distribution centres created so far. Knowing that we started this iteration by creating a C type distribution centre C, which according to Table 1 shall supply 47 customers, we still have left $(117 - 47) = 70$ customers to supply. As the number of distribution centres

must be whole and positive, also from Table 1 we deduce that we still can create $(70:35) = 2$ A type distribution centres.

Acting similarly, hereinafter we obtain,

- For $\xi_3 = 2$:

$$r_2 = r_3 - 12\xi_3 = 42 - 12\xi_3 = 42 - 12 \cdot 2 = 18$$

$$f_{AB}(r_2) = \max f_{AB}(18) = 35$$

$x_3^* = f_{ABC}(r_3) = 47 \cdot \xi_3 + f_{AB}(r_2) = 47 \cdot 2 + 35 = 129$, which represents the maximum number of customers supplied by all distribution centres. Knowing that we started the iteration by creating 2 C type distribution centres, and having left a number of $(129 - 94) = 35$ customers to be supplied, we deduce that, following the above conditions, we can create one more A type distribution centre.

- For $\xi_3 = 3$:

$$r_2 = r_3 - 12\xi_3 = 42 - 12\xi_3 = 42 - 12 \cdot 3 = 6$$

$$f_{AB}(r_2) = \max f_{AB}(6) = 0$$

$x_3^* = f_{ABC}(r_3) = 47 \cdot \xi_3 + f_{AB}(r_2) = 47 \cdot 3 + 0 = 141$, which represents the number of customers supplied by a number of 3 C type distribution centres.

The results obtained during this step are shown in Table 3.

Analyzing the data within Tables 2 and 3, we can prioritize the optimal policies of transportation capacity repartition by centre of distribution (CD), as shown in Table 4.

Table 3

Maximum number of customers to be supplied by the three created distribution centres, depending on the number of assigned vehicles

Iteration no.	ξ_3	r_2	$f_{AB}(r_2)$	x_3^*	Order of policy
1	0	42	136	136	(2)
2	1	30	70	117	(4)
3	2	18	35	129	(3)
4	3	6	0	141	(1)

Table 4

Hierarchy of logistic policies					
Policy	Number of DCs to be created, by type:			Maximum number of customers to be supplied by created DCs	Number of vehicles required for CDC equipment
	A type	B type	C tpe		
1	-	-	3	141	36
2	-	2	-	136	40
3	1	-	2	129	39
4	2	-	1	117	42
5	1	1	-	103	35

Using the data within Table 4 we drew the chart within Figure 1.

It easily notes that the optimal logistic policy to implement under the given circumstances is $p_{opt} = p_1 = (0, 0, 3)$, respectively to create 3 C type distribution centres, which shall supply a number of 141 customers and whose equipment requires 36 road vehicles, of those 42 to be potentially purchased.

The efficient use of the available transport capacity represents an essential objective toward increasing the performances of logistic systems. Such an objective can be reached by identifying and implementing methods and models within operational research area. The purpose of such an action shall be reflected in the mathematic formula by the tendency to increase the value of the efficiency criterion which shall completely replace the purpose of the operation (Ghermeier, 1973). The dynamic programming represents one of the methods of system optimization, in which the problem solving mechanism treats their discomposure into steps, the optimizations within each step having reclusive character.

Regardless if the optimal value of the decisions are determined by table calculations or by analytical methods, their successive determination proved to be much more efficient. In order to be able to implement the methods of dynamic programming it is necessary that the assessments (of costs) Associated to decisions be additive, and the path through which the system reached a certain status must not influence the future statuses (Ackoff, Sasieni, 1975).

In order to increase the performance of logistic system and to diminish the costs, from the transportation point of view, it is necessary to:

- fully use the available capacities;
- use on a large scale the IT software for setting the transportation routes, for monitoring and coordinating the specific operations;
- drastically diminish or to eliminate empty carrier routes;
- equip the distribution centres with minimum required freight carrier number;

- maximize the lifetime of freight carriers;
- use on a large scale the pallets and containers;
- use appropriate freight carriers for material and product characteristics;
- fully and duly meet customer requirements.

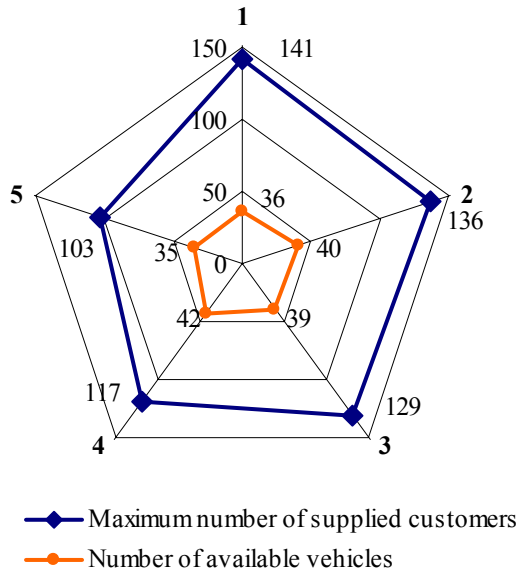


Figure 1. Logistic policies' chart

Obtaining an increased transportation capacity involves two issues – an investing one and an organizing one. The first issue considers the strategic side and treats the acquisition of new freight carriers, in accordance with the developing perspectives of logistic system. The second issue treats two sides – tactical and operational – in which the tactical side refers to using additional capacities, on limited term, supplied by specialized transporting entities, and the operational side refers to current measures to be taken by logistic managers for purpose of increasing the degree of use for the existing transport capacities.

To fully know and understand the factors influencing the volume, rhythm, quality and efficiency of transport operations within logistics, to identify and to use the modern method and technologies able to ensure prompt deliveries to customers, to increase the freight carriers' degree of occupancy and to maximize the diminishing of costs, represent the main lines of management action for logistic system's functionality and structure improvement.

References

- Ackoff, R.L., Sasieni, M.W. (1975). *Bazele cercetării operaționale*, Editura Tehnică, București
- Bellman, R.E. (1957). *Dynamic programming*, Princeton University Press, Princeton
- Ghermeier, I.B. (1973). *Introducere în teoria cercetării operaționale*, Editura Tehnică, București
- Kaufmann, A. (1967). *Metode și modele ale cercetării operaționale*, vol. I, II, Editura Științifică și Enciclopedică, București
- Stokey, N.L., Lucas, R.E. (1989). *Recursive methods in economic dynamics*, Harvard University Press

User Types in Online Applications

Ion IVAN

Bucharest Academy of Economic Studies
ionivan@ase.ro

Dragoş PALAGHITA

Bucharest Academy of Economic Studies
dragos.palaghita@ie.ase.ro

Sorin VINTURIS

Bucharest Academy of Economic Studies
sorinvintturis@ie.ase.ro

Abstract. *Online applications are presented in the context of information society. Online applications characteristics are analyzed. Quality characteristics are presented in relation to online applications users. Types of users for AVIO application are presented. Use cases for AVIO application are identified. The limitations of AVIO application are defined. Types of users in online applications are identified. The three-dimensional matrix of access to the online application resources is built. The user type-oriented database is structured. Access management of the fields related to the database tables is analyzed. The classification of online applications users is done.*

Keywords: online application; user; access; metric; security.

JEL Code: C88.

REL Code: 10J.

Online applications

In the literature (Roşca et al., 2006) there are presented the coordinates of the information society which consist in:

- information creation by passing from fixed assets to informational assets, through the development of computer systems, development of digital libraries, by developing of informational portals;
- information distribution is achieved through the development of computer networks and Internet; information access is much faster and more efficient due to online search engines;
- information dissemination via the Internet, media or email;
- information usage whenever needed using personal computers or public access terminals to solve citizens problems or to improve business processes;
- information integration in complex information management systems which allow easy information retrieval using search keys;
- information management by optimizing data access processes providing for users simple and effective ways of information access.

The informatics application is a software product developed in order to be operated on a computer and to serve solving complex problems.

Distributed system is represented by a number of independent computers that communicate via a network. A distributed system is designed to solve a single problem common to all processing units or to resolve a number of issues specific to each processing unit and the role of the distributed system is to manage the resources associated to the processing units. A distributed system has the following properties:

- fault-tolerance is the degree to which the distributed system retains its functions in case of any hardware failure of its component entities;
- network topology is the pattern of computers and peripherals interconnection that make up the distributed system;
- independence degree is reflected by the extent to which computers that form the distributed system use or are aware of other computers in the distributed system.

The access to the Internet and the development of computer networks have led to the development of distributed applications such as:

- electronic payments that are done by providers or recipients, reducing the formalities and the required time for physical payments;
- digital maps that allow routes establishment, distances calculation and viewing of satellite images (Cotfas, 2009a, pp. 466-471, 2009b, pp. 31-34);

- image sorting using color palettes for identifying the images that containing certain shades or shades combinations;
- e-government that enable an effective collaboration between state agencies and citizens through the implementation of online platforms for taxes payment or the management of state and citizen problems and responsibilities;
- orthogonality analysis of the organization identifiers to ensure registration of organizations with names significant in relation to organization identifiers registered in the database.

User-oriented online applications have the following advantages, according to (Ivan et al., 2009a, Ivan et al., 2009b, pp. 139-145):

- give access to the desired resources through online databases that store information of interest to citizens;
- reduce waiting times for solving problems or for operations execution desired by the user;
- increase the efficiency of operations performed by rapid processing of the required operations and delivering results in a much shorter time;
- achieve the link between customers and suppliers by providing a collaborative environment for problems solving, services, procurement of services, provision of goods and their acquisition;
- improve companies efficiency by increasing sales and providing access to a much greater range of customers locally and internationally;
- give citizens access to a much greater range of products in an online space where the price quality ratio is high;
- make available to the public financial management systems to record individual income and expenses by eliminating the risk of mistakes and omissions made in calculations;
- citizens have access to online banking systems that allow checking account, online payments, management of bank deposits and transfers management.

Online applications are highly diverse offering varied content and the possibility to perform complex operations according to (Vintilă, Pavel, 2010, pp. 64-72).

Online applications features in regard to the user

When developing computer applications quality level is planned. According to (DEX, 1998) quality represents all the essential characteristics of an object that differentiate it from other objects. Palaghita (2009, pp. 38-58) defined a system of quality characteristics associated with computer

applications. Online applications users take into account only certain quality characteristics that directly concern them.

Complexity represents the amount of resources for developing, testing, implementation, modification, correction and use of the computer application. McCabe complexity is defined as:

$$C = m - n + 2,$$

where:

m - number of arcs in the graph;

n - number of nodes in the graph.

McCabe complexity is has a maximum level when any node is referred by another one. Figure 1 shows the maximum complexity associated graph for the organizational names validation class with five interconnected nodes from AVIO software product.

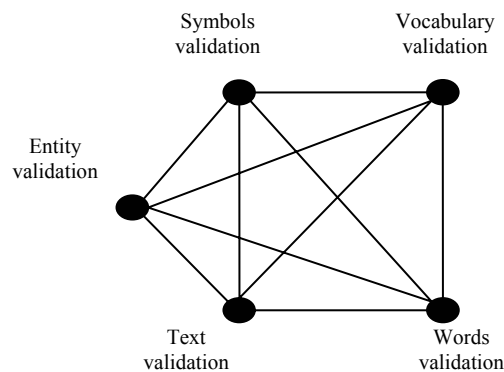


Figure 1. *The graph for AVIO names validation class*

McCabe complexity for organization names validation class is:

$$C_{\text{name}} = 11 - 5 + 2 = 8.$$

Maximum complexity of a module must not exceed the value of 10 in order to ensure appropriate testing process, to ensure product reliability and maintain simplicity of the software design. Minimum complexity is achieved in linear structures of applications. Figure 2 shows the linear structure for the management class of the RGB format used for comparing the organization logos in AVIO application.

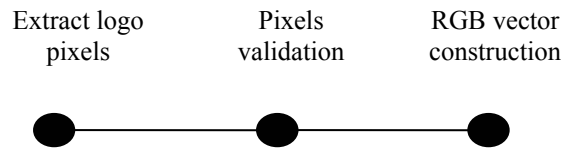


Figure 1. RGB management class in AVIO application

The complexity of the RGB management class in AVIO application is:

$$C_{\text{rgb}} = 2-3+2 = 1.$$

There are also intermediate structures combining linear structure with that of the graph type resulting complex software structures, but with an index of complexity suitable for maintaining the reliability and testability at a high level.

Accuracy according to Ivan and Boja (2004) is the degree to which results obtained from using the application are as close to real ones. The C accuracy is calculated using the following indicator:

$$C = \frac{N_c}{N_T},$$

where:

N_c – number of correct results;

N_T – number of total runs.

In AVIO application after running a set of tests containing 4096 of generated graphical identification elements, the accuracy index was determined with $N_c = 3072$ and $N_T = 4096$ with the value:

$$C = \frac{3072}{4096} = 0.75.$$

The correction of methods for images scaling and normalization by eliminating the default reformatting of graphic identifiers that caused the C index value of 0.75 led to a value of the C index of 1 for the executed test set.

If a distributed system component is made up of n sub-components $\{C_1, C_2, \dots, C_n\}$ then the accuracy level is calculated using the C_c indicator:

$$C_c = \sum_{i=1}^n \frac{N_{ci}}{N_{Ti}} = \sum_{i=1}^n C_i$$

where:

N_{ci} – number of correct results of i component;

N_{Ti} – number of total results of i component;
 C_i – accuracy level of i component.

After running the test set were identified the values of associated variables for the software components that make up the AVIO application in order to calculate the C_c indicator according to Table 1.

Table 1

The accuracy indicator - C_c			
Component	N_{ci}	N_{Ti}	C_i
Images	4,096	4,096	1
Company	4,096	4,096	1
NameArray<T>	4,096	4,096	1
ComplexArray	4,096	4,096	1
Complex	4,096	4,096	1
ImageMetrics	3,072	4,096	0.75
BitmapAlreadyLoaded	4,096	4,096	1
Validator	4,096	4,096	1
ImageValidator	4,096	4,096	1
UnmanagedImage	4,096	4,096	1
RGBL	4,096	4,096	1
RGB	4,096	4,096	1
Histogram	4,096	4,096	1
ColorSetLocations	4,096	4,096	1
ColorLocationList	4,096	4,096	1
ColorLocation	4,096	4,096	1
BmpStatisticsHelper	4,096	4,096	1
BmpHelper	3,072	4,096	0.75
StatisticsHelper	4,096	4,096	1
LogHelper	4,096	4,096	1
PairColours	4,096	4,096	1
LogWriter	4,096	4,096	1
C_c			0.97727273

The test set shows a value of the C_c identifier associated to the AVIO application before resolving the defects identified during testing of 0.977. After resolving the defects the C_c index value increased to 1.

Continuity is the quality characteristic represented by the degree to which changes in the interface of the software versions occurs. Considering the set of software versions $SV = \{V_1, V_2, \dots, V_k\}$ which has an associated set of versions of the software interface $SI = \{I_1, I_2, \dots, I_k\}$. A software interface version I_i associated to the software version V_i is defined by a set of user visible components $SCI_i = \{C_{i1}, C_{i2}, \dots, C_{im}\}$. A high degree of continuity for an IT

application is defined by a high degree of similarity between the user interfaces associated with each version. This requires a high degree of similarity between components sets that make up the interfaces. Changes applied to the interface components are:

- *interchange* is defined by changing positions of two components of the interface between them;
- *exclusion* represented by deleting certain interface components that are not representative for the current version of the software interface;
- *addition* is the operation through which is created a new interface component that is included in the components set associated with the last interface version of the software product;
- *change* which alters the shape, length or content of user interface components of the software application.

Continuity of user interface I_i is defined by the CT indicator:

$$CT_i = \frac{\sum_{j=1}^m \frac{\min(TC_{ij}, CN_{ij})}{\max(TC_{ij}, CN_{ij})}}{m}$$

where:

TC – total interface components;

CN- number of unmodified components in regard to the I_{i-1} interface.

The CT_i aggregate indicator of continuity is easily determined by analyzing the dynamics of interface components and is a useful metric in determining the fluctuations occurring in software interfaces.

Security is the quality characteristic of a distributed system that is achieved through the ability to protect the logical and physical resources of the system. Security⁽¹⁾ is represented by the measures taken to protect a system. Security is also considered as a condition of a system which results from the establishment and preservation of some measures to protect the system. Security is a condition of system resources to which unauthorized access, unauthorized or accidental changes, destruction or loss are not allowed.

Security of a system is influenced by the used network communication protocols, network topology, user authentication methods, and used encryption systems and by the human factor involved in all aspects of the distributed system life cycle. Security is represented by the access control to software and hardware resources and to the application components. Computer systems implement the following methods to secure the access to resources:

- *authentication* is the process of identity validation; before an application authorize the access to protected resources the authentication processes are necessary for establishing user's identity and to verify that the information passed in the authentication process are recorded in the associated users group database of the distributed system;
- *authorization* is the process of setting the user access permission to protected resources within the distributed system; even if a user has proved to be recorded in the users group database it doesn't mean that it has access to the system's resources;
- *data protection* is the process of ensuring confidentiality and integrity of data stored in distributed system databases; encryption provides data confidentiality; data integrity is ensured by using digital signatures, hash algorithms and message authentication codes.

Security is an important issue for online applications according to (Doinea et al., 2010) being necessary to preserve the integrity of applications and as well as data for imposing confidentiality level.

User access restrictions in AVIO application

The application for organizational identifiers analysis determines the level of identifiers orthogonality in order to eliminate the situations where there are two companies with very similar names and logos.

In the module for organization names orthogonality analysis is built the vocabulary $VOCDEN = \{D_1, D_2, \dots, D_k\}$ that contains all names entered in the organizations database. It is considered that the entity has a name consisting of several words and orthogonality is determined by analysis at the vocabulary level and at the word level. Vocabulary level analysis is done first in order to determine the correspondence between texts and for the requirements of application validation for orthogonality calculation.

In order to examine the orthogonality of two texts T_1 and T_2 two vocabularies are built, V_1 and V_2 , that are defined by alphabetical sorting of the words that compose the T_1 and T_2 texts. Vocabularies are defined as sorted sets of words $V_1 = \{C_{11}, C_{12}, \dots, C_{1n}\}$ and $V_2 = \{C_{21}, C_{22}, \dots, C_{2n}\}$ where C_{1i} corresponds to the word from the i position of the V_1 vocabulary and C_{2j} corresponds to the word from the j position of the V_2 vocabulary. Names orthogonality is represented by the following formula:

$$ORTOT(V_1, V_2) = 1 - \frac{NCC}{\max(NoCV_1, NoCV_2)}$$

where:

- NCC – number of common words;
- NoCV₁ – number of words from the V₁ vocabulary;
- NoCV₂ – number of words from the V₂ vocabulary.

The orthogonality analysis of the organization logos is done by the compared analysis of the differences between two logos and it results an orthogonality index. A logo is a unique graphic used by organizations, companies or individuals to be publicly identified. A logo has the following characteristics:

- uniqueness, thus each logo is associated with one entity facilitating the identity recognition of the owner;
- standardization, which is reflected in the logo format in a way to ensure the compliance with other existing logos format; is aimed the width, height and quality of the logo;
- representation, which means the degree to which the logo is representative for the defined scope of the owner;
- simplicity, which is characterized by a representation which is easy to remember having a complexity of the alphabetical and graphical elements as light as possible;
- impact, which is the characteristic that determines the success of the logo considering the design elements influencing public opinion on the entity that is represented by the logo;
- color; exists logos that use only a limited set of colors that are considered representative of the entity, and logos using only black and white;
- shape differentiates logos depending on the geometric elements like round, square, oval, rectangular, hexagonal or logos composed of composed geometric shapes; as a symbol contains more geometric elements its complexity increases and the degree in which it is easily associated with the represented entity decreases.

Two logos are considered different if:

- there are different color elements between the two logos, so there is a chromatic difference in the comparative analysis;
- there are different geometry elements composing the logos so that their visual comparisons reveal obvious differences.

To determine the orthogonality for the S_{beta} and S_{beta2} logos in AVIO application in order to validate the organization identifiers, it is determined the differences between the two logos as follows:

- determining the matrices of pixels associated to the S_{beta} and S_{beta2} logos scaled to the following sizes:

- 4x4 pixels, creating the matrix $MS_{\beta_{4 \times 4}}$ associated to the S_{β} logo and the $MS_{\beta_{24 \times 4}}$ matrix associated to the S_{β_2} logo; each matrix contains four columns and four lines of pixels;
- 8x8 pixels, creating the matrix $MS_{\beta_{8 \times 8}}$ associated to the S_{β} logo and the $MS_{\beta_{28 \times 8}}$ matrix associated to the S_{β_2} logo; each matrix contains eight columns and eight lines of pixels;
- 16x16 pixels, creating the matrix $MS_{\beta_{16 \times 16}}$ associated to the S_{β} logo and the $MS_{\beta_{216 \times 16}}$ matrix associated to the S_{β_2} logo; each matrix contains sixteen columns and sixteen lines of pixels;
- are created two sets of matrices $ST_{\beta} = \{MS_{\beta_{4 \times 4}}, MS_{\beta_{8 \times 8}}, MS_{\beta_{16 \times 16}}\}$ and $ST_{\beta_2} = \{MS_{\beta_{24 \times 4}}, MS_{\beta_{28 \times 8}}, MS_{\beta_{216 \times 16}}\}$;
- is realized the comparison of the sets of matrices by using the following weighted formula:

$$ORTOST(ST_{\beta}, ST_{\beta_2}) = \frac{(ND4 \times 16 + ND8 \times 4 + ND16)}{256 \times 3}$$

where:

ND4 – number of registered differences between the $MS_{\beta_{4 \times 4}}$ and $MS_{\beta_{24 \times 4}}$ matrices; maximum number of differences is $4 \times 4 = 16$;

ND8 – number of registered differences between the $MS_{\beta_{8 \times 8}}$ and $MS_{\beta_{28 \times 8}}$ matrices; maximum number of differences is $8 \times 8 = 64$;

ND16 – number of registered differences between the $MS_{\beta_{16 \times 16}}$ and $MS_{\beta_{216 \times 16}}$ matrices; maximum number of differences is $16 \times 16 = 256$;

$ORTOST(ST_{\beta}, ST_{\beta_2}) \in [0,1]$ because if there are a maximum number of differences between the two sets of matrices, meaning $ND4 = 16$, $ND8 = 64$ and $ND16 = 256$ then:

$$ORTOST(ST_{\beta}, ST_{\beta_2}) = \frac{16 \times 16 + 64 \times 4 + 256}{256 \times 3} = \frac{256 + 256 + 256}{256 \times 3} = 1$$

In the context of working with large volumes of data as (Doinea, Pavel, 2010, pp. 72-85) for AVIO application are identified the following types of users:

- users that have access to the functionality of displaying the organizations with orthogonal identifiers stored in the database; this type of users does not requires registration to access this functionality;
- users that have access to the organization identifiers validation functionality by introducing new identifiers to determine orthogonality; this type of user requires registration to get necessary permission to use the AVIO application;

- users that have access to the management functionality of AVIO product; this type of user is unique, being represented by the administrator of the IT application that manages the submitted content and the good functioning of the software.

To determine the AVIO application flows it is necessary to determine the available terms of use for the described types of users. It is also important the interaction with application and between users types. AVIO application flows are determined based on the use case described in Figure 3.

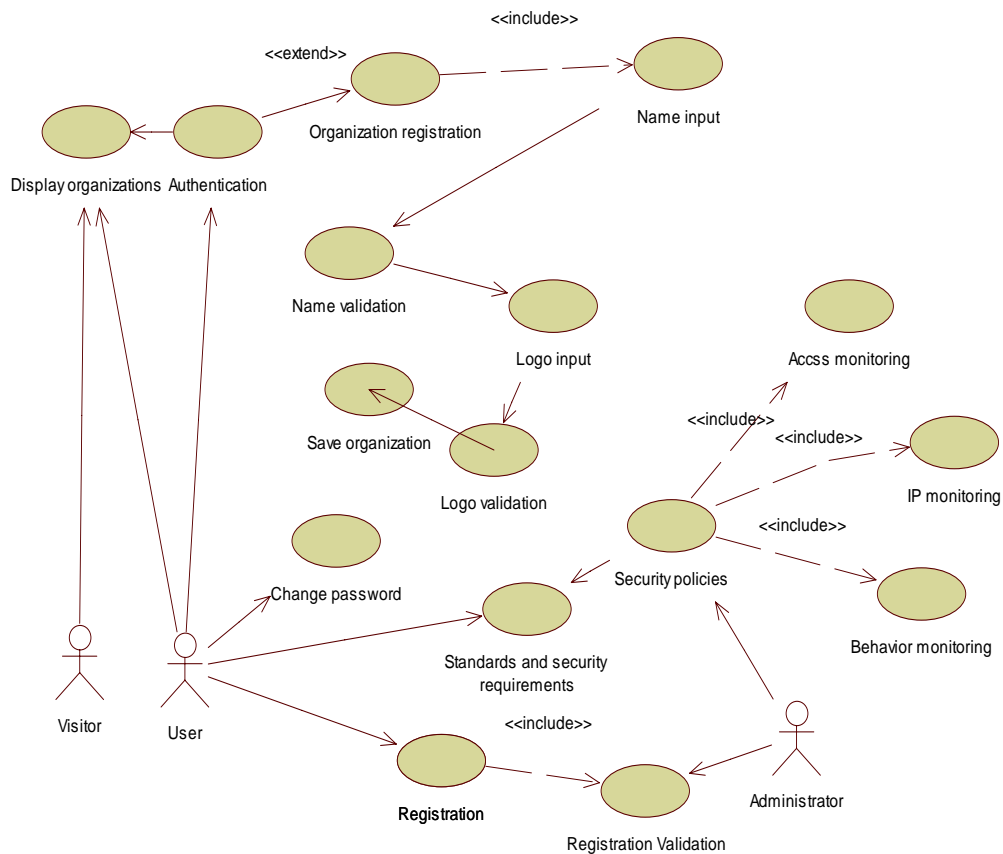


Figure 3. AVIO use case

From the use case shown in Figure 3 is determined the operations access matrix for AVIO application in Table 2.

Table 2

Permit Role	Read	Identifiers orthogonality analysis	Add identifiers in the database	Validate users	Security policy management	Users management	Events management
Visitor	X						
Registered	X	X	X				
Administrator	X			X	X	X	
Application							X

The tables' access matrix that composes the database used by the AVIO application is presented in Table 3.

Table 3

Table User	App_FIRME	aspnet_Users	Log_EXCEPTII	Log_LIB	Log_Evente	Log_COMP	Log_ACTIVITATI
Visitor	X						
Registered	X						
Administrator	X	X	X	X	X	X	X
Application	X	X	X	X	X	X	X

Guest user type has read access rights to the table organization identifiers stored in App_FIRME table without seeing which user entered them. In Table 4 are presented the permissions for the associated fields App_FIRME table for the Guest user type.

Table 4

Operation	Field	Name	Logo	ID	UserID
Read		X	X		

Registered type user has read access rights but also to introduce new organization identifiers if the analysis proves they are orthogonal with the existing identifiers from the database. Registered type user is restricted to delete only the identifiers self introduced and do not have permission to delete identifiers entered by other users.

Table 5 shows the permissions for the associated table fields App_FIRME table of the Registered user type.

Table 5

Registered user access permissions to App_FIRME table fields

Field \ Operation	Name	Logo	ID	UserID
Read	X	X		
Write	X	X		
Delete - restricted	X	X		

Administrator user has extended access rights to the App_FIRME table like registration of new orthogonal organization identifiers, reading, deleting the existing identifiers that are improper or modifying the existing ones. Modification involves the resumption of processing in order to determine the orthogonality to the changes carried on identifiers.

Table 6 shows the permissions for the associated table fields App_FIRME table of the Administrator user type.

Table 6

Administrator user access permissions to App_FIRME table fields

Field \ Operation	Name	Logo	ID	UserID
Read	X	X	X	X
Write	X	X		X
Delete	X	X		X
Modify	X	X		X

The Aspnet_Users, Log_EXCEPTII, Log_LIB, Log_Eventimente, Log_COMP, Log_ACTIUNI tables have reading rights for Administrator user and writing rights for the Application. Aspnet_Users table is used for users' management and the other tables form the AVIO application monitoring system having an informative role for the Administrator user type.

Access matrix

Access matrix implies the existence of the database structure because the access to the table's fields is done starting from the table's architecture that store data. The access type is imposed by the inclusion of access information in tables and by creating the auxiliary tables to achieve a high level of granularity in defining access rules. To achieve the access matrix is started from the permissions data to determine the access level to the table's fields from database. It is considered the database consisting of a set of tables $T = \{T_1, T_2, \dots, T_n\}$.

To each T_i table is assigned a set of records $I_i = \{I_{i1}, I_{i2}, \dots, I_{ik}\}$. The I_{ij} record is defined by a set of fields $C_{ij} = \{C_{ij1}, C_{ij2}, \dots, C_{ijm}\}$. There are access restrictions to the table level classified depending on the table's role in the software product ensemble.

Thus there are tables that are subject to reading operations and it allows:

- unrestricted access to read, this type of table contains non-confidential information aimed at informing users by offering for reading the stored data; the tables with unrestricted access to the data are used in information portals, government sites for instructing or other types of computer applications aimed at providing non-confidential information;
- partially restricted access to reading; this type of table contains information which are confidential, but also public information; such access is selected by the user's access level; if the user has access rights to confidential data the entire table is presented, otherwise only the public information is presented; these tables are used in applications that implement security systems, users and roles management for differential access to information and resources; the tables that have partially restricted reading access are used to record confidential details and the elements of public interest that are presented anonymously in the absence of access rights;
- reading restricted access, this table presents only confidential information that are presented to the users with access privileges; reading restricted access tables are used for recording confidential information; access is checked and data is encrypted in order to ensure a high level of confidentiality.

There are tables on which write operations are performed depending of the purpose of the software product, by allowing:

- unrestricted write access, records are made automatically by the software application or manually by the user;
- partially restricted write access means allowing the writing of only a set of table fields, the other ones receiving values automatically assigned through an algorithm; this type of table is used for sales where the items prices, VAT and the price without VAT are automatically filled; thus the user does not receive the write access for the entire table;
- restricted write access so only users with writing access perform this type of operation;
- partially restricted write access or restricted with validation; this principle is applied to partially restricted and restricted write access;

the users performing inserts in this type of table must have special access privileges as well as those that perform data validation.

There are tables on which modification operations are carried out allowing:

- unrestricted modification access in which the amendments are made by all registered users of the database or of the software application that uses the table;
- partly restricted modification access by preventing the amendment of high privileges access fields;
- restricted access to modify by preventing the amendment for all users necessary access rights to the table;
- partially restricted access and restricted access with validation to modify; this kind of access allows returning to the unchanged record if the change is erroneous or not accepted by the user that is responsible to validate the operation.

The delete operations must be performed by users with higher privileges in order to restrict the group of users who have access to this functionality.

There are tables that have mixed permissions access for reading, writing, modifying or deleting; such privileges presumes mixed access having a combination of access types for each presented operation. Table 7 presents an access matrix to the tables set $T = \{T_1, T_2, \dots, T_n\}$ for the users set $U = \{U_1, U_2, \dots, U_p, \dots, U_t\}$.

Table 7

Access matrix to the tables set

User \ Table	T₁	T₂	...	T_{i-1}	T_i	T_{i+1}	...	T_{n-1}	T_n
U ₁	X			X					X
U ₂					X	X			
...									
U _{p-1}		X							
U _p		X			X			X	X
U _{p+1}	X	X		X	X	X		X	X
...									
U _{t-1}	X					X		X	
U _t		X			X				

There are several types of fields:

- which are used to identify an element from a collectivity after specific coordinates such as unique identification codes, personal identification number, registration number or other unique items;

- which is used to describe entities that contains C_{ij} fields necessary to identify the characteristics for the virtualized entity record I_{ij} containing fields type C_{ij} ; the fields used for description are required to define the entity characteristics in order to determine the difference degree of the entities collectivity stored in the T_i table;
- it aims the state and dynamics of the C_{ijl} element belonging to the $C_{ij} \rightarrow$ fields collectivity associated to the I_{ij} record; this field has a dynamic developed since it is subject to frequent changes that define the entity dynamic; this field type is used to identify the evolution of a currency pair on the market exchange, the roadmap management of an automobile or other activity types that require frequent changes;
- connecting entities from other tables that are designed to maintain the logical connections between entities; these fields are represented of unique identifiers that belong to other entities and are used to create logical connections between the two records;
- fields for the delimitation of the daily expenditure that are subject to change depending on the number of items purchased as a result of procurement transactions.

In order to apply the security restrictions for each field it is necessary to establish the conditions for editing fields. Such fields are:

- with unrestricted read permissions which are displayed to all users and serve the public interest in the database; the access to these fields is done with minimal privileges;
- with restricted read permissions to be displayed only to the users who have the necessary permissions to gain access to the data stored in respective fields; this field type contains confidential information or an increased importance level;
- with unrestricted write permissions that are written by all database users; these fields contain items of general interest and with a moderate importance level;
- with restricted writing permissions that are written only by users who have permissions to change that field; this field has high importance and in some cases contain confidential information;
- with unrestricted modify permissions that are modifiable by all the database users; these fields are used to store the dynamic data that changes frequently and have a moderate importance level;
- with restricted modify permissions that are modifiable only by certain database users that have access privileges to that field; these fields are used to store confidential data or with high importance level.

For the C_{ij} fields set associated to the T_i table is considered the basic operations matrix allowed for the U_p user shown in Table 8.

Table 8

Basic operations allowed by the U_p user

Field Operation	C_{ij1}	C_{ij2}	...	$C_{ij_{j-1}}$	C_{ij_j}	$C_{ij_{j+1}}$...	$C_{ij_{m-1}}$	C_{ij_m}
Read	X	X		X				X	X
Restricted read					X	X			
Write		X							
Restricted write	X								
Modify		X			X			X	
Restricted modify	X			X		X			X
Work simulation		X		X				X	
Copy data	X			X					X
Export data		X			X			X	

In Figure 4 is presented a three-dimensional matrix that provides access control the T_i table fields.

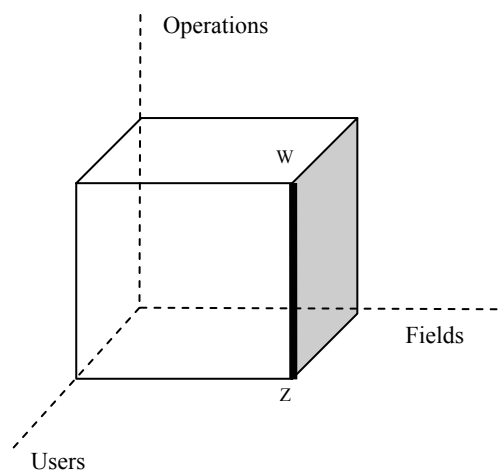


Figure 4. Fields access three-dimensional matrix

The WZ segment is represented by the operations set to be performed by all users. Figure 5 shows the three-dimensional arrays for the fields access to the $T=\{T_1, T_2, \dots, T_n\}$ tables. In order to optimize the access to the fields and to impose effective restrictions user roles are implemented in order to effectively create operations restrictions for users. Access permissions to the table fields

are saved in the database by the administrator and associated to the user roles. By implementing user roles the permission tables are tightened thus requiring a number of permissions set equal to the number of roles from the database.

The three-dimensional role-based access matrix is smaller and more manageable. Addressing the access control through roles is effective when the permissions allocation for each user is redundant, having multiple users with the same sets of allowed operations.

For proper management of fields access it is necessary to use triggers tables or using the programming language that implements the database.

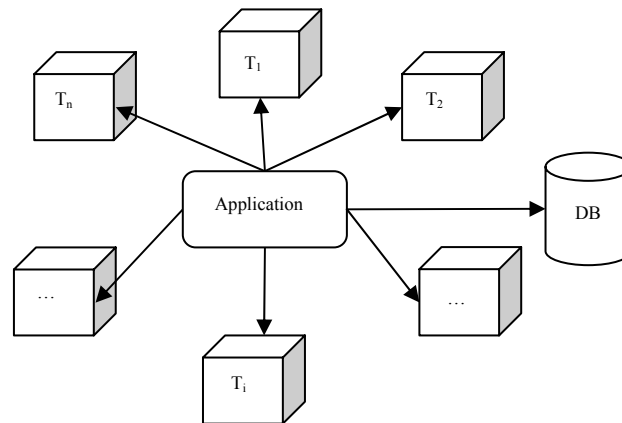


Figure 5. *The permissions set for the T tables collectivity*

The permissions set for the T tables collectivity is representative for the access to information stored in the database by the fact that is implemented an access level to the field level that allow an effective control of the operations on the database resources.

The three-dimensional access matrix provides the possibility to identify all user actions and their control if necessary. Its implementation is important in the context of maintaining a uniform way to control the access to the resources.

Users classification

Online applications, through their complexity, offer a large variety of interactions types which correspond to the users types. The users consult the online applications to get information. There are online applications that are used for making complex transactions and confidential nature such as:

- document management through storage and loading of the documents on a computer server; this application is useful because it provides

high availability of the documents regardless of the used terminal; the applications that provide this service have the option to view online documents, edit them, grammar checking or downloading or saving the modified document on the working terminal; there are security restrictions implemented to maintain the confidentiality of the stored documents; is also implemented the functionality to change the confidentiality of documents into a public one;

- online budget management through introduction of monthly expenses and income; this type of online application is useful to clearly identify and eliminate unnecessary spending; personal data regarding income and expenses must be protected by an effective security system because the database privacy loss lead to the disclosure of a large volume of highly confidential information;
- managing bank accounts through e-banking applications; such applications provide the user with a large number of banking transactions such as management of deposits, payments to vendors, making bank transfers or view statements; to preserve the confidentiality is necessary to effectively manage the system security and using of information encryption mechanisms and effective authentication mechanisms that take account of the latest types of threats;
- virtual stores that offer the products viewing functionality manage shopping cart and online payment; this kind of application is useful for making online purchases of various products, management of orders and views the shopping history.

Users types in complex applications that have a high level of confidentiality is set by the access level they need to operate. There are users who:

- visualize the presented information and use them in their activities;
- add information in the database; these users need differentiated permissions to determine in which tables have the permission to add data and what fields are affected by the added records;
- change information in the database; these changes occur due to inventory differences or changes made in documents or other factors of influence; in order to make the changes is needed to establish the tables and fields modifiable by that user; this is achieved by setting the necessary permissions for the user to efficiently carry out its proposed activities; changes made are at the field or table level and, in some cases, involves changes in other fields or tables as side effects;
- delete the information from the database that are no longer useful or have been incorrectly entered; this type of user needs high access privileges and well defined to select tables and fields that has access

to; by implementing the deletion logic mechanisms are created the premises of a better database management and the risk of permanent loss of the information are reduced;

- validate changes; this type of user has a high access level with the task of validating the changes, additions or removal operations initiated by other users; the user role is necessary in the context in which the application is working with valuable information such as bank details or scholarship indicators to ensure the integrity and accuracy of the database; the privileges are given depending on the position and the competence of the user having areas where it has the needed expertise to validate the fields or table changes;
- manage the application and have the highest access level of all users; this user type has administrative rights on the database bringing structural changes and managing data stored in the database, has user management rights and can activate and deactivate user accounts.

Figure 6 shows how to manage changes in the database done by different user types; U_1 user has Administrator rights, U_2 have validation rights and U_3 , U_4 , U_5 and U_6 users have modification rights. Figure 6 shows a scenario limited to six users to differentiate the access levels and user roles.

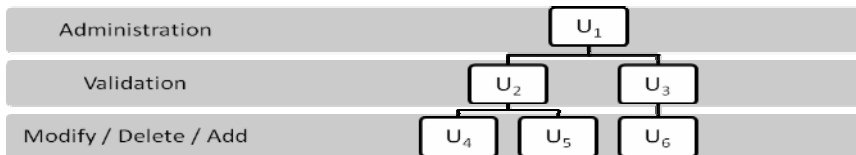


Figure 6. Operations validation performed by users

The types of users are ranked according to the privileges types that they receive in the distributed application. In Figure 7 the users' hierarchy is carried out according to the group permissions.

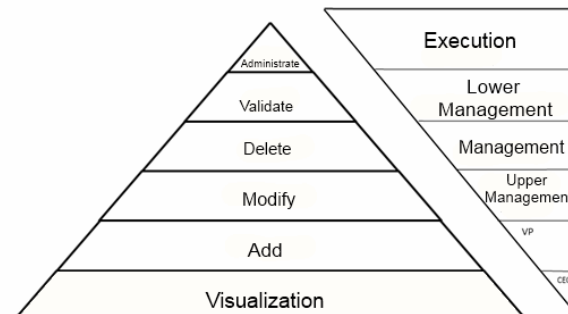


Figure 7. User type classification in the organization hierarchy

The user types are determined through direct connection with the users' roles and their relationship with the database entities. The tables and fields access restrictions are managed according to user type. If the user does not have the privileges to visualize, change or delete a field or a table entry the operation is suspended and the action is recorded in the logging table.

Conclusions

Online applications have the advantage of providing services of increased complexity in a distributed environment. Online applications efficiently work with databases, make use of services and have intuitive user interface. There are online applications that present general interest information, but also online application that process confidential information requiring access restrictions.

The data access issue is important to be treated in order to mark the boundaries between strictly confidential and non-confidential data. This is done by analyzing the information flows from the online application. It is necessary to establish access methods to the database tables and table fields.

By using the data access matrix it is provided a clear understanding of the access privileges used in the online application. It is necessary to establish access permissions for each user type to correlate the permissions with the information which provides access to. Data access matrix is a stable indicator of the user access level presenting small variations to a small number of operations available for a small number of users, but high variations in a large number of operations available for a large number of users.

The using of the three-dimensional matrix representation as a method of access privileges is significant in the context of assessing the number of users and permissions.

AVIO application is made to examine the organization identifiers orthogonality. The processes implemented for determining the difference is only accessible to registered users. The application offers the possibility to view the identifiers stored in the database. The access setup process is based on the information confidentiality. For this purpose only the administrator has access to the running information and the registered users of the AVIO application.

The costs for data access matrix are low because it involves an analysis of the flows of the online application through identifying the operations in the use cases. The cost of access privileges identification appropriate to user types is lower using the access matrix in the phase of the specifications development than in the implementation phase of the system security.

Acknowledgements

This article is a result of the project „Doctoral Program and PhD Students in the education research and innovation triangle”. This project is co funded by European Social Fund through The Sectorial Operational Programme for Human Resources Development 2007-2013, coordinated by The Bucharest Academy of Economic Studies.

References

- Roşca, I.Gh., Ghilic-Micu, B., Stoica, M. (2006). *Informatica: societatea informațională: e-serviciile*, Editura Economică, Bucureşti, ISBN (10) 973-709-266-X
- Cotfas, L., „A Genetic Algorithm and GIS based solution for public transport networks”, *The Proceedings of the Ninth International Conference on Informatics in Economy*, 2009a, ISBN 978-606-505-178-2
- Cotfas, L.A., „Advanced personalization of location based services”, *4th International Conference on Knowledge Management: Projects, Systems and Technologies*, pp. 31-34, Bucharest: "Carol I" National Defence University, 2009b, ISBN 978-973-663-783-4
- Vintilă, B., Pavel, S., „Assisted Design, Development And Evaluation Of Citizen Oriented Collaborative Applications”, *Journal of Applied Collaborative Systems*, vol. 2, no. 3, 2010, ISSN 2066-7450
- Dicţionarul explicativ al limbii române* (1998), Academia Română, Institutul de Lingvistică „Iorgu Iordan”, Editura Univers Enciclopedic
- Palaghita, D., „Quality characteristics of open source components”, *Open Source Journal*, www.opensourcejournal.ro, 2009
- Ivan, I., Boja, C. (2004). *Metode statistice în analiza software*, ISBN 973-594-498-7, Editura ASE, Bucureşti
- Doinea, M., Ciurea, C., Dumitrache Marilena, „Collaborative Environmental Security Facing the Challenges of the Economic Process Development”, *Proceedings of 17th International Economic Conference – IECS 2010*, „The Economic World Destiny: Crisis and Globalization?”, May 13-14, 2010, Sibiu, Romania, Special Issue of Revista Economica, Lucian Blaga University of Sibiu
- Doinea, M., Pavel, S., „Security Optimization for Distributed Applications Oriented On Very Large Data Sets”, *Informatica Economica Journal*, Vol. 14, No. 2, 2010, ISSN 1453-1305
- Cotfas, L.A., Diosteanu, Andreea, Smeureanu, I., „Knowledge Dynamics in Semantic Web Service Composition for Supply Chain Management”, *Journal of Applied Quantitative Methods*, Vol. 5, No. 1, 2010, ISSN 1842-4562
- Ivan, I., Vintila, B., Ciurea, C., Doinea, M., „The Modern Development Cycle of Citizen Oriented Applications”, *Studies in Informatics and Control*, Vol. 18, No. 3, 2009, ISSN 1220-1766
- Ivan, I., Vintila, B., Ciurea, C., Doinea, M., „Citizen Oriented Informatics Applications development Cycle”, *Ekonomika, Statistika, Informatica, MESI*, No. 4, 2009b, ISSN 1994-7844

Optimality of Fiscal Policy in Romania in Terms of Laffer Curve

Adina TRANDAFIR

“Spiru Haret” University, Bucharest
atrandafir04@yahoo.com

Petre BREZEANU

Bucharest Academy of Economic Studies
brezeanupetre@yahoo.com

Abstract. *Optimality of fiscal policy is an issue widely debated in the literature from multiple perspectives. One way to address this problem is with the Laffer curve, causing the correlation between tax burden and tax revenue. This paper addresses the correlation with Laffer curve for income tax made during the period 2000-2010, highlighting the fact that the Romanian economy lies in the inadmissible slope of the curve, both in analyzing the entire period, and in the part of each year. Moreover, this result reveals the existence of unnecessary redistribution of income in the Romanian economy during the period under review.*

Keywords: fiscal policy; Laffer curve; tax burden.

JEL Codes: E62, E63.

REL Codes: 8K, 8M.

1. Introduction

Taxation is one of the areas that suffered most changes in the last two decades in our country. Unfortunately, these changes were either too thick or too slow or too sudden, so that the Romanian fiscal environment is perceived by all taxpayers as a factor of instability in the Romanian economy.

It is true that there has been some progress in legislative matters, and regulatory harmonization with the EU or the flat, but insufficient administrative capacity makes the Romanian tax system to represent a weakness of the national economy. Providing a unified framework (Fiscal Code) has been overshadowed by the state's inability to respect fundamental principles assumed, and the imposition of efficiency and certainty, stability and predictability, essential principles on which a tax system must satisfy a viable economy.

Payment of taxes and the tax burden is sustained for the taxpayers to the state budget of Romania, most often suffocating. The taxpayer agrees to pay the tax and is subject to this burden willingly, but at a time when taxes exceed certain limits of endurance, occur phenomena that without serious detrimental state capacity to collect this revenue. The desire to secure taxpayers' income before increased tax pressure without additional effort contribute to the development of parallel economy, which gradually replaces the real economy activity, giving way to the emergence of parallel economy (economy). The consequences of this are fewer taxpayers and material reduction in the tax base and ineffective macroeconomic policies in the field.

This article addresses to the optimality issue of Romanian fiscal policy during the period 2000-2010, from the perspective of Laffer curve, causing the slope of the the mentioned period in area roumanian fiscal policy.

In the second section, the article presents existing research literature and theories in the Laffer curve. Section Three examines the Laffer curve slope for Romania on the basis of general consolidated budget, both for the entire period, and each individual year.

2. The current state of knowledge

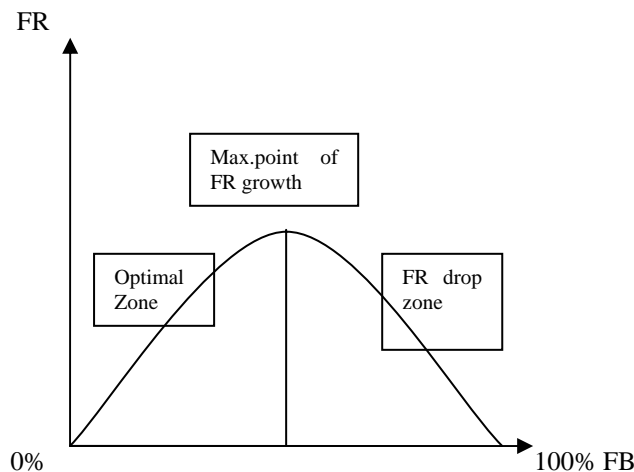
In 1776, A. Smith has established that high tax rates will damage the tax base. This concept was embodied by the American economist Arthur Laffer⁽¹⁾ who built a curve linking the tax rate and tax base.

The basic idea behind the relationship between tax rates and tax revenues is that changes in tax rates can have two effects on revenues: the arithmetic effect and economic effect.

The arithmetic effect refers to the fact that when tax rates decrease, the tax revenues (expressed per unit of taxable income) will also decrease. Otherwise, when the tax rate increases, the effect makes arithmetic will cause tax revenue collected per unit of taxable income to increase.

The economic effect, however, lead to a positive impact of lower tax rates on labor and production and therefore also on the tax base. In contrast, increasing the tax rate will have an economic effect, conversely, the penalty for participating in taxable activities. Therefore, the arithmetic effect will always act to reverse the economic effect. When combining the two types of effects, the consequences of tax rate change on tax revenues are not so obvious.

The theoretical model of Laffer curve is presented in the figure below:



Source: Arthur B. Laffer (2004), "The Laffer Curve: Past, Present, and Future", The Heritage Foundation.

Figure 1. *The Laffer curve*

In public finance literature one meets classical reversed form (U) of the Laffer curve⁽²⁾. However, Malcolmson (1986, pp. 263-279) argues that there are potential discontinuities at high tax rates.

Feige, Edgar L., and Robert T. McGee (1982, pp. 499-519) say that studies suggest that the phenomenon observed economy has important implications both for macroeconomic policy and public finances. In their paper the attention is focused on the implications of public finances by developing a simple macromodel that is possible to obtain a Laffer curve. This model shows that the shape and position of the Laffer curve for Sweden depend on the power supply, the progressivity of the tax system and the size of the observed economy. Also, they

simulated Laffer curve for the UK and answered the question regarding the costs of establishing rates for obtaining the maximum revenue.

In dynamic, the Laffer curve was studied by Jonas Agell and Mats Persson (2000), and Jesús Alfonso Novales and Ruiz (2002, pp. 181-206). Jonas Agell and Mats Persson (2000) analyze the government budget balance in a simple endogenous growth model, by conducting an empirical study of transfer-adjusted tax rates in OECD countries to see which country has the greatest potential for improvement tax. Jesús Alfonso Novales and Ruiz (2002) analyze the potential welfare gains that can come from substituting debt for taxes in the management deficit. They find that tax cuts on labor and capital income have a positive effect on growth rate of the economy, thus gradually increasing the long term tax base.

In quantitative terms, the Laffer curve was analyzed by Trabandt Mathias and Harald Uhlig (2006, pp. 1-69) using a simple model of the neoclassical growth, calibrated for the US, and EU-15 economy. They showed that in the US and the EU-15 labor and capital are located on the left side of Laffer curve, but the EU-15 economy is much closer to the slopes than the United States prohibited. They also found that the slope of the Laffer curve for the EU-15 economy is much flatter than in the US, citing a much higher degree of distortions in the EU-15.

3. The Laffer curve and the optimality of Romanian fiscal policy during the 2000-2010 period

In what follows we will try to determine the shape of the Laffer curve general government budget tax revenues of we Romania. Analyzing the effects of increase or decrease the gross tax burden, one can reveal which part of the curve lies the Romanian economy: the permissible or the prohibited area.

Variables taken into account in determining the Laffer curve in Romania during 2000-2010, are:

- Realized tax revenues at current prices;
- GDP in current prices;
- GDP deflator;
- Real tax revenue, converted by GDP deflator;
- Real GDP;
- Gross tax burden, calculated using realized tax revenue and real GDP.

From the given period, the values of these variables are as follows:

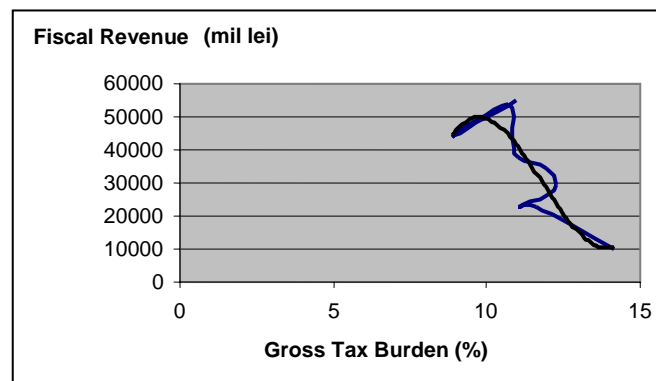
Table 1

**Laffer curve shape variables for the consolidated general government fiscal revenue
in Romania for the period 2000-2010**

Year	Fiscal Revenue (mil lei)	Real GDP (mil. lei)	Gross Tax Burden (%)	Δ Gross Tax Burden (%)	Δ Fiscal Revenue (mil. lei)
2000	10177.4	72060	14.12351115	-	-
2001	23033.05	197971	11.63455945	-2.48895	12855.65156
2002	22948.43	208068	11.02929178	-0.60527	-84.62687869
2003	26166.63	218887.9	11.95435184	0.92506	3218.202899
2004	29201.45	238700	12.23353493	0.279183	3034.818165
2005	34325.25	287286	11.94811042	-0.28542	5123.800632
2006	37636.74	342418	10.99146155	-0.95665	3311.494291
2007	43693.29	404700	10.79646354	-0.195	6056.545137
2008	53946.77	503700	10.71009947	-0.08636	10253.4831
2009	43629.09	491300	8.880336394	-1.82976	-10317.67834
2010	54771.11	499652.1	10.96184904	2.081513	11142.01625

Source: Data from Statistical Yearbook of Romania (www.insse.ro) and own calculations.

Based on data from the previous table we built the Laffer curve for realized tax revenue.

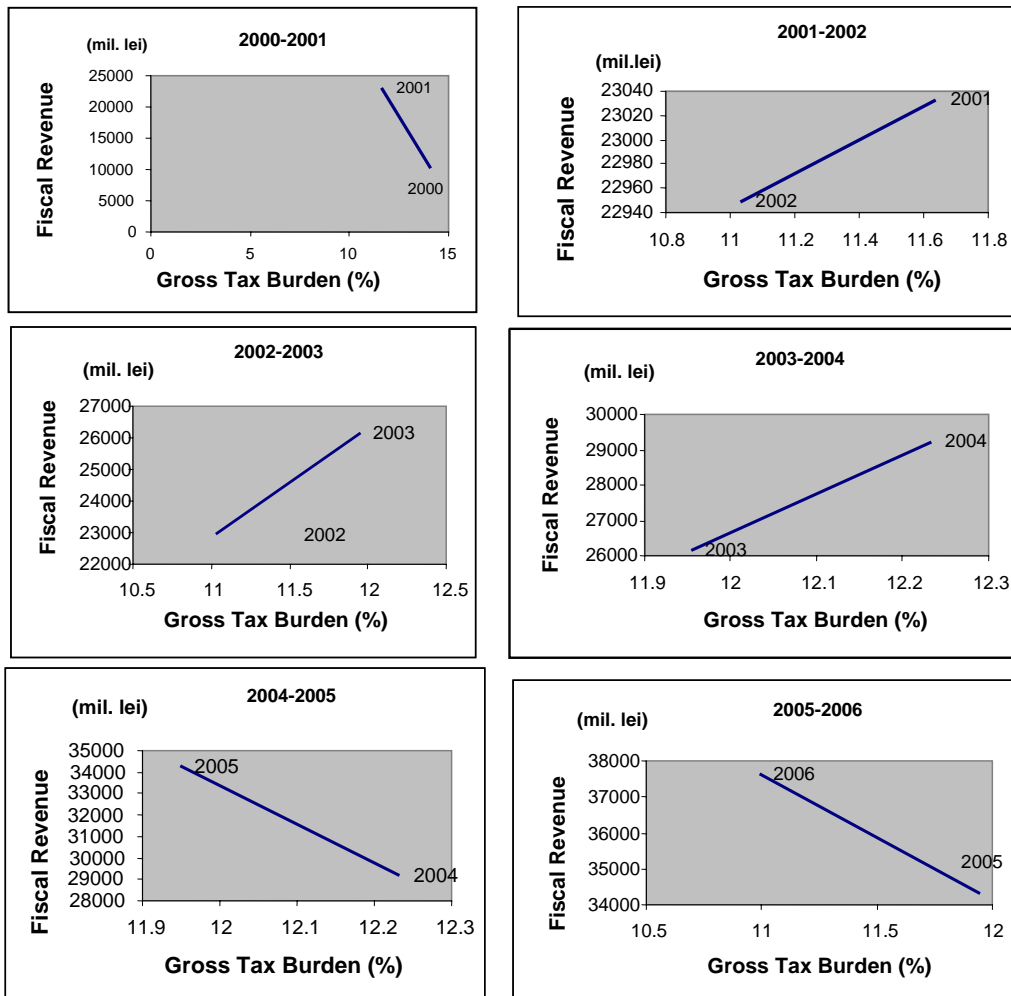


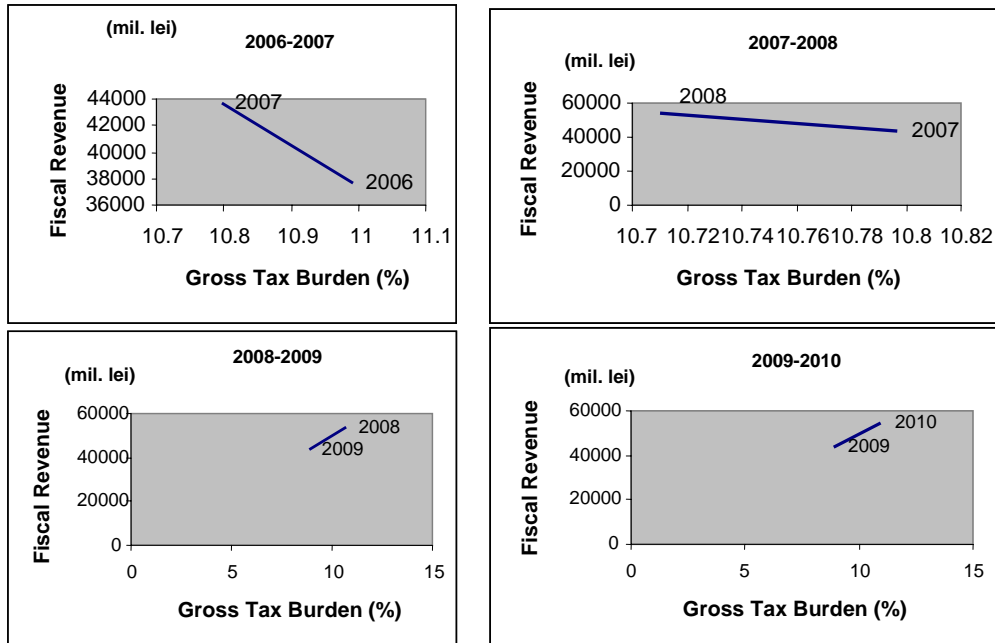
Source: own processing of data taken from Statistical Yearbook of Romania (www.insse.ro).

Figure 2. Income tax Laffer curve for Romania during 2000-2010

As shown in the figure above, the Laffer curve constructed on the basis of gross tax burden and real tax revenue during 2000-2010 stands the Romanian economy on prohibited slope of the curve, in the prohibited area. During the period under review, in 2010 reaches the peak of the realized tax revenue from a 10.96% gross tax burden.

Analyzing the problem, we noticed that the slope varies from year to year. Thus, the following will be displayed in real tax revenue changes, in correlation with changes in gross tax burden every year to see if, during the period under review, income tax burden was real or not above the optimal level and what is this optimal level.





Source: own processing of data taken from Statistical Yearbook of Romania (www.insse.ro).

Figure 3. Annual Laffer Curve for tax revenues of general government budget of Romania, 2000-2010

Looking at the graphs we can see that the gross tax burden generated by the realized tax revenue was in prohibited area in years: 2000, 2001, 2004, 2005, 2006, 2007, 2008 and 2009. To gain more detailed, analysis should be broken down components of tax revenue.

4. Conclusions

Increase or decrease the tax burden on a given period is linked with confidence economic and social role of the state, its intervention in order to ensure coverage of the source of public spending. The debate generated by excessive state intervention in the economy have generated a new economic thinking, thinking that we observe and the American economist Arthur Laffer, who used as a market analysis of the US economy, through a curve showing the relationship between rate pressure tax and tax revenue stream.

In the previous section we built Laffer curve for the Romanian economy on tax revenues incurred during the period 2000-2010. The analysis results show that Laffer curve slope for the entire period places the Romanian economy in the inadmissible or prohibited area, an area where an increasingly important part of the income factor is taken over by the state. Therefore, subjects in economics restrict their taxable activities and, consequently, reduce

the tax basis. Subjects in the economy reject public utilities, private utilities preferred. This result reflects the economic realities of Romania. Analyzing the optimality of Romanian tax policy, during the time, in 2010 reaches the peak of the real tax revenue realized from a 10.96% gross tax burden.

Laffer curve slope varies from year to year, which led to its construction each year in part obtaining the following results: in 2000, 2001, 2004, 2005, 2006, 2007, 2008 and 2009, the Laffer curve slope was located in prohibited (inadmissible) area. The slope of the Laffer curve for the general government budget of Romania in the prohibited area instability finds its explanation in the fiscal area, the weak administrative capacity of the Romanian authorities and the fact that, most times, this area was used as a political tool.

As the pressure increases there is a tax decrease of production and, hence, tax revenue. The fiscal pressure area determined inadmissible unnecessary redistribution of income smoothing through public coercion and deterrence subjects of economic activities, individual initiatives and risk taking. To obtain more accurate results, the analysis in this article could use components of realized tax revenue, as provided in the general government budget of Romania.

Notes

- ⁽¹⁾ The "Laffer curve" concept was introduced by Jude Wanniski, who in 1974 published an article in *The Public Interest*, entitled "Taxes, Revenues, and the "Laffer Curve".
- ⁽¹⁾ See Fullerton, D., (1982), "On the possibility of year inverse relationship between tax rates and government revenues", *Journal of Public Economics*, 19, pp. 3-22.

References

- Agell, J., Mats, P., „On the Analytics of the Dynamic Laffer Curve”, *Working paper*, 2000, pp. 1-26
- Feige, E.L., McGee, R.T., „The Unobserved Economy and the UK 3. Laffer Curve”, *Journal of Economics*, 85 (4), 1983, pp. 499-519
- Fullerton, D., „On the possibility of an inverse relationship between tax rates and government revenues”, *Journal of Public Economics*, 19, 1982, pp. 3-22
- Laffer, A.B., „The Laffer Curve: Past, Present, and Future”, *The Heritage Foundation*, 1765, 2004
- Malcolmson, J.M., „Some analytics of the Laffer curve”, *Journal of Public Economics*, 29, 1986, pp. 263-279
- Novalés, A., Ruiz, J., „Dynamic Laffer curves”, *Journal of Economic Dynamics & Control*, 27, 2002, pp. 181-206
- Smith, A. (1776). *An Inquiry into the Nature and Causes of the Wealth of Nations*, ed. Edwin Cannan, London: Methuen & Co., Ltd.
- Statistical Yearbook of Romania, www.insse.ro
- Trabandt, M., Uhlig, H., „How Far Are We From The Slippery Slope? The Laffer Curve”, *SFB 649 Discussion Paper, 2006-023 April 3*, 2006, pp. 1-69
- Wanniski, J., Taxes, „Revenues, and the „Laffer Curve”, *The Public Interest*, 1974

The Causal Relationship between Health and Education Expenditures in Malaysia

Chor Foon TANG

University of Malaya, Malaysia
tcfoon@yahoo.com

Yew Wah LAI

University Sains, Malaysia
ywlai@usm.my

Abstract. *A major macroeconomic policy in generating economic growth is to encourage investments on human capital such as health and education. This is because both health and education make significant contribution to increasing productivity of the labour force which ultimately exerts a positive effect on raising output levels. A question that arises is whether investments on health and education have a causal relationship and if so, what is the directional causality? The objective of this study is to examine the causal relationship between health and education expenditures in Malaysia. This study covered annual data from 1970 to 2007. Using Granger causality as well as Toda and Yamamoto MWALD causality approaches, this study suggests that education Granger-causes health expenditure in both the short run and long run. The findings of this study implied that the Malaysian society places preference on education expenditure rather than health. This preference is not unexpected as generally, an educated and knowledgeable society precedes a healthy one. Before a society has attained a relatively higher level of education, it is less aware of the importance of health. Thus, expenditure on education should lead expenditure on health.*

Keywords: causality; education; health; Malaysia; MWALD.

JEL Codes: H51, H52, I00, J24.

REL Codes: 13B, 13C.

1. Introduction

One of the major macroeconomic policies in generating long run economic growth in a nation is to encourage investments on human capital such as health and education (Mushkin, 1962, Barro, 2001, Pereira, Aubyn, 2009). It can be reasonably assumed that investments in health and education will lead to better health and a higher level of education standard in the long term. Higher levels of health and education are factors contributing to increasing productivity and efficiency of the labour force which ultimately exert a positive effect on raising output levels. The economic literature also suggests that there is a strong positive relationship between health and education (Ross, Wu, 1995). Moreover, various theoretical explanations have also been provided by many researchers towards a better understanding of this relationship. For example, Grossman (1972) opined that education affects health by enhancing the efficiency in health production. Kenkel (1991) documented that education has a positive effect on health via the allocation of health input because well-educated people are more likely to choose healthy life-styles. Hartog and Oosterbeek (1998) looked at the effects of different levels of education on health. They found that only relatively higher-educated people are aware of the importance of health. Cowell (2006) also found that people with higher levels of education tend to engage in healthy life-styles. In contrast, Arendt (2005), who examined the effect of education on health in Denmark using panel data, found that the effect of education on health is inconclusive. In Netherlands, Groot and Maassen van den Brink (2007) found that the effect of education on health is positive and large. However, they cautioned that this significant effect does not imply that it will result in the efficient allocation of resources when they are channelled into education in order to encourage a healthy society. Most of these studies are based on the assumption that there is unidirectional causality from education to health and have discounted the possibility that the reverse relationship can occur.

Analysing the direction of causality between health and education is important as it provides the necessary and important information for policy planners when they formulate appropriate macroeconomics policies, in particular on the relationship between health, education and economic growth. If the causality is from education to health, for example, it may result in changes in individual choices made in favour of health relative to other products and services. Moreover, such a directional causality will result in increased dissemination of knowledge and information about the true effects of other factors on health. For instance, a more educated community will have a better knowledge on the dangers of smoking or the ill effects of consuming fatty food. As both education and health contribute to economic growth

(Aka, Dumond, 2008), and the possible causality from education to health, investments in education and health are essential in the process of development.

A review of existing literature reveals that empirical studies on the relationship between health and education mostly focused on developed countries. Papers on the relationship between health and education for developing countries are relatively limited. Apart from that, many of the early empirical studies have been performed using inappropriate econometric methodologies, as they did not take into consideration the time series properties of the data used (for example, Ross, Wu, 1995, Arendt, 2005, Silles, 2009). According to Granger and Newbold (1974), the estimated regression results are spurious if the series used are non-stationary and are not cointegrated. For this reason, the results provided by the aforementioned empirical studies are questionable and should be used with caution.

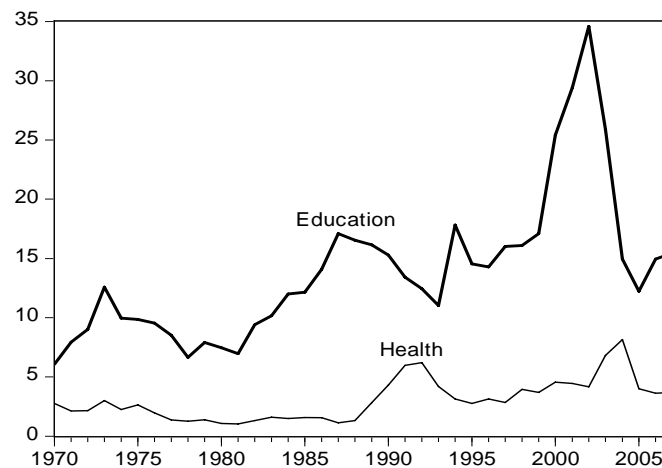


Figure 1. *Proportion of government development expenditure on education and health (percent)*

Figure 1 shows the expenditure on education and health as a proportion of total government development expenditure in Malaysia for the period 1970 to 2007. It is evident that both types of expenditure increased steadily during the period. However, it is also clear that the proportion of government development expenditure on education is consistently higher than that of health expenditure, implying that the government has recognised the relatively more important role of education in generating economic growth and development. It is aware of the fact that in order to create a stable and competitive economy, investments in human capital via education are essential. During the decade from 1981 to 1990, the proportion of total expenditure on education increased from 6.96 per cent to 15.29 per cent, while that on health rose from 1.07 per cent to 4.31 per cent.

The proportion of expenditures on education further increased from 13.43 per cent in 1991 to a peak of 34.57 per cent in 2002. This increasing pattern may be attributed to the implementation of the policy strategies that emphasised on the creation of knowledge-based economy (K-economy). In contrast, the proportion of expenditure on health decreased from 5.98 per cent to 4.20 per cent over the same period of 1991 to 2002. By 2008, however, the proportion of expenditure on education and health has stabilised to about 19 per cent and 5 per cent, respectively.

The purpose of this study is to empirically investigate the causal relationship between health and education expenditures in Malaysia within the Granger causality framework using yearly data from 1970 to 2007. More specifically, this study attempts to examine the empirical question of whether funds should first be spent on health or education. In reality, resources are limited and hence preferences and choices have to be set by all consumers, firms, government and policymakers during the process of allocation of the available resources so that an optimal outcome could be attained. Therefore, it is useful to establish empirically how the choice could be made. This study adds to the body of existing literature in three ways. First, the relationship between health and education for less developed countries is rarely studied. Thus, by investigating empirically such a relationship in Malaysia, which is a small and open developing economy, meaningful comparison can be made with the results from developed countries. Malaysia is an interesting economy to study because of its impressive growth record over the past few decades. Furthermore, the investment on human capital such as health and education expenditures also showed an increasing pattern over time. It is evident from Figure 1 that, as a proportion of total development expenditure, education expenditure far exceeded that of health.

Second, this study is an advantage over the existing literature since we first undertake a thorough examination on the stationarity properties for each series before proceeding to the estimation of the causal relationship between education and health expenditures. This is to avoid possible spurious estimation problems. In this respect, we employed various unit root tests to affirm the degree of integration for each series. This procedure for testing unit roots is absent in most existing literature. The unit root tests employed by this study are Augmented Dickey-Fuller (ADF) (Dickey, Fuller, 1979, 1981), Phillips-Perron (PP) (Phillips-Perron, 1988), Kwiatkowski-Phillips-Schmidt-Shin (KPSS) (Kwiatkowski et al., 1992), Zivot and Andrews (ZA) (Zivot, Andrews, 1992) and Lumsdaine and Papell (LP) (Lumsdaine, Papell, 1997) tests. Third, we examine both the short and long run causal relationship of health and education by using Granger (1969) and Toda and Yamamoto (1995) causality procedures.

The remaining of this paper will be organised as follows. Section 2 will briefly discuss the data source and econometric techniques used in this study. Next, the empirical results and concluding remarks will be presented in Sections 3 and Section 4, respectively.

2. Data source and econometric techniques

2.1. Data source

The annual data of public expenditures on health and education for Malaysia are obtained from various issues of the *Economic Report* published by the Ministry of Finance, Malaysia, and the *Monthly Statistical Bulletins* published by Bank Negara Malaysia. The Consumer Price Index (CPI, 2000 = 100) was used to deflate the series to the real variables. Annual data have been used in this study because of the unavailability of higher frequency data (e.g., quarterly or monthly). Moreover, the use of annual data will also avoid the seasonal bias problems. The annual data covered the period 1970 to 2007. All data used in this study are in natural logarithm form.

2.2. Unit root tests

To examine the time series properties of data, we employ five sets of unit root tests. Apart from the conventional ADF, PP and KPSS unit root tests, this study will also employ the ZA and LP unit root tests with one and two structural breaks, respectively. As the conventional unit root tests were well defined in earlier literature, this study will only discuss the ZA and LP unit root tests.

Models A and C for one structural break ZA unit root test will be used to examine the order of integration for each series. Model A allows for a change in the intercept of the series, while Model C allows for changes in both the intercept and the slope of the trend of the series. The models used for testing are expressed as follows:

$$\text{Model A: } \Delta y_t = \kappa + \alpha y_{t-1} + \beta t + \theta_1 DU1_t + \sum_{i=1}^k d_i \Delta y_{t-i} + \xi_t \quad (1)$$

$$\text{Model C: } \Delta y_t = \kappa + \alpha y_{t-1} + \beta t + \theta_1 DU1_t + \gamma_1 DT1_t + \sum_{i=1}^k d_i \Delta y_{t-i} + \xi_t \quad (2)$$

where Δ is the first difference operator ($y_t - y_{t-1}$), the error terms ξ_t are assumed to be normally distributed and white noise. As in the conventional ADF unit root test, we incorporate the Δy_{t-i} terms into the testing equations (1) and (2) so as to remove the autocorrelation problem of higher order between the error terms. The dummy variables are defined as: $DU1_t = 1$ and $DT1_t = t - TB1$

if $t > TB1$ and 0 otherwise. $TB1$, with $1 < TB1 < T$, where T is the sample size, denotes the time at which the structural break occurs. The optimal lag order (k) is determined by the “ t -significance” method suggested by Hall (1994) and the breakpoint ($TB1$) is selected where the ADF t -statistic $t(\hat{\lambda}_{\text{inf}})$ is maximised in absolute term. In addition, the breakpoints search is carried out over the 70 per cent trimming region $(0.15T, 0.85T)$, where T is the sample size.

Nevertheless, the ZA unit root test is particularly designed to handle one structural break. The power of the test is low when the estimated series is confronted with more than one structural breaks. For this reason, we apply the LP unit root test for two structural breaks to ascertain the order of integration for each series under investigation [$\ln EE$, $\ln HE_t$]. Corresponding to the ZA test, we estimate the following Models AA and CC for LP unit root tests:

$$\text{Model AA: } \Delta y_t = \kappa + \alpha y_{t-1} + \beta t + \theta_1 DU1_t + \psi_1 DU2_t + \sum_{i=1}^k d_i \Delta y_{t-i} + \varepsilon_t \quad (3)$$

$$\text{Model CC: } \Delta y_t = \kappa + \alpha y_{t-1} + \beta t + \theta_1 DU1_t + \gamma_1 DT1_t + \psi_1 DU2_t + \omega_1 DT2_t + \sum_{i=1}^k d_i \Delta y_{t-i} + \varepsilon_t \quad (4)$$

where $DU1_t = 1$ and $DT1_t = t - TB1$ if $t > TB1$ and 0 otherwise. Similarly, $DU2_t = 1$ and $DT2_t = t - TB2$ if $t > TB2$ and 0 otherwise. $TB1$ and $TB2$ represent the time at which the structural breaks one and two occur respectively, where $TB2 > TB1 + 2$. The optimal lag order (k) is determined by the “ t -significance” method and the breakpoints $TB1$ and $TB2$ are selected where the ADF t -statistics $t(\hat{\lambda}_{\text{inf}})$ is maximised in absolute term. Finally, the GAUSS programming codes will be used to compute the ZA and LP unit root tests for one and two structural break(s), respectively.

2.3. Causality tests

In this study, we applied the Granger and MWALD causality tests to estimate the short and long run causal relationship between health and education expenditures, respectively.

2.3.1. Granger (1969) causality test

Since the standard Granger causality testing procedure has been widely used in earlier empirical studies, only a brief discussion is offered here. Causality in the Granger sense asserts that education expenditure causes health expenditure if the past values of education expenditure can be used to forecast health expenditure

more accurately than just the past values of health expenditure. In order to apply the Granger causality test one must ensure that all the estimated variables in the VAR system must be stationary. As most of the macroeconomics series are $I(1)$ processes (Nelson, Plosser, 1982), it follows that the VAR system with first differenced variables should be estimated. Therefore, the Granger causality testing equation for the short run causal relationship between health and education expenditures can be expressed as follows:

$$\begin{bmatrix} \Delta \ln HE_t \\ \Delta \ln EE_t \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \end{bmatrix} + \begin{bmatrix} A_{11,1} & A_{12,1} \\ A_{21,1} & A_{22,1} \end{bmatrix} \times \begin{bmatrix} \Delta \ln HE_{t-1} \\ \Delta \ln EE_{t-1} \end{bmatrix} + \dots + \begin{bmatrix} A_{11,k} & A_{12,k} \\ A_{21,k} & A_{22,k} \end{bmatrix} \\ \times \begin{bmatrix} \Delta \ln HE_{t-k} \\ \Delta \ln EE_{t-k} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \quad (5)$$

where Δ is the first difference operator, $\ln HE_t$ and $\ln EE_t$ are the real health and education expenditures respectively and k is the optimal lag order. The errors $(\varepsilon_{1t}, \varepsilon_{2t})$ are assumed to be white noise and normally distributed. The Granger causality test is implemented by computing the χ^2 -statistic on the lagged explanatory variables. From equation (5), $A_{12,k} \neq 0 \forall_k$ implies that there is causality running from education to health expenditures. On the other hand, health expenditure Granger-causes education expenditure, if $A_{21,k} \neq 0 \forall_k$ holds.

2.3.2. Modified Wald (MWALD) causality test

He and Maekawa (2001) argued that the F -statistics for Granger causality test often leads to spurious causality inference when one or both of the estimated series are non-stationary. Furthermore, due to the lower power of the test, the unit root test will always have a degree of uncertainty with respect to the order of integration. Owing to this problem, Toda and Yamamoto (1995) proposed a simple procedure (modified Wald – MWALD test) which involves the estimation of an augmented vector autoregression (VAR) model at the level irrespective of the order of integration. Thus, pre-testing of unit root is not required in this causality test. The test is conducted for variables at the level by adding an extra lag (d_{\max}) into the VAR system. This is to ensure that the asymptotic critical values can be applied when the test is conducted between the integrated variables. The d_{\max} lag refers to the assumed maximum order of integration. Thus, the MWALD testing equation can be expressed as follow:

$$\begin{aligned}
\begin{bmatrix} \ln HE_t \\ \ln EE_t \end{bmatrix} &= \begin{bmatrix} \beta_1 \\ \beta_2 \end{bmatrix} + \begin{bmatrix} B_{11,1} & B_{12,1} \\ B_{21,1} & B_{22,1} \end{bmatrix} \times \begin{bmatrix} \ln HE_{t-1} \\ \ln EE_{t-1} \end{bmatrix} + \dots + \begin{bmatrix} B_{11,k} & B_{12,k} \\ B_{21,k} & B_{22,k} \end{bmatrix} \times \begin{bmatrix} \ln HE_{t-k} \\ \ln EE_{t-k} \end{bmatrix} + \\
&\quad \begin{bmatrix} B_{11,p} & B_{12,p} \\ B_{21,p} & B_{22,p} \end{bmatrix} \times \begin{bmatrix} \ln HE_{t-p} \\ \ln EE_{t-p} \end{bmatrix} + \begin{bmatrix} \xi_{1t} \\ \xi_{2t} \end{bmatrix} \tag{6}
\end{aligned}$$

In order to employ the MWALD test, we have to pre-specify the maximum order of integration (d_{\max}) for the series in the VAR system. Regarding the extra lag (d_{\max}) term, Dolado and Lütkepohl (1996) suggested using $d_{\max} = 1$ due to its best performance in their Monte Carlo study. In this respect, we use $d_{\max} = 1$ in our study. Similarly, the F -statistic is employed to examine the existence of causal relationship. From equation (6), $B_{12,k} \neq 0 \forall_k$ asserts that there is causality running from education to health expenditures; whereas the reverse causality running from health expenditure to education expenditure holds if $B_{21,k} \neq 0 \forall_k$.

3. Empirical results

The first step in our empirical analysis is an investigation of the order of integration, $I(d)$ of the two variables under consideration. This is because the estimated relationship may be spurious if the variables are non-stationary (Granger, Newbold, 1974, Phillips, 1986). The conventional unit root tests (i.e. ADF, PP and KPSS) suggest that the two estimated series are integrated of order one, that is, they are $I(1)$ processes⁽¹⁾. However, Perron (1989) argued that the conventional unit root tests have low power when the series are subjected to structural change and the effect of structural break(s) on the unit root test is ignored. The plots of education and health expenditures in Figure 1 clearly showed that the series are subject to structural change over the sample period from 1970 to 2007. Therefore, the conventional unit root test results may be biased. To take this into consideration, we also applied the ZA and LP unit root tests for one and two structural breaks, respectively to re-affirm the order of integration. Table 1 shows the summary of the ZA and LP unit root test results for the variables.

At the 1 per cent level of significance, the ZA test statistics cannot reject the null hypothesis of a unit root, except for health expenditure in Model C (see Table1, Panel A). This implied that the order of integration for the variables under investigation may either be $I(0)$ or $I(1)$ processes. In practice, the estimate series may be subject to more than one structural break, thus ZA unit root test

may have low test power (Lee, Strazicich, 2003). The LP unit root test results are shown in Table 1, Panel B. Interestingly, the LP test statistics failed to reject the null hypothesis of a unit root test for both Model AA and Model CC at the 1 per cent significance level. This demonstrates that both variables of interest are integrated of order one and are thus, $I(1)$ processes⁽²⁾. Furthermore, this result is in line with the findings of Nelson and Plosser (1982) which showed that most of the macroeconomic variables are non-stationary at level, but are stationary after first differencing. With these findings, we then proceed to examine the short and long run causal relationship between health and education expenditures in Malaysia via the Granger and MWALD causality tests.

Table 1

The results of unit root tests with structural break(s)

Panel A: Zivot and Andrews test for unit roots with one structural break				
	Health expenditure		Education expenditure	
	Model A	Model C	Model A	Model C
<i>TB1</i>	1983	1986	1986	1998
$t(\hat{\lambda}_{\text{inf}})$	-5.242**	-5.601***	-3.701	-4.071
Lag length	3	3	1	1
Critical values:				
1 per cent	-5.34	-5.57		
5 per cent	-4.80	-5.08		
Panel B: Lumsdaine and Papell test for unit roots with two structural breaks				
	Health expenditure		Education expenditure	
	Model AA	Model CC	Model AA	Model CC
<i>TB1</i>	1986	1986	1978	1986
<i>TB2</i>	1988	1995	1998	1999
$t(\hat{\lambda}_{\text{inf}})$	-6.418**	-7.105**	-4.760	-6.227
Lag length	3	3	1	1
Critical values:				
1 per cent	-6.94	-7.34		
5 per cent	-6.24	-6.82		

Note: The asterisks *** and ** denote the significance at 1 and 5 per cent level, respectively.

A common practice in performing causality tests is to determine the optimal lag order for the autoregressive distributed lag (ARDL) model. For ease of computation, the lag structures for the causality test models can be assumed to be uniform. Nevertheless, we preferred to use the ARDL model owing to the

assumption that the non-uniform lag order reflects the relationship of the variables better than the uniform lag order (Tang, 2008, Tang, Lean, 2007, 2009). The ARDL model used in this study does not include the contemporaneous variables because it is acknowledged that the present or future do not cause the past (Granger, 1969). In order to ascertain the optimal lag combination for the ARDL models, we employed the Akaike's Information Criterion (AIC). The AIC performs better than other criteria, in particular when the estimated sample size is small (Liew, 2004, Lütkepohl, 2005).

Table 2

The results of causality tests

Panel A: Short run causality – Granger test		Test statistics (χ^2)
$\Delta \ln HE_t \rightarrow \Delta \ln EE_t$	1, 1	2.209
$\Delta \ln EE_t \rightarrow \Delta \ln HE_t$	1, 1	3.662*
Diagnostic tests		Test statistics
Breusch-Godfrey serial correlation test:		
LM test [1]		0.514
LM test [2]		0.873
Heteroskedasticity test:		
ARCH LM test [1]		0.015
Ramsey RESET LR test [1]		2.208
Stability tests:		
CUSUM		Stable at 5 per cent
CUSUM of Squares		Stable at 5 per cent
Panel B: Long run causality – MWALD test		Test statistics (χ^2)
$\ln HE_t \rightarrow \ln EE_t$	3, 3	0.412
$\ln EE_t \rightarrow \ln HE_t$	3, 2	3.806*
Diagnostic tests		Test statistics
Breusch-Godfrey serial correlation test:		
LM test [1]		0.514
LM test [2]		1.296
Heteroskedasticity test:		
ARCH LM test [1]		0.171
Ramsey RESET LR test [1]		0.000
Stability tests:		
CUSUM		Stable at 5 per cent
CUSUM of Squares		Stable at 5 per cent

Note: The asterisks ***, ** and * denote the significance at 1, 5 and 10 per cent level, respectively. The parentheses refer to the order of diagnostic tests. The AIC measure was used to determine the optimal lag combination.

The results of the causality analyses are reported in Table 2. A number of diagnostic tests are conducted on both the short and long run ARDL models to ascertain the suitability of the models. Specifically, the Breusch-Godfrey LM test statistics showed that the null hypothesis of no autocorrelation problem up to order 2 cannot be rejected. Thus the estimated ARDL models are free from serious autocorrelation problem. The Ramsey RESET test failed to reject the null hypothesis of no general specification error at the conventional significance level. We are thus confident that the estimated ARDL models for short and long run causality are correctly specified. Additionally, the ARCH LM test showed that the residuals are free from the autoregressive conditional heteroskedasticity (ARCH) problem.

For the short run causality test, the Granger causality test results revealed that the education expenditure Granger-causes health expenditure in Malaysia, but there is no evidence of the reverse causation. For the case of long run causality, the MWALD test results also indicate a unidirectional causality running from education to health expenditures in Malaysia. Interestingly, our empirical evidence appears to suggest that between the two types of human capital investments, investments on education takes precedence over that on health care in Malaysia during the period 1970 to 2007. This is consistent to the finding of Forster et al. (1981) for the case of the United Kingdom (see also Grossman, 1972). An implication of this precedence is that relatively more educated people are knowledgeable about the importance of health compared to less educated ones. They will take necessary steps to ensure that they remain healthy so as to reduce the expenditure on medical services. When confronted with the choice, investing relatively more on education rather than health services would be a more proactive and sensible planning policy. A knowledgeable society is necessary and sufficient condition for a healthier society. Thus, policy initiatives which place importance on education expenditure should be implemented. This would exert positive externalities on other parts of society, including its health aspect, thus eventually generating sustainable economic growth and development.

4. Concluding remarks

Expenditure on health and education are investments in human capital as they have an impact on labour productivity which in turn positively affects a society's income. Although both forms of human capital investments are important, and thus expenditures are unavoidable, priority has to be set between them. This is because these expenditures usually involve huge sums and are mainly provided for by the public sector which has limited resources.

The question of interest is whether there is any causal effect between the two types of expenditure and if so, what is the direction of causality. If education unilaterally Granger-causes health, then priority should be placed on education expenditures as they eventually lead to better health and improvements in both will lead to better well-being of society.

The intention of this paper is to examine whether expenditure on health or education takes precedence in Malaysia during the period of 1970 to 2007. The empirical analysis involves the use of both the unit root and causality test procedures. Our empirical results have important implications that need to be considered by policymakers in modelling economic growth and development policies for Malaysian economy.

The unit root tests results with structural break(s) using the ZA and LP tests suggest that at the 1 per cent level of significance, both education and health expenditures in Malaysia are non-stationary, but they are stationary after first differencing. The Granger's and MWALD causality tests were applied to investigate both the short and long run causality between education and health.

The results consistently showed that education expenditure Granger-causes health expenditure, but the reverse causation does not hold. This finding conforms to most studies in various countries that showed the positive association between education and health. The general observation is that low educational attainment leads to poor health. Given the unidirectional causality from education to health expenditures, it is apparent that when policy planners are confronted by a choice between education and health expenditure, a rational policy decision would be to place more importance on education expenditure. Past education expenditure will have a positive effect on health, thus reducing health care costs to society. An educated and knowledgeable community precedes a healthy one.

Notes

- (1) To conserve space, the conventional unit root tests results are not reported here, but it is available upon request from the author.
- (2) In order to yield robust results for the order of integration, we also performed the ZA and LP unit root tests with the first differenced variables. The results showed that all the variables are integrated of order one. To conserve space these results are not reported here, while it is available upon request from the authors.

References

- Aka, B.F., Dumond, J., "Health, education and economic growth: Testing for long-run relationships and causal links in the United States", *Applied Econometrics and International Development*, 8(2), 2008, pp. 101-110
- Arendt, J.N., "Does education cause better health? A panel data analysis using school reforms for identification", *Economics of Education Review*, 24(2), 2005, pp. 149-160
- Barro, R.J., "Human capital and growth", *American Economic Review*, 91(2), 2001, pp. 12-17
- Cowell, A.J., "The relationship between education and health behavior: Some empirical evidence", *Health Economics*, 15(2), 2006, pp. 125-146
- Dickey, D.A., Fuller, W.A., "Distribution of the estimators for autoregressive time series with a unit root", *Journal of the American Statistical Association*, 74(366), 1979, pp. 427-431
- Dickey, D.A., Fuller, W.A., "Likelihood ratio statistics for autoregressive time series with a unit root", *Econometrica*, 49(4), 1981, pp. 1057-1072
- Dolado, J.J., Lütkepohl, H., "Making Wald tests work for cointegrated VAR system", *Econometric Reviews*, 15(4), 1996, pp. 369-386
- Forster, D.P., Francis, B.J., Frost, C.E.B., Heath, P.J., "Health and education expenditure in the United Kingdom: What priority?", *Health Policy and Education*, 2(1), 1981, pp. 77-84
- Granger, C.W.J., "Investigating causal relations by econometric models and cross-spectral methods", *Econometrica*, 37(3), 1969, pp. 424-438
- Granger, C.W.J., Newbold, P., "Spurious regression in econometrics", *Journal of Econometrics*, 2(2), 1974, pp. 111-120
- Groot, W., Maassen van den Brink, H., "The health effect of education", *Economics of Education Review*, 26(2), 2007, pp. 186-200
- Grossman, M., "On the concept of health capital and the demand for health", *Journal of Political Economy*, 80(2), 1972, pp. 223-255
- Hall, A., "Testing for a unit root in time series with pretest data-based on model selection", *Journal of Business and Economic Statistics*, 12(4), 1994, pp. 461-470
- Hartog, J., Oosterbeek, H., "Health, wealth and happiness: Why pursue a higher education?", *Economics of Education Review*, 17(3), 1998, pp. 245-256
- He, Z., Maekawa, K., "On spurious Granger causality", *Economics Letters*, 73(3), 2001, pp. 307-313
- Kenkel, D.S., "Health behavior, health knowledge, and schooling", *Journal of Political Economy*, 99(2), 1991, pp. 287-305
- Kwaitkowski, D., Phillips, P.C.B., Schmidt, P., Shin, Y., "Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that the economic time series have a unit root?", *Journal of Econometrics*, 54(1-3), 1992, pp. 159-178
- Lee, J., Strazicich, M.C., "Minimum Lagrange multiplier unit root test with two structural breaks", *Review of Economics and Statistics*, 85(4), 2003, pp. 1082-1089
- Liew, K.S., "Which lag length selection criteria should we employed?", *Economics Bulletin*, 3, 2004, pp. 1-9
- Lütkepohl, H. (2005). *New Introduction to Multiple Time Series Analysis*. Germany: Springer-Verlag
- Lumsdaine, R.L., Papell, D.H., "Multiple trend breaks and the unit-root hypothesis", *Review of Economics and Statistics*, 79(2), 1997, pp. 212-218
- Ministry of Finance, Malaysia (various issues) *Economic Reports*, Kuala Lumpur: National Printer, Malaysia
- Mushkin, S.J., "Health as an investment", *Journal of Political Economy*, 70(5), 1962, pp. 129-157

- Nelson, C.R., Plosser, C.I., "Trends and random walks in macroeconomic time series: Some evidence and implications", *Journal of Monetary Economics*, 10(2), 1982, pp. 139-162
- Pereira, J., Aubyn, M.S., "What level of education matters most for growth? Evidence from Portugal", *Economics of Education Review*, 28(1), 2009, pp. 67-73.
- Perron, P., "The great crash, the oil price shock and the unit root hypothesis", *Econometrica*, 57(6), 1989, pp. 1361-1401
- Phillips, P.C.B., "Understanding spurious regression in econometrics", *Journal of Econometrics*, 33(3), 1986, pp. 311-340
- Phillips, P.C.B., Perron, P., "Testing for a unit root in time series regression", *Biometrika*, 75(2), 1988, pp. 335-346
- Ross, C.E. Wu, C.L., "The links between education and health", *American Sociological Review*, 60(5), 1995, pp. 719-645
- Sequeira, T.N., "Does health cause schooling or does schooling cause health?", *Department of Management and Economics Discussion Paper*, No. 01/2007, Portugal: Universidade da Beira Interior
- Silles, M.A., "The causal effect of education on health: Evidence from the United Kingdom", *Economics of Education Review*, 28(1), 2009, pp. 122-128
- Tang, C.F., "A re-examination of the role of foreign direct investment and exports in Malaysia's economic growth: A time series analysis", 1970-2006, *International Journal of Management Studies*, 15(Bumper Issue), 2008, pp. 47-66
- Tang, C.F., Lean, H.H., "Will inflation increase crime rate? New evidence from bounds and modified Wald tests", *Global Crime*, 8(4), 2007, pp. 311-323
- Tang, C.F., Lean, H.H., "New evidence from the misery index in the crime function", *Economics Letters*, 102(2), 2009, pp. 112-115
- Toda, H.Y., Yamamoto, T., "Statistical inference in vector autoregressions with possibly integrated processes", *Journal of Econometrics*, 66(1-2), 1995, pp. 225-250
- Zivot, E., Andrews, D.W.K., "Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis", *Journal of Business and Economic Statistics*, 10(3), 1992, pp. 251-270

Law Antimonopoly of China – a Model of European Inspiration

Cornelia LEFTER

Bucharest Academy of Economic Studies
cornelialefter@ase.ro

Oana OPREA (TEODORESCU)

Bucharest Academy of Economic Studies
Oana.Teodorescu@bc1-leasing.ro

Abstract. *Globalization of present world economy has not only an economic component but also an important juridical aspect. Many countries are concerned to review or to supplement their internal legislation in order to make it compatible with legal rules that already exist in other countries or geographical zones that, usually, have an important role within their economic exchanges. China represents such an example, a country that, in the last decades, has intensified its commercial exchanges with EU member states. This trend was encouraged by the adoption of the Law Anti-Monopoly in China.*

Keywords: globalization; cooperation; competition; concerted practices; economic concentrations.

JEL Code: K21.

REL Codes: 5D, 17F.

Globalization of present world economy has not only an economic component but also an important juridical aspect. The globalization process impacts both the world economic flow and the implementation of unitary regulations or at least of a harmonized regulatory framework that can sustain the more and more complex economic relationships between the enterprises from different countries. Therefore, more and more countries are concerned to review or to amend their internal legislation in order to make it compatible with legal rules that already exist in other countries or geographical zones that, usually, have an important role within their economic exchanges.

China represents such an example, a country that, in the last decades, has intensified its commercial exchanges with EU member states, as traditional partners within China exchanges.

Moreover, after China became in 2001 a member of the World Trade Organization, its opening to foreign investments increased significantly⁽¹⁾.

In this context, China Anti-Monopoly Law finds its reason of being⁽²⁾. As we will see, this law has been conceived and based on almost identical principles to the Community right provisions on competition. The law provides, within the Chinese market, action and control mechanisms similar to those regulated by the European treaties, such as: interdiction of the concerted practices⁽³⁾, interdiction of dominant position abuse⁽⁴⁾, mergers and concentrations control (Foster, 2007, p. 161). This similarity emerges, as shown herein⁽⁵⁾, in the successful economic cooperation between the European Union and China.

1. The bilateral economic cooperation EU-China

The continuous development within the last decades of the commercial exchanges between EU and China permitted the adoption, on the 2003 Summit, of a joint declaration which identified the competition policies as a major interest zone for the two parties. Then, starting 2003, a series of inter-institutional exchanges⁽⁶⁾ took place between EU and China, mainly aimed at sharing to Chinese partners the expertise and success of European authorities in competition field. The consultations and EU recommendations to China consisted in: setting up clear objectives in China for the competition law and its application regime, establishment of strong and independent state institutions for the control of competition practices and to secure its procedural equity and transparency in approaching competition aspects. In the same line, in 2004 a Dialogue of Competition Policies was opened between Europe and China (www.europa.eu), as a permanent forum of consultation and transparency. Until LAM adoption in 2007, this dialogue pursuit mainly issues related to antitrust,

meaning cross border mergers, public utilities liberalization and state intrusion in market processes, multilateral competition. Official visits, high level idea exchange and consultations between EU representatives (the Director of International Relationships Division of the European Commission or the European Commissary for Competition) and Chinese officials have constituted a real push and support for the adoption of the Anti-monopoly Law in China⁽³⁾.

Received with encouragement by European officials, the new Chinese law is based on certain key concepts of the European competition law. The goals of this law, as mentioned by article 1, are: to prevent monopolist commercial behaviors, to protect a fair competition on the market and to strengthen its economic efficiency in order to safeguard consumer's interests and the public interest. Thus, article 3 of the law defines as monopolist behaviors incompatible to a normal competition climate, the following: agreements of monopoly type between market operators, abuses of dominant position; economic cluster which eliminate or affect competition, or might eliminate or affect competition on the relevant market). Also, article 4 of the law provides that all economic activities in China may be performed only within the state control and in accordance with the principles of socialist market policies: macro-control and a unified, opened and competitive market system. Therefore, the anti-monopoly practices are controlled by three State agencies: the Trade Ministry (for the mergers control), the National Commission for Development and Reform (for the price related monopolist policies) and the State Administration for Industry and Trade (for agreement between undertakings and dominant position abuse which are not related to price settlement on the market).

2. Interdiction of agreements of concerted practices

European Commission regards these practices as ones of the most serious violations of the competition right. The practice shows, at least, at a statistic level, that the majority fields in which such concerted practices occur are: setting up prices on a relevant market, geographical allocation of clients among certain companies, or setting up and limitation of production volumes. Based on these grounds, article 101 TFEU⁽⁷⁾, ex-article 81 TCE⁽⁸⁾ defines these concerted practices and the limits within which they are acting⁽⁹⁾.

At European level, the Commission and the competition authorities of the Member States benefit of a series of competences to prevent such anti-competition behaviors, including: fiscal facilities or fiscal reductions for the companies offering information about such anti-competition practices; inspection and control competences; the competence to consistently request

documents and information from the active companies by activity sectors. For instance, in November 2008, the Commission sanctioned⁽⁴⁾ the enterprises Asahi, Pilkington, Saint-Gobain, S Oliver, in the autovehicles glasses field, imposing the payment of about EUR 1.3 billion as sanction on the participants to such an understanding put into practice with the violation of Art. 101 TCE. The involved parties were found guilty of an illegal sharing of the market and of exchanges of sensitive commercial information about the product deliveries on the relevant market.

As for LAM, these concerted practices or understandings are known as monopoly agreements and are divided as follows:

- *horizontal monopoly agreements*, which, in general, are the equivalent of the concerted practices at European Union level. They relate to agreements between companies aimed at setting up product prices, at limiting production volume and products supply, at sharing the dominant market among them and at restricting research-development activities on the relevant market or even at boycotting certain suppliers, competitors or even clients.
- *vertical monopoly agreements*, regarding the understandings between a company and its commercial partners aimed at setting up reselling prices or to restrict the minimum reselling prices to third parties.

Similar to the European regulations, the articles 53 and 54 of LAM provides a system of facilities and fiscal reductions, or even for the exemption from sanctions application on the companies involved in such a monopoly agreement, but which offered conclusive information and report these prohibited agreements to the competent state authorities. As for their powers, the competent authorities to apply anti-monopoly practices have the following assignments: inspections on the company's premises; requests of information and documents from the involved companies; requests of bank account statements of the companies and requests of information regarding their relations with banking authorities; sealing and retaining the proofs found out; request of relevant documents belonging to the companies, interested parties or even to other relevant entities, or individuals.

3. Interdiction of dominant position abuse

According to the European competition law, a company is in a dominant position if its economic power is allowing it to act independently from its competitors and eventually, to its clients (Foster, 2007, p. 161). The dominant position abuse is defined by article 102 TFEU (ex-article 82 TCE)⁽¹⁰⁾.

One of the best known cases in this field is that of the European Commission against Microsoft (<http://ec.europa.eu/competition/antitrust/cases/microsoft>). On this case, the European Commission intervened based on the complaint of Sun Microsystems and after an assessment decided in March 2004 that Microsoft abused of its dominant position on the market of PC operation systems. Consequentially, Microsoft was forced to pay a fine of EUR 497 million for abusing its dominant position on the market of PC operation systems and to disclose the information allowing its competitors to operate and become compatible with Windows.

LAM defines the abuse of dominant position as a market position of a company which can: either control the prices or quantity of products, or any other conditions of the transactions on the relevant market; or to block and affect the access of other companies to the relevant market.

The abusive and thus prohibited practices include: product sales at excessive and unjustified prices; product purchases at unjustified low prices; unjustified refuse to enter commercial relations with certain companies; product sales at dumping prices, also without justification.

In this case, the anti-monopoly authorities have, like EU rules, the discretionary power to establish if the companies have or not a dominant position and if these companies are submitted to a special responsibility (such as that of not abusing their dominant position, so that not to affect or restrict effective competition).

4. Control of company's mergers and takeovers

In the field of company's mergers and takeovers control, EU has a system of previous notifications and there is actually a jurisdiction divided between the Commission and the Member State authorities entitled to apply competition policies.

The mergers of a certain level, with major impact on European and even world economy, fall within the exclusive jurisdiction of European Commission. Such a transaction has to be notified to the Commission, which has about 35 days to clarify its terms and conditions and to make certain recommendations. Only after this period and if the respective mergers prove they do not affect real competition, the Commission starts the actual case analysis. To this end, the Commission has 125 working days to decide about the banning of the transaction or its permission, considering its compliance with competition practices. Usually, the clarification of transaction terms is done during the first phase and the Commission shall not authorize a merger if, its justified

conclusion is that the respective merger has a negative effect on the competition balance (http://ec.europa.eu/competition/mergers/overview_en.html).

If the merger has a major significant impact over the intra-community competition, the assessment and decision authority belongs to the Member States' authorities. They can make market analyses and surveys and can impose the terms of a merger, in order to ensure an effective competition, or can even forbid the whole process *per se*.

LAM provides for a pre-notification system of mergers falling within certain value thresholds. In a similar way to EU provisions, the thresholds are set up depending on the respective companies' income. The Decree regarding the Declaration of Thresholds for Economic Clusters was published on August 3rd, 2008, while the China State Council has been empowered to adopt application norms in specific fields such as banks, insurances, goods etc.

Worth mentioning is also that the economic clusters of foreign investing companies in China will be pre-notified in China once they reach the thresholds set up by the above mentioned legislation. The Ministry of Commerce of China can impose specific conditions in this sense, as it happened in the previously mentioned case *Anheuser Busch/InBev*⁽¹¹⁾.

The standards and thresholds which make such a pre-notification necessary are calculated according to the annual income of the companies involved in the clustering, the same as in EU. In addition to the Community provisions, the Chinese Ministry of Commerce can intervene in the concentrations which do not meet the pre-notification thresholds established if it has justifications to consider the respective concentration might affect competition on the relevant market. The conclusion is that, like in EU, where the previous notifications are actually a competition test, the same is happening in China, but the Ministry of Commerce can justify a transaction not necessarily by the thresholds reached, but due to other reasons, such as the public interest. The Ministry of Commerce has in this way a discretionary power whose application should, on our opinion, make the object of new regulations, also aimed at eliminating abuses on the relevant markets.

Even if, unlike European competition policies, the Chinese ones are in an incipient stage, there is, as mentioned before herein, a significant convergence between the two policy types, both at concept and application level.

Moreover, the fact that the principles and methods of their application are so similar, and sometimes identical, shows once more a successful export of commercial policies of EU, which makes nothing else but strengthens its role of major player on the world economic market.

Notes

- (1) European investments on Chinese market exceed EUR 35 billion, most of them after 2001.
- (2) The Anti-monopoly Law or LAM was adopted in August 2007 and entered into force on the 1st of August 2008.
- (3) According to Competition, The Law and Leading Lawyers Worldwide, vol. I, Practical Law Company, PLC Cross Border Handbooks, Legal and Commercial Publishing Ltd., 2009, p. 39
- (4) Jurnalul Oficial C173, 25/07/2009, pp. 13-16
- (5) www.europa.eu/competition/international/bilateral
- (6) Between the European Commission and the Trade Ministry of China.
- (7) Treaty for the functioning of the European Union.
- (8) European Community Treaty.
- (9) Article 101 TFEU provides that:
- (1) Any agreements between companies are incompatible with the domestic market and banned, as well as any decisions of companies' association and any concerted practices which might affect the trade between the Member States and which have as object or effect the hindering, narrowing or distortion of competition within the Common Market and especially those which:
- (a) set up, directly or indirectly, buying or selling prices, or any other trading conditions;
 - (b) limit or control production, trading, technical development or investments;
 - (c) divide the markets or supplying sources;
 - (d) apply, in the relations with commercial partners, unequal conditions for equivalent services, generating in this way a competition disadvantage;
 - (e) condition the contracts signing by the partners' acceptance of additional services, which, by their nature, or according to commercial customs, have no connection to the object of the respective contracts;
- (2) Agreements or decisions banned based on the present article are rightfully null.
- (3) Nevertheless, the provisions of paragraph (1) can be declared as inapplicable in case of:
- any agreements or categories of agreements between companies;
 - any decisions or categories of decisions of companies' association;
 - any concerted practices or categories of concerted practices
- which contribute to the improvement of production or products distribution, or to the promotion of technical or economic progress, also securing the consumers an equitable part of the obtained benefit and which:
- (a) do not impose on the respective companies constraints which are not indispensable for the meeting of those objectives;
 - (b) do not offer the companies the chance to eliminate competition as regards a significant part of the respective products.
- (10) Article 102 (former article 82 TCE) provides that:
- It is incompatible with the domestic market and banned, to the extent in which it can affect the trade between the Member States, the abuse use by one or several companies of a dominating position gained on the domestic market, or on a significant part of it.
- These abusive practices may consist especially of:
- (a) imposing, directly or indirectly, buying or selling prices, or any other inequitable trading conditions;

- (b) limit or control production, trading, technical development to the consumers' disadvantage;
- (c) apply, in the relations with commercial partners, unequal conditions for equivalent services, generating in this way a competition disadvantage;
- (d) condition the contracts signing by the partners' acceptance of additional services, which, by their nature, or according to commercial customs, have no connection to the object of the respective contracts.

⁽¹¹⁾ Anheuser Busch/InBev is the first case where the Chinese Trade Minister published in 2008 a decision in the area of mergers. This case deals with the undertaking of Anheuser Busch by InBev. The Trade Minister stated that the respective undertaking would not affect the relevant market (the beer producers market in China), but imposed some disputed conditions limiting InBev to acquire interest parts in other companies on the relevant market. Thus, InBev was forbidden: to acquire interest parts in two Chinese beer producers – Resources Snow and Beijing Yanjing, to increase the ownership of Anheuser-Busch in another beer producer (Tsing-Tao Brewery) and to increase InBev ownership in another beer producer, Zhujiang Brewery. These restrictions imposed on the future transactions surprised the experts as a competition authority would not normally impose conditions for a future undertaking, but only to the effects of such a concentration on the market. In other words, a competition authority would not normally state unfavorably with respect to a future concentration, unless the respective concentration would negatively impact competition on the relevant market.

References

- Anti-Monopoly Law of China, source: www.china.org.cn/government/laws/2009-02/10/content_17254169.htm
- CONCIL REGULATION (EC) No. 139/2004 of January 20th, 2004 regarding the control of economic clustering among companies
- Consolidated version of the Treaty regarding the Functioning of European Union (with further amendments made by the Lisbon Treaty)
- Craig, P., De Burca, G. (2009). *Dreptul Uniunii Europene*, Editura Hamangiu
- Foster N. (2007). *EU Law 2007*, Sixth Edition, Oxford University Press 2007, p. 161
<http://ec.europa.eu/> (*case Microsoft and case Asahi, Pilkington, Saint-Gobain, S Oliver*)
- Online legislative library – <http://www.thefreelibrary.com/>
- Weatherill, St. (2003). *Cases and Materials on EU Law*, 7th Edition, Oxford University Press
- Web portal of European Union - <http://ec.europa.eu/>
- Web portal of European Court of Justice - <http://curia.europa.eu/>
- Web portal of European legislation - <http://eur-lex.europa.eu/>
- Web portal of the Government of PR of China: <http://www.china.org.cn/>

Work: Social Status and the Role of Work along History – Since Ancient Times to Modern Times

Mirela Ionela ACELEANU

Bucharest Academy of Economic Studies
aceleanu_mirela@yahoo.com

Abstract. *Work has always had the fundamental role in the human existence and the social communities. The Statute of work has evolved over time, this being determined and influenced by the socio-economic level and social and creative maturity of those who performed work. Reality has shown that work remains the fundamental value which through scientific creativity, efficiency and morality characterizes life and human evolution in various stages of development. This paper presents the significant contributions concerning work's role in the history since the ancient times until the modern era.*

Keywords: work; employment; work in the ancient times; work in the Middle Ages.

JEL Codes: B11, J01.

REL Codes: 1B, 3A, 12A.

Work has always had the fundamental role in the human existence and the social communities and has seen a continuous diversification. The Statute of work has evolved over time, this being determined and influenced by the socio-economic level and social and creative maturity of those who performed work.

In the contemporary world work is conducted in thousands of ways in some socio-economic structures becoming more complex. The general universe of work and its forms have done and are still doing the subject to various reflections and appreciations. It is about both the extensive theoretical and scientific confrontations in connection with one aspect or another of the content and the role of work, as well as doctrinal and ideological confrontations about what this process is and what this process should be in our current and future society.

In the specialized literature there are numerous definitions for work, which vary depending on the particular approach: economic, philosophical, social.

Work is the man specific conscious activity, directed towards a purpose, in which man performs, regulates and controls through his action the exchange of materials between him and nature to meet his needs (DEX).

According to the dictionary of economics, labour is defined as the primary factor of production consisting of the human subject who performs a transformative action on the material factors of production, in order to obtain useful economic effects.

The economists P. Liedtke and O. Giarini define work as "an understanding between human beings and their environment primarily aimed at self-preservation" (Giarini, Liedtke, 2001, p. 31).

Work - the French economists J. Bremond and A. Geledan state - "is a creative activity of goods and service, an activity sustained by all workers who have technical knowledge and are in a certain relation with the instruments of labour" (Bremond, Geledan, 1995, p. 264).

Geroges Friedman defines work as "all actions that man with his brain, hands, tools or machinery performs on the matter, actions that, in turn, react on man, adjusting him" (Friedman, 1962, p. 64).

Philosophically speaking, the academician Mihai Drăgănescu considers "work is way of human action necessary to man to integrate in the social and material existence and to transform them, like the man himself ... work is an essential human and society specific operator, in other words, this is a natural condition of human life" (Drăgănescu, 1987, p. 161).

What is universally accepted as the definition of work is the fact that work is a human activity, mandatory for human and society existence for the general progress.

To analyze the concept of work it is important to know the meaning of work throughout history, from early human evolution, when human effort involved hunting and harvesting, until now, when on the first place is the symbolic work, the scientific work.

At the beginning of human evolution, work was a continuing battle for survival in a hostile environment, on which man had no influence.

Initially, the human activities *could not be classified as employment*. Searching of food by primitive people was made in those places where the natural environment was favourable. In those circumstances man was collector, hunter, and fisherman. The particular activities and the results obtained were dependent on the nature generosity or poverty. Consuming and obtaining consumer goods were made simultaneously in time and space, the demarcation between work and non-work, between employment and non-employment having no effect (Braudel, 1985, p. 64).

The growing needs for food and continuous threats from wild animals forced people to move to farming and livestock. The volume and intensity of work varied according to the seasons and weather, people worked harder in the summer when the weather was good for crops and the day was longer.

By farming humans became producers, they started to create tools to cultivate plants and raise animals to tame. Thus, production is separated from consumption. Man acquires for the first time the means to change his environment and to ensure greater chances of survival. Each active unit (family, tribe) the goods produced by people - specialized on natural criteria and who used primitive tools - were consumed in particular by its members. The economy was called by Karl Bucher "closed domestic economy" and by Fernand Braudel as "non-economy". Employment by adults was defined and dimensioned in relation to the other community members (Frois, 1994, p. 28) .

As creating certain specialized tools and a wider professional and social division of labour, and work experience transmitted from one generation to another, people were able to produce more goods than there were necessary for everyday consumption of producers, to those who worked, of people employed.

There was thus a temporary surplus of goods – the plus-product. Moreover, they started to save a part of the surplus product. Saving is gradually becoming a feature of human activity, giving his rational character.

The physical more gifted producers and more economists started to save, imposing their particular-private ownership of the goods produced. On the foundation of these longstanding processes appears the direct exchange of products, the first form of existence of the exchange economy. To facilitate exchanges, increasingly numerous and increasingly bulky, necessary tools were created – the money.

From the absolute freedom of the first people, dependent only on the natural environment in which they lived, it ended up to multiple forms of social dependency. First, there was the absolute dependence on slaves of the slave owners. It is mainly about the physical work providers. This form of dependence was followed by the feudal one, whereby those living in fiefs were dependent on its master.

The division of the society into social classes followed the same pattern: the low stratum of society was made up of workers filing the hardest work and the high stratum was reserved for noble professions that of making decisions, orders or were involved in recreational activities.

Many hundreds of years ago a great wise Greek Euripides postulated: "Nobody is able to gather the necessary things for living by doing nothing, without fatigue, just mentioning the gods and always begging" (Simenscy, 1978, p. 582). Without work no thing is easy for people, claimed Phocylides. He continued, this is possible even to the gods. It seems that this finding of the Greek philosopher is still current and useful to delineate work from non work, as well as to shape the work content in all its actions (Dobrotă, Șerban, 2008, p. 54).

The same idea is supported by the Roman philosopher – Seneca – as follows: "There is nothing that can not be won by hard work and a tense and attentive care".

The Greek philosopher Xenophon is the first author who identified in work the source of all wealth, "what adorns the temples, statues, gods and men, only field work produces" (Xenofon, 1987, p. 147). Xenofon, Platon and Aristotel considered agricultural work as the most important: "Agriculture is the mother and teacher of all arts. When agriculture prospers also do the other arts, and when field work is neglected also the other professions, in one way or another linger everywhere" (Xenofon, 1987, p. 149).

In general, the Greek philosophers considered the agricultural work the most important, but make a difference between workers, which they exclude them from any intellectual, political activity, and the intellectual ones who had to hate the physical work, which they considered inferior in terms of the moral (Platon, 1986, p. 371).

In Aristotle's conception, work was incompatible with the real purpose of human life. This contradiction is resolved by the laws of nature themselves. In fact, people are different among themselves from nature. Those with lower intellectual qualities are doomed to become slaves. So, the nature of society dictates the rule of assigning work only to slave to produce goods through crop and the livestock, fishing and the hunting, and various craft activities subordinated to them. The volume of work performed by each slave in part and

by all slaves in a community, their occupation, in different time horizons (daily, year, and lifetime) are directly related to the city population size, the consumption of its each member. The intellectually gifted were intended, according to the same natural law, to lead the less gifted ones (Aristotel, 2000, pp. 8-12).

The Greek philosophers believed that the division of labour had no professional basis, but a sociological one. In general, the manual workers were turned into slaves, being intended for the lower work, which degraded the body and the spirit. Plato emphasized the benefits resulting from the division of labour specialization, considering that "the work products are more numerous, better and faster made when each makes one thing, according to his nature, in his own time and without being concerned with the other activities" (Platon, 1986, p. 136). The superior tasks, management and protection of the fortress were in the hands of the freemen – thinkers, military – who had no other concern.

Unlike the ancients, who considered manual work degrading, the medieval theories support the double ennoblement through labour: firstly, work ennobles because it is required by God, and secondly work has a noble goal because by work, man develops his physical and moral life. Moreover, scholars define work as any occupation which allowed the man to earn an honest existence, unlike the ancients, which reduced it to manual work (Rogojanu, 2009, p. 134). The scholarly theories identify two types of occupations: possessive – which included farm work, considered the leading ones, the industrial and administrative jobs and pecuniary occupations which included trade activities, exchange, and credit.

The possessive activities were intended to produce wealth directly usable by people under the form of consumer goods designed to meet the needs of life. Pecuniary occupations were designed to purchase artificial wealth – pecuniary, being considered speculative.

During the medieval centuries there was an increase in the dignity of labor. The guilds of craftsmen and traders provided the same respect as master builders.

In the Middle Ages utopians notes and ideas appear, through the contribution of Thomas More, who in his book *Utopia* or *Thomas More's Golden Book* presents the economic situation of England in his time, preoccupied with poverty faced by the lower classes. Morus's utopia of The legendary Communism resulted from the influence of Plato's philosophy and the events of his time, which were characterized through the profound social transformation. Thomas Morus addressed the most pressing economic problems of his time generating poverty whose solutions he identified in Communism.

Utopia was dominated by statist – production was shared equally and so was work. Farm work was mandatory, beginning in childhood, working time being limited to six hours per day. Work was considered the source of all welfare, among those who could work, those who were dedicated to the study of arts and sciences were exempted from work, but if they did not justify the usefulness of the study, they were sent to work again. Speculating the attitude of his time hostile to trade, Thomas More projects a production, distribution and consumption on a communist basis that cancels out any possibility for trade and currency use.

New aspects in the relationship between employment and non-employment also in terms of work appeared in the feudal economy. It prevailed in the Western Europe and developed over 13 centuries around the rural areas, laic or church-owned. Agricultural was the base of production in feudalism and was achieved by the peasants' work, the main producers of goods. The vast feudal property was predominant, the feudal area being a closed economic unit. Gradually, the development of production and exchange encouraged the city – commercial and craft centres, marking the beginning of the developed feudalism.

Such an economy was administratively directed and organized to produce only to meet the needs of those who inhabited the area. This was a subsistence economy, that was aimed only at meeting the needs of present and ignored the interests of the owner's profit, the latter claiming from his subjects (serfs or thrall) only benefits in nature (as working days). Employment of the labour resources was determined by the natural conditions, the form of land ownership.

In the late fifteenth century, due to the development technology and inventions, in feudal society there were great economic and social transformations. The feudal ordering began to unravel, to decompose. Simple tools were replaced by machines instead of workshops, there were built factories, which produced much more varied goods, trade developed and a new class appeared – the bourgeoisie. Thus, the bourgeois revolution in England in 1642 is considered to be the development of capitalism, being also the beginning of the modern history.

One important school of thought for the development of economics is the mercantilism, which occurred during the decay of feudalism. Many mercantilists in their works revealed the importance of labour. Thus, A. De Montchrestien wrote: „Man is born to live in a permanent employment and exercise.... human welfare is mainly in wealth, and wealth in employment” (De Montchrestien, 1889, p. 21). The mercantilists believed that a large population that works makes abundant the supply of labour and reduces wages,

and therefore the costs. The obligation to work is reasonable because in the mercantilist conception unemployment is both a potential loss of production, and a source of decadence.

Another mercantilist, W. Petty supports the low pay idea as a condition of some competitive costs and believes that maintaining the high grain prices, even in the years with good harvests, requires additional work. W. Petty is considered the father of the demographic statistics and is concerned about the distinction between the total population, the active and unemployed population. He also examines the quality of work, based on a statistic of the employed population by industry, and shows that labour productivity varies depending on the branch.

In their vast majority, the mercantilists were populists in the sense that they were on the side of the increase of population of a State. Thus, for the mercantilist the relationship between population and development is based on reciprocity the population growth easily allows obtaining of labour force and there are possibilities for the development of industry and trade, as economic development allows the employment of a growing number of people, which encourages population growth.

Physiocracy was a turning point in the evolution of the economic thought; the physiocrats were the first authors who developed a clear concept about the social sciences and the economic principles.

The physiocrats' sources of inspiration are in the intellectual traditions, in the common cultural heritage and economic and political realities of the eighteenth-century France.

In the concept of the physiocrats, the work in agriculture and in the annex sectors is the only productive one, the other activities, industrial, commercial ones, being useful, but not productive.

An important contribution of the physiocrats is Fr. Quesnay's economic picture, which presents the economic cycle as a means of allocating the net product in the economy. The basic idea of the operation of this mechanism is the division of society in the three classes, namely: *the productive class* – which included farmers, people from the agricultural field, fishermen and sailors, *the sterile class* – included traders, industrialists and practitioners of liberal professions and housing and *the proprietary class* – included all those landowners who had independence taken from property (Pohoată, 1993, pp. 56-73).

Employment of human resources acquires new features when moving from dark feudal economy, of subsistence to the capitalist one, to the industrial age.

The Industrial Revolution marked the shift from production based on manual technique to the one sitting solidly on the systematic use of the machinery, therefore, to machinist large-scale production.

The impact of the Industrial Revolution on society was enormous, fundamentally changing the way we live and the perception on work. There is a decoupling of work from nature, following the introduction of independent production processes of natural conditions (e.g. artificial lighting), and an increase in work intensity, following the development of the industrial machinery. The purpose in the industrial age was the production of more goods, the production efficiency being measured by the quantity of units produced per unit time.

The capitalist system is characterized, as it is known, by the unity between the two legal institutions (the individual property rights and the freedom of contract) and three economic institutions (the private enterprise as the basic cell of economic activities, the market as a meeting place between demand and supply, the state, as an indirect participant in the economic activity).

In this institutional framework, the individual ownership right is the fundamental support of the free enterprise under all forms of freedom: freedom to work, to consume, to change, to contract, to serve society by the grouping a larger or lower number of capital gains.

In the basis of institution of individual property, contractual freedom was imposed and operates, which states the equality between the economic agents, legal equality governed by the Civil Code.

It is recognized that the private ownership of material factors generates a sharing of the social body in owner-entrepreneurs of capital, and employees, who "rent" their services for remuneration rates, without participating in decision-making and profit sharing.

By changing to the capitalist system, the status of those who work as employees changed in their meaning of legal freedom, combined with the economic dependence to the owners of capital. Under the influence of the general economic progress provided by the capitalist market economy, the working conditions and the social status of employees has improved continuously.

Socially, the capitalist system is defined by: the free market of employment (of labor) contractual relationship employment user – employee, groups (of unions), as professional defender of employees, discussed and negotiated salaries and bonuses, the possibility of strike.

Until the appearance of macroeconomics as a science, *employment was only addressed with microeconomic sense* and solved by the legislating the

legal age for employment, by regulating the duration of the working week and working hours, possibly by negotiating and establishment of paid leave from work.

The principle of free labour is considered as the first of the new principles for capitalism. Freedom of labour manifests itself with the following principles: freedom for travel, freedom for circulation of goods. But the individual freedom should not prevent the manifestation of other people's freedoms (Frois, 1994, pp. 30-34). In this spirit, the French economist Bastiat F. appreciated that the economy, including the capitalist one, is a natural order which involves a spontaneous harmony between the interests of individuals regardless of their social position. As a response to Bastiat's remarks, the sociologist Lacordaire postulated: "Between the poor and the rich the freedom is that which oppresses and the law is the one issuing".

The glorification of work in capitalism is made by comparison with the slave labour (torture-tripalium) and with work as a punishment for the original sin atonement. In the Middle Ages, in the spirit of Christian dogma, it was convicted the accumulation of money and the banker's work and it was admired the ascetic monk's life.

The successive revolutions which changed the social condition and structure of work were triggered by technical factors (energy, mechanization, automation), by scientific factors (knowledge), as well as the social factors. After the fall of the Roman Empire, the monasteries were turned into agricultural production centres. The emergence of the reformed religion, especially the Calvinist doctrine, changed the medieval view on work. During the Reform, Jean Calvin emphasized the major role that work plays in achieving a state of spiritual salvation, which had significant economic effects. This relationship prompted Max Weber to discover the origins of capitalism in the ascetic ethic work proclaimed by Calvinism (Giarini, Malița, 2005, p. 79). Thus, Max Weber explained the relationship between faith, spiritual life and work sacralization.

Work and accumulation were treated as non values of the modern era. But profit was regarded as a source of accumulation, and not as means for satisfying pleasures.

The model worker is the entrepreneur, who is at the antipodes of the renter, but at the antipodes of the speculator merchant and banker (usurer).

Obviously, all these elements of the employment of people of working age were applied and had economic, social and even political consistency under the circumstances in the capitalist system, of the values of wage labour civilization, modernity specific.

Acknowledgements

This paper was co-financed by the European Social Fund, through the Human Resources Development Operational Program 2007-2013, Project number POSDRU/1.5/S/59184 „Excellency and performance in postdoctoral research in economic sciences in Romania”.

References

- Aceleanu, Mirela, Crețu, Alina (2010). *Strategii și politici de ocupare în contextul pieței actuale a muncii*, Editura ASE, București
- Aristotel (2000). *Politica*, Editura Antet, București
- Braudel, F. (1985). *Jocurile schimbului*, vol. II, Editura Meridiane, București
- Bremond, Janine, Geledan, A. (1995). *Dicționar economic și social*, Editura Expert, București
- Colectivul Catedrei de Economie și Politici Economice (2001). *Dicționar de Economie*, Ediția a doua, Editura Economică, București
- Dobrotă, N., Șerban, Andreea (2008). *Munca – esență, forme, structuri și finalitate*, Editura ASE, București
- Drăgănescu, M. (1987). *Mutații în caracterul muncii*, în „Tratat de economie contemporană”, vol. 2, Cartea 1, Editura Politică, București
- Friedman, G., Neville, P. (1962). *Traite de sociologie du travail*, Paris, Edition Armand Colin
- Frois, G.A. (1994). *Economie politică*, Editura Humanitas, București
- Giarini, O., Liedtke, P.M. (2001). *Dilema ocupării forței de muncă și viitorul muncii*, Editura All Beck, București
- Giarini, O., Malița, M. (2005). *Dubla spirală a învățării și a muncii*, Editura Comunicare.ro, București
- Ivanciu, N.V. (1996). *Tratat de doctrine economice*, Editura Monitorul Oficial, București
- Montchrestien, A. De (1889). *Traite de l'économie politique*, Paris
- Platon (1986). *Opere V-Republica*, Editura Științifică și Enciclopedică, București
- Pohoată, I. (1993). *Doctrine economice universale*, Vol. I, Editura Fundația Gh. Zane, Iași
- Rogojanu, Angela (2009). *Stăpânii ideilor economice*, vol. I, *În Antichitate și în Evul Mediu*, Editura Economică, București
- Silași, G., Jivan, Al. (1995). *Doctrine economice: idei fundamentale ale principalelor școli de gândire economică*, Editura Universității de Vest, Timișoara
- Simensy, Th. (1978). *Un dicționar al înțelepciunii*, Editura Junimea, Iași
- Xenofon (1987). *Despre economie*, în *Amintiri despre Socrate*, Editura Univers, București

Determination of Import Demand in Pakistan: The Role of Expenditure Components

Muhammad Irfan CHANI

National College of Business Administration and Economics, Lahore, Pakistan
irfanchani@yahoo.com

Zahid PERVAIZ

National College of Business Administration and Economics, Lahore, Pakistan
ecozaheed@yahoo.com

Amatul R. CHAUDHARY

National College of Business Administration and Economics, Lahore, Pakistan
amatul.chaudhary@yahoo.com

Abstract. *The paper uses imperfect substitution approach to derive the aggregate import demand function on the basis of disaggregated expenditure components. This derived import demand function is then empirically tested for Pakistan by using co-integration and error correction mechanism. The empirical results show that elasticity of import demand with respect to different macro components of final expenditure is different. The import demand in Pakistan is affected positively and significantly by all expenditure components. The relative prices have negative but insignificant relationship with import demand in Pakistan. The findings indicate that use of aggregate expenditure variable in the aggregate import demand function leads to aggregation bias because different macro components of final expenditure have different import contents. The model derived in this study provides in-depth guidelines for macroeconomic policy decisions in order to overcome the problem of persistent trade deficit in the country.*

Keywords: import demand; expenditure components; relative prices; trade deficit.

JEL Codes: F10, F14, F41.

REL Codes: 10D, 10E.

1. Introduction

The role of international trade is very important and crucial in the development of any economy. In this modern era of globalization, trade among nations has become almost unavoidable and inevitable due to its important role in fulfilling the growing needs of the economies across the globe. Traditional trade theories of absolute advantage and comparative advantage consider international trade as beneficial for trade partners due to its economic efficiency and welfare effects. Theoretically trade can minimize income inequalities among and within nations by increasing the incomes of unskilled labour in labour abundant countries. However the empirical evidence shows that distribution of trade gains among different nations is uneven. This has given birth to a sort of controversy among economists regarding the gains of trade.

On the basis of above mentioned controversy, trade economists can be distinguished into two different groups termed as “Trade Pessimists” and “Trade Optimists” (Kavoussi , 1985). “Trade Pessimists” are inward looking and favour import substitution and protection policies whereas “Trade Optimists” advocate for free trade policies. The intellectual roots of Trade Optimists’ view can be found in the theory of absolute advantage put forward by Smith (1776) that still resonates today due to its persuasive flair. Expected gains from free trade may include increase in economic efficiency, promotion of competition among firms, acceleration of economic growth, advancement in technology and increase in human welfare through the availability of better quality and wide variety of products at competitive prices (Dollar, Kraay, 2004, Gupta, Choudhry, 1997, World Bank, 2002). The opposing view of Trade Pessimists emphasizes fair trade instead of free trade by arguing that free trade may be less beneficial or harmful for the developing nations and the poor.

Trade optimistic views are dominant in present era of globalization. The issue of free trade has gotten great importance and being debated among intellectuals and in the policy circles of different countries especially after the emergence of World Trade Organization (WTO). This has become a matter of great concern for developing countries like Pakistan which are heavily dependent on the import of diverse capital and consumer goods to fulfill the growing needs of their industries and households. Most of these countries are facing the problem of persistent trade balance which can be eased only by formulating the rational and research based trade policies (Salvatore, 1983). This objective can be met through a careful analysis of trade pattern of these countries.

Apart from studying the causes and effects of trade among nations, estimation of the income and price elasticities of imports and exports are

important because it can be helpful in judging the effect of income and price changes on trade balance (Brester, 1996). These elasticities can also be used in explaining the welfare and employment implications of changes in own or partner-countries' trade restrictions and the severity of external balance constraints on domestic policy choices (Goldstein, Khan, 1985). Income elasticities of imports and exports are as important as their price elasticities, especially in a growing economy. In a two country model, if trade is initially balanced, prices are stagnant and income growth is the same in both countries then the trade balance between them can still change over time if their respective income elasticities of demand for imports differ (Johnson, 1958). In such case, even relatively slow domestic income growth may be insufficient to alleviate payments imbalances for the country having relatively unfavorable income elasticities (Houthakker, Magee, 1969). Thus these elasticities seem to have wide macroeconomic policy implications.

Unlike previous studies on Pakistan which have used total expenditures as an explanatory variable in import demand function, the present study uses the disaggregated components of total expenditure (GDP) like consumption expenditure, investment and exports. In fact the use of aggregate expenditure variable in the aggregate import demand function leads to aggregation bias because different macro components of final expenditure have different import contents. This study will provide detailed information for macro-economic policy decisions in Pakistan. This information will be useful for efficient utilization of both expenditure switching and expenditure dampening policies to overcome the problem of persistent trade deficit in the country.

The study comprises of five different sections. Introduction of the study is given in section one. The second section reviews the relevant literature. Theoretical evolution of import demand function and methodological issues have been presented in third section. Fourth section consists of the discussion of empirical results. Concluding remarks and policy suggestions are presented in fifth section.

2. Literature review

Import demand literature can be categorized into three different dimensions⁽¹⁾. First kind of literature considers import demand as a function of aggregate income and prices. The second strand of literature consists of those studies which use the disaggregated imports of different commodity groups as a function of income and relative prices. In the third category of literature aggregate import is treated as a function of disaggregated components of total income or aggregate expenditure. In all these categories, both kinds of studies are included that take price determinant of import demand as relative prices or

take domestic and import prices separately. Harberger (1953), Hinshaw (1945), Liu (1954), Lovasy and Zassenhaus (1953) and Vegh (1941) are among the earlier studies that checked the effect of aggregate national income and relative prices on import demand. In fact, studying income and price elasticities of import demand have been matter of interest for trade economists due to their important implications for trade balance.

The impact of real income and relative prices on import demand for the case of United States has been checked by Adler (1945). By using data for the period 1922 to 1937, the study has found positive and significant effect of national income on import demand while the effect of relative prices was noted to be insignificant; however this effect of relative prices remained significant and negative when duty free imports were used as dependent variable.

By applying Johansen co-integration and the error correction models, Abbott and Seddighi (1996) estimated the import demand function for United Kingdom. Their results reveal that import demand is more sensitive to changes in consumption expenditures as compared to changes in export expenditures and investment expenditures. But for the case of Malaysia investment expenditures were found as having the most explanatory power for import demand behavior. Consumption expenditures and expenditures on exports were proved to be of lesser importance in this regard (Mohammed, Tang, 2000).

Mohammed et al. (2001) has proved the existence of long-run co-integrating relationship between import demand and expenditure components for the case of ASEAN countries. Afzal (2001) has calculated the import demand elasticity with respect to income and relative prices by using log linear form of import demand equation for the case of Pakistan. The results of this study reveal that import demand elasticity with respect to income is positive while it is negative with respect to relative prices. Moreover the coefficient of relative prices remains statistically insignificant in this study.

Min et al. (2002) reveal that import demand in Korea is positively affected by consumption and export expenditures, whereas it is negatively affected by relative prices and investment expenditure. In order to estimate import demand function for China, bounds testing co-integration approach has been used by Tang (2003a). Positive long run effects of export expenditure, consumption expenditure and investment expenditure on import demand of China has been noted by this study. The study revealed negative long run relationship between import demand and relative prices. The coefficient of export expenditure seems to be the largest among all variables used in this study. In Fiji import demand has been found inelastic with respect to total consumption, relative prices, investment expenditure and export expenditure (Narayan, Narayan, 2005).

By applying Johansen co-integration technique and using data for the period of 1975 to 2005, Rehman (2007) confirms the existence of long run relationship among the variables of aggregate import demand, income, import prices and domestic price level for Pakistan. The elasticity of domestic price proves to be insignificant in long run as well as in short run, while income and import price elasticities are found to be significant in long run but insignificant in short run. Hye (2008) also proves the existence of co-integrating relationship among the variables of imports, income and relative prices but does not discuss the significance of long run coefficients of income and relative prices.

A time series analysis of demand function for Cote D'Ivoire has been conducted by Constant and Yue (2010). The study has used data for the period 1970 to 2007 and autoregressive distributed lag model approach to co-integration has been employed to check the long run relationship among import demand, consumption expenditure, investment expenditure, exports and relative prices. The results reveal that in long run, import demand in Cote D'Ivoire is more sensitive to investment and exports expenditure as compared to relative prices while in short run consumption expenditures have been found as major determinant of import demand. The import demand in the country is price inelastic as the variable of relative prices seems to be having insignificant effect on import demand in long run as well as in short run analysis.

3. Theoretical framework

Two general models of trade are widely used in the empirical literature. These models of trade are known as the perfect substitutes model and the imperfect substitutes model (Goldstein, Khan, 1985). The perfect substitutes model is based upon the assumption that traded goods are perfectly substitutes. If this is the case then a country can be either an importer or an exporter but not both of them (Rhomberg, 1973). But in reality, traded goods are not perfect substitutes hence both (imported goods and locally produced goods) coexist in the same market. The increasing trade among the nations and existence of intra-industry trade also put the question mark on the validity of the perfect substitutes hypothesis (Giovannetti, 1989). Thus imperfect substitutes model based upon the assumption of differentiated products seems to be more realistic. Drawing upon this imperfect substitutes framework, the basic import demand model can be given as:

$$M_t = f(X_{1t}, X_{2t}, X_{3t}), t = 1, 2, 3, \dots, T, \quad (1)$$

where M_t is the import demand, X_{1t} represents nominal income of the importing country, X_{2t} represents the prices of imports and X_{3t} represents the prices of domestically produced goods and t denotes time period.

According to Goldstein and Khan (1985) import demand function based on the imperfect substitutes model is in accordance with conventional demand theory which follows utility maximization framework. Thus the resulting demand functions for imports represent the quantity demanded as a function of the level of nominal income in the importing country, the imported good's own price, and the price of domestically produced goods. This framework considers the 'absence of money illusion' as the demand function is homogeneous of degree zero (Deaton and Muellbauer, 1980). This implies that dividing the right hand side of the equation (3.1) will give the following result:

$$M_t = f(Y_{1t}, Y_{2t}), t = 1, 2, 3, \dots, T, \quad (2)$$

where,

$$Y_{1t} = (X_{1t} / X_{3t}) = \text{real income (final expenditure) of importing country}$$

$$Y_{2t} = (X_{2t} / X_{3t}) = \text{relative prices of imports (relative to domestic prices)}.$$

The prices of imports relative to the prices of their domestically produced substitutes (Y_{2t}) are main determinant of the import demand. The relative prices are expected to be inversely related to the demand for imports. The studies which only examine the import demand behaviour normally assume that the supply elasticities are infinite and the domestic prices are assumed to be flexible and would change to eliminate excess demand at home.

The final expenditure (Y_{1t}) is one of the important factors affecting import demand. Different macro-components of final expenditure have different import content. Considering the composition of final expenditure is very important while studying the import demand (Abbott, Seddighi, 1996, Giovannetti, 1989). Giovannetti (1989) has also proved that the use of a single aggregate expenditure variable in the aggregate import demand function results in aggregation bias because different macro components of final expenditure have different import contents. However, following Abbott and Seddighi (1996), Giovannetti (1989), Min et al. (2002) and Narayan and Narayan (2005) income (final expenditure) can be split into three components in import demand function. Xu (2002) and Tang (2003b) propose that time trend should be included in import demand function to represent the role of taste and habits in import demand. Thus our import demand function takes the following form:

$$M_t = f(CG_t, I_t, X_t, RP_t), t = 1, 2, 3, \dots, T, \quad (3)$$

where M_t is the import demand in time t , CG_t is the sum of household and government consumption expenditure in time t , I_t is the total investment in time t and X_t is expenditure on exports of goods and services in time t and RP_t is the ratio of the import prices to the domestic prices in time t .

The equation (3) can be written in the following form:

$$M_t = \alpha_0 C G_t^{\beta_1} I_t^{\beta_2} X_t^{\beta_3} R P_t^{\beta_4} e^{\beta_5 t} e^{\varepsilon_t}, t = 1, 2, \dots, 37, \quad (4)$$

where 'e' is base of natural logarithm and ε_t is the error term.

Taking natural logarithm of equation (4), we can have the following estimation equation:

$$\ln M_t = \beta_0 + \beta_1 \ln CG_t + \beta_2 \ln I_t + \beta_3 \ln X_t + \beta_4 \ln RP_t + \beta_5 t + \varepsilon_t, t = 1, 2, 3, \dots, 37, \quad (5)$$

where 'ln' represents the natural logarithm and $\beta_0 = \ln \alpha_0$.

A. Data sources

This study uses the variables of consumption expenditure, total investment expenditure, expenditure on total exports of goods and services, imports of goods and services and relative prices of imports in Pakistan for empirical analysis from 1972 to 2008. Data for the variables of consumption expenditure, total investment expenditure, expenditure on total exports of goods and services and imports of goods and service is taken from World Development Indicators (WDI) online database by World Bank (2009). The relative price variable is the ratio of unit value index of imports to the GDP deflator and both variables are taken from International Financial Statistics (IFS) online database by International Monetary Fund (2010).

B. Econometric methodology

Most of the time series and economic data faces the problem of non-stationarity due to the presence of time trend in it. In such situation regression results may be misleading and unauthentic (Granger, Newbold, 1974). According to Phillips (1986), in the absence of co-integrating relationship among the variables, regression results obtained from Ordinary Least Square (OLS) method may be spurious. Thus the regression results obtained through Ordinary Least Square (OLS) method are reliable only if the variables are stationary and co-integrated. Hence verifying stationarity and co-integration is necessary at the first step.

B.1. Augmented Dickey-Fuller test

Augmented Dickey-Fuller test proposed by Dickey and Fuller (1979) and Dickey and Fuller (1981) has been used by this study to check the stationarity of the variables. The following regressions are used for the application of this test.

$$\Delta X_t = \alpha + \delta X_{t-1} + \sum_{j=1}^q \gamma_j \Delta X_{t-j} + \epsilon_{1t} \quad (6)$$

$$\Delta X_t = \alpha + \beta t_1 + \delta X_{t-1} + \sum_{j=1}^q \gamma_j \Delta X_{t-j} + \epsilon_{1t} \quad (7)$$

$$\Delta \Delta X_t = \alpha + \delta \Delta X_{t-1} + \sum_{j=1}^q \gamma_j \Delta \Delta X_{t-j} + \epsilon_{2t} \quad (8)$$

$$\Delta \Delta X_t = \alpha + \beta t_1 + \delta \Delta X_{t-1} + \sum_{j=1}^q \gamma_j \Delta \Delta X_{t-j} + \epsilon_{2t} \quad (9)$$

where

$$\Delta X_t = X_t - X_{t-1}$$

q = number of lags in the dependent variable.

In order to check the stationarity following hypotheses are tested;

H_0 : $\delta = 0$ (X_t is non-stationary)

H_a : $\delta < 0$ (X_t is stationary).

B.2. Johansen co-integration test

Johansen co-integration test proposed by Johansen (1988) and Johansen and Juselius (1990) is used to find long run relationship among the variables which are found to be stationary at the same order. Initially, the concept of co-integration was put forward by Engle and Granger (1987). Unlike two steps estimation approach suggested by Engle and Granger (1987) by which only one co-integrating vector can be found, Johansen (1988) and Johansen and Juselius (1990) suggest maximum likelihood testing procedure to find out the number of co-integrating vectors in the Vector Autoregressive (VAR) representation. The general form of VAR is as under:

$$Y_t = \mu + \beta_t Y_{t-1} + \dots + \beta_k Y_{t-k} + \epsilon_t \quad (10)$$

where Y_t is an $(n \times 1)$ vector of variables that are integrated of order 1, α is a $(n \times 1)$ vector of constant terms, $\beta_t \dots \beta_{t-k}$ are parameters and ϵ_t is an independently and identically distributed error term. This VAR can also be written in the following alternative form of Vector Error Correction Model (VECM).

$$\Delta Y_t = \mu + \sum_{i=0}^{p-1} \Gamma_i \Delta Y_{t-i} + \Pi Y_{t-1} + \varepsilon_t \quad (11)$$

where Y_t is a $(n \times 1)$ column vector of p variables, μ is a $(n \times 1)$ vector of constant terms, ε_t is $(n \times 1)$ vector of usual error term, Δ is difference operator and Γ and Π represent coefficient matrices. The coefficient matrix Π is also termed as impact matrix and it describes about the long run relationship. Two types of likelihood ratio tests termed as trace test statistics and maximum eigenvalue test statistics are used to find the number of co-integrating vectors. The representation of VECM with respect to our variables is as given:

$$\Delta \ln M_t = \alpha + \sum_{j=0}^n \beta_1 \Delta \ln I_t + \sum_{j=0}^n \beta_2 \Delta \ln CG_t + \sum_{j=0}^n \beta_3 \Delta \ln X_t + \sum_{j=0}^n \beta_4 \Delta \ln RP_t + \eta ECT_{t-1} + \varepsilon_t \quad (12)$$

The significance of the coefficient of error correction term ECT_{t-1} describes about the existence of short run relationship. Its value and sign tells about the speed and convergence or divergence to or from the long run equilibrium. Its negative value indicates about the convergence whereas its positive value indicates about the divergence. A significant coefficient of error correction with negative sign is considered as a further proof of the existence of stable long run relationship (Banerjee et al., 1998).

4. Estimation results

We have used ADF unit root test to check the stationarity of time series data in logarithmic form. According to these results variables of import of goods and services, consumption expenditure, total investment expenditure, exports of goods and services and relative prices of imports are not stationary at level. This implies that null hypothesis of unit root at level cannot be rejected for all variables. However all the variables are stationary at first difference. This shows that the null hypothesis of unit root for all variables is rejected when we use the first difference of the variables. Thus the variables have same order of integration. All of them are I(1) (integrated of order one).

Table 1

Augmented Dickey-Fuller (ADF) Unit Root Test Results		
Augmented Dickey-Fuller (ADF) Test at Level		
Variables	t -Statistic	p- Value
$\ln M_t$	-0.6881	0.8372
$\ln I_t$	-0.4952	0.8807
$\ln CG_t$	-0.5798	0.8628
$\ln X_t$	-0.5101	0.8777
$\ln RP_t$	-1.9871	0.2909
Augmented Dickey-Fuller (ADF) Test at 1st Difference		
Variables	t -Statistic	p- Value
$\Delta \ln M_t$	-6.1518	0.0000
$\Delta \ln I_t$	-5.6909	0.0000
$\Delta \ln CG_t$	-6.2154	0.0000
$\Delta \ln X_t$	-6.1500	0.0000
$\Delta \ln RP_t$	-4.5961	0.0008

Keeping in view the number of observations, number of variables to be studied and lags requirement of the cointegration test maximum three lags are allowed to select the optimum lag length in Vector Auto-Regressive (VAR) process. Schwarz Information Criterion (SIC) suggests that an optimal lag length of 1. Thus the lag length 1 has been used in our analysis.

Johansen co-integration technique has been applied to check the co-integration among the variables of import demand, consumption expenditure, investment expenditure, export expenditure and relative prices.

The results of Johansen's co-integration test have been reported in Table 2 and Table 3. Trace statistics λ_{trace} and maximum eigen statistics are used to check the number of co-integrating vectors. Both statistics test the null hypothesis of no co-integration against the alternative of co-integration, starting with the null hypothesis of no co-integration ($r \leq 0$) among the variables. The trace-test statistics is 100.2037, which is above the critical value of 84.3782 at 10% significance level. Hence it rejects the null hypothesis $r \leq 0$ in favour of alternative hypothesis $r = 1$. Similarly, the null hypothesis of $r \leq 1$ can also be rejected in favour of alternative hypothesis of $r = 2$. But null hypothesis of $r \leq 2$ can not be rejected in favour of alternative hypothesis of $r = 3$ because trace statistics 31.4703 which is less than the critical value of 39.7553 at 10% significance level. All of this shows the existence of two cointegrating vectors. Same is the case when we use maximum eigen test statistics, which also confirm the existence of two cointegrating vectors.

Thus the analysis of data confirms the presence of long run relationship among import demand, consumption expenditure, total investment expenditure, exports of goods and services and relative prices of imports in Pakistan.

Table 2

Unrestricted Co-integration Rank Test (Trace)

H ₀	H ₁	Trace Statistic	0.10 Critical Value	Prob. ^a
R = 0*	R ≥ 1	100.2037	84.37817	0.0059
R ≤ 1*	R ≥ 2	63.32148	60.08629	0.0556
R ≤ 2	R ≥ 3	31.47026	39.75526	0.4175
R ≤ 3	R ≥ 4	14.41054	23.34234	0.6236
R ≤ 4	R ≥ 5	3.192006	10.66637	0.8529

^a MacKinnon-Haug-Michelis (1999) p-values

* denotes rejection of the hypothesis at the 0.1 level

Table 3

Unrestricted Co-integration Rank Test (Max-Eigen)

H ₀	H ₁	Max-Eigen Statistic	0.10 Critical Value	Prob. ^a
R = 0*	R ≥ 1	36.88223	35.58124	0.0726
R ≤ 1*	R ≥ 2	31.85122	29.54003	0.0538
R ≤ 2	R ≥ 3	17.05972	23.44089	0.4527
R ≤ 3	R ≥ 4	11.21853	17.23410	0.4911
R ≤ 4	R ≥ 5	3.192006	10.66637	0.8529

^a MacKinnon-Haug-Michelis (1999) p-values

* denotes rejection of the hypothesis at the 0.1 level

As cointegration exists among the variables used in the study, therefore, the results presented for long run are reliable. These results represent long run elasticities of import demand with respect to expenditure components. The long run results are reported in Table 4.

Table 4

Long Run Relationships

Dependent Variable: $\ln M_t$			
Variable	Coefficient	t-Statistic	p-Value
$\ln I_t$	0.5860	2.4453	0.0208
$\ln CG_t$	2.6734	6.3363	0.0000
$\ln X_t$	0.2685	2.5341	0.0169
$\ln RP_t$	-0.1352	-1.0786	0.2896
Time	-0.1200	-4.9566	0.0000
Constant	-69.7417	-6.0809	0.0000
R ² = 0.9664 Adj-R ² = 0.9549 F-Statistic = 139.1804 Prob(F-statistic) = 0.0000 Durbin-Watson = 2.1713			

The results reported in the Table 4 show that all expenditure components (consumption expenditure, total investment expenditure, exports of goods and services) have statistically significant impact on import demand in Pakistan. But the impact of relative prices on import demand is negative and not significant in long run. While studying the import demand behaviour in Pakistan, Afzal (2001) and Rehman (2007) also find the similar result about the effect of relative prices on import demand in Pakistan. The consumption expenditure, total investment expenditure, exports of goods and services have positive impact on import demand. The results show that consumption expenditure has the highest 2.6734 elasticity of import demand and it is followed by investment expenditure 0.5860 and exports of goods and services 0.2685. Relative prices have insignificant, negative and the lowest elasticity - 0.1352 of import demand. The positive and significant import demand elasticities with respect to all components of final expenditure indicate that increase in economic growth will lead to higher import demand in Pakistan as indicated by Keynesian absorption theory.

The results show that long run coefficients of independent variables have theoretically correct signs. The difference in magnitude of the effects of different expenditure components on import demand further strengthen the significance of using different components of final expenditure separately in import demand equation. The inelastic and insignificant effect of relative prices on import demand reflects that import substitution policy adopted by government of Pakistan since 1950s has not been successful in achieving the target of producing sufficient import substitutes. The elasticity import demand with respect to relative prices reveals that a large proportion of Pakistan's imports are essential goods which have inelastic demand.

Once cointegration among the variables is proved, we can use VECM to study the short run dynamics. Table 5 shows the short run dynamics of the variables. According to the table, consumption expenditure, total investment expenditure, exports of goods and services have statistically significant effect on import demand in short run while the impact of relative price variable is statistically insignificant in short run.

Table 5

Short Run Dynamics			
Dependent Variable = $\Delta \ln M_t$			
Variable	Coefficient	t-Statistic	p-Value
$\Delta \ln I_t$	0.6877	3.6603	0.0010
$\Delta \ln CG_t$	2.6024	7.7284	0.0000
$\Delta \ln X_t$	0.2119	2.0180	0.0529
$\Delta \ln RP_t$	-0.0532	-0.4441	0.6603
ECT _{t-1}	-0.4560	-3.6749	0.0010
Time	0.0008	0.8392	0.4082
Constant	-0.1490	-4.9012	0.0000
R ² = 0.7647 Adj-R ² = 0.7160 F-Statistic = 15.7088 Prob(F-statistic) = 0.0000 Durbin-Watson = 1.9554			

The error correction term is statistically significant and has a negative sign. It is further proof of long run relationship among the variables of our interest. The results, reported in Table 5, show that coefficients of all expenditure components have theoretically expected signs and are statistically significant in short run. The coefficient of relative price variable has theoretically correct sign and is insignificant in short run. The consumption expenditure, total investment expenditure, exports of goods and services have positive impact on import demand in short run as well. The results show that consumption expenditure has the highest 2.6024 elasticity of import demand and it is followed by investment expenditure 0.6877 and exports of goods and services 0.2119. Relative prices have correct negative but insignificant elasticity -0.0532 of import demand.

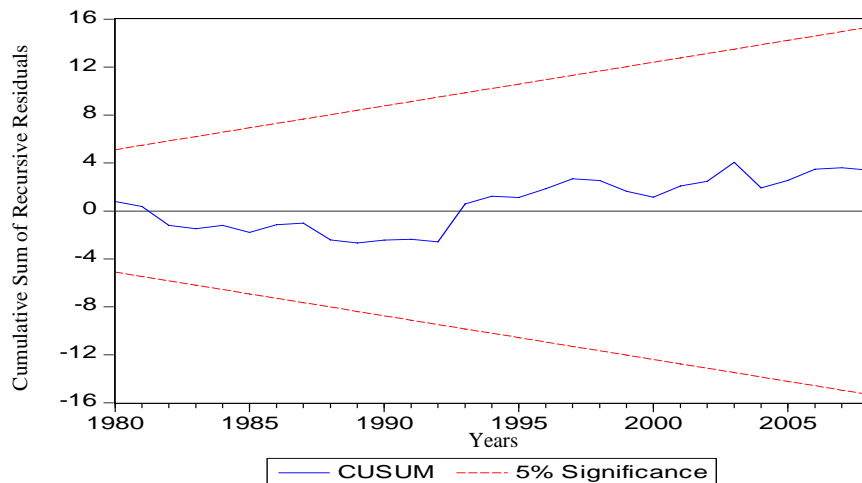
Diagnostic tests are applied to check the validity of the assumptions of serial correlation, normality; model specification and heteroskedasticity have been conducted. The results of these tests are presented in Table 6.

Table 6

Diagnostic Tests		
<i>Normality Test</i> (Jarque-Bera Statistics)	Jarque-Bera Statistics = 0.2199	Probability = 0.8959
<i>Serial Correlation</i> (Breush-Godfrey Serial Correlation LM Test)	F-statistics = 0.4377	Probability = 0.5137
<i>ARCH Test</i> (Autoregressive Conditional Heteroskedasticity Test)	F-statistics = 0.4135	Probability = 0.5245
<i>Heteroskedasticity Test</i> (White Heteroskedasticity Test)	F-statistics = 1.1554	Probability = 0.4434

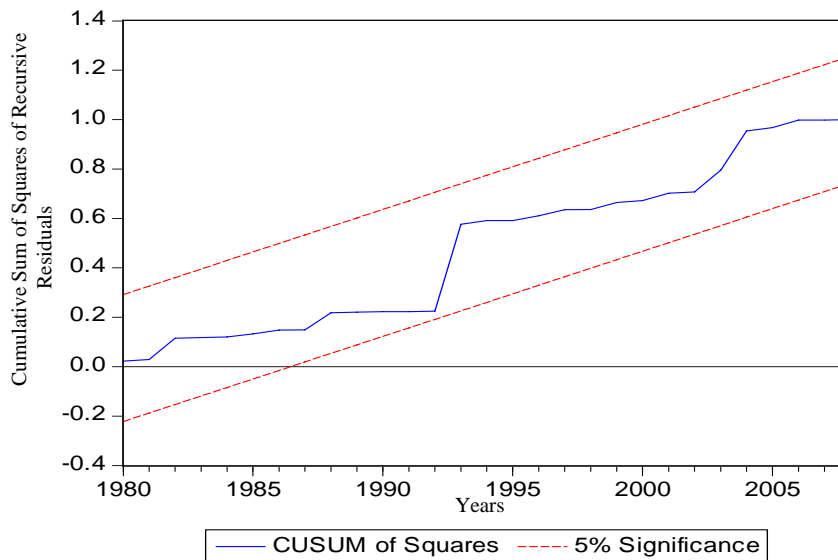
These results indicate that the residuals are normally distributed and there is no presence of heteroskedasticity. There is also no problem of serial correlation and autoregressive conditional heteroskedasticity.

To analyze the stability of the long-run coefficients together with the short run dynamics, the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMsq) are applied. A graphical representation of CUSUM and CUSUMsq are shown in figures 1 and 2. The null hypothesis that the regression equation is correctly specified cannot be rejected if the plot of these statistics remains within the critical boundaries of the 5% significance level. Figures 1 and 2 show that the plots of both the CUSUM and the CUSUMsq are within the boundaries and hence these statistics confirm that the model is correctly specified.



**The straight lines represent critical bounds at 5% significance level*

Figure 1. Plot of cumulative sum of recursive residuals



The straight lines represent critical bounds at 5% significance level

Figure 2. Plot of cumulative sum of squares of recursive residuals

5. Conclusion and policy implications

The results indicate that consumption expenditure is the major determinant of import demand in Pakistan as it has the highest coefficient in our import demand equation. The investment expenditure has the second highest coefficient and is followed by government expenditure and exports. The highest elasticity of import demand with respect to consumption expenditure is due to the reason that final consumer goods and raw materials used as inputs in the production of consumer goods have more than sixty percent share in total imports of Pakistan. Our results also confirm the reality that our imports are more consumption oriented and import growth of Pakistan is more sensitive to change in domestic consumption.

The results of present study have profound policy implications. The empirical findings suggest that exchange rate policies which directly affect the relative prices will have little impact on import demand in Pakistan. Thus devaluation of domestic currency is not a rational and suitable policy to overcome the problem of persistent trade deficit rather this policy can increase the severity of the problem by reducing the competitiveness of our exports. Devaluation of domestic currency may serve to raise the production costs

because very large share of our imports consists of raw material and capital goods. It may also increase the import bill and can lead to balance of payment problems.

Import substitution policy should focus on the establishment of capital goods industries and the industries which can utilize the domestic resources rather than imported raw material.

Industrial policy should be formulated in a way which could increase the export of value added goods instead of exports of raw material or primary goods. For this purpose forward and backward linkages among the industries should be established.

The positive and significant import demand elasticities with respect to all components of final expenditure indicate that increase in economic growth will lead to higher import demand in Pakistan as indicated by Keynesian absorption theory. Thus monetary and fiscal policies should be designed in such a way that may be helpful in altering the existing composition of final expenditure for reducing the trade deficit. This objective can be achieved by increasing the share of those components for which import demand elasticity is low and by reducing the share of those components for which import demand elasticity is high. For instance, monetary policy promoting saving and investment and fiscal policy providing incentives for domestic resource-based and export oriented industries will be useful. Export of finished goods instead of primary or semi-finished commodities should be promoted.

Note

- ⁽¹⁾ For detailed review of literature and discussion on Pakistan's economy refer Irfan, M. (2010), „The Impact of Expenditure Components on Import Demand in Pakistan: An Empirical Analysis”. An unpublished M. Phil dissertation submitted to National College of Business Administration and Economics, Lahore, Pakistan.

References

- Abbott, A.J., Seddighi, H.R., "Aggregate Imports and Expenditure Components in the U.K.: An Empirical Analysis", *Applied Economics*, 28(9), 1996, pp. 1119-1125
- Adler, J.H., "United States Import Demand during the Interwar Period", *The American Economic Review*, 35(3), 1945, pp. 418-430
- Afzal, M., "Import Function for Pakistan: A Simultaneous Equation Approach", *The Lahore Journal of Economics*, 6(2), 2001, pp. 109-116
- Banerjee, A., Dolado, J., Mestre, R., "Error-Correction Mechanism Tests for Cointegration in a Single-Equation Framework", *Journal of Time Series Analysis*, 19(3), 1998, pp. 267-283
- Brester, G.W., "Estimation of the US Import Demand Elasticity for Beef: The Importance of Disaggregation", *Review of Agricultural Economics*, 18(1), 1996, pp. 31-42
- Constant, N'guessan Bi Zambe Serge, Yue, Y., "An Econometric Estimation of Import Demand Function for Cote D'Ivoire", *International Journal of Business and Management*, 5(2), 2010, pp. 77-84
- Deaton, A., Muellbauer, J. (1980). *Economics and Consumer Behaviour*, Cambridge: Cambridge University Press
- Dickey, D.A., Fuller, W.A., "Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root", *Econometrica*, 49(4), 1981, pp. 1057-1072
- Dickey, D.A., Fuller, W.A., "Distribution of the Estimators for Autoregressive Time Series with a Unit Root", *Journal of the American Statistical Association*, 74(366), 1979, pp. 427-431
- Dollar, D., Kraay, A., "Trade, Growth, and Poverty", *The Economic Journal*, 114(493), 2004, pp. F22-49
- Engle, R.F., Granger, C.W.J., "Co-Integration and Error Correction: Representation, Estimation, and Testing", *Econometrica*, 55(2), 1987, pp. 251-276
- Giovannetti, G., "Aggregate Imports and Expenditure Components in Italy: An Econometric Analysis", *Applied Economics*, 21(7), 1989, p. 957
- Goldstein, M., Khan, M.S., "Income and Price Effects in Foreign Trade", in Jones, R.W. and P.B. Kenen. (Eds.), *Handbook of International Economics II*, New York: Elsevier Science Publications, 1985, pp. 1041-1105
- Granger, C.W.J., Newbold, P., "Spurious Regressions in Econometrics", *Journal of Econometrics*, 2(2), 1974, pp. 111-120
- Gupta, S.D., Choudhry, N.K. (1997). *Globalization, Growth and Sustainability: An Introduction*, in S. D. Gupta and N. K. Choudhry. (Eds.), Globalization Growth and Sustainability, Massachusetts, USA: Kluwer Academic Publishers
- Harberger, A.C., "A Structural Approach to the Problem of Import Demand", *The American Economic Review*, 43(2, Papers and Proceedings of the Sixty-fifth Annual Meeting of the American Economic Association), 1953, pp. 148-159
- Hinshaw, R., "American Prosperity and the British Balance-of-Payments Problem", *The Review of Economics and Statistics*, 27(1), 1945, pp. 1-9
- Houthakker, H.S., Magee, S.P., "Income and Price Elasticities in World Trade", *The Review of Economics and Statistics*, 51(2), 1969, pp. 111-125
- Hye, Q.M.A., "Aggregate Import Demand Function for Pakistan: Analysis in the Form of Old and Relatively New Cointegration Techniques", *International Journal of Economic Perspectives*, Vol. 2, no. 4, 2008, pp. 236-245

- International Monetary Fund (2010), "International Financial Statistics (IFS) Online Database", Washington, D.C., USA: International Monetary Fund
- Johansen, S., "Statistical Analysis of Cointegration Vectors", *Journal of Economic Dynamics and Control*, 12(2-3), 1988, pp. 231-254
- Johansen, S., Juselius, K., "Maximum Likelihood Estimation and Inference on Cointegration - with Applications to the Demand for Money", *Oxford Bulletin of Economics and Statistics*, 52(2), 1990, pp. 169-210
- Johnson, H.G. (1958). *International Trade and Economic Growth*, Cambridge: Harvard University Press
- Kavoussi, R.M., "International Trade and Economic Development: The Recent Experience of Developing Countries", *The Journal of Developing Areas*, 19(3), 1985, pp. 379-392
- Liu, T., "The Elasticity of U.S. Import Demand: A Theoretical and Empirical Reappraisal", *Staff Papers - International Monetary Fund*, 3(3), 1954, pp. 416-441
- Lovasy, G., Zassenhaus, H.K., "Short-Run Fluctuations in U.S. Imports of Raw Materials, 1928-39 and 1947-52", *Staff Papers - International Monetary Fund*, 3(2), 1953, pp. 270-289
- Min, B.S., Mohammed, H.A., Tang, T.C., "An Analysis of South Korea's Import Demand", *Journal of Asia Pacific Affairs*, 4(1), 2002, pp. 1-17
- Mohammed, H.A., Tang, T.C., "A ASEAN Economic Bulletin, 17(3), 2000, p. 257
- Mohammed, H.A., Tang, T.C., Othman, J., "Aggregate Import Demand and Expenditure Components in Five ASEAN Countries: An Empirical Study", *Journal Ekonomi Malaysia*, 35, 2001, pp. 37-60
- Narayan, S., Narayan, P.K., "An Empirical Analysis of Fiji's Import Demand Function", *Journal of Economic Studies*, 32(2), 2005, pp. 158-68
- Phillips, P.C.B., "Understanding Spurious Regressions in Econometrics", *Journal of Econometrics*, 33(3), 1986, pp. 311-340
- Rehman, H.U., "an Econometric Estimation of Traditional Import Demand Function for Pakistan", *Pakistan Economic and Social Review*, 45(2), 2007, pp. 245-256
- Rhomberg, R.R. (1973), "Towards a General Trade Model", in R. J. Ball. (Eds.), *The International Linkage of National Economic Model*, North-Holland: Amsterdam, pp. 9-20
- Salvatore, D., "A Simultaneous Equations Model of Trade and Development with Dynamic Policy Simulations", *Kyklos*, 36(1), 1983, p. 66
- Smith, A. (1776). *An Inquiry into the Nature and Causes of the Wealth of Nations*, Chicago, University Of Chicago Press
- Tang, T.C., "An Empirical Analysis of China's Aggregate Import Demand Function", *China Economic Review*, 14(2), 2003a, pp. 142-163
- Tang, T.C., "Japanese Aggregate Import Demand Function: Reassessment from the 'bounds' Testing Approach", *Japan and the World Economy*, 15(4), 2003b, pp. 419-436
- Vegh, I.D., "Imports and Income in the United States and Canada", *The Review of Economics and Statistics*, 23(3), 1941, pp. 130-146
- World Bank (2009). *World Development Indicators (WDI) Online Database*, Washington D.C., USA: The World Bank
- World Bank (2002). *World Development Report: Building Institutions for Markets*, Washington, D.C., USA: The World Bank
- Xu, X., "The Dynamic-Optimizing Approach to Import Demand: A Structural Model", *Economics Letters*, 74(2), 2002, pp. 265-270

Stock Markets Correlation: before and during the Crisis Analysis*

Ioana MOLDOVAN

Bucharest Academy of Economic Studies
ioana.moldovan@economie.ase.ro

Abstract. *The article studies the correlations between the stock markets of the greatest financial centers in the world, namely New York, London and Tokyo, in two different time intervals, namely before the global crisis that erupted in 2007 and during it, in order to determine whether the stock markets correlate more strongly during increasing or decreasing trends. The results of the analysis, carried out by means of multiple regressions, show that the links between the three stock markets were more intense during the crisis, on a decreasing trend respectively, than before the financial turmoil, when the stock indexes had an upward trend.*

Keywords: stock exchange; financial crisis; contagion.

JEL Codes: G01, G15, F30.

REL Codes: 8N, 11B.

* Ideas in this article were presented at the Symposium „The global crisis and reconstruction of economics?”, 5-6 November 2010, Faculty of Economics, Bucharest Academy of Economic Studies.

Introduction

The enhancement of the interdependences between international stock markets has brought major benefits to investors worldwide, who have the opportunity to diminish their risks by diversifying portfolios. Close links between markets have also led to lower transaction costs.

In the context of strengthening relations between markets, their trends have become increasingly correlated, so that, generally, major international stock markets register similar developments. Thus, in the expansion intervals of the economic cycle, stock markets have positive developments, but in time of crisis they are highly correlated on their decline.

Stock market crashes are probably the biggest risk assumed by investors, as in such circumstances the performances of stock can be quickly dispelled by the general market trend, even though normally there would be no reason for the price of that security to decrease. Systemic risk is the one that intervenes in such cases because investors follow the market trend and make massive sales, rather than devoting time to make assessments on whether to maintain portfolios. Investors' sense may thus be more important than economic fundamentals that should underpin investment decisions and the price formation.

Financial crises are characterized by sudden and simultaneous materialization of risks that in periods of normality seemed independent. As a result, the opportunities of risk sharing are significantly reduced just when they are needed the most, and that can cause a substantial threat to the global financial system.

If in times of normality, the stock markets are moderately correlated, the relationship between them intensify when sudden prices declines occur (Mink, Mierau, 2009).

This is largely due to the occurrence of the phenomenon of shift contagion, defined as a shift in the strenght of the transmission of shocks from a stock market in a one country to a stock market in another country (Rigobon, 2002).

Although the increased correlations between equity markets imply a possible decrease in risk sharing possibilities, it is not necessarily caused by an increased strength of the shock transmission between stock markets. Some studies have shown that the transmission power of the shocks does not change in times of crisis, compared with normal intervals on stock markets (Mink, Mierau, 2009).

The global financial crisis and its implications on stock markets

The sub-prime crisis began in mid 2007 with the outbreak of the housing market bubble in the US, which was accompanied by increased cases of default on mortgages sold in the sub-prime segment. Initially, the crisis has affected creditors, as they were faced with many cases of default, but problems have spread quickly across the entire US financial system since the credit institutions did not maintain the sub-prime loans in their portfolios, but sold them to other investors as *Collateralized Debt Obligations (CDOs)*. These securities have also been bought by investors outside the US and have been used as collateral for loans not only on US financial markets, but also in the rest of the world, so that financial problems have rapidly made their presence felt in the global financial system.

Given the fact that the money market began to prefigure the bankruptcies of leading investment banks, credit decreased, so that the real economy began to experience liquidity problems.

Basically, the crisis began with the bankruptcy of American Home Mortgage, one of the largest independent housing loan companies. Amid financial globalization, namely the multitude of relationships between investors and international financial institutions, the problems in the American markets have rapidly spread in Europe, amid the contagion phenomenon, given that European financial institutions had invested in toxic assets.

Thus, shortly after the American Home Mortgage bankruptcy, the problems at French bank BNP Paribas followed. The bank suspended three investment funds, citing problems in the US housing sector. In September, Northern Rock, the largest British mortgage bank, was near insolvency, leading to rapid migration of customers to other banks.

In March 2008, Bear Stearns, one of the big five investment banks on Wall Street, which was also near bankruptcy, was taken over by another big bank, JP Morgan Chase and the Federal Reserve and US Treasury have assured protection to economic agents that had lost from bankruptcy. However, in September 2008, another large investment bank, Lehman Brothers, was left to go bankrupt, as the US authorities considered that losses resulting from this failure would not be very large. This has led to a drastic reduction of investors' confidence in the business environment, along with the collapse of assets' prices and credit channels.

Companies Fannie Mae and Freddie Mac, which hold about half of the mortgage market (Forte and Pesce, 2009), were also nationalized in September. Subsequently, the largest insurance company in the world, American Insurance Group, was supported by the US state from public funds and nationalized, due

to the great systemic risk that its bankruptcy would have represented. However, this failed to halt panic in financial markets and improve the situation.

State take overs has been accomplished in Europe as well, Royal Bank of Scotland and Northern Rock in Britain being two important examples that were taken over by the British government. The entire euro area began to be affected by financial crisis, so that the governments of Belgium, Netherlands and Luxembourg's funds have injected about 11.2 billion euro in Fortis bank, while Dexia Bank has received an aid of 6.4 billion euros from Belgium, France and Luxembourg.

Besides saving bankrupt financial institutions, the monetary authorities have resorted to considerable reduction in key rates, supplied liquidity to a wide range of financial institutions, even to non-depository financial institutions, or have even purchased toxic assets.

All these interventions have led to a dramatic change of the role played by central banks. In past crises, they played the role of lender of last resort, in the 2008 crisis, they have assumed a new role, that of investor of last resort, through the asset acquisition programs for supporting markets and pumping liquidity in the economy (Roubini, Mihm, 2010).

The rapidity with which the problems of US financial markets have expanded internationally recalled that financial markets tend to move together through times of crisis.

Obviously, these problems were significantly transferred on the stock markets and the major stock indexes have suffered enormous losses.

In 2008, the shares offered on international markets have lost between 20% and 70% of values recorded in 2006 and 2007. In January 2009, the value of shares listed on US exchanges had fallen by 50% of the level it had in the first half of 2007. These losses have reported that the United States were in the worst economic recession in the last 75 years.

Stock markets in Europe have also experienced similar losses. The representative index of the London Stock Exchange, FTSE, fell by almost 50% in 2008, and a similar loss was recorded by the index of the Frankfurt Stock Exchange, DAX.

However, in late 2008, the Nikkei index of Tokyo Stock Exchange had lost about 55% of the value recorded in early 2007.

Methodology

For testing the interdependences between stock markets we have taken into account the representative indexes of the stock markets of the world's financial centers, namely the New York Stock Exchange (Dow Jones Industrial

Average), the London Stock Exchange (FTSE) and the Tokyo Stock Exchange (Nikkei).

The research is based on daily values of the three indexes between January 2003 and March 2010, period that I divided it into two intervals:

- *January 2003 – December 2006* – that pre-crisis period, when the global economy was in the expansion;
- *January 2007– March 2010* – the period when the global financial system has gone through crisis, with severe effects on real economy.

The collected data was modeled using multiple regressions, so that for each interval, each of the three indices was expressed related to the other two, according to the equations below:

$$dl_dow = a \times dl_ftse + b \times dl_nikkei + \varepsilon_1$$

$$dl_ftse = c \times dl_dow + d \times dl_nikkei + \varepsilon_2$$

$$dl_nikkei = e \times dl_dow + f \times dl_ftse + \varepsilon_3$$

where: dl_dow , dl_nikkei and dl_ftse are the time series of the three indices, a , b , c , d , e , f are coefficients associated with each of the exogenous variable, and ε_1 , ε_2 and ε_3 are the errors associated with the three regressions.

The purpose of the modeling is to estimate the coefficients associated to the indexes playing the role of exogenous variables, in order to determine their influence on the indexes representing endogenous variables.

I considered the two intervals in order to test whether the relations between international stock markets were stronger during the crisis or before the crisis.

Correlations between stock indexes

The graphs representing the evolution of the three indexes during the two intervals (Figure 1 and Figure 2) show that the stock markets had similar trends both before and during the crisis.

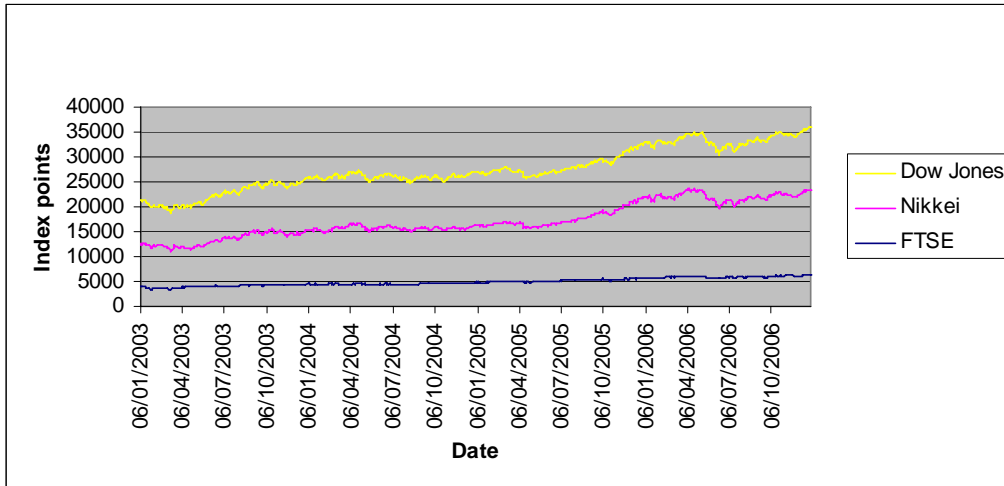


Figure 1. *Stock indexes evolution before the crisis*

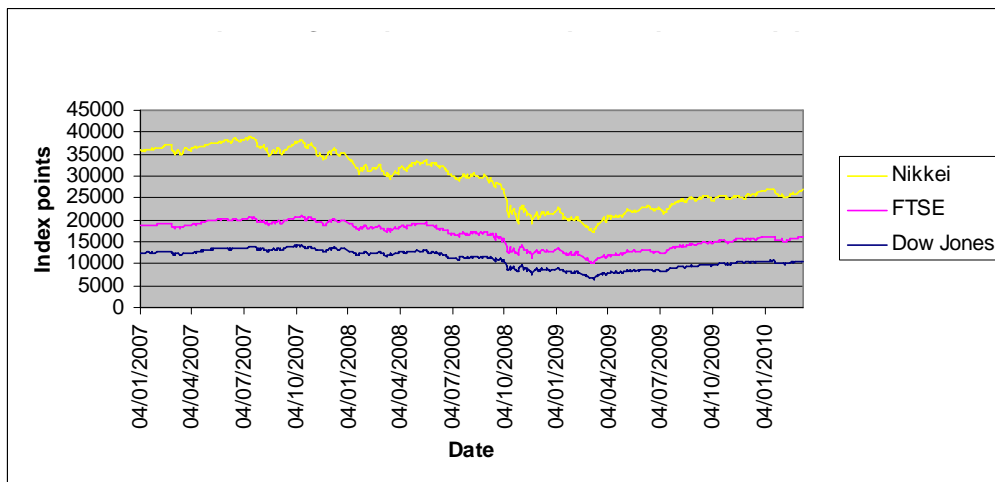


Figure 2. *Stock indexes evolution during the crisis*

By applying the regressions on data collected for the period before the crisis, I have obtained the following results:

Table 1

**Results of the regression with Dow Jones index as endogenous variable,
before the crisis**

Dependent Variable: DL_DOW				
Method: Least Squares				
Date: 10/12/10 Time: 09:54				
Sample (adjusted): 2 935				
Included observations: 934 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DL_NIKKEI	0.143082	0.018598	7.693316	0.0000
DL_FTSE	0.356639	0.026270	13.57596	0.0000
R-squared	0.253504	Mean dependent var		-0.000376
Adjusted R-squared	0.252703	S.D. dependent var		0.007725
S.E. of regression	0.006678	Akaike info criterion		-7.177929
Sum squared resid	0.041560	Schwarz criterion		-7.167566
Log likelihood	3354.093	Hannan-Quinn criter.		-7.173977
Durbin-Watson stat	2.391728			

Table 2

**Results of the regression with FTSE index as endogenous variable,
before the crisis**

Dependent Variable: DL_FTSE				
Method: Least Squares				
Date: 10/12/10 Time: 09:53				
Sample (adjusted): 2 935				
Included observations: 934 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DL_DOW	0.462944	0.034100	13.57596	0.0000
DL_NIKKEI	0.087534	0.021663	4.040693	0.0001
R-squared	0.219263	Mean dependent var		-0.000472
Adjusted R-squared	0.218425	S.D. dependent var		0.008606
S.E. of regression	0.007608	Akaike info criterion		-6.917047
Sum squared resid	0.053948	Schwarz criterion		-6.906684
Log likelihood	3232.261	Hannan-Quinn criter.		-6.913095
Durbin-Watson stat	2.584753			

Table 3

**Results of the regression with Nikkei index as endogenous variable,
before the crisis**

Dependent Variable: DL_NIKKEI				
Method: Least Squares				
Date: 10/12/10 Time: 09:55				
Sample (adjusted): 2 935				
Included observations: 934 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DL_DOW	0.417337	0.054247	7.693316	0.0000
DL_FTSE	0.196688	0.048677	4.040693	0.0001
R-squared	0.120127	Mean dependent var		-0.000737
Adjusted R-squared	0.119183	S.D. dependent var		0.012152
S.E. of regression	0.011405	Akaike info criterion		-6.107452
Sum squared resid	0.121222	Schwarz criterion		-6.097090
Log likelihood	2854.180	Hannan-Quinn criter.		-6.103501
Durbin-Watson stat	2.139019			

For this period, estimated coefficients related to exogenous variables in the three regressions are:

$$dl_dow = 0,356639 \times dl_ftse + 0,143082 \times dl_nikkei$$

$$dl_ftse = 0,462944 \times dl_dow + 0,087534 \times dl_nikkei$$

$$dl_nikkei = 0,417337 \times dl_dow + 0,196688 \times dl_ftse$$

From the three regressions I have deduced the following:

- a change of 100 index points in FTSE has determined a change in the same direction, by 35.6639 points, of Dow Jones, and a change in Nikkei of 100 index points has led to a change in the same direction, of 14.3082 points, in the Dow Jones index;
- a modified 100-point Dow Jones printed a change in the same direction, by 46.2944 points of the FTSE index and a change in the Nikkei index of 100 points has conducted to a 8.7534 points move the in the same sense of the FTSE index;
- an increase of 100 points in Dow Jones index has led the change with 41.337 points in the same sense of the Nikkei index, while the amendment to the FTSE of 100 index points determined the change of Nikkei in the same direction with 19.6688 points.

For data sets during the crisis, I have obtained the following results:

Table 4

**Results of the regression with Dow Jones index as endogenous variable,
during the crisis**

Dependent Variable: DL_DOW				
Method: Least Squares				
Date: 10/12/10 Time: 09:49				
Sample (adjusted): 2 741				
Included observations: 740 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DL_FTSE	0.618712	0.032648	18.95120	0.0000
DL_NIKKEI	-0.071619	0.027492	-2.605119	0.0094
R-squared	0.359330	Mean dependent var		0.000219
Adjusted R-squared	0.358462	S.D. dependent var		0.017377
S.E. of regression	0.013918	Akaike info criterion		-5.708525
Sum squared resid	0.142965	Schwarz criterion		-5.696074
Log likelihood	2114.154	Hannan-Quinn criter.		-5.703724
Durbin-Watson stat	2.785531			

Table 5

**Results of the regression with FTSE index as endogenous variable,
during the crisis**

Dependent Variable: DL_FTSE				
Method: Least Squares				
Date: 10/12/10 Time: 09:49				
Sample (adjusted): 2 741				
Included observations: 740 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DL_DOW	0.529078	0.027918	18.95120	0.0000
DL_NIKKEI	0.310067	0.022847	13.57173	0.0000
R-squared	0.482623	Mean dependent var		0.000152
Adjusted R-squared	0.481922	S.D. dependent var		0.017882
S.E. of regression	0.012871	Akaike info criterion		-5.865028
Sum squared resid	0.122253	Schwarz criterion		-5.852577
Log likelihood	2172.060	Hannan-Quinn criter.		-5.860227
Durbin-Watson stat	2.849046			

Table 6

**Results of the regression with Nikkei index as endogenous variable,
during the crisis**

Dependent Variable: DL_NIKKEI				
Method: Least Squares				
Date: 10/12/10 Time: 09:52				
Sample (adjusted): 2 741				
Included observations: 740 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DL_DOW	-0.127232	0.048839	-2.605119	0.0094
DL_FTSE	0.644158	0.047463	13.57173	0.0000
R-squared	0.237172	Mean dependent var		0.000658
Adjusted R-squared	0.236139	S.D. dependent var		0.021226
S.E. of regression	0.018551	Akaike info criterion		-5.133873
Sum squared resid	0.253979	Schwarz criterion		-5.121422
Log likelihood	1901.533	Hannan-Quinn criter.		-5.129072
Durbin-Watson stat	2.486360			

For the crisis period, estimated coefficients related to exogenous variables in the three regressions are:

$$dl_dow = 0,618712 \times dl_ftse - 0,071619 \times dl_nikkei$$

$$dl_ftse = 0,529078 \times dl_dow + 0,310067 \times dl_nikkei$$

$$dl_nikkei = 0,644158 \times dl_ftse - 0,127232 \times dl_dow$$

From the three regressions I have deduced the following:

- at an amend of 100 points in FTSE, the Dow Jones has changed in the same direction by 61.8712 points, while a 100 points change in the Nikkei index has printed an opposite change, by 7.1619 points, to Dow Jones;
- a modified 100-point Dow Jones printed, during the crisis, a change in the same direction, with 52.9078 points on FTSE index and a change in Nikkei of 100 index points has led to the modification of FTSE, by 31.0067 points, in the same sense;
- at an increase (a decrease respectively) of 100 points in the Dow Jones index, the Nikkei index decreased (increased respectively) by 12.7232 points, while the amendment to the FTSE by 100 index points, determined a change in Nikkei, in the same direction, by 64.4158 points.

The analysis has demonstrated that the relations between the three indices were stronger during the financial crisis that erupted in mid-2007 than before it.

While before the crisis, Dow Jones changed with 35.6639 points, in the same direction, at a 100 points change in FTSE, during the crisis, the US index changed with 61.8712 points at the same change of the English index. On the other hand, Dow Jones and Nikkei were negatively correlated during the crisis, and the Japanese index had a smaller influence on the American one during the financial turmoil. The negative correlation between the two indexes might be explained by the fact that, along with the outbreak of the crisis, investors began to close positions on the US market and placed their money in securities traded on the Tokyo Stock Exchange.

I found that FTSE index was more strongly influenced during the crisis both by Dow Jones and Nikkei. While before the crisis, the London index changed with 46.2944 points at a 100 points move of the US index, during the turmoil the influence of the American index has reached 52.9078 points, and the relationship between the two indexes remained positive. On the other hand, the influence of Nikkei on FTSE has grown considerably. Before the crisis, the FTSE index rose by 8.7534 points at an advance of 100 points in Nikkei, and during the crisis it changed by 31.0067 points at the same move of the Asian index, the two remaining positively correlated.

Before the crisis, Dow Jones showed a direct significant influence on Nikkei, so that when it increased by 100 points, the Asian index increased by 41.7337 points. During the crisis, however, the relationship between the two indices became negative, so that when the Dow was rising 100 points, Nikkei was falling by 12.7232 points. However, the relationship between the FTSE and Nikkei remained positive during the turmoil, becoming even more intense. Before the crisis, an increase of 100 in the London index determined an advance of 19.6688 points of the Japanese index, and the same change of FTSE induced an advance of 64.4158 points of Nikkei.

The fact that the correlation coefficients were closer to 1 for the values recorded during the crisis than for those recorded before the turmoil also shows that the relations between the three indexes were stronger during the financial turmoil than before it. The correlation coefficients for Dow Jones, FTSE and Nikkei before the crisis were 0.25, 0.21 and 0.12 respectively, while during the crisis they were 0.35, 0.48 and 0.23 respectively.

Conclusions

Stronger correlations between the three indices during the crisis, namely during the decline period, might be explained by the fact that investors panic in

a crisis is much more intense than the feeling of excitement during growth periods.

In times of crisis, panic determines massive sales that lead to the quotations collapse, and bad feelings feed themselves on, as most investors rush to liquidate holdings in order to avoid higher losses. However, in these moments, speculators, who desire to buy at low prices, make acquisitions, so that the supply and demand are balanced.

Acknowledgements

This article is a result of the project „Doctoral Program and PhD Students in the education research and innovation triangle”. This project is co funded by European Social Fund through The Sectorial Operational Programme for Human Resources Development 2007-2013, coordinated by The Bucharest Academy of Economic Studies.

References

- Acharya, V., Richardson, M., *Restoring Financial Stability: How to Repair a Failed System*, John Wiley&Sons, New Jersey, 2009
- Forte, A., Pesce, G., „The International Financial Crisis: An Expert Survey”, *Working Paper No. 24, Southern Europe Research in Economic Studies*, 2009, University of Bari
- Markwat, T., Kole, E., van Dijk, D., „Contagion as a domino effect in global stock markets”, *Journal of Banking & Finance*, 33, 2009
- Mink, M., Mierau, J., „Measuring Stock Market Contagion with an Application to the Sub-prime Crisis”, *De Nederlandsche Bank Working Paper*, No. 217, July, 2009
- Rigobon, R., „International Financial Contagion: Theory and Evidence in Evolution”, *The Research Foundation of AIMR*, August, 2002, Charlottesville, Virginia
- Roubini, N., Mihm, St., „Crisis Economics: A Crash Course in the Future of Finance”, *The Penguin Press*, 2010
- www.nyse.com
- www.tse.or.jp
- www.londonstockexchange.com

The Decision to Invest and Economic Growth. Romania's Case*

Raluca Andreea POPA

Bucharest Academy of Economic Studies
raluca.popa@economie.ase.ro

Matei CRĂCIUN

Bucharest Academy of Economic Studies
mateibc@yahoo.de

Abstract. *Over time there was a diverse and continually evolving methods of business development beyond the country of origin, from the traditional export with the center to the complex leading to today's concept of international investment. The level of humanity development known today results from an ongoing investment in various forms. Different ways of measuring the efficiency of investment and investment level were the subject of discussions since the beginning of economic science, leading today that investment hold a great significance because of the dynamics of the economic development and economic growth, and also because of the great inequalities, given by the information asymmetry. In this paper we first proposed to explore the determinants of investment that lead to making the investment decision and in the second part we analyze the competitive economic environment with regard to Romania and its implications for economic growth and investment decision.*

Keywords: investment decision; competitiveness; economic growth.

JEL Codes: 8B, 8E, 10H.

REL Codes: E21, O11.

* Ideas in this article were presented at the Symposium „The global crisis and reconstruction of economics?”, 5-6 November 2010, Faculty of Economics, Bucharest Academy of Economic Studies.

Introduction

Today investors must cope with a changing investment environment, they are forced by the current contexts designed to adapt more quickly to demand, to react very quickly and chose to act, as have all the powers of leveraging their production processes. All these actions and decisions taken by an international firm have effects on economic growth. Our work aims to capture aspects of an investment, at the level of national competitiveness and economic growth. In the first part of the paper it is presented the concept and current state of knowledge, in the second part is analized investment decision in the companies that operate internationally and in the final part analysis is made of competitiveness of the Romanian economic environment and its impact on growth.

Conceptual framework and current state of knowledge

Over time there was a diverse and continually evolving methods of business development beyond the country of origin, from the traditional export with the center to the complex leading to today's concept of international investment. According to International Monetary Fund and OECD, foreign direct investment is the investment that implies the existence of a eminent trader and a receptor trader located in different national spaces. Regarding foreign investment, we use the definition given by OECD, that foreign investment is part of international investment and refers to the interest held by a resident entity seeking long-term benefits from an entity resident in another economy called receptor unit. This type of investment involves a significant degree of influence over the firm receiving investor. Such a relationship occurs if the foreign investor holds more than 10% of the votes of the receiving entity.

Many studies approach the relevance of the impact of foreign direct investment (FDI) on economic growth. Some authors sustain the positive aspects of FDI impact and others are adepts of the negative aspects.

The decision to invest is reflected in the level of foreign direct investment taking place in a country and the risks assumed by them. These investments influence the development and growth of the country. Many studies approach the relevance of the impact of guiding foreign investment (FDI) on economic growth. Some authors support the positive impact of FDI while others its negative aspects.

For example, the Solow neoclassical growth model of the standard growth suggests that FDI increases capital stock and thus economic growth in the host country, through financing capital formation (Brems, 1970). Endogenous

growth models imply that FDI can promote long-term growth by increasing the existing stock of knowledge in the host economy by creating jobs and skills, on the one hand, and introducing alternative management practices and organizational arrangements, on the other side.

From the theoretical point of view there are several ways in which foreign investment can have an effect on growth. Foreign investment can play an important role in economic growth. Agosin and Mayer (2000) find that FDI in the form of mergers and acquisitions do not necessarily lead to increased capital stock in countries where there is a shortfall in this regard. Gorge and Greenaway (2004) make a critical review of studies regarding the productivity of firms in developing countries, developed and transition. They concluded that only 25 of the studies using appropriate data and estimation techniques lead to the conclusion that there are differences between a company with foreign capital and a national capital, none of them are in developing countries. One of these 25 studies, Aitken and Harrison (1999) for Venezuela, finds negative effects of the presence of foreign investors in the country. Despite these potential adverse effects, empirical analysis shows that FDI has a positive impact on economic growth here giving researchers such as Lim (2001) and Hansen and Rand (2006). Existence and magnitude of the impact of FDI on economic growth ultimately depends on economic and political conditions of the host country such as GDP per capita, human capital, openness, degree of financial market development, political stability.

Investment decision

In a turbulent macroeconomic environment investment decision becomes more difficult, talks about their investment and strategic guidance to the world are becoming increasingly heated. So existing investors and corporate managers worldwide are faced with daily changes at the financial, commercial, technological and policy making more difficult the decision to invest. Thus, regardless of the nature of investment, investment decision always means taking some risks in the hope of obtaining profit.

Theory shows that to be competitive internationally, an investor (company) must have some specific assets such as knowledge, technology, organizational strategies, management or marketing skills. A firm "blessed" with such activities has some alternatives (except for export here) to get additional revenue by creating new subsidiaries, joint ventures, licensing, franchising, management contracts, marketing contracts. However, production at the subsidiary and joint ventures involving various degrees of foreign

presence and force the company to decide where to locate their activities abroad.

All international companies which invest abroad decide to invest only after a rigorous cost-benefit analysis. There is no single way to describe how companies use their own methods of decision-making or public information available, especially those relating to development of certain factors in the host country to reach a decision on the location, control, risk management of new investment. While some investors take into account benchmarks as tariff barriers, risk premiums and the "philosophy", others use the company's strategy to reach the decision to invest. While others believe that the location of investment is usually based on a combination of trial and error, experimentation and the acquisition of past experiences.

The most common way of market penetration is that of mergers and acquisitions. We could say that investors decide to invest in some locations due to clustering effect showing the existence of positive links between existing firms as the incitation appears to be in their vicinity. Another reason why companies are moving into areas where there were clusters, according to Howard J. Shatz and Anthonz J. Venable (2000), is that they are based on the experiences of existing companies which gives them greater confidence.

In a study of the International Monetary Fund (2003), an analysis of the types of investment decisions is made of. Most investors make their decisions based on strategic behavior. Some companies, especially banks and managerial those in the mining, use a decision-making from the top down, where the executive departments analyze the overall management of the investment not taking into account the decision taken in consultation with its subsidiaries, realizing decision centers. It is carried out a study of geographical and demographic location of new investment including market size, input availability, distribution of income etc.

Other investors reference that very important for decision to invest is autonomy saying that the decision to invest should belong to the executive department of each subsidiary company. Thus each flow business will operate as an autonomous part. Parent company can provide advice and guidance to the decisions if requested. Other investors, especially those in the manufacturing sector, identify a hybrid form of decision making, thus taking account of the parent company's approval each branch can develop their own investment plans. Thus, each branch may have a different strategic purpose. In this way, the decision to remain centralized while investing ideas, financing, investment management is decentralized.

Many economists have studied various aspects of the decision to invest. David Wheeler and Ashoka Mody (1992), in their study, examine the decision

of international investors in terms of a wide range of indicators. Thus the two indicators divided in five classes (classical variables, the economic benefits of agglomeration, geopolitical risk, risk indicators of local and political variables, indicators of host country openness to foreign investors) Further analysing these indicators, the authors found relevant that foreign investors give great importance in their decisions to the benefits provided by economic agglomerations, on the one hand, and is also a strong emphasis indicates a combination of risk factors and the classics. The decision to invest depends on a balance between these indicators. Investors seem to prefer a quality infrastructure than tax incentives data. Relations with neighbors have a modest impact on the decision to invest a little more impact than having the relationship with the West but the removal of these two indicators do not affect the model itself.

In their study Yuko Kinoshita and Nauro F. Campos (2003) carried out a model that explains the decision to invest in terms of location. They examine 13 indicators that firms take into consideration when deciding to invest in another location demonstrating that institutions, natural resources and economic agglomerations are the most important determinants. The findings show that a more open economy HitPark contribute to a greater number of FDI inflows. Market size and labor costs are key factors in the decision to invest. A 1% increase in GDP leads to an increase of 0.1% FDI levels per capita that is because investors are attracted to a larger size of the local market. Abundance of resources is also a factor in the decision to invest.

We can say that as a country has a higher level of resources is even more attractive to investors looking for resources. Analysis of the institutional variables in the model shows that a country with a strong manages the institutional environment to attract more foreign investment. Analysis of the institutional variables in the model shows that a country with a strong institutional environment manages to attract more foreign investment. Variables such as level of education and infrastructure have been found significant. But not for all authors of models these variables are insignificant, depending on how advanced technology investment and whether they will need higher qualified workforce.

We believe that investors decide to invest in the host country only if economic fundamentals are strong. Most notable among these are market size and real income level, where there is skilled labor, infrastructure, provision of inputs and other components that facilitate productive activity, they also hang together trade policy, macroeconomic and political stability and other central determinant that we have previously analyzed invetsitor specific basis.

Investment decision, the host country's competitiveness and economic growth. Romania's case

Regarding the strong economic fundamentals in the host country, a role with a high impact on the decision to invest has the competitiveness of the host economy. In the following we intend to conduct an analysis of the level of competitiveness of Romanian economy and the relationship between competitiveness, foreign direct investment and economic growth for Romania.

There are a number of global methods and procedures for determining this level, among which are found some works such as The World Competitiveness Yearbook, prepared by International Institute for Management Development in Lausanne (IMD) and The Global Competitiveness Report issued by the World Economic

World Economic Forum analyzes competitiveness based on 12 pillars and these pillars 12 are divided into three development stages: factor-driven, efficiency-driven, innovation-driven. In its most recent report (The Global Competitiveness Report 2009-2010), WEF ranks Romania as the transition from the second stage (investment - driven stage) in the third stage (innovation driven stage), along with other Central European countries and Eastern Europe such as Poland, Hungary, Latvia, Lithuania, Russia, etc.. Romania ranks 64 in global competitiveness rankings with an average score of 4.11 (overall competitiveness score can range between 1 and 7), and is formed as an average of: Basic requirements, Romania with an average score of 4.10 instead of 86 (last rank 133); Efficiency enhancers, with an average score of 4.25, 49th place (last place in ranking 133); Innovation Factors, with an average score of 3.44, 75th (last rank 119). After analyzing the tables, Romania has recorded a positive development after joining the European Union resulting in the last position exceeded the value recorded before accession, the last seats, currently occupied Latvia, Greece and Bulgaria.

In what follows we analyze the competitiveness of Romanian economy in relation with the EU 25. The central objective of the Competitiveness Index calculation is to compare the situation of Romanian investment environment with the EU - 25. To do this analysis we used the matrix "Hard" performed by the Group of Applied Economics. Matrix "Hard" is based on structural indicators that are found in the Lisbon agenda, grouped by Eurostat in the following categories: general economic environment, employment, innovation and research, economic reform, social cohesion and environment. Taking into account these elements of the Group of Applied Economics Lisbon structural indicators grouped as follows:

- Economic indicators (general economic environment and economic reform);
- Social indicators (employment and social cohesion);
- Technology Indicators (innovation and research).

After weighting these three indicators to arrive at a formula to calculate the competitive index (CI) (sum of weights is utilize sum to 100). Each of these indicators are calculated as weighted averages of selected variables within each group. In the following we present the weights used for these three indicators:

▪ **Economic indicators (I_E):**

E1 - GDP per capita	10
E2 - GDP growth rate	10
E3 - Labour productivity	30
E4 - Net exports	10
E5 - Gross fixed capital formation	20
E6 - Net income per capita	20

▪ **Social indicators (I_S):**

S1 – Dispersion of regional employment rates	30
S2 – Employment (total)	40
S3 – Employment - women	10
S4 – Average life expectancy index	20

▪ **Technology indicators (I_T):**

T1 – R & D expenditure as% of GDP	40
T2 – Employment in high technology sectors	30
T3 – Tertiary Education specializing in advanced technology	30

This leads to the following calculation model for the three indicators:

$$I_E = \frac{10 E1 + 10 E2 + 30 E3 + 10 E4 + 20 E5 + 20 E6}{100}$$

$$I_S = \frac{30 S1 + 40 S2 + 10 S3 + 20 S4}{100} \quad I_T = \frac{40 T1 + 30 T2 + 30 T3}{100}$$

Competitiveness index, I_C, is given by the weighted average of the three as follows:

$$I_C = \frac{40 I_E + 30 I_S + 30 I_T}{100}$$

The value of these indicators calculated by the method presented above is as follows:

Table 1

	Romania					EU - 25				
	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
Economic index	-86.51	-239.63	-161.1	-275.62	6.85	103.75	104.78	105.73	111.44	103.28
Social index	79.18	77.58	80.33	80.29	80.3	95.51	97.04	97.47	97.28	97.36
Technology index	25.85	25.39	27.67	29.02	28.4	103.74	102.38	103.02	105.17	106.27
Competitiveness index	-3.09	-64.96	-32.04	-77.45	35.35	101.28	101.74	102.44	105.31	102.4

Source: Eurostat.

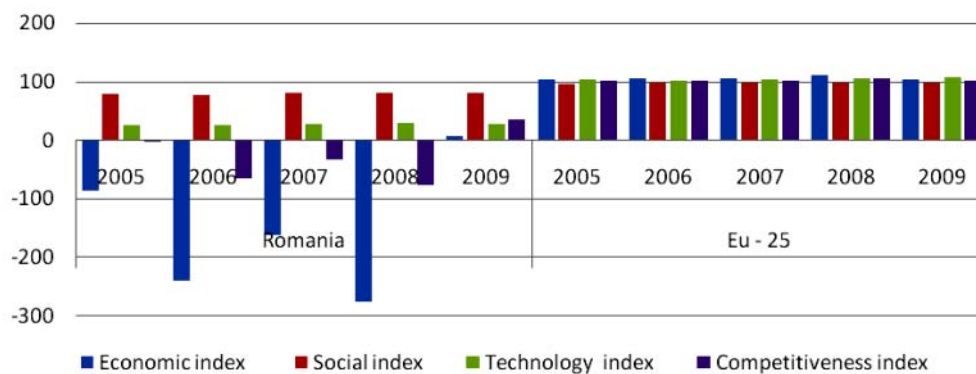


Figure 1. The evolution of IE, IS IT and IC for Romania and the EU (2005-2009)

As shown in Figure 1, Romania's competitiveness index is negative in relation with the EU-25. Given the model structure by which index of competitiveness was calculated, the main reason why the values showed a negative trend is mainly due to economic index, except for 2009, when it recorded a positive value, and it is observed that, by default, the competitiveness index registered this year a positive value but significantly less than the amount registered in the EU.

Next we will analyze the evolution of the indicators are part of the model, for we can get a broader picture of the competitiveness of Romanian economy.

Table 2

Evolution of indicators of competitiveness index

Economic Indicator	Romania					EU - 25				
	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
GDP per capita	35	38.4	41.6	43.5	41.2	104.1	103.9	103.07	103.4	102.5
GDP growth rate	210	246.87	217	1042.8	169.04	95	96	100	85.71	100
Labour productivity	36	39.6	43.3	50.2	48.2	104	103.9	103.7	103.3	103
Net exports	-1457.1	-3050	-2316.6	-4333.3	-590	114.28	125	133.33	200	110
Gross Fixed Capital Formation	118.5	123.67	141.78	151.18	134.03	100	99.51	99.53	99.05	100
Net income per capita	1.02	1.15	16.81	18.91	17.82	106.06	106.11	105.39	108.64	105.65
Social Indicator	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
Dispersion of regional employment rates	37.81	31.57	41.44	42.85	44.95	86.54	89.47	90.99	91.07	92.66
Employment	98.05	98.67	98.07	97.7	97.07	98.64	100.27	100.19	100.03	99.67
Employment - Women	102.42	102.69	101.68	100.36	98.97	99.81	99.79	99.85	99.92	100
Average life expectancy index	91.89	91.85	92.49	91.61	90.46	100.57	100.56	100.54	99.78	98.47
Indicator Technology	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
R & D% of GDP	22.52	24.32	28.1	30.52	30.52	100.54	100.54	100.54	100.52	102.62
Advanced Education with a specialization in research	36.6	25	25	25	21.21	120	115.62	118.75	121.87	118.18
Advanced Education with a specialization in research	19.54	27.19	29.78	31.04	32.75	91.75	91.58	90.6	94.68	99.24

GDP per capita is one of the most significant indicators of the competitiveness of the national economy in which economic growth reflects. It can be noticed significant differences in per capita GDP in Romania and the EU-25. In 2008 GDP per capita has also improved reaching 43.5% of EU

average (GDP expressed in purchasing power parity), but in 2009, it decreased, reaching 41.2% of the average European Union because of economic crisis. High values for growth rates of GDP are associated with good performance of the national economy. Since 2004 the Romanian economy has risen above the average economic growth of European Union countries. This was due mainly to increased consumption, leading Romania to economic growth "on duty", so making their presence felt in 2009, when Romania was one of the most powerful economic setbacks in the European Union. In the period 2005-2008 investments were a direct driver for growth of Romanian economy, leading to increased technology transfer leading to increased competitiveness of Romanian companies internationally.

Labour productivity measures the efficiency in obtaining the use of human capital GDP. With labor productivity in some way we can see the level of competitiveness of the economy compared with other economies. Romania's peak was 50.2% in 2008, then in 2009 recorded a 2% decline the previous period. There are several reasons which justify the low level of productivity of the Romanian economy, but the main issue is the lack of investment in new technologies, many of them have expired lifetime.

Absolute value of net exports has little relevance when used in comparative analysis, therefore, usually expressed as a percentage of GDP. In addition to the indicator GDP, per capita, net exports are an indicator of where we want to see how competitive is national economy. Competitiveness of an economy is given by the degree to which goods and services produced in that country meet the test of international markets. Romania has a high trade balance difficult, and this is also the main reason for the negative values of the Competitiveness Index, with the exception of 2009, when it declined due to weaker domestic demand for goods originating from abroad and not due to an increase of competitive.

Gross fixed capital formation in the national economy is the value of goods purchased by resident producer units to be used for at least a year in production and services incorporated in the bodies of the value of fixed capital. For comparative analysis between the economy, the greater is the ratio of gross fixed capital formation and GDP the more attractive is that economy for investment. High value is perfectly justified, because Romania is an emerging economy with high growth potential, is therefore attractive to foreign investors. It should be noted that it will take some time before these investments will be reflected in GDP growth.

Employment is calculated as a percentage of the total population. This indicator is particularly important in terms of competitiveness of an economy, because, considered together with the GDP we can draw a conclusion about the

productivity level, of the human capital efficiency. Also, this indicator is useful when you want to see how economic activity is presented in a given country. Romania is at a level closer to the EU average in terms of employment, the difference is less than one percent (Romania - 43.00% and 43.73% EU-25 in 2009). Also, it is apparent that the economic recession of 2009 had a negative effect on employment, falling by an average of one percent from the previous year. Average life expectancy index is an indicator of quality of life. Influences on this indicator are multiple, they can leave from the level of GDP, per capita, the quality of health care system, and reach the level of criminality. Also, you can not achieve a high level of competitiveness with a population living at subsistence limit. In Romania, the index of the average life expectancy is 73.5 years and for the euro area the average age is 80.89 years in 2009.

According to European Union's new strategy, expenditure on research development, along with other factors that enter into the composition of total factor productivity are considered as the main engines of sustainable growth. Investing in research and development and education is a necessary pillar in terms of real convergence with European Union countries because investment accelerates the process of catching up. Expenditure on research development in Romania are the fourth of the average costs incurred by European Union countries. Even if the commitment assumed by Romania through the Accession Treaty was to spend 1% of the public budget for research and the development and to facilitate private development project expenditures by 2% of GDP, this is far from being realized. The average level of research expenditure to GDP development in the last three years was 0.5% of GDP. This indicator shows how "concerned" is an economy with research development. Also as the percentage of employment in high tech sectors and total employment is higher so the economy recorded a higher level of competitiveness. Disappointing is the fact that in Romania the number of people working in high technology-intensive sectors is very low in comparison with the average European Union countries. In Romania, only 0.07% of total employed population works in technology-intensive sectors. If in the Eurozone the number of people employed in high technology has remained constant in 2009 (first year of economic recession), in Romania the number number of people employed in high setoare decreased from 0.08% in 2008-0, 07% in 2009.

Indicator advanced specialized tertiary education in research refers to the number of students with advanced research studies, the total number of students. It also has a special importance for longer time horizons, because investment in education will increase the quality of a nation's future generations. In Romania, only 1.7% of total number of students are in advanced

studies in research, while in the Eurozone more than 5% of students have advanced studies in research.

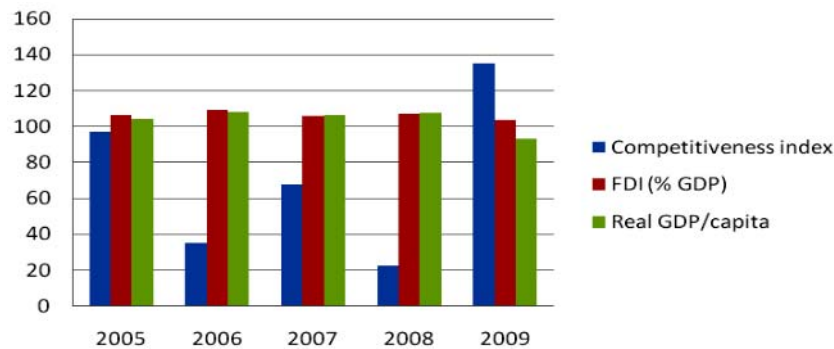


Figure 2. Evolution of FDI, economic growth and competitiveness (2005-2009)

Continuing with the analysis, it is illustrated in Figure 2 that there is a synchronous development of foreign direct investment, level of competitive and growth for Romania. Dunning noted that FDI interact with existing competitive advantage while the host country and influence the future competitive advantage. John Dunning has made an adaptation of Michel Porter's diamond (diamond competitive advantage), demonstrating the influence of FDI on the four facets of the diamond and on government actions and mentality of the host country entrepreneurs. Porter's conclusion is that success or failure of international companies in a given area is the result of combined action of all factors to which we referred in the process. The four elements creates the environment in which national firms appear and compete. The economic policy adopted by governments can positively or negatively influence each of the components business. These influences are manifested through subsidies, tax policy, antitrust policy, education policy etc.

Conclusions

FDI contribution to the development of a country is straightforward: transnational company established branches and subsidiaries that directly increase the level of investment in the host country and increase the productive capacity and decrease unemployment. FDI can also bring additional benefits in the form of technology transfer, managerial and marketing strategies. FDI can increase access to foreign markets because international companies are investing distribution channels of goods from one country to other markets. For

developing countries, the contribution of foreign investment the development is strengthened by the transfer of technical knowledge, organization and management. Joseph E. Stiglitz (2008) argues that the main cause of all negative effects of FDI and hence the companies that operate internationally is that they operate for profit, are not acts of charity, hence the strength and their weakness. Money is a strong motivation and desire to win can bring benefits society. When things go wrong, they can mobilize very many resources, can spread the most advanced technologies and contribute to the development of markets available exponentially. Recognition of these advantages by host countries, noting that foreign investors do not always bring benefits but also negative aspects which we discussed earlier, it has prompted them to strengthen their legal framework, the institutional as well as various advantages that can attract foreign investment. But FDI flows to host country depends on investment decisions made by international companies investing are determined by several factors. Knowledge management plays a key role as decision maker in the global economy. Information flow, information technology, learning, working and sharing their knowledge are embedded in both economic level of a country (see „Lisbon Strategy”) and at the enterprise level.

Acknowledgements

Research Financed by UEFISCSU, Project No. 180, 2009, IDEI.

References

- Agosin, M.R., Mayer, R. (2000). „Foreign direct investment in developing countries”, *UNCTAD Discussion Paper*, p. 146
- Aitken, B.J., Harrison, A.E., „Do domestic firms benefit from direct foreign investment? Evidence from Venezuela”, *American Economic Review*, 1999
- Alfaro et al. (2004). „Who, using a linear interaction model, find that the development of local financial markets is an important pre-condition for a positive impact of FDI on growth”
- Alfaro, L., Chanda, A., Kalemli-Ozcan, S., Sayek, S., „FDI and economic growth: the role of local financial markets”, *Journal of International Economics*, 64, 2004, pp. 89-112
- Brems, H., „A growth model of international direct investment”, *American Economic Review*, 60, 1970, pp. 320-331
- De Mello, Jr., L.R., „Foreign direct investment in developing countries and growth: A selective survey”, *The Journal of Development Studies*, 34, 1997
- Dunning, J.H. (1993). *Multinational Enterprise and the Global Economy*, Edison-Wesley Publishing Co., Wokingham, England, p. 287
- Eurostat - http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database

- Gorg, H., Greenaway, D., „Much ado about nothing? Do domestic firms really benefit from foreign direct investment?”, *World Bank research Observer*, 19, 2004, pp. 171-197
- Hansen, H., Rand, J., „On the causal links between FDI and growth in developing countries” *The World Economy*, 29, 2006, pp. 21-41
- Howard, J.S., Anthony, J.V. „The Geography of International Investment” *The World Bank Development Research Group*, 2000
- Iacovoiu, V., „Motivațiile companiilor multinationale de a investi în economiile în tranziție”, *Buletinul U.P.G. Ploiesti*, LVI (3), 2004, ISSN 1221-9371
- IMF, „Balance of Payments Manual”, pp. 86-p.101
- Institute for Management Development – „World Competitiveness Yearbook”, <http://www.weforum.org/en/index.htm>
- Lim, E.-G., „Determinants of, and the relation between, foreign direct investment and growth: a summary of the recent literature.”, *IMF Working papers*, 2001
- OECD, „Benchmark definition of Foreign direct investment”, Ediția a treia
- Porter, M.E. (1990). *The Competitive Advantage of Nations*, The MacMillan Press Ltd., London
- Stiglitz, J.E. (2008). *Mecanismele globalizării*, Ed. Polirom, București
- Wheeler, D., Mody, A., „International investment location decisions”, *Journal of International Economics*, nr. 33, 1991
- World Economic Forum – The Global Competitiveness Report <http://www.weforum.org/en/media/publications/CompetitivenessReports/index.htm>
- Yuko, K., Nauro, F.C., „Why does FDI go where it goes? New evidence from the transition economies”, *William Davidson Institute Working Paper*, nr. 573, 2003

Economic Crisis Perspective between Current and Forecast*

Cristina BURGHELEA
“Hyperion” University, Bucharest
crystachy@yahoo.com

Abstract. *Almost every field of human activity there are concerns about disruptions that may occur within it and, therefore, investigates the causes, mode of occurrence and manifestations of their consequences. Crises are such failures. They have major implications in everyday life people, with unintended consequences almost always follow.*

Keywords: financial crisis; economic growth; macroeconomic analysis; global impact; the labor market.

JEL Codes: O11, E31, J20.

REL Codes: 10I, 10J.

* Ideas in this article were presented at the Symposium „The global crisis and reconstruction of economics?”, 5-6 November 2010, Faculty of Economics, Bucharest Academy of Economic Studies.

1. Introduction

Crises have characterized financial markets, both in times of economic integration and disintegration in the economy. Crises create inequalities and financial transfers between different social groups. Thus, participants receive important financial sector's privileged capital gains and small losses incur true.

Crises that affected several economies, most of them emerging during the past two decades, led to the emergence of different models, some of them ex post attempt to capture the causes of crises, without having a high degree of effectiveness in preventing future crises. However, they are a starting point in building approach aimed at anticipating crises. Crises have the same effect on all classes of people and this despite the negative overall impact. Crises affect particularly disadvantaged by negative shocks to income and employment level of employment, rising inflation, relative price changes and reducing public expenditure.

2. Impact of crisis on the economies of the European Union

As parts of the economies of the European Union are interconnected and trade exchanges between them are strong effects of the crisis have spread extremely rapidly in all these economies.

The financial crisis has hit various Member States with a different degree. Ireland, the Baltics, Hungary and Germany are likely to present this year clearly exceed the EU average contractions of -4%. In contrast, Bulgaria, Poland, Greece, Cyprus and Malta seem to be less affected than most.

The level at which the financial crisis has affected individual EU Member States depends largely on their original state and associated vulnerabilities.

In the current crisis GDP growth and private components of domestic demand (household consumption, residential investment and business fixed investment) have fallen more quickly than in previous crises⁽¹⁾.

A first vector that causes the phenomenon of crisis is the level at which the real estate market was overvalued and oversized construction industry. Strong increases in real housing prices have been observed over the past decade, the United Kingdom, France, Ireland, Spain and the Baltic countries, and in some cases this was associated with buoyant construction activity – with the glaring exception of the United Kingdom where prevailing zoning laws ruin. What was projected contraction in GDP – around -4.5% – is far below the crisis in history.

Export dependence and the current economy is one of the first steps that led to the outbreak of the global economic meltdown. Countries that export

demand was high and/or accounts recorded surpluses are more exposed to lower global trade (e.g. Germany, Netherlands and Austria). Countries that have large surpluses may also be exposed to adverse effects and correction, balance, in terms of financial assets markets. In contrast, countries that have large deficits could run the risk of capital flow reversals. Some Member States from Central and Eastern Europe are in this category. In some of these cases, the sudden stop of foreign financing forced EU governments to seek assistance, the IMF and World Bank for the balance of payments.

Major failures in the financial sector have been determined by the size of this sector and its exposure to risky assets. Countries that have large financial centers such as Great Britain, Ireland and Luxembourg, are obviously exposed to financial turmoil. In contrast, countries that are based across the border banking activities in emerging economies in Central and Eastern Europe may be more severely affected. European banks' exposure to emerging market risk is higher in some countries (notably Austria, Belgium and Sweden – the last being the most exposed Baltic economies).

Pre-crisis projects have provided a potential slowdown of the European Union at 2% per annum in the next decade, to just over 1% from 2020 on, due to aging. This slowdown is perceived as needing an overall adjustment of the balance of fiscal positions, as has been included in the Stability and Growth Pact – the set of tax rules that EU members have committed.

However, it is difficult to imagine that this crisis would have an impact on long-term potential growth rate in the immediate future, before appearing aging. Financial crises reduce investment opportunities because it is expected that demand will be low, the real cost of higher loan and credit will be granted very slowly. In addition, rising unemployment may prove to be structural, because they can be difficult workers to return to the labor market as the lead industrial organization, not least because wages are falling.

A range of industries, including financial sector and construction industries and machinery, will "right size" in the disproportionate expansion of credit fuel the frenzy. Moreover, productivity growth may be affected by the crisis; however the net impact is ambiguous. Development R & D activity is pro-cyclical, so innovation may be uncertain. But, on the one hand, since large chunks of capital stock may become obsolete, the less efficient parts disappear, and this can have a positive impact on productivity.

Fiscal costs of financial crisis are enormous deterioration of public finances is happening now. The decline in growth potential due to the crisis may add further pressure on public finances. In general countries that have sound fiscal positions to the onset of the crisis may be about 3% of GDP or even less this year and next.

The growing deficit, rising two floors of the GDP, will appear in Latvia, Great Britain, Ireland and Spain. UK and Ireland are important financial centers.

Major problem is the rapidly increasing public debt. Increasing public duty, nearly 20% of GDP by the end of 2007 until the end of 2010 is typical for an episode of financial turmoil⁽²⁾.

Like other sectors and the labor market in the European Union began to deteriorate considerably in the second half of 2008 continued during the years 2009 and 2010.

Increased internal flexibility (flexibility of oral arrangements, liquidation time, etc.) overlapped with nominal wage concessions to the stability of employment in some firms and industries.

Apparently they failed to prevent even greater losses probably only delaying labor. Even so, the unemployment rate in the European Union rose more than two percentage points and one percentage increase is possible in the next quarter.

According to a survey by the European Commission by the end of 2010 the unemployment rate will increase by 11% (11.5% in the euro area).

Until the financial crisis began in summer 2007 in the EU labor market performed relatively well. The employment rate of almost 68% of the workforce is approaching 70% target set in Lisbon thanks to significant employment rate of women and older people. Significant decline in the rate of non-partisanship has led to an acceleration of inflation. These improvements were driven reforms to increase labor market flexibility and increase the potential for additional work. Important is that in many countries, increasing labor market flexibility has been achieved even easier access to non-standard forms of employment⁽³⁾.

Labor markets in the European Union began to falter in the second half of 2008, worsening during 2009. In the second quarter of 2009 unemployment rate increased by 2.2 percentage points from 6.7% a year earlier. The biggest problems of unemployment were recorded in the Baltic States, Ireland and Spain.

All progress in 2005 was unsuccessful when he got unemployment rate decreased from 9% and in 2005 a year all work has been lost.

The European Commission's report is expected to increase the unemployment rate to 11.5% in the "euro zero" in 2010.

Once you have created 9.5 million jobs in the European Union in 2006-2008, according to the European Commission between 2009-2010 employments fell to 8.5 million. The European Union Commission Women are less affected than men, the crisis hitting the first areas where employees were mostly men, automotive and construction.

Increases in unemployment sector were affected by a contraction in employment falling by 0.3% in the last quarter of 2008 and 0.5% in the first quarter of 2009. This may be due to the effect of discouraging employees.

Global crisis makes its impact felt on the Romanian economy and the new concern of analysts is not whether our country will be affected by the crisis, but when and how it will reach its peak in our country.

Deterioration of macroeconomic indicators, such as current account deficit, inflation and worsening the country's rating outlook led investors to lower interest for the Romanian financial market. Investor interest in the Romanian market declined due to decline in basic macroeconomic indicators.

Macroeconomic Analysis shows that the Romanian economy's evolution in the fourth quarter 2008, global economic crisis began to unfold in Romania⁽⁴⁾.

Thus, in the 4th quarter of 2009 Romania's GDP declined sharply by 7.1% compared to 3rd quarter of 2008. IMF forecasts a growth of 0.5% of GDP in 2010, is a more conservative estimate of between -1% and +1%.

Industrial production decreased 1.6% in November 2009 after a return of 3.5% in October; this volatility is present throughout the whole year 2009. Agriculture has decreased by 11.82% in Q3 2009 to Q3 2008. Construction sector has been considered by the engine of economic growth in 2008, rose by 2.9% in November 2009 after a significant decrease of about 4% between July and October⁽⁵⁾.

Romania's balance of payments deficit was reduced by 68.7% in 2009, following the strong reduction of the imbalance of trade and income balance deficit. As mentioned on the release of the central bank a decisive influence to reduce the current account balance had a trade deficit, which decreased by 64.7% compared to 2008. Current account deficit and trade balance so steep rise to effects such as declining tax revenues and increased unemployment. In November 2009 the foreign direct investment covered 81.6% of current account deficit even though it fell by about 45% over the same period of 2008.

In the first quarter of 2010 an annual inflation rate fell by 0.54 percentage points to 4.20%, falling within the range of ± 1 percentage point inflation target properly. With persistent contraction of consumer demand, good supply of food supply and the national currency's appreciation against the euro, deflation was seen both in the volatile prices and the inflation-adjusted basis⁽⁶⁾.

The disinflation process has produced an adverse effect on unemployment, unemployment rate increased by 77% from 4.4% at the end of 2008 to 7.8% in December 2009. In Q1 of 2010 the unemployment rate rose only 0.2 percentage points from the previous year end.

3. Slowing global economic growth

Global economic growth has been achieved in the last decade of the following countries: Brazil, Russia, India, China and the US not least, an important contribution. However, a weak financial system in coming years removed from the US among countries that have adopted economic growth, remained the hope that other countries could restore economic disaster. Contrary to the countries mentioned above but the economy slows as a result of the crisis felt by consumers.

Such loans in Russia that supported the needs of consumers have been reduced.

In India, the employment offered by the subsidiaries of Western financial companies has begun to decline.

In China, property prices decrease consumers to alert them to reflect a longer time on possible acquisitions.

In Brazil, for example, export prices of raw materials have reported a significant decrease.

Unlike growth in European Union countries, growth in Brazil, Russia, India and China are going much faster.

Slowing global economic growth has changed the ranking of the largest economic powers on the basis of GDP expressed in dollars, and the recession has propelled China into the second position in the world now in 2010 at the expense of Germany and Japan.

US retains its leadership position in terms of Gross Domestic Product with a turnover of 14.334 billion US dollars in 2008, \$ 14,571,000,000 in 2009 to \$ 13,808,000,000 in 2007.

Britain has fallen in the rankings of the largest economic power, due to recession and massive depreciation of the pound sterling against the euro.

Japan has maintained second position in the world in 2009 with GDP estimated at \$ 4,803,000,000 to \$ 4,844,000,000 in 2008. In 2007 GDP was \$ 4,382,000,000.

In 2010 Japan was overtaken by China became the second economic power in the world.

Brazil is ranked 10 in the world in 2007, rising one position per year, one in 2008 and another in 2009.

According to statistics, economic crises and the effects can be truly tragic. Some examples could be the increased number of suicides, murders and fatal heart attacks, according to a study from a European publication appeared in "The Lancet".

Each increase in the unemployment rate by 1% leads to a possible increased approximately 0.7% of suicides among the elderly.

But in some cases crisis may have positive effects, because people drive cars less, and decreases the number of road accidents resulting in deaths, with 1.39%.

Another positive effect of the current crisis is to reduce pollution in major cities around the world by burning fewer emissions. Lower real estate prices: the boom of the last three years on the housing market turned Romania into one of the most expensive markets in Central and Eastern European region. The crisis ended this "bubble", bringing housing prices down to earth.

Increased interest on deposits: "We'll meet soon too real positive interest rates on bank deposits". Currently, bank interest reached values very attractive to those who have cash, "said Mihail Ion, President of the investment management company Raiffeisen Asset Management. Banks have enough to pay interest over 20% for those with substantial amounts in lei they want to "store" them.

In this time of crisis you can buy a company with 500,000 Euros on the stock exchange crisis of the Bucharest Stock Exchange has made more accessible to small investors. Stock prices fell as much as 500,000 Euros would be enough for an investor to buy the smallest company on the stock market, Energopetrol Cămpina (ENP), which performs construction-assembly and installation. With the same money, an investor could buy the stake from the manufacturer of enamel pots Ves Sighișoara (VESY), recently promoted to RASDAQ market share.

The market is full of bargains and cheap assets: for companies interested in strengthening market position through the acquisition of players, the crisis has generated one of the most favorable contexts. Now companies can buy assets at prices which two years ago did not dream.

The crisis has taught us how important self-control, confidence and simple things. Witness the history making moments because we lived in 2009 and in 2010 we live in a few years you will find in history books.

4. Forecast for next period

Optimistic forecast before the deepening economic crisis show that over the next two years, it is expected that GDP growth will gradually switch to positive, with increased trade and manufacturing production. After stopping the recession this year, for which there is an almost zero growth (0.1%) in 2011 it is expected to revive economic activity, and on this basis, the gross domestic product growth of 2.4%. These rates take into account the assumption that the

economic environment will improve and international financial market will stabilize, and incentives will encourage investment and private consumption.

In this context, it is necessary to a positive domestic demand (a decrease of 0.5% in 2010 followed by an increase of 2.3% in 2011), with the relaxation of lending and investment supported by resumption of investment. As good as the materialization of such a scenario depends on the capacity to absorb structural funds for Romania, which should have the effect of training in particular with regard to private investment. Therefore, gross fixed capital formation could be related to the levels in 2009 will have a reduction of only 0.5%. For 2011, amid positive developments in the area of savings and credit and the recovery of domestic demand is a positive investment return of the propensity for such developments would contribute to the recovery of gross fixed capital formation, which in turn could increase 3.5%.

The positive developments will lead to labor market orientation to a new equilibrium, with positive implications in terms of increased productivity and incomes of the population according to these developments. It is therefore apparent upward a new line of private consumption in 2010, given that for 2010 was expected to continue its tightening trend, but with a lower rate than in previous years, about 0.6%. It is expected that government consumption will continue to increase, with rates of 0.1% by the end of this year and 1.2% in 2011.

Foreign trade in goods and services was one of the areas where the private sector adjustment, especially in financial and economic crisis, was a remarkable. Amid global economic revival and European, positive contribution to GDP recorded in 2009 (2.6%) was reduced from 0.6% in 2010 because 2011 is expected to be slightly negative (-0.1 %).

It is expected that by the end of this year and the year 2011 to accelerate the investment process, as the share of gross fixed capital formation in GDP to reach the level of 31.4% of GDP, similar to that of 2008. Budget sector adjustment aims to achieve fiscal consolidation and continuation of coverage as large external financing needs through foreign direct investments, which are expected to arrive in 2011 to 3.8% of GDP. One of the sources of financing for investment (gross fixed capital formation) will become domestic saving. Domestic savings will cover a greater proportion of the planned investments will grow from 60% in 2008 to 82% in 2011. In addition, it is expected to increase financing of investments by foreign transfers, including European funds, it will cause an annual reduction in borrowing from external sources to 1.1% of GDP.

Assuming this year to stop the recession and global economic recovery in 2011, exports of goods are expected to grow by 5.5% and imports by 2.8% in 2011 as they will be increased by 6.2% and 4.8%. Thus, the trade deficit will

decrease by 4.3% this year but will increase slightly in 2011. For intra-EU exports are expected to increase by 3.5% below average by the end of the year and 3.7% in 2011, and intra-EU imports of goods will increase by 0.4% and 2.5%. The level of current account deficit will remain at a value between 9 and 10 billion Euros, with its share in GDP of 6.5% in 2010 and 6.3% in 2011.

In these two years, the current transfers balance will experience stabilization at around 5.5 billion Euros, however, helping to mitigate the negative impact of trade balance and income balance deficit on current account. For 2011 it is expected to attract foreign investment worth 5.6 billion Euros. Finance the external deficit will be achieved in a significant proportion, reaching the end of 2011 to 80%. As the level of foreign investment will be steady, it is expected a decreasing trend in the coverage ratio of foreign direct investment while the deficit with substantial increase in the contribution of capital transfers mainly due to the assimilation of the European Union funds.

With the return of economic growth on a slope upward for 2011 are expected population increases by 0.6% and 1%, which makes it possible to improve the employment rate.

In 2011 the gradual reduction of administered price increases, wage policy and the continuation of structural reforms will maintain the disinflation process on a sustainable path. Thus, the inflation rate will fall gradually to the level of 3.2% in 2011.

For prices of industrial production, also foresees a gradual reduction of these to a level of 7%, the annual average in 2011.

In terms of wages following the draft law assumed by the Government it is assumed that the ratio between the minimum basic wage economy and maximum basic salary of staff paid from public funds will increase, the proportion of GDP projected expenditure of public sector staff are will reduce to 7% by 2015 compared to 9.4% as it is today, and the average wage in the period 2010-2015 will be 56% of basic salary as the main element of earning and is accomplished through the inclusion the basic salary bonuses of a general nature, so their share in total earnings not to exceed 30%⁽⁷⁾.

Given that the current economic situation of Romania, forecasts changes from day to day, depending on the changes that the Government takes. From early 2010 until the present crisis measures aimed to: reduce salaries by 25%, decreased the number of public sector employees, reduce pensions by 15%, the government is directing to increase value added tax from 19% 24% to ensure the functioning of the Agreement of 20 billion International Monetary Fund, allowing Romania to fall in the deficit target of 6.8%.

Many economists believe that the decrease in pensions and wages will reduce GDP between 1.5% and 3% this year. A reduced earnings by 25% leads

to a situation where between 60% and 70% of working families with a member state will not be able to cover current consumption needs compared to 25% in the previous period.

With regard to the VAT increase, as in the other cases of discounts the effects are multiple but we are talking mainly to a decrease in consumption, production staff and therefore lead to rising unemployment and increasing consumer prices. This increase in prices (4.2% believe some economists) leads to lower purchasing power of people, so ultimately to higher inflation. Specialists consider that the inflation will increase at a rate of 10%. It was an economic contraction this year.

Conclusions

Humanity is facing a period of increased financial uncertainty. The financial crisis has had an impact on the global economy, edited and produced economic indicators in the economic and financial instability. In addition, the financial crisis changed the ranking of the largest economies in the world according to GDP expressed in dollars.

Initially we looked to the United States of America's compassion on them. The next time the crisis has reached Europe, and many scholars and politicians were wrong forecasting that Romania will not be affected. Companies must understand that the past era of massive consumption and must refocus its business.

The financial crisis has brought waves of bankruptcies, stressed financial jam, blocking investments. Companies must shift their production and to relocate business relationships.

The thing is now the world needs is a rescue operation. To do this, government policy makers worldwide must make moving the credit to stimulate spending.

This task, putting into motion of credit is a very difficult task, but must be met as soon as possible.

After you turn on credit, will be strong need to reform the system so that such crises do not happen again.

Notes

- (1) European Commission, Economic Crisis in Europe: Causes, Consequences and responses, 2009.
- (2) European Commission, Economic Crisis in Europe: Causes, Consequences and responses, 2009.
- (3) European Commission, Economic Crisis in Europe: Causes, Consequences and responses, 2009.
- (4) Financial Stability Report, 2009, www.bnro.ro.
- (5) Ministry of Finance, Report on the macroeconomic situation in 2009 and projection for 2010-2012, www.cdep.ro.
- (6) Inflation Report, the central bank, in May 2010, www.bnro.ro.
- (7) Source: National Commission for Prognosis.

References

- Dinu, M., Marinaș, M, „Transformarea economică a Uniunii Europene în contextul ciclurilor Kondratieff”, *Economie teoretică și aplicată*, nr. 8/2006
- Dinu, M. (2010). *Economia de dicționar. Exerciții de îndemânare epistemică*, Editura Economică, București
- Krugman, P. (2009). *Întoarcerea economiei declinului și criza din 2008*, Editura Publica, București
- Minsk, H. (2008). *Stabilizing an Unstable Economy*, Editura McGraw Hill
- Popescu, C., Ciucur, D., Gavrilă, I., Popescu, Gh. (2008). *Teorie economică generală*, Vol. II, Editura ASE, București