INTERNATIONAL RESEARCH JOURNAL OF FINANCE AND ECONOMICS
http://www.internationalresearchjournaloffinanceandeconomics.com

Publication Ethics and Publication Malpractice Statement

International Research Journal of Finance and Economics is a peer-reviewed international research journal, which aims to publish articles of high quality dealing with issues in international finance and economics which impact on national and global economies. International Research Journal of Finance and Economics provides an international forum for applied research on financial markets, including the bond and equity markets, derivative securities markets, the foreign exchange market, corporate finance, market microstructure and cognate areas.

International Research Journal of Finance and Economics is also concerned with the link between the real and financial sides of the economy, forecasting and recent developments in econometric techniques applicable to financial research. International Research Journal of Finance and Economics relates primarily to experience in the main financial centers of Europe, North America, the Far East and Australasia, as well as issues relating to development finance and the emerging financial markets of the developing world and the transforming economies of Central and Eastern Europe.

International Research Journal of Finance and Economics aims at publishing articles and short research notes particularly in the areas of international economics, economic development, international

finance, international banking and portfolio management, financial economics, international political economy, financial analysis, financial market regulation, financial risk analysis, transition economies, corporate finance, exchange rate modeling, forecasting financial markets, economic policy, monetary and fiscal policy decision-making, portfolio and asset management, pricing and risk of financial instruments, advances in financial econometrics and statistics, and public finance decision-making.

International Research Journal of Finance and Economics is intended to serve as an outlet for theoretical and empirical research in all areas of international economics and finance. These include, but are not limited to the following: trade patterns, commercial policy; international institutions; exchange rates; open economy macroeconomics; international finance; international factor mobility. International Research Journal of Finance and Economics especially encourages the submission of articles which are empirical in nature, or deal with issues of open economy macroeconomics and international finance. Theoretical work submitted to the Journal should be original in its motivation or modeling structure.

Duties of Editors

Confidentiality— Editors of the journal must treat received manuscripts for review as confidential documents. Editors and any editorial staff must not disclose any information about submitted manuscripts to anyone other than the corresponding author, reviewers, other editorial advisers, and the publisher.

Equal Treatment—Editors of the journal must evaluate manuscripts for their intellectual content and their contribution to specific disciplines, without regard to gender, race, sexual orientation, religious belief, ethnic origin, citizenship, or political philosophy of the authors.

Disclosure and Conflicts of Interest— Editors of the journal and any editorial staff must not use materials disclosed in a submitted manuscript (published or unpublished) for their own research without the author's written authorization.

Integrity of Blind Reviews—Editors of the journal should ensure the integrity of the blind review process. As such, editors should not reveal either the identity of authors of manuscripts to the reviewers, or the identity of reviewers to authors.

Publication Decisions—Editors of the journal are responsible for deciding which of the manuscripts submitted to the journal should be reviewed or published. However, editors may consult other editors or reviewers in making such decisions.

Cooperative involvement in investigations—Editors of the journal should conduct a proper and fair investigation when an ethical complaint (concerning a submitted or published manuscript) is reported. Such process may include contacting the author(s) of the manuscript and the institution, giving due process of the respective complaint. If the complaint has merits, a proper action should be taken (publication correction, retraction, etc.). Besides, every reported action of unethical publishing behavior should be investigated even if it is discovered years after publication.

Duties of Reviewers

Confidentiality—Reviewers must consider all received manuscripts for review as confidential documents. Received manuscripts must not be seen by or discussed with others, except as authorized by the journal editors or authorized editorial staff.

Objectivity—Reviewers should conduct their reviews objectively. Criticism of the author's personality or the topic is unprofessional and inappropriate. Reviewers should explain their recommendations clearly and explicitly and provide rational support and justification. Editors Recommendations could be one of the following:

• Accept the publication of the manuscript after compliance with the reviewers' recommendations.

• Consider the publication of the manuscript after minor changes recommended by its reviewers.

• Consider the publication of the manuscript after major changes recommended by its reviewers.

• Reject the publication of the manuscript based on the reviewers' recommendations

Fast-Track Reviews—Reviewers are requested to complete their reviews within a timeframe of 30 days. Reviewers also are free to decline reviews at their discretion. For instance, if the current work load and/or other commitments make it impossible for reviewers to complete fair reviews in a short timeframe (e.g., few days for fast-track review), reviewers should refuse such invitations for review and promptly inform the editor of the journal.

Qualifications—Reviewers who believe that they are not qualified to review a received manuscript should inform the journal editors promptly and decline the review process.

Disclosure—Information or ideas obtained through blind reviews must be kept confidential and must not be used by reviewers for personal benefits.

Conflict of Interest —Reviewers should refuse the review of manuscripts in which they have conflicts of interest emerging from competitive, collaborative, or other relationships and connections with any of the authors, companies, or institutions connected to the manuscripts.

Substantial Similarity—Reviewers should inform editors about significant resemblances or overlap between received manuscripts and any other published manuscripts that reviewers are aware of.

Proper and Accurate Citation —Reviewers should identify relevant published work that has not been cited by the authors. Statements that include observation, derivation, or argument (currently or previously reported) should be accompanied by a relevant and accurate citation.

Contribution to Editorial Decisions—Reviewers assist editors in making editorial publication decisions, and also assist authors in improving their submitted manuscripts, through the editorial communications with authors. Therefore, reviewers should always provide explicit and constructive feedback to assist authors in improving their work.

Duties of Authors

Originality—Authors submitting manuscript to the journal should ensure that this submission is original work and is neither currently under consideration for publication elsewhere, nor has been published as a copyrighted material before. If authors have used the ideas, and/or words of others researchers, they should acknowledge that through proper quotes or citations.

Plagiarism—Plagiarism appears into various types, such as claiming the authorship of work by others, copying and paraphrasing major parts of others research (without attribution), and using the results of research conducted by other researchers. However, any type of plagiarism is unacceptable and is considered unethical publishing behavior. Such manuscripts will be rejected.

Authorship of Manuscripts—Authorship of a manuscript should be limited to authors who have made significant contributions and the names of authors should be ranked by efforts. The corresponding author must ensure that all listed coauthors have seen and approved the final version of the manuscript (as it appeared in the proofreading copy) and agreed to its publication in the journal. Authors can permit others to replicate their work.

Multiple or Concurrent Publication— Authors should not publish manuscripts describing essentially the same research in more than one journal. Submitting the same manuscript to more than one journal concurrently constitutes unethical publishing behavior and is unacceptable. This action leads to the rejection of the submitted manuscripts.

Acknowledgement of the Work of Others—Authors should always properly and accurately acknowledge the work of others. Authors should cite publications that have significant contribution to their submitted manuscripts. Unacknowledged work of others contributing to manuscripts is unethical behavior and is unacceptable. Such manuscripts will be rejected.

Reported objectives, discussions, data, statistical analysis, and results should be accurate. Fraudulent or knowingly inaccurate results constitute unethical behavior and are unacceptable. Such manuscripts will be rejected.

Data Access and Retention— Authors may be asked to provide the raw data in connection with manuscripts for editorial review, and should be prepared to provide public access to such data if possible. However, such authors should be prepared to retain data for a reasonable time after publication.

Hazards and Human or Animal Subjects— If a research study involves chemicals, procedures or equipment that have any unusual hazards inherent in their use, the author(s) must clearly identify these in the submitted manuscript. Authors should also inform participating human subjects about the purpose of the study.

Conflicts of Interest— In their manuscript(s), authors should disclose any financial or other substantive conflict of interest that might influence the results or interpretation of their manuscript.

Copyright of Accepted Manuscripts—Authors of accepted manuscripts for publication in the journal agree that the copyright will be transferred to journal and all authors should sign copyright forms. However, those authors have the right to use of their published manuscripts fairly, such as teaching and nonprofit purposes.

Substantial errors in published Manuscripts—When authors discover substantial errors or inaccuracy in their own published manuscripts, it is the authors' responsibility to promptly inform the journal editors or publisher, and cooperate with them to correct their manuscripts.

Acknowledgement of Indirect Contributors and Financial Supporters—Authors should acknowledge individuals whose contributions are indirect or marginal (e.g., colleagues or supervisors who have reviewed drafts of the work or provided proofreading assistance, and heads of research institutes, centers and labs should be named in an acknowledgement section at the end of the manuscript, immediately preceding the List of References). In addition, all sources of financial support for the research project should be disclosed.

Disclaimer

Neither the editors nor the Editorial Board are responsible for authors' expressed opinions, views, and the contents of the published manuscripts in the journal. The originality, proofreading of manuscripts and errors are the sole responsibility of the individual authors.

All manuscripts submitted for review and publication in the journal go under double-blind reviews for authenticity, ethical issues, and useful contributions. Decisions of the reviewers are the only tool for publication in the journal and will be final.

International Research Journal of Finance and Economics

Contents

A Survey of the Relationship between Economic Globalization and Economic Growth in MENA Countries

Ali Fegheh Majidi
Assistant Professor in Economic
Kurdistan University, Kurdistan, Iran
E-mail: a.f.majidi@gmail.com

Mohammad Omid Akhgar
Assistant Professor in Accounting
Kurdistan University, Kurdistan, Iran
E-mail: m.o.akhgar@gmail.com

Parvin Alimoradi Afshar
Ph.D. Student of Economic

Abstract

Globalization describes the ongoing global trend toward an unrestrained flow of trade and investment across borders which consequently results in the integration of international economy. As it expands economic freedom and competition, globalization is believed to raise the productivity and living standards of people. Therefore, in this paper we investigated the cause of Economic Globalization on Economic Growth in 21 MENA (Middle East and North Africa) countries based on panel data from 1970-2009. The results show that economic growth during this period of time in MENA countries increases as economy globalization increases.

1. Introduction

Globalization has been in the focus of many research works of the present era. Globalization of the economy has been in spotlight of the community. Although there is no agreed-upon definition of globalization, the aggregate theories gives the inference that globalization is a reality in the present world. It is an undeniable phenomenon, with drastic impact on economics, culture and politics. It is a process where the role of geographic distance fades away in economic, political and scientific ties and the network of communications sweep these borders, changing the nature of definitions of culture, society and politics in the international relations. The incipient and evolving nature of this phenomenon entails no clear definition for it. However, researchers and academics have given different interpretations based on their specific vintage point. In a globalized economy, the role played by states is decreased and the level of interdependence among countries in the world escalates. Globalization of the economy is perceived as the opening of the borders and expansion of the trade and acceleration of the pace of industrial developments worldwide, with the impact on the nature of international labor division, increase in the compatibility and interdependence of economies. Globalization is a

multidimensional phenomenon and it has found its way to various aspects of society, economics, politics, law, culture, military, technology and environment. Krugman defines globalization as "more integration of the world markets". International monetary fund deems globalization as "increasing economic interdependence of countries globally through variety and volume of goods and services exchanged beyond borders and widening the domain of technology". Elements of this phenomenon are large multi-national companies. Globalization is the triumph of capitalism and the rule of pure competition globally (Kalbasi and Jalayi, 2002).

Changes wrought by globalization are seen in economics more than other fields. Deepening interdependence of national economies, integration of financial markets, increasing trade and deregulation, dispensing tariffs, and financial boosts, funding international financial institutes such as World Trade Organization with the objective of expanding international trade are among the indications of globalization of the economics. Structural changes in global economies have expanded the supranational economic relations. Vast amount of investments has been capitalized in economies with the opening of financial markets, which has increased large mergers and regional unions. Covert financial markets are linked in a way that a global village in the near future will be inevitable.

The economic side of coin of globalization is important in that in capitalist world, with ambitious plan of ruling the present world, culture and politics have been overshadowed by economic policies which targeted the flourishing in trade and the maximum interest. In fact, globalization of the economy is more an outcome of a series of economic policies of the north countries, especially United States during the recent few decades rather than technology information revolution and advancement of the transportation systems. Due to giant leap in communications and transportation, along with special economic policies in capitalist countries, and imposing similar policies by international economic bodies, three main factors has been the important cause of economic integration of countries, as followings:

1. Expansion of the trade;
2. Direct and indirect foreign investments;
3. Institutionalizing the financial markets.

Part of global trade expansion is indebted to advances in information and communications technology, which has facilitated the exchange of information and decreased the transportation costs, and connected the world through information highways. Advancement of transportation system and its technology has minimized the time and cost of transporting goods and accelerated the trade and increased its volume. Also, greater part of the growth in global trade is wrought by policy decisions of organizations such as GOT and WTO.

Multi-national investments are the main cause of growth of in foreign investments. In early years of economic integration, international trade and tackling legal problems on the way of trade have been crucial in globalization of the economies. In the present world economy, the major players are multi-national companies and ever-growing financial markets. Multi-national companies have hailed the supra-national markets in order to cut the production costs, maximizing interest, and to retain competitive advantage and have invested in countries where the costs of production is low. Consequently, the direct foreign investments have been catapulted.

2. Review of Literature

Weinhold & Rauch (1997) has investigated the relationship between freedom of trade, optimization and economic growth in 39 under-developed countries. The results were indicative of a positive relationship between freedom of trade and economic growth, and also relationship between freedom of trade and optimization has been positive and significant. Stieglitz (2004) has investigated the relationship between globalization and economic growth in Emerging markets. His findings demonstrated that unless well managed, globalization will wreck negative impacts on the economies of developing countries. Lancaster (2004) has examined the relationship between globalization and regionalism in small countries, focusing on the factors of influence on economic growth. He has

counted, among these factors, social capital, economic openness, social cohesion, social power, and political power. Neto (2006) has studies the impact of financial globalization on economic growth of 23 countries in a period 1983-2003. His findings indicated that globalization of the finance has positive effects on growth. Vujakovic (2008) has studied the measurement of the level of globalization. He has used 21 variables to study the measurement of the globalization in a new fashion. His period of the study ranges 1995 to 2005, with 75 countries to be examined. Oxelheim (2009) studied the links between globalization and transparency and economic growth in China in a 2-year period of 2005-2007, with results indicating the positive effect of globalization on growth.

3. Theoretical Underpinnings

In general, countries with more open economies, display higher growth. It is due to the efficiency of competitive environment, gains of privatization, technology flow, and organizational improvements. These countries could absorb global notions in minimum costs. The major gain is globalization welcomed by these countries. Globalization contributes to economic growth through the following channels:

3.1. Technology Transfer

Technology is among the effective factors on economic growth according to exogenous and endogenous models of growth (Romer, 2001). Globalization of the economy has boosted technology transfer and improved quality of life in developing countries. Globalization of the economy provides opportunities for developing countries to engage in integrated system of trade globally, and reap the profits and positive outcomes of expansion of trade, economic growth, and integration to global economy equally with developed countries (Malek, 2005).

3.2. Development of International Division of Labour

There is a belief among the advocates of globalization of the economy that it provides better division of labour, and that with large number of labour force in developing countries, these countries to specialize in production of labour-intensive goods in one hand, and developed countries can improve their present level of proficiency in production of these goods, with labour force enjoying high levels of performance engaged in production on the other hand. So, both groups of countries would benefit from gains provided by international division of labour. With this, and tackling the financial barriers on the way of transfer of investments and financial resources, international division of labour will be increased, with improvements in the performance of international economy (Malek, 2005).

3.3. Increasing Competition

Among the positive impacts of globalization of the economy, is increasing global competition. With cutting transportation costs, advances in IT and electronic trade, economic firms assume all global markets as their own private venue. Increasing competition increases the proficiency of global economy, since competition is deemed as the most important factor in the performance of a system.

3.4. International Trade

Theoretically, globalization favors an approach that prefers open economy over closed economy. Economic openness contributes to dynamism of factors of production internationally and global competition increases performance and economic growth (Daniel, 2000). According to mercantilists, in international trade, with a country profiting from the market, a second country would bear losses. While according to classical theories of economics, all countries engaged in global trade gain simultaneously. According to Ricardian theory of partial advantage, if a country imports goods in the production of which has little advantage, and imports goods which can produce with advantage, both

countries would gain from the exchange. This theory is crucial in advancing the cause of globalization of the economy. According to this theory, international trade increase economic growth and social welfare (Ramadhanpour, 2004).

3.5. Foreign direct Investment

FDI is a potential source of job creation and economic growth. According to new theories of growth such as endogenous growth model, FDI is key factor of economic growth. Investments in human capital, learning through doing, learning through supervision, and increasing output with respect to scale has been emphasized (ALO, 1995). In contrast to theories above unanimous on their verdict on the positive impact of globalization on growth, some economists such as Stieglitz believe that globalization has negative impacts on the economic growth of developing countries. Factors alluded to by these economists are as follows:

3.5.1 Job Creation

According to theory of partial advantage, deletion of barriers in trade, move resources from sections with lower performance towards sections with high performance. This leads to economic growth and, disregarding the distributive effects, increases individual welfare. But in fact, previous jobs are deleted in subsidized industries before creation of new jobs. Resources do not move from lower performance to higher performance, but move from lower performance to zero performance, which contributes to increasing poverty and decreasing GDP (Stieglitz, 2004).

3.5.2. Risk

Globalization would increase risk and consequently, would decrease economic growth. Excluding the exchange rate regime, intense inflow of capital and its outflow poses larger costs to the countries. In fact, firms demand for risk premiums in the face of drastic changes in the price of output and input, which has negative impact on investments and growth (Easterly et al., 1997). Liberating of capital market is systematically related to monetary and financial crises (Demirguc-Kunt and Detragiache, 1998). These crises can be assumed as forms of instability with large costs. In fact, these crises mar the financial system and slow the economic growth (Caprio and Summers, 1996). It should be noted that not only liberalizing the capital market, but also liberalizing trade through drastic changes in prices increase risk. Concerns about bankruptcy pushes firms to the wall and consecutively, brings about economic recess (Stieglitz, 1990)

3.5.3. Why Flow of Capital does not Brings Home Growth?

Economists usually believe that inflow of investments pushes the economic growth of developing countries forward. But a distinction must be made between methods of investments inflow such as FDI and other methods. Little evidence exists indicating that capital market liberalization increase the inflow of capital and hence, bringing about economic growth. Higher risks and capital expenses slows economic growth. Financial capital inflow (or portfolio) causes appreciation of the currency which if not accompanied by real investments, leads to Dutch disease (Stieglitz, 2004).

3.5.4. Facilitating Capital Flight

Outflow of capital is detrimental to economy, especially, if in the form of capital flight. Globalizations improve this phenomenon. Countries such as South Africa and Russia have faced this problem in 1990s (Stieglitz, 2004).

3.5.5. Independence of Monetary Policy

Globalization leads to independence of monetary policy and exchange rate control through liberalizing capital market, with harmful impact on economic growth. An example of this is recent financial crises (Stieglitz, 2004).

3.5.6. Resolution of National Financial Institutions

Financial institutions in developing countries have an unmarked competitive advantage vis a vis international firms. It is obvious that globalization would lead to bankruptcy of many of these national institutions, wreaking havoc on economic growth of developing countries (Stieglitz, 2004).

3.5.7. Globalization and Domestic Political Stability

When international firms such as IMF engage in a country, they impose policies on already fragile political situation of the country. Also, reforms dictated by foreign players are not sustainable. Investors understand this issue well. As a result, globalization would decrease economic growth from this vintage point (Stieglitz, 2004). With large number of theoretical models and experiments studies, there are still disagreements as to the impact of globalization on economic growth. Yet, it seems that a consensus by researchers on the positive impact of globalization on economic growth is likely.

4. Methodology

In theoretical models of growth, economic variables of effect on growth are set according to mechanisms governing the theory. Then, other variables acting on the growth through main variables are incorporated to the model. This procedure is seen in both neoclassical theory of growth (e.g. Weizberg, 2001) and endogenous growth mode. (e.g., Edwards, 1992, 1998).

Oftentimes, in economic studies, the regression for growth model is determined as the following equation:

$$GY = a1 + a2LN(GDP0) + a3Z + e \tag{1}$$

Where *GY* denotes the growth rate of per capita GDP. GDP 0 represents the per capita GDP in the beginning of the period, which is used to carry out a conditional convergence test. *Z* denotes vectors of variables effective on growth. In experimental studies, different variables are used for *Z*, such as physical investments, human capital, and openness of trade, geographical variables, exchange relationship, population growth, government expenditures, direct foreign investments, exchange rate premium, natural resources, institutions and quality of macroeconomic policies. Based on the nature of the research and the country under study, pick the variables and incorporate in the model (Yavari and Salmani, 2004).

In the present study, a model is suggested based on the theoretical underpinnings and studies carried out on the structure of the countries, which is as follows:

$$GY = a1 + a2LN (GDP0) + a3GLOECO + a4Z + e) \tag{2}$$

Where *GLOECO* denotes globalization of the economy and *Z*, is the vector of other effective variables excluding the *GLOECO* which include inflation rate, human capital, gross domestic investment, population growth, and government expenditure. Ultimate form of the model is as the following:

$$G_{i,t} = f(I_{i,t}, POP_{i,t}, G_{i,t}, INF_{i,t}, HC_{i,t}, GLOECO_{i,t}) \tag{3}$$

i=1, 62t=1980, 2000

where $I_{i,t}$, is gross domestic investment vis a vis gross domestic product.

$POP_{i,t}$ is annual rate of population growth.

$GC_{i,t}$ is government consumption expenditure, which is the ratio of government ultimate expenditure to GDP.

$INF_{i,t}$, inflation, which is annual rate of growth, an indirect index of GDP, which denotes the ratio of government consumption expenditure to GDP.

$HC_{i,t}$ human capital, which denotes investments in human capital to increase their output. Due to their future-oriented nature, they are called 'investment in human capital'. Literacy rate has been a proxy for human capital in the present study.

GLOECO$_{i,t}$, economic globalization, denotes a process of economic convergence of countries which improves their presence in the global markets.

The *KOF* index is used as a measure of level of economic globalization. *KOF* index was introduced for the first time by Dreher (2002) and developed further by Gastone and Martins (2008). *KOF* index of globalization includes politics (26 per cent), economics (36 per cent), and social (38 per cent). Economic globalization index consists of two components of 50 per cent of actual flows { weight mean of trade (22 per cent), FDI to GDP (29 per cent), portfolio investment (percent of GDP) (22 per cent), income payments to foreign nationals (per cent of GDP)(27 per cent)}and 50 per cent of restrictions { hidden import barriers (22 per cent), mean tariff rate (28 per cent), taxes on international trade (percent of current revenue) (27 per cent), and capital account restrictions(23 per cent)}. In the present study, both indices are incorporated into the model separately. *i,* denotes number of countries and *t* is years of the study. 21 developing countries form the sample population, examined for 1970-2009. It should be noted that all variable (except for *KOF*) have been used from *IFS* and *WDI*, which denote World Development Index and International Financial Statistics. Countries have been selected based on data available for them. In the appendix the countries have been listed.

As seen in the suggested model, observations in the model enjoy 2 dimensions. In fact, based on experimental research, 3 sorts of data are available:

Time-series data, cross-sectional data, and panel data. In the present study, due to the cross-sectional and time-series nature of data, they fall into third category, i.e., panel data. In the panel data regression, to choose accurate model of estimations, Chow, Breusch-Pagan, and Hausman tests have been used, and based on the results of these tests, the accurate model has been assumed. In the present paper, to do relevant tests, Stata9 and Eviews7, econometric statistical software, have been used. In the next section, results of estimations are presented.

5. Estimation of the Model and Interpretation of the Results
Before doing estimations, tests to be used have been examined in Table 1.

Table 1: The results of tests, Source: calculations of the study.

Chow	F(61,1231)=2.02	*Prob*=0.0000
Breusch-Pagan	*Chi2*(1)=9.88	*Prob*=0.0017
Hausman	*Chi2*(4)=13.45	*Prob*=0.0363

The results of all tests confirm the fixed effects in models of examination. So, through ordinary least squares method, the model is estimated, which is known as least squares dummy variables in the fixed effects model. The results of the estimation are given in the Table 2 below.

Table 2: The results of estimations. Source: findings of the research Comments: time variable has been incorporated to the model to exclude the time trend.

Variable	First regression: political, social and economic globalization		Regression: economic globalization	
	Estimation coefficients	t statistics	Estimation coefficients	t statistics
C	15.08	3.52	2.49	1.51
$I_{i,t}$	0.81	4.49	0.09	4.76
$POP_{i,t}$	0.08	0.21	28	1.41
$GC_{i,t}$	-0.19	-1.71	-0.20	-3.75
$INF_{i,t}$	-0.02	-0.58	0.03	0.75

Table 2: The results of estimations. Source: findings of the research - continued

$HC_{i,t}$	0.29	0.79	0.27	0.75
$GLOEC_{i,t}$	-0.16	-1.89	0.09	3.19
R^2	0.32		0.29	
Prob (F-statistic)	0.000		0.000	

According to the estimations and statistics for *t, F,* and R^2, the models estimated, are accurate models. Also, according to statistics of Dhurbin-Watson, the possibility of autocorrelation among the models is nullified. In growth models, it is stated that increase in investments and labor force is the most important resource of gaining economic growth. In the present study, these two variables have been incorporated into the model. The findings of the study indicate that investments have a significant and positive impact on economic growth of countries in Middle East and Northern Africa. But population growth rate (labor force) has no impact on the growth of these countries. It could be attributed to the higher rate of unemployment and noninvolvement of the population in the labor market. These results are consistent with experimental works of Barro (1994), Levine and Renelt (1992), etc. in most of the experimental work such as Levine and Renelt (1992) and Barro (1994), the negative role of the government on economic growth has been emphasized. For example, Barro (1994) detected a negative and significant effect (-0.13) of government in his study. In the present model, the results predict negative and significant effect of government on economic growth. Similarly, inflation and human capital are not significant statistically, but bear the negative and positive signs predicted for them. The lack of effectiveness of human capital could be attributed to long-term effect of that on economic growth and brain drain (part of investments flight). In the same fashion, inflation rate can wield different effects on economic growth in different economic circumstances. The effect of economic globalization on economic growth is positive and significant, and consistent with theoretical underpinnings of the research. But the effect of globalization on the economic growth is negative, and consistent with Stieglitz (2004).

6. Discussion and Conclusion

The present study aimed at the investigation of the effect of globalization on economic growth. To this end, panel data has been the main tool of the study. Findings indicated that economic globalization has positive and significant effect on the economic growth of MENA countries, but the general index of globalization (including economic, social and political globalization) has a negative effect on the economic growth of MENA countries.

Similarly, gross domestic investment and government consumption has significant effects on the economic growth of countries in the period 1970-2009, with no significant effect of inflation, human capital, and population growth on the economic growth. Findings reflect the fact that movement towards economic globalization is salutary for economic growth, but general globalization along with its components, does not profit economic growth. To attain more growth in society, policies should be adopted to curb the hand of the government in economy, increase investments, and trade.

References

[1]   Azerbaijani, Krim (2002). Globalization, economic-regional convergence and its effect on the growth of Caspian and Caucasian countries, Journal of Economic Research, no 61, pp. 149-169.
[2]   Barro, Robert J. (1991), Economic growth in a cross section of countries, The Quarterly Journal of Economics, PP. 407-443.
[3]   Barro, Robert. J. (1994), Democracy and Growth, Working Paper, No. 4909.

[4]   Caprio, G., & Summers, L. (1996). Financial reform: Beyond laissez faire. In P. Dimitri (Ed.), Stability of the financial system. Macmillan.

[5]   Daniels, John. D, Emerging Economies and the Challenge of Globalization, Globalization the Multinational Firm, Volume 10, 2000.

[6]   del milagro del Este Asiatico, (1997). (with English summary) *Desarrollo Economico*, *37*(147),, October–December, pp. 323–349.

[7]   Dreher, Axel, (2006). Does Globalization Affect Growth? Evidence from a new Index of Globalization, Applied Economics 38, 10: 1091-1110.

[8]   Dreher, Axel; Noel Gaston and Pim Martens, (2008). Measuring Globalization - Gauging its Consequence, New York: Springer.

[9]   Easterly, W. et al. (1993). Good policy or good luck? Country growth performance and temporary shocks (National Bureau of Economic Research Working Paper: 4474).

[10]   Easterly, W., Loayza, N., & Montiel, P. (1997, November). Has Latin America's post-reform growth been disappointing? Journal of International Economics, 43(3/4), 287–311.

[11]   Gordji, Ebrahim and Masoumeh Alipourian (2006).An analysis of the impact of trade liberalization on economic growth of OPEC countries, Commercial Research Quarterly, no. 40, pp. 188-201.

[12]   ILO, World Employment Report 1995, geneva.

[13]   ILO. Yearbook of Labor Statistics, different years.

[14]   IMF, World Economic Outlook, Washington, D.C, 1997.

[15]   IMF: Direction of Trade Statistics; New York.

[16]   Kalbasi, Hassan and Seyyed Abdolmajid Jalayi (2002).Investigation of the effect of globalization on foreign trade of Iran. Economic research Quarterly, no 11.

[17]   Karbasi, Alireza and Mehdi Piri (2009).Examination of the relationship between trade liberalization and economic growth in Iran. Journal of Science and Development, no. 27, pp. 145-160.

[18]   Krugman, P. (1994, November–December). The myth of Asia's miracle. Foreign Affairs, 73(6), 62–78.

[19]   Levine, Ross and Renelt, David. (1992), A Sensitivity analysis of cross-country growth regressions, The American Economic Review, Vol. 82, No. 4, PP. 942-963.

[20]   Loayza, Norman and Soto, Raimundo. (2002), The sources of economic growth: An overview, Working Paper

[21]   Newbery, D., & Stiglitz, J. (1984, January). Pareto inferior trade. Review of Economic Studies, 51(1),1–12.

[22]   Ramadhanpour, Ismael (2005). Economic globalization and its impact on employment.Journal of economic research, no 68.

[23]   Stieglitz, Joseff (2004). Globalization and its issues.Transl. into Persian by Hassan Golriz, Tehran, Ney Publications.

[24]   Stiglitz, J. (1996). Some lessons from the East Asian miracle. *World Bank Research Observer*, *11*(2), 151–177.

[25]   Stiglitz, J. (1999, November). Trade and the developing world: Anewagenda. Current History, 98(631), 387–393.

[26]   Summers, L. (1981), 'Taxation and corporate investment: A q-theory approach', Brookings Papers on Economic Activity 1(1), 67—127.

[27]   World Bank (2008), World Development Indicators, CD-Rom, Washington, DC.

[28]   World Bank. (1994). The East Asian miracle. Oxford and New York: Oxford University Press for the World Bank.

[29]   World Bank. (1997). World development report: The state in a changing world. Oxford and New York: Oxford University Press for the World Bank.

[30]   World Bank. (1999). World development report: Knowledge for development. Oxford and New York: Oxford University Press for the World Bank.

[31]   World Bank. (2001). World development report: Attacking poverty. Oxford and New York: Oxford, University Press for the World Bank.

[32]   Yavari, Kazem, Shaqaqi Shahri, Vahid and Reza Najarzadeh (2005). Economic-regional convergence and its effect on foreign direct investment and economic growth (case study of MENA countries). Economic research Quarterly, no. 3, pp. 68-89.

[33]   Yavari, Salman and Kazem Yavari (2004). Trade policy and economic growth: the case study of OPEC members, Commercial Research Quarterly, no 30, pp. 39-68.

Threshold GARCH Modeling of the Relationship between Output Volatility and Output Growth: An Application for Turkey

Serpil Türkyılmaz

Bilecik Şeyh Edebali University, Department of Mathematics
Faculty of Arts & Sciences, Bilecik, Turkey
E-mail: serpil.turkyilmaz@bilecik.edu.tr
Tel: +90-228-2141486; Fax: +90-222-2160080

Mesut Balıbey

Bilecik Şeyh Edebali University, Department of Mathematics
Faculty of Arts & Sciences, Bilecik, Turkey
E-mail: mbalibey@tunceli.edu.tr
Tel: +90-228-2141486; Fax: +90-222-2160080

Abstract

In this study, the empirical relationship between output volatility and output growth is examined by using AR(3) TGARCH(1,1)-M model over the period 2002:01-2011:09 for Turkey. Firstly, the findings imply that the "in-mean" coefficient is statistically significant and output volatility affects output growth. Secondly, the empirical results support evidence of asymmetry between output volatility and output growth. Finally, the Granger Causality Test Results indicate that bidirectional causality exists between output volatility and output growth.

Keywords: AR(3) TGARCH(1,1)-M Model, Asymmetric Effect, Granger Causality Test, Output Volatility.
AMS 2010: 91B84, 62M10.

1. Introduction

In recent years, the issue of the impact of volatility on economic growth has gained importance. In addition, much attention has been focused on researchs about relationships between output uncertainty an output growth. However, there is significant controversy about whether and how output uncertainty affects output growth.

Empirical evidence that gives mixed results concerning the relationship between output volatility and output growth can be drawn from the results of various studies. Pindyck (1991), Ramey and Ramey (1995), Martin and Roger (2000), Kneller and Young (2001) find that there exists a negative relationship between output volatility and output growth. Henry and Olekalns (2002) find evidence in favour of a negative association using post-war GDP data for the United States stemming from investment irreversibilities at firm level also. Caporale and McKiernan (1996) find a positive relationship between output growth and it's volatility for both the U.K. and the U.S.. Fountas and Karanasos (2006) find a positive relationship for Germany and Japan but not for the U.S. based on cross-country evidence data also. Blackburn (1999) indicated that volatility raises the long-run

economic growth. Speight (1999) find no relationship between output variability and growth by using GARCH in mean models for post war monthly UK industrial production data. Hamori (2000) examined the existence of asymmetry between output volatility and growth in the United States, United Kingdom and Japan by using GARCH, TGARCH and EGARCH models. He couldn't find evidence of asymmetry. Bhar and Hamori (2003) examined the relationship between output volatility and economic growth for Japan using a Markov Switching model. Fountas, Karanasos and Mendoza (2004) showed that output variability does not affect output growth. In addition, asymmetric impact was not found. Rebello (2005) indicated that the evidence of the impact of real uncertainty on output growth was ambiguous. Fang and Miller (2008) accounted for the possible effects of structural change in the volatility process. Their results showed no significant relationship between output growth and it's volatility in the U.S. data during 1947-2006. Beamont, Norrbin and Yiğit (2008) employed several GARCH in mean models to investigate the link between volatility and output growth in 20 OECD countries and find only little evidence of this relationship. Lee (2010) revised the empirical relationship between output growth and it's volatility using panel data of monthly industrial production indexes of G7 countries over the period 1965-2007, and find evidence that supported the Black hypothesis[1]. Jiranyakul (2011) tested the Black's hypothesis in five crisis-affected Asian Countries (India, Japan, Malaysia, South Korea and Thailand). He find that the results showed that output volatility positively Granger caused output growth in two economies, Japan and South Korea.

The study examines the asymmetric relationship between output volatility and output growth. It also analyses whether there is the Granger Causality relationship between output volatility and output growth. This study contributes as addition paper to the literature about testing of asymmetric relationship and Granger Causality between output volatility and output growth in Turkey.

The paper is organized as follows. Section 1 presents the selected review of literatures. Section 2 presents data and the results of preliminary analysis. Section 3 outlines the methodology and empirical results employed analysis of the asymmetric relationship between output volatility and output growth. Section 4 indicates Granger Causality Test Results. Finally, in section 5, conclusions are presented.

2. Estimation and Results

Data: The data used consider 117 monthly frequency observations and cover the period from 2002 M01 to 2011 M09. The time series data on GDP for Turkey obtained from the Central Bank of the Republic of Turkey. GDP time series data adjusted seasonally with Tramo/Seats Method. Real output growth (LGDP) is defined as the difference in the log of GDP data [LGDP=log (GDP$_t$ – GDP$_{t-1}$)] and is plotted in Figure 1.

Figure 1: Real Output Growth Data: Turkey 2002:M01-2011:M09

---
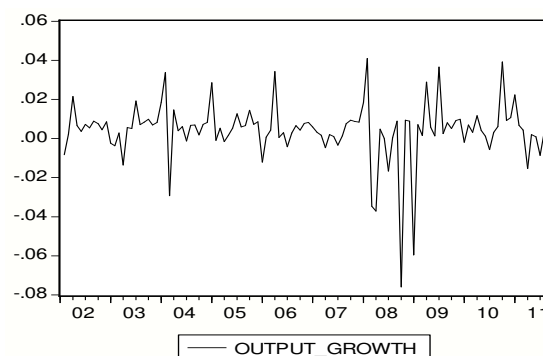
[1]   Black (1987) states that real uncertainty or output volatility positively impacts output growth. There is a positive tradeoff between output growth and real uncertainty. See Jiranyakul (2011) for more information about Black's hypothesis.

Stationary properties of GDP time series tested by using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) and KPSS (Kwiatkowski-Phillips-Schmidt-Shin) tests. The results of these tests are presented in Table 1.

Table 1:   The Results of Unit Root Tests

	Tests	**Test Statistics**	**Test Critical Values**
LGDP	ADF(0)	-10,88651*	-2,886732
	PP(5)	-10,90422*	-2,886732
	KPSS(5)	0,130153*	0,463000

* denotes significance at the 5% level.

According to Table 1, the results of ADF, PP and KPSS tests suggest that LGDP variable is integrated of order level and LGDP has a stationary process.

3. Empirical Results

In this stage, various ARMA-GARCH models have been estimated by Marquardt numerical optimization algorithm to obtain the maximum likelihood estimates of the parameters. According to the Schwarz Information Criterion (SIC), Akaike info Criterion (AIC) and Log Likelihood (LogL) value, AR(3) model for the conditional mean has been selected as an appropriate model. Table 2 reports the results of AR (3) model.

Table 2:   The Results of AR(3) Model Estimate

Variable	**Coefficient**	**Std.Error**	**t Statistic**	**Prob.**
c	0,004084	0,001783	2,290281	0,0239
AR(3)	0,219308	0,092048	2,382544	0,0189
AIC	-5,571439			
SIC	-5,523166			
LogL	316,7863			

In empirical analysis, the conditional variances from estimated AR(3) model are used as a measure of output growth volatility/real uncertainty for Turkey. Furthermore, to investigate the relationship between output growth and output growth uncertainty, Threshold GARCH Model in mean (TGARCH-M) Model[23] that use one of h_t, $\sqrt{h_t}$ and ln (h_t) as a regressor in the mean equation to capture the in-mean effect and evaluate asymmetry effects in volatility has been estimated.

Table 3 shows the estimation results of AR(3)-TGARCH(1,1) in mean model for growth uncertainty.

Table 3:   The Results of AR(3) –TGARCH (1,1)-M Model

Parameters	**Coefficient**	**Std.Error**	**z-Statistic**	**Prob.**
ln(h_t)	0,017002*	0,002765	6,149809	0,0000
β_0	0,148666*	0,023997	6,195201	0,0000
β_1	0,156668*	0,022416	6,988963	0,0000
w	0,000024*	0,000004	6,786472	0,0000
α	-0,135664*	0,031224	-4,344795	0,0000
γ	0,148180*	0,027192	5,449440	0,0000

---

[2]   For the conditional variance, GARCH, Exponential GARCH(EGARCH), Threshold GARCH (TGARCH), GARCH-M, EGARCH-M, TGARCH-M models have been estimated. AIC, SIC and LogL criteria suggest the choise of AR(3)-TGARCH(1,1)-M Model that use ln(ht) as a regressor in the mean equation.

[3]   For more information about TGARCH Models, see to Tsay (2010).

Table 3: The Results of AR(3) –TGARCH (1,1)-M Model - continued

β	0,928634*	0,030657	30,29158	0,0000
AIC	-5,552786			
SIC	-5,383832			
LogL	320,7324			

* denotes significance at the 5% level.

As can be seen from Table 3, in the estimated AR(3)-TGARCH(1,1)-M Model, γ is positive and significant which means that the news impact is asymmetric. It can be said that bad news increases output growth volatility (γ>0).

4. Granger Causality Test Results

Granger Causality Test is performed using the estimated conditional volatility series from AR(3) TGARCH(1,1)-M Model in Table 3 and the output growth series. Table 4 presents the results of causality test.

Table 4: The Results of Granger Causality Test

H_0:Output Volatility does not cause Output Growth	H_0:Output Growth does not cause Output Volatility	Optimal Lag
20,99877 (+) (0,0038)	38,833305 (+) (0,0000)	7

(F statistics are given in Table 4. The number in parenthesis is the probability of accepting the null hypothesis of no causality. The optimal lag is determined by LR, FPE, AIC, SIC and HQ criteria.)

The results in Table 4 indicate that bidirectional causality exists between output volatility and output growth at the 0.05 significant level. Positive sign in paranthesis indicates the positive relationship between two variables. This finding supports the Black's Hypothesis (Black 1987). Moreover, output volatility is positively related to output growth in Turkey.

5. Conclusion

This study has examined the empirical relationship between output growth volatility or uncertainty and output growth by using Turkey GDP monthly data for the 2002:01-2011:09 period. In empirical analysis, alternative specifications of GARCH type models, namely GARCH Model, GARCH-M Model, EGARCH Model, EGARCH-M Model, TGARCH Model, TGARCH-M Model, AIC, SIC and LogL criteria suggest the choice of AR(3)-TARCH(1,1)-M Model. According to AR(3)-TGARCH(1,1)-M model, two important results has obtained.

Firstly, the "in-mean" coefficient is statistically significant. This evidence supported output growth volatility affects output growth.

Secondly, the evidence of asymmetry effect between output growth volatility and output growth is find statistically significant. This finding indicates that bad news increases output growth volatility.

In contrast, the GARCH-M models are the simultaneous approach that does not capture the lagged causal effects of the conditional variances on the conditional means. The results of Granger causality test that allows for causal effects of output growth between it's volatility show that bidirectional causality effects.

Finally, this findings support Black's Hypothesis and findings of Jiranyakul (2011) for Japan and South Korea, findings of Caporale and McKiernan (1996) for both the U.K. and the U.S and findings of Fountas and Karanasos (2006) for Germany and Japan.

References

[1]   Beamont, P., Norrbin, S. and Yiğit, F., 2008. "Time series evidence on the linkage between the volatility and growth of output", *Applied Economic Letters*, 15, pp. 45-48.

[2]   Bhar, R. and Hamori, S., 2003. "Alternative characterization of the volatility in the growth rate of real GDP", *Japan and The World Economy*, 15, pp. 223-231.

[3]   Blackburn, K., 1999. "Can stabilization policy reduce long-run growth", *Economic Journal*, 109, pp. 67-77.

[4]   Caporale, T. and McKiernan, B., 1996. "The relationship between output variability and growth: evidence form post war UK data", *Scottish Journal of Political Economy*, 43, 229-236.

[5]   Fang, W.S. and Miller, S. M., 2008. "The great moderation and the relationship between output growth and its volatility and growth of output", *Southern Economic Journal*, 74, pp. 819-838.

[6]   Fountas, S., Karanasos, M. and Mendoza, A., 2004. "Output variability and economic growth: the Japanese case", *Bulletin of Economic Research*, 56, pp. 353-363.

[7]   Fountas, S. and Karanasos, M., 2006. "The relationship between economic growth and real uncertainty in the G3", *Economic Modelling*, 23, pp. 638-47.

[8]   Hamori, S., 2000. " Volatility of real GDP: Some evidence from the United States, the United Kingdom and Japan", *Japan and the World Economy*, 12, pp., 143-152.

[9]   Henry, O. and Olekalns, N., 2002. "The effect of recessions on the relationship between output variability and growth", *Southern Economic Journal*, 68, pp. 683-692.

[10]   Jiranyakul, K., 2011. "The Link between Output Growth and Output Volatility in Five Crisis-Affected Asian Countries", *Middle Eastern Finance and Economics*, ISSN:1450-2889 Issue 12, 101-108.

[11]   Kneller, R. and Young, G., 2001. "Business cycle volatility, uncertainty and long-run growth", Manchester School, 69, pp. 534-552.

[12]   Lee, J., 2010. "The link between output growth and volatility: Evidence form a GARCH model with panel data", *Economics Letters*, 106, pp. 143-145.

[13]   Martin, P. and Roger, C. A., 2000. "Long-term growth and short-term economic instability", *European Economic Review*, 44, pp. 359-381.

[14]   Pindyck, R., 1991. "Irreversibility, uncertainty and investment", *Journal of Economic Literature*, 29, pp. 1110-1148.

[15]   Rebello, S., 2005. "Real business cycle models: Past, present and the future", *NBER Working Paper*, No. 11401.

[16]   Ramey, G., Ramey, V., 1995. "Cross-country evidence on the link between volatility and growth", *American Economic Review,* 85, 1138-1151.

[17]   Speight, A., 1999. "UK output variability and growth: Some further evidence", *Scottish Journal of Political Economy*, 46, pp. 175-184.

[18]   Tsay, R.S., 2010. Analysis of Financial Time Series, Third Edition, John Wiley&Sons, New Jersey, Canada.

Exports Diversification and Economic Growth: Case of Jordan and Other Selected ARAB Countries

Khawlah Ali Abdalla Spetan
Business Economics Department, The University of Jordan, Amman, Jordan
E-mail: khawlahs2000@yahoo.com; khawlah.spetan@ju.edu.jo
Tel: +962-6-5355000, ext: 24163; Fax: +962-6-5300801

Nahil Saqfalhait
Business Economics Department, The University of Jordan, Amman, Jordan
E-mail: nahil.saqfalhait@ju.edu.jo
Tel: +962-6-5355000, ext: 24172; Fax: +962-6-5300801

Abstract

A large body of empirical literature has explored the linkages between exports diversification and output growth. However, empirical verification remains indecisive and the topic remains open to discussion.

This paper examines the relationship between exports diversification and economic growth in Jordan and group of Arab countries including Jordan. Overall, we found that exports diversification had no significant effect on economic growth during the study period. This suggests that greater emphasis on exports diversification should be given to trade and industrial policies in Jordan and the other Arab countries. Efforts should be directed toward investigating exports sectors that enhance economic growth in each country in order to answer the question whether to specialize or to diversify.

Keywords: exports diversification, economic growth, gross capital formation.

1. Introduction

The international trade patterns have witnessed a mounting intricacy since the beginning of this century. These patterns propose that a country cannot solely depend on particular industrial activities, as the conventional trade theory suggest regarding the specialization and comparative advantage, and should be more aware of the role of exports diversification in sustaining national competitive advantage.

The belief that exports diversification contributes to an acceleration of economic growth has been an essential principle in the discussion of the growth dynamic in developing countries since the 1950s. According to the Prebish-Singer thesis, concentration in the exports of primary products would lead to deteriorating terms of trade. Accordingly, change in the structure of exports from primary to manufactured products is required in order to attain sustainable growth. Exports Diversification is expected to contribute to long-run economic growth as suggested by endogenous growth theory, which stresses the role of increasing return to scale and dynamic spillover effects. However, the neoclassical trade theory argued in favor of exports diversification on the bases that diversifying exports range diminishes earnings variability and enhances the terms of trade.

The connections between economic growth and exports diversification have been long-standing issues of debate. However, Economic literature provides forecast of a link between exports diversification, exports growth, and economic growth. The significant effect of exports diversity on economic performance was approved by Malizia and Ke (1993), Wagner and Deller (1998), Al-Marhubi (2000), Lederman and Maloney (2003) and (Woerter (2007) in their empirical studies. On the other hand, the studies done by Amin Gutierrez de Pineres and Ferrantino (2000: chapter 4,5) document no evidence in support of diversification-induced growth. So, the effect of exports diversification on economic growth has shown mix result.

In this context, we will investigate the effect of the concentration (specialization) and diversification indices on economic growth in Jordan and a group of Arab countries. Using a dynamic growth framework, some studies established nonlinearity in the relationship between exports diversification and economic growth. The conclusion was that developing countries benefit from diversifying their exports while the developed countries perform better with exports specialization.

In this regard, the nature and composition of exports basket should be considered when making predictions about exports diversification and growth relationship, as they may lead to different and or inverse conclusions. Neither diversification nor specialization promotes growth as long as exports comprise of mainly low value added commodities (Rodrik 2006, Acharyya 2007).

This paper investigates the relationship between exports diversification and economic growth for Jordan and other Arab countries using two sets of data. First, the study intends to examine the impact of exports diversification on the economic growth for Jordan using a time series analysis for the period of (1975-2010). Second, the study will investigate the same relationship by including other 8 countries from the same region (Egypt, Saudi Arabia, Morocco, Algeria, Qatar, Kuwait, Oman, and Tunisia) in addition to Jordan using panel data analysis for the period of (1990-2010).

This paper is structured as follows: subsequent to the introduction, section 2 and 3 cover the theoretical background and the review of empirical literature respectively. Section 4 describes the data, while section 5 provides the empirical work. Finally, section 7 summarizes the conclusions.

2. Theoretical Background

Development literature has provided great attention to the exports advancement and diversification and their role in growth in developing countries over the last 50 years. Theoretically, exports diversification has categorized into two types, the horizontal diversification, and vertical diversification. The first one can reduce the dependence on limited number of exports by diversifying products across different type of industries through adding new products in the existing exports baskets within the same sector which will in turn decreases exports volatility. Whereas, the vertical diversification encompasses diversity inside the same industry. So, the exports composition changes from primary to manufactured products, which leads to mount the added value. Both types are expected to have a positive effect on economic growth. Several endogenous growth models suggest that diversification of dynamic manufactured exports instead of traditional primary exports (Sachs and Warner 1995) lead economic growth.

The literature of international trade and its effect on the economic growth has shown two viewpoints - one aspect emphasizes on the importance of production specialization in early stages of development and on trade as engine of growth, the other stresses the role of exports diversification. The traditional trade theory argued for the need to expand and promote exports to boost economy. Heckscher and Ohlin theory of comparative advantage in 1930s and other conventional theories were unable to explain the causes of trade and main trends such as developing country's trade and intra-industry. Thus, a new comparative advantage theories developed in order to explain trade within different considerations (e.g. economies of scale, increasing returns to scale, demand and tastes, product cycles).

The modern theory of portfolio developed by Harry Markowitz emphasizes the importance of diversification in international trade that positively induces economic growth. In some cases,

diversification may not have significant effect on economic growth, specifically if we consider development stages.

3. Review of Empirical Literature

The literature takes two opinions – one aspect tell diversify, the other specialize. The empirical evidence suggests that both are necessary along the development path. The first relates to the positive effects that exports diversification may have on long-run economic growth. Bacchetta et.al (2007), have investigated the role of exports diversification as a shock absorber. They found that for lower income countries product differentiation plays an important role in lowering income volatility. The richer the country will be, the less important the role of product diversification, and the more important the role of geographical diversification.

Interestingly, Herzer (2004) also found a long-run statistical relation between growth and exports diversification based on time-series data from Chile. Compatible with this finding, Arip et al. have examined the relationship between exports diversification and economic growth in Malaysia using time-series data. It has been noticed that exports diversification plays significant role to economic growth in Malaysia. Moreover, Agosin (2007) develops a model of exports diversification and growth where exports diversification is found to be highly significant in explaining per capita GDP growth.

Samen (2010), provides empirical evidence in the literature that links between exports diversification, exports growth, and overall growth. The more diversified are country's exports, the less volatile its earnings will be. Al-Marhubi (2000) uses a cross country sample of 91 countries over the period of 1961-1988, where various measures of exports concentration were added to the basic growth equation. He confirms the existence of a relationship between growth and exports diversity. Amin Gutiérrez de Piñeres and Ferrantino (1997) and Herzer and Nowak-Lehmann (2006) analyze the link between exports diversification and economic growth in Chile, where both studies find evidence that Chile has benefited from diversifying its exports products. Lederman and Maloney (2003) find a negative relationship between exports concentration and GDP per capita growth in a cross-section and panel data regression. Similarly, De Ferranti et al. (2002) estimate that 1.0 percent increase in exports concentration is associated with a 0.5 per cent decline in GDP per capita growth. In a seminal paper, Imbs and Wacziarg (2003) showed that the relationship between exports diversification and economic development (measured by per capita GDP) is broadly positive for countries with per capita incomes of $10,000 (2000 US dollars). Countries with incomes higher than $10,000 tend to specialize in goods. Hesse (2006) confirms that the relationship between exports diversification and economic growth continues to be positive. Agosin (2007) provides an evidence that exports diversification has stronger impact on the growth of income per capita if a country's aggregate exports grow as well.

However, there is also a literature suggests that countries benefit from concentration. Imbs and Wacziars (2003) find a U-shape pattern of relationship between income per capita and domestic sectoral concentration across countries. Klinger and Lederman (2006) and Cabellero and Cowan (2006) show that, the most advanced economies benefit from more concentrated exports structure. Mohan and Watson (2011) show that Caribbean countries first diversify and subsequently respecialize. Aditya and Sinha (2010) finds that economic growth across countries increases with diversification of exports up to a critical level of exports concentration which is then reversed with increasing specialization leading to higher growth. Ferdous (2011), concluded that GDP of the exporting country tend to be positively related with the specialization of that economy. The ESCAP (2004), using 1973-2001 long term data establishs that in Malaysia both horizontal and vertical exports diversification variables have statistically significant effect on total exports, in Nepal and Bangladesh only vertical diversification has positive statistically significant effect, while in Myanmar neither of the diversification variables have statistically significant influence on total exports growth.

4. Data Description

Data used in our study are annual data, and the main variables are real gross domestic product (constant US$ 2000) (RGDP) and the Herfindahl Index (HH) to represent the exports diversification. We also include four control variables in order to get rid of any misleading results, which are real gross capital formation (constant US$ 2000) (RGCF), population (POP), the degree of openness (OPE), secondary school enrollment (SCH) to represent the human capital, and the WTO accession as a dummy variable to capture the effect of country integration with other world. For Jordan model, we used annual data for the period 1975 to 2010, while for the selected ARAB countries including Jordan we use annual data for the period 1990 to 2010 constrained by data availability. The main sources of the data are the World Development Indicators (WDI) data base website and the World Integrated Trade Solution (WITS) website. We used two exports diversification indices. The first index of exports diversification is the Hirschman and Herfindahl Index (HHI):

$$HHI = \sum_{i=1}^{N} \left(\frac{xi}{X}\right)^2$$

Where xi is the exports value of a specific commodity i, X is the country's total exports, and N is the number of exports products at the SITC R1-4digits level. As HHI approaching 0 indicates a high degree of exports diversification, a value approaching of 1 implies a high degree of specialization.

The second indicator is the exports diversification index (DX) is defined as:

$$DX_j = \frac{\sum_{i=1}^{M} |h_{ij} - h_i|}{2}$$

Where h_{ij} is the share of commodity i in total exports of country j, and h_i is the share of the commodity in world exports. The value of this index ranges between 0 – less diversified exports- and 1 which means more diversified exports. This index is also called the absolute deviation of the country commodity shares that discriminates more finely between countries which are relatively more diversified in their exports diversification (F. Al- Marhubi, 2000).

A normalized HHI (HN) is used also in order to assure the robustness of the model. It measures the degree of market concentration and its values ranking from 0 to 1 (maximum concentration), the formula is as formula:

$$H_j = \frac{\sqrt{\sum_{i=1}^{n} \left(\frac{x_i}{X}\right)^2} - \sqrt{1/n}}{1 - \sqrt{1/n}}$$

where Hj = country or country group index, xi = value of exports of product I, X is the total exports and n = number of products (SITC Revision 3 at 3-digit group level).

5. Exports Diversification and Economic Growth

5.1. Case of Jordan

5.1.1. Overview

Jordan, the resource-poor and labor-abundant country, has made much progress in the area of trade policy as part of growth strategy. The country entered into various bilateral and regional trade agreements, lessened tariffs and other impediments to trade such as behind-the-border constraints and non-tariff barriers (NTBs) to promote trade liberalization. As a result of these efforts, the country has been rewarded with a boost in exports growth. Jordan has been growing relatively fast over the past 30 years. However, the pattern of relatively high long-run growth interrupted by one deep economic crisis, between 1988 and 1989 as a result of financial crisis caused by growing external debt, declining remittance income and foreign aid, and shrinking foreign currency reserves culminated in a financial crisis in 1988. Average exports growth was high but did not much correspond to trends in GDP growth for the period of 1977-2010.

Goods and services exports have been showing an increasing trend during the period (1977-2010). As shown in figure 1, for some periods economic growth did function well with the real exports growth, while economic growth underperformed exports growth in other periods.

One can notice the structural weaknesses of the exports sector, specifically the large reliance on a few, generally traditional products and little technological progress. Essentially, in Jordan the commodities of clothes, potash, "medical and pharmaceutical products", vegetables, fertilizers and phosphates topped the list of exported commodities in 2010; accounting for 56.9 percent of the total domestic exports compared with 56.7 percent, 60.9 percent, 68.3 percent in 2009, 2008, 2007 respectively. Table 1 summarize exports structure that shows a considerable change in exports concentration which is mostly triggered by the emergence of textile and clothing exports after the establishment of the QIZ's in early 2000s.

Figure 1: Jordan's RGDP and Real Exports Growth (1977-2010)
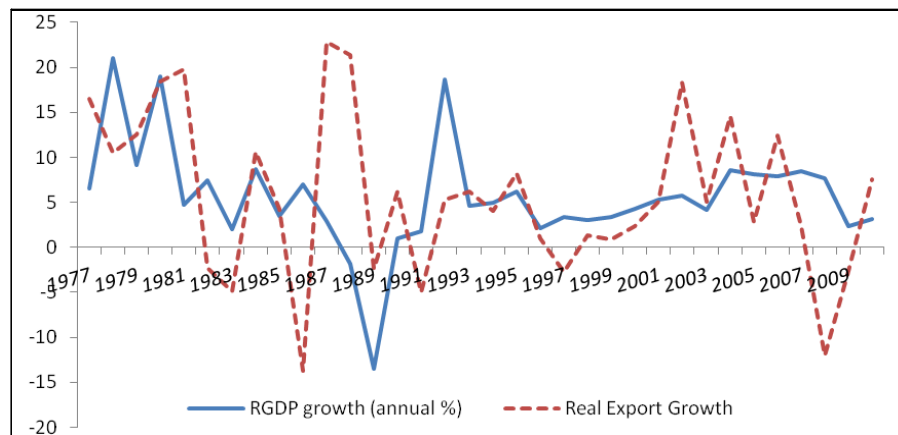
Source: Calculated on the bases of data from WDI, World Bank, (constant 2000 US $).

Results from recent researches indicate that exports growth often corresponds with economic growth incitement. However, we cannot confirm a similar relationship between GDP growth and exports growth for Jordan. In fact, the two variables only show weak linkages for the observed period. The reason for the lack of correlation could be related to country's exports structure. It appears that the structure of exports and their diversification is vital for such development to happen and to influence economic growth.

Table 1: Jordan's Exports Structure (1990-2006)

	Five largest products exported (share of total exports)	Ten largest products exported (share of total exports)	Twenty largest products exported (share of total exports)	Sectoral Categories		
				Fuel exports (share of total exports)	Manufactured exports (share of total exports)	Mineral exports (share of total exports)
1990	67.13	78.5	86.84	0.09	55.55	33.3
1991	76.8	83.59	89.14	0	54.62	38.65
1992	68.16	77.15	84.92	0	53.75	34.99
1993	68.62	77.95	85.22	0.83	61.9	26.06
1994	67.75	75.57	83.4	0	62.03	28.41
1995	65.89	74.39	81.23	0.25	64.14	25.98
1996	61.42	71.9	79.3	1.78	60.35	23.06
1997	60.27	70.87	79.11	0.07	60.04	29.5
1998	62.44	72.9	78.74	0.83	63.4	24.06
1999	58.64	71.08	77.38	0.15	64.73	20.21
2000	49.42	61.07	70.95	0.2	70.64	15.47
2001	45.37	62.87	74.06	0.48	73.26	14.25

Table 1:   Jordan's Exports Structure (1990-2006) - continued

2002	44.55	64.78	77.39	0.28	75.64	11.52
2003	40.76	63.32	77.57	1.13	76.4	11.77
2004	43.34	67.1	79.14	0.01	81.64	12.56
2005	41.79	63.46	76.66	0.1	80.68	12.71
2006	43.37	65.89	78.77	0	84.25	9.89

Source: economic diversification and growth in developing countries, World Bank, 2009,
http://info.worldbank.org/etools/**prmed/** CountryScorecard.aspx.

To examine the relationship between the exports diversification and economic growth in Jordan, we use time series analysis for the period of (1975-2010). The following sections will provide the empirical work.

5.1.2. Model Specification
The following model was applied:

Ln RGDP = B1 + B2 lnHHI +B3 lnRGCF + B4 lnOPE + B5 lnSCH + B6 lnPOP + B7 WTO+ e

Where the variables are as defined previously, and e is a vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables. We have performed the log-linear specification which is preferable to the linear formulation. The OLS estimation technique is applied covering the period (1975 – 2010).

5.1.3. Stationarity of the Variables
The augmented Dickey-Fuller (AD-F) unit root test was implemented. These unit-root tests are performed on both levels and first differences for all the log of the variables. The results are presented in Table 1 in the appendix, which illustrates that two of the variables in their level form are nonstationary; i.e. contain a unit root. The hypothesis of unit root was not rejected for lnRGCF and LnRGDP variables at the 5% level of significance.

Interestingly, first differencing of all the variables shows stationarity for all variables. The hypothesis that there is a unit root was easily rejected at 5% level of significance for the first difference of the logarithm of all variables. Given these results, our research proceeded with the assumption that the variables are integrated with the same order, i.e., I (1), and thus, all variables were entered into the regression model based on their rates of change.

5.1.4. Estimation Results
Table 2 illustrates the regression results by ordinary least squares analysis. The results from three of the estimated models are shown. The variation between the three models results from the inclusion of additional explanatory variables in models two and three. In all models the coefficients of HH are small, positive and insignificant. On the other hand, the coefficients of GCF, OPE, and SCH were highly significant. The population growth coefficients in models two and three were negative, which is consistent with the prediction of negative impact of labor-force growth by Solow growth model, but they were insignificant at any conventional significance level. Moreover, the effect of accessing the WTO as presented by the third model was very tiny and positive but insignificant at any conventional significance level. In fact, less attention should be paid for the variables that were added in the second and third models since these two models were found to suffer from serial correlation. Regardless of this weakness, results from these two models are useful for checking the robustness of the magnitudes, signs and significance of the coefficients of variables in the first model. Results from the first model are the most credible, since this model passed the Autocorrelation and Heteroskedasticity tests. We can write the estimated equation by the first model as:

DLOGRGDP = 0.036357938626 + 0.0154743953129*DLOGHH +

0.180256108087*DLOGGCF1 – 0.303103248989*DLOGOPE2 +

1.44814324506*DLOGSCH3

Inspection of the results in table 2 indicates positive and significant impact of GCF and SCH on economic growth which is consistent with the expectations. Surprisingly, OPE appears significant but negative. That is, increasing the degree of openness harms the economic growth in Jordan. in fact, this result was found to be consistent with previous studies findings that greater trade openness bring less developed countries to bear an adverse effect on economic growth, supporting the hypothesis that a country behind the technology frontier can be driven by trade to specialize in traditional goods and suffer from a decline in its long-run growth rate.

Regarding exports diversification, the results had shown no significant effect on Jordan's economic growth during the study period. These findings contradict those from other empirical studies that identified positive linkages between exports diversification and economic growth. In fact, the creation of qualified industrial zones attracted foreign capital in sectors with high technological contents throughout the 1990s and 2000s. Such interdependence between exports diversification and foreign investment by large multinationals may have caused limitations to the amount of knowledge spillovers generated by the exports sectors. Consequently, Jordan has not been able to use its high-tech and high value-added exports to trigger a sustained process of economic growth.

Furthermore, despite the development of non-traditional agricultural exports in the last decade, Jordan is still exporting mainly clothes, pharmaceuticals, and agricultural products with little value added. In spite of the range of exports products in Jordan has grown, a group of few products, including manufactured and agricultural products, continued to account for the majority of the exports value.

5.1.5. Robustness
To check the robustness of our findings to alternative definition of exports diversification, we present our estimations for a second indicator of exports diversification (DX) as reported in table 2. The estimated results confirm the previous results. Equally HH and DX showed positive and significant effect of both GCF and SCH on economic growth, which is expected and reliable. Once more, OPE was significant with negative sign which is not surprising for less developed country like Jordan. All over again, the model failed to find a significant relationship between exports diversification and economic growth. This result may be the reflection of some aspects of the exports diversification experience in Jordan as previously explained.

Table 2:   Time Series Results for Jordan*

Variable	HH			DX		
	Model I	Model II	Model III	Model I	Model II	Model III
C	0.36358 (0.008040)	0.059039 (0.018692)	0.041965 (0.025515)	0.036761 (0.007977)	0.0618460 (3.284323)	0.042015 (0.025070)
DLOGHH	0.015474 (0.026166)	0.013603 (0.025864)	0.012883 (0.025889)			
DLOGDX				-0.149649 (0.153906)	-0.157930 (0.151417)	-0.169696 (0.151294)
DLOGGCF	0.180256 (0.043573)	0.177113 (0.043070)	0.179762 (0.043178)	0.188483 (0.044233)	0.185920 (0.043522)	0.189664 (0.043512_
DLOGOPE	-0.303103 (0.081483)	-0.288921 (0.081117)	-0.304557 (0.082704)	-0.330785 (0.082774)	-0.316196 (0.082014)	-0.334599 (0.083456)
DLOGSCH	1.448143 (0.302347)	1.521399 (0.303380)	1.575033 (0.308406)	1.355606 (0.294002)	1.435615 (0.294413)	1.492905 (0.298072)
DLOGPOP	-	-0.685239 (0.511331)	-0.376718 (0.600091)		-0.719887 (0.504024)	-0.382967 (0.589357)
WTO	-	-	0.018365 (0.018669)			0.020095 (0.018383)

Table 2:   Time Series Results for Jordan* - continued

R-squared	0.593134	0.616860	0.629660	0.600966	0.627191	0.642450
Adjusted R-squared	0.538885	0.550802	0.550301	0.547761	0.562913	0.565832
F-statistic	10.93357	9.338086	7.934368	11.29539	9.757561	8.385110
Akaike info criterion	-3.345642	-3.348584	-3.325419	-3.365080	-3.375917	-3.360565
Schwarz criterion	-3.123449	-3.0819533	-3.014350	-3.142887	-3.109286	-3.049495
Durbin-Watson stat	2.472030	2.728239	2.748133	2.460191	2.756337	2.792689

* In all models, the dependent variable is DLOG (RGDP)
* S.E is between brackets.

5.2. Case of Selected Arab Countries

5.2.1. Overview
In this section we intend to examine the effect of exports diversification on economic growth for seven countries in the Arab region which are: Jordan, Egypt, Saudi Arabia, Morocco, Algeria, Qatar, Kuwait, Oman and Tunisia. These countries are located nearly in the same region and have similar social and cultural features although each country has its own economic characteristics. Additionally, the issue of data availability constitutes main reason for the choice of countries. A panel data analysis for the time period of (1990-2010) is used. Comparable to other developing countries, Arab countries have performed trade policy reforms besides their steps toward liberalization and openness.

In our model, we use Herfindahl-Herschman (HH) index and exports diversification index (DX) to measure the exports diversification and examine its impact on economic growth for these nine countries. HH index is the most commonly used in measuring exports diversification where its value is between zero and one, the higher the value the lower the exports diversification. Figure 2 shows the HH index for the period (1990-2010). As we can notice, all countries have a downward trend which reflects their engagements toward exports diversification. Countries like Jordan, Egypt, Tunisia, and Morocco, has less HH index compared to Algeria, Kuwait, Qatar, Saudi Arabia and Oman which can be described as natural resource abundant countries.

Figure 2: Herindahl-Hirschman Index

Source: WITS website. https://wits.worldbank.org/WITS/WITS/Restricted/Login.aspx.
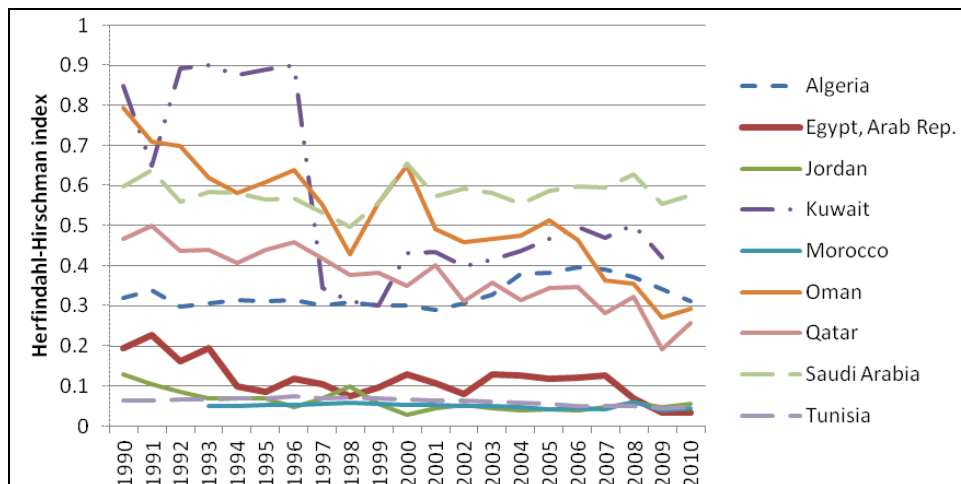
According to the top four exports in each country, they have dominated total exports in natural and oil resources abundant countries in the sample (Saudi Arabia, Oman, Algeria, and Kuwait), which explain the high concentration degree of exports that these countries witness. More than 90 per cent of total exports comprise just four products. For the other non-oil countries, the top four products exports contribution in their total exports is much smaller reflecting more exports diversification as depicted in figure 3.

Figure 3: Top Four Exports (% of Total Exports)
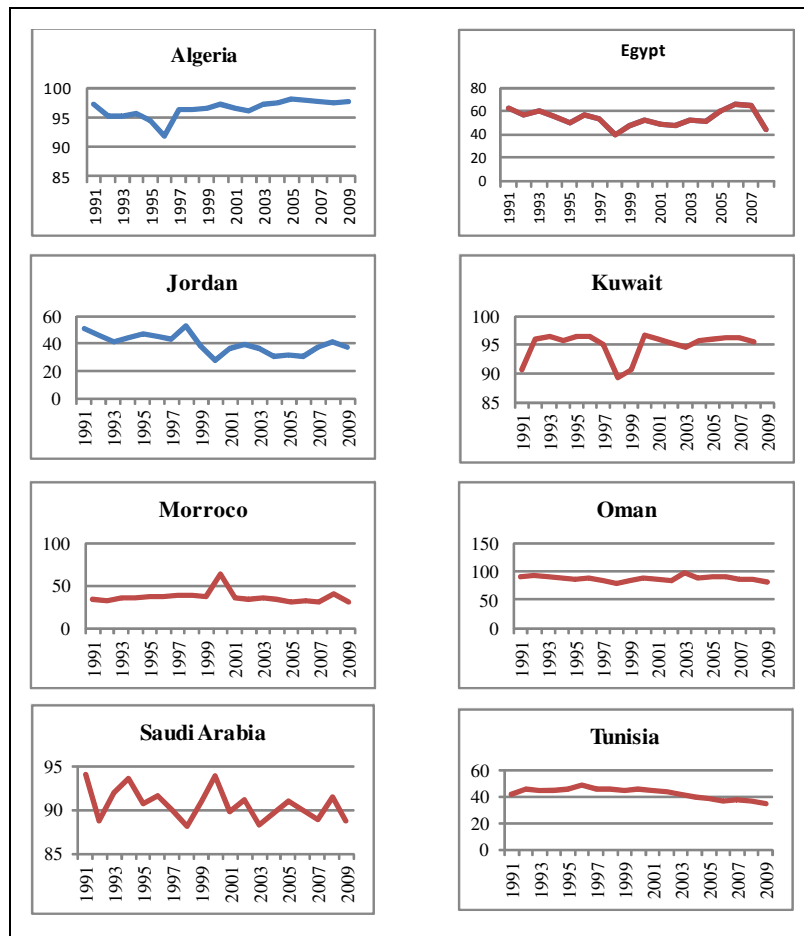
5.2.2. Empirical Work
We will explore whether exports diversification has any explanatory power in an economical empirical model of growth. The estimation strategy is to estimate the growth rate of real GDP by employing panel-data techniques on nine Arab countries during the period 1990-2010. In this paper, the focal variables are real gross domestic product (RGDP) and the degree of specialization and diversification (HI or DX). However, focusing on these two variables in a bivariate context may not be satisfactory since they may be driven by common factors, thus the results will be misleading. To avoid that, we also have included other variables which are: (RGCF), (OPE), (SCH), (POP) as control variables. The symbols are as defined previously. To test the effect of WTO accession, we also added a dummy variable (WTO).

5.2.3. Stationarity of the Variables
Levin and Lin (1992, 1993) and Levin, Lin and Chu (LLC) (2002) thereafter have provided some results on panel unit root tests. They have developed a procedure using pooled *t*-statistic of the estimator to evaluate hypothesis that each individual time series contains a unit root against the alternative hypothesis that each time series is stationary.

Table 3 in the appendix contains the results for this test and other stationarity tests for variables' logarithm, and for the first difference of the logarithm. It is clearly shown that while the null hypothesis of a unit root cannot be rejected for almost all variables logarithm, it is rejected at extremely low probability for the difference of the logarithm for all cases.

The model will be estimated using the generalized least squares technique (GLS) with panel data for the period (1990 – 2010). GLS is fully efficient and yields consistent estimates of the standard errors since it eliminates serial correlation and heteroskedasticity.

5.2.4. Estimation Results

In employing a panel regression, a choice must be made between the Fixed Effects and Random Effects Pooled models. If T (the number of time series data) is large and N (the number of cross-sectional units) is small, as in our case, there is likely to be little difference in the values of the parameters estimated by fixed effects model FEM or random effects model REM. On this score, FEM may be preferable as it assumes that there are main variations among individual countries but little temporal effect. That is, it shows what occurs in a typical Arab country along the growth path.

The results of the estimated models are shown in table 3. The difference among the three models results from applying various diversification measures for each model. As can be shown, the third model which applied (HN), results in insignificant F-statistics with poor R^2, while the first and second models result in highly significant F-statistics, and better explanatory power. Model I provides the best results. In terms of (DX), diversification was extremely insignificant, indicating that for the group of Arab countries covered in our study, diversification cannot be considered as a growth determinant. Even in Model I, (HH) was significant only at 10%, but with a positive sign. The implication is that, when diversification coefficient appears significant, it reflects positive relation between concentration and growth. This implies that, everything else being equal, on average, between 1990 and 2010 in the case of our sample of Arab countries, every percentage point increase in (HH) concentration measure may have contributed roughly 4 out of 100 points in the real growth rate of GDP. This result is not surprising in case of oil producing Arab countries, which depend on oil exports in their economy. Additionally, exports in other non-oil producing Arab countries are still concentrated in specific exports lines (see figure 3).

Table 3: Panel Results - Fixed Effects - 1990-2010

The Variable	Model I (HH)	Model II (DX)	Mode lII (HN)
C	0.037243 (0.009937)	0.039281 (0.010141)	0.041065 (0.006622)
DLOGHH	0.042015 (0.024679)	-	-
DLOGDX	-	0.003498 (0.103094)	-
DLOGHN	-	-	0.039891 (0.050177)
DLOGGCF	0.125945 (0.033229)	0.116739 (0.033618)	0.056227 (0.040531)
DLOGOPE	-0.050136 (0.050476)	-0.050132 (0.051600)	-0.008293 (0.054018)
DLOGSCH	0.150368 (0.117394)	0.158525 (0.119820)	0.053797 (0.136319)
DLOGPOP	0.169370 (0.153554)	0.033480 (0.134302)	0.011563 (0.133790)
WTO	-0.009059 (0.011149)	-0.008475 (0.011382)	-
R-squared	0.280377	0.249259	0.139119
Adjusted R-squared	.0151489	0.114798	-0.054140
F-statistic	2.175359	1.853760	0.719857
Durbin-Watson stat	2.532506	2.475368	2.115094

* In all models, the dependent variable is DLOG (RGDP)

* S.E is between brackets.

In terms of other coefficients in the models, they were all insignificant except for real gross capital formation which was, as expected, highly significant in all models. Indeed, other explanatory variables in our model were taken as control variables. This confirms that other growth determinants in Arab countries, beyond the scope of our paper, should be considered when the issue is investigating growth determinants.

6. Conclusion

This study has presented empirical evidence that exports diversification is not associated with faster economic growth in Jordan over the period of 1975 to 2010. In terms of policy implications, this study presents evidence that expansion and diversification of exports per se may not be sufficient to promote economic growth unless they lead to the creation of new productive capabilities in other sectors of the economy via knowledge externalities. Authorities should design a new set of policies seeking to improve the nation's long-term economic growth potential such as creating more relationships between the exports sector and the rest of the economy so that new channels for knowledge spillovers may be opened. Additionally, the focus should be directed toward benefiting from the presence of foreign companies in the country in order to develop national industries and to increase the value added. Moreover, additional support should be provided to small and medium domestic exports-oriented firms.

With respect to the group of nine Arab countries covered in our study, panel-data techniques were employed during the period 1990-2010. (DX) diversification measure was extremely insignificant, representing that for the group of Arab countries covered in our study diversification cannot be considered as a growth determinant. Moreover, (HH) diversification measure was significant only at 10%, but with a positive sign, which reveals positive relation between concentration and growth. This finding is expected in the situation of oil producing Arab countries, which count on oil exports in their economy. Yet, exports in other non-oil producing Arab countries are still concentrated in certain exports lines.

References
[1]　Agosin, M.R., 2007, "Exports Diversification and Growth in Emerging Economies", working paper No. 233, Departmento de Economias Universidad de Chile.
[2]　Al-Marhubi, F. (2000), "Exports diversification and growth: an empirical investigation," *Applied Economics Letters* 7: 559–62.
[3]　Amin Gutiérrez de Piñeres, S. and M. Ferrantino (1997), "Exports diversification and structural dynamics in the growth process: the case of Chile," *Journal of Development Economics* 52: 35–91.
[4]　Anwesha Aditya (Jadavpur University) and Saikat Sinha Roy (Jadavpur University): "Exports Diversification and Economic Growth: Evidence from Cross-Country Analysis" ,6th Annual Conference on Economic Growth and Development, December 16-18, 2010.
[5]　Arip, Mohammad Affendy & Yee, Lau Sim & Abdul Karim, Bakri, 2010. "Exports Diversification and Economic Growth in Malaysia," MPRA Paper 20588, University Library of Munich, Germany.
[6]　Bacchetta, M., M. Jansen, R. Piermartini, and A. Amurgo-Pacheco: 2007, 'Exports Diversification as an Absorber of External Shocks'. Unpublished Manuscript.
[7]　Cabellero, R.J. and K. Cowan, 2006, "Financial Integration without the Volatility", Unpublished, Massachusetts Institute of Technology, Cambridge, MA.

[8]   De Ferranti, D., G. Perry, D. Lederman and W. Maloney (2002), *From Natural Resources to the Knowledge Economy*, World Bank.

[9]   Economic and Social Commission for Asia and the Pacific – ESCAP, 2004, "Exports Diversification and Economic Growth: the Experience of Selected Least Developed Countries", Development Papers No. 24, United Nations, USA.

[10]   Exports diversification and competiveness in developing countries, V. Chandra, J, Boccardo and I. Osorio, March 2007.

[11]   Feenstra, R., and H.L. Kee (2004) "Exports Variety and Country Productivity," *NBER Working Paper* 10830, National Bureau of Economic Research: Cambridge MA.

[12]   Ferdous, Farazi Binti, Pattern and Determinants of Exports Diversification in East Asian Economies, 2011, International Conference on Social Science and Humanity IPEDR vol.5, IACSIT Press, Singapore.

[13]   Ferreira, Gustavo, The Expansion and Diversification of the Exports Sector and Economic Growth: The Costa Rican Experience, Dissertation, 2009.

[14]   Gutiérrez-de-Piñeres, S. A. and Ferrantino, M. (2000). Exports Dynamics and Economic Growth in Latin America: A Comparative Perspective. Ashgate Publishing.

[15]   Herzer, Dierk (2004), "Exports Diversification, Externalities and Growth"; University of Göttingen Discussion Paper #99.

[16]   Herzer, D. and D. F. Nowak-Lehmann (2006), "What does exports diversification do for growth? An econometric analysis," *Applied Economics* 38: 1825–1838.

[17]   Imbs, J., and R. Wacziarg, 2003, "Stages of Diversification", American Economic Review, 93(1):63-86.

[18]   Islamic Corporation For The Development Of The Private Sector, Member of IsDBGroup Al-Marhubi, F. (2000). Exports diversification and growth: an empirical investigation, *Applied Economics Letters*, 7, 559-562.

[19]   Klinger, B. and D. Lederman, 2006, "Diversification, Innovation, and Imitation inside the Global Technological Frontier", Research Policy Working Paper 3872, World Bank, Washington D. C.

[20]   Lederman D. and W. Maloney (2003), "Trade Structure and Growth," Policy Research Working Paper, No. 3025, World Bank.

[21]   Matthee, M.and Naudé, W. (2007). Exports diversity and regional growth: Empirical evidence from South Africa, United Nations University Research Paper No. 2007/11.

[22]   Mohan, Preeya, Watson, Patrick Caribbean Exports Diversification along its Development Path, 43rd Annual Monetary Studies Conference Financial Architecture and Economic Prospects Beyond the Crisis in the Caribbean, 2011.

[23]   Rukel, Dario (2009) Modeling Fiscal and Monetary Policy Interactions in Croatia Using Structural Vector Error Correction Model, *Privredna kretanja i ekonomska politika* 121 / 2009.

[24]   Samen, S., 2010, *A Primer on Exports Diversification: Key Concepts, Theoretical Underpinnings and Empirical Evidence*, Growth and Crisis Unit, World Bank, Washington, DC.

[25]   World Bank, WDI, http://databank.worldbank.org/ddp/home.do?Step=12&id=4&CNO=2.

[26]   World Integration Trade Solutions (WITS) website. https://wits.worldbank.org/WITS/WITS/Restricted.

Appendix

Table 1:　Augmented Dickey-Fuller test statistic

Null Hypothesis: LOG--- has a unit root Exogenous: Constant Lag Length: 0 (Automatic based on SIC, MAXLAG=9)						
The variable	**LOGDX**	**LOGGCF**	**LOGHH**	**LOGOPE**	**LOGPOP**	**LOGRGDP**	**LOGSCH**
A. D.-Fuller (t)	-3.362094	-2.391857	-3.284192	-0.380110	-3.173288	-2.290414	-7.367864
Prob.*	0.0194	0.1512	0.0234	0.0188	0.0302	0.1805	0.0000
1% level	-3.632900	-3.632900	-3.632900	-3.639407	-3.632900	-3.632900	-3.632900
5% level	-2.948404	-2.948404	-2.948404	-2.951125	-2.948404	-2.948404	-2.948404
10% level	-2.612874	-2.612874	-2.612874	-2.614300	-2.612874	-2.612874	-2.612874
Null Hypothesis: D(LOG---)has a unit root **Exogenous: Constant** **Lag Length: 0 (Automatic based on SIC, MAXLAG=9)**						
The variable	**D(LOGDX)**	**D(LOGGCF)**	**D(LOGHH)****	**D(LOGOPE)**	**D(LOGPOP)**	**D(LOGRGDP)**	**D(LOGSCH)**
A. D.-Fuller (t)	-6.391752	-5.830290	-6.699490	-4.767354	-3.01008	-4.925133	-3.312415
Prob.*	0.0000	0.0000	0.0000	0.0005	0.0440	0.0003	0.0221
1% level	-3.639407	-3.639407	-3.646342	-3.639407	-3.639407	-3.639407	-3.639407
5% level	-2.951125	-2.951125	-2.954021	-2.951125	-2.951125	-2.951125	-2.951125
10% level	-2.614300	-2.614300	-2.615817	-2.614300	-2.61300	-2.61300	-2.61300
Null Hypothesis: DLOG--- has a unit root **Exogenous: Constant, Linear Trend** **Lag Length: 0 (Automatic based on SIC, MAXLAG=8)**						
The variable	**DLOGDX**	**DLOGGCF1**	**DLOGHH****	**DLOGOPE2**	**DLOGPOP**	**DLOGRGDP *****	**DLOGSCH3**
A. D.-Fuller (t)	-6.286432	-5.829315	-6.560122	-4.699661	-3.720145	-3.605077	-3.602564
Prob.*	0.0000	0.0002	0.0000	0.0033	0.0345	0.0452	0.0445
1% level	-4.252879	-4.252879	-4.262735	-4.252879	-4.252879	-4.273277	-4.252879
5% level	-3.548490	-3.548490	-3.552973	-3.548490	-3.548490	-3.557759	-3.548490
10% level	-3.207094	-3.207094	-3.209642	-3.207094	-3.207094	-3.212361	-3.207094

*MacKinnon (1996) one-sided p-values.

**Lag length: 1 (Automatic based on SIC, MAXLAG=8).

*** Lag length: 2 (Automatic based on SIC, MAXLAG=8).

Table 2:　Autocorrelation and Heteroskedasticity tests Model

Sample: 1976- 2010						
Included observations: 35						
Autocorrelation	**Partial Correlation**		**AC**	**PAC**	**Q-Stat**	**Prob**
**| . |	****| . |**	1	-0.278	-0.278	2.9407	0.086
. |** |	. |*. |	2	0.241	0.177	5.2117	0.074
. | . |	. |*. |	3	-0.002	0.114	5.2119	0.157
. |*. |	. |*. |	4	0.136	0.134	5.9845	0.200
.*| . |	. | . |	5	-0.084	-0.053	6.2884	0.279
. |*. |	. | . |	6	0.146	0.066	7.2443	0.299
.*| . |	. | . |	7	-0.078	-0.022	7.5288	0.376
. | . |	.*| . |	8	-0.032	-0.117	7.5787	0.476
. | . |	.*| . |	9	-0.061	-0.099	7.7643	0.558
. | . |	. | . |	10	-0.007	-0.035	7.7666	0.652
**| . |	.*| . |	11	-0.215	-0.195	10.267	0.507
. |*. |	. |*. |	12	0.167	0.109	11.834	0.459
.*| . |	. |*. |	13	-0.099	0.084	12.410	0.494
.*| . |	.*| . |	14	-0.115	-0.150	13.228	0.509
. | . |	.*| . |	15	-0.036	-0.088	13.311	0.578
. | . |	.*| . |	16	-0.064	-0.092	13.590	0.629

Table 2: Autocorrelation and Heteroskedasticity tests Model - continued

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.732157	Prob. F(2,28)	0.1953
Obs*R-squared	3.853603	Prob. Chi-Square(2)	0.1456
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.974063	Prob. F(4,30)	0.4363
Obs*R-squared	4.023125	Prob. Chi-Square(4)	0.4029
Scaled explained SS	6.035938	Prob. Chi-Square(4)	0.1965

Table 3: Panel data Unit root Test

Sample: 1990 -2010

Exogenous variables: Individual effects
Automatic selection of maximum lags
Pool unit root test: Summary
Series: LOGGDP_ALG, LOGGDP_EGY, LOGGDP_JOR, LOGGDP_KWT,
LOGGDP_MOR, LOGGDP_OMN, LOGGDP_QAT, LOGGDP_SAU,
LOGGDP_TUN

Automatic selection of lags based on SIC: 0 to 3

Newey-West bandwidth selection using Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.38722	0.9173	9	158
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	5.00993	1.0000	9	158
ADF - Fisher Chi-square	2.46792	1.0000	9	158
PP - Fisher Chi-square	2.12378	1.0000	9	163

Pool unit root test: Summary 1st dif
Series: LOGGDP_ALG, LOGGDP_EGY, LOGGDP_JOR, LOGGDP_KWT,
LOGGDP_MOR, LOGGDP_OMN, LOGGDP_QAT, LOGGDP_SAU,
LOGGDP_TUN
Automatic selection of lags based on SIC: 0
Newey-West bandwidth selection using Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.65726	0.0000	9	154
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.73034	0.0000	9	154
ADF - Fisher Chi-square	104.317	0.0000	9	154
PP - Fisher Chi-square	100.601	0.0000	9	154

Pool unit root test: Summary
Series: LOGH_ALG, LOGH_EGY, LOGH_JOR, LOGH_KWT, LOGH_MOR,
 LOGH_OMN, LOGH_QAT, LOGH_SAU, LOGH_TUN
Automatic selection of lags based on SIC: 0 to 2
Newey-West bandwidth selection using Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.72677	0.2337	9	149
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.75840	0.2241	9	149
ADF - Fisher Chi-square	31.7343	0.0236	9	149
PP - Fisher Chi-square	35.7561	0.0076	9	159

Table 3:   Panel data Unit root Test - continued

Pool unit root test: Summary 1st dif
Series: LOGH_ALG, LOGH_EGY, LOGH_JOR, LOGH_KWT, LOGH_MOR,
LOGH_OMN, LOGH_QAT, LOGH_SAU, LOGH_TUN

Automatic selection of lags based on SIC: 0 to 2

Newey-West bandwidth selection using Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-12.1283	0.0000	9	139
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-10.9341	0.0000	9	139
ADF - Fisher Chi-square	120.140	0.0000	9	139
PP - Fisher Chi-square	145.283	0.0000	9	146

Series: LOGOPE_ALG, LOGOPE_EGY, LOGOPE_JOR, LOGOPE_KWT,
LOGOPE_MOR, LOGOPE_OMN, LOGOPE_QAT, LOGOPE_SAU,
LOGOPE_TUN

Automatic selection of lags based on SIC: 0 to 4

Newey-West bandwidth selection using Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.82315	0.0001	9	169
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.73883	0.0031	9	169
ADF - Fisher Chi-square	35.9225	0.0072	9	169
PP - Fisher Chi-square	25.8789	0.1026	9	174

Pool unit root test: Summary 1st dif
Series: LOGOPE_ALG, LOGOPE_EGY, LOGOPE_JOR, LOGOPE_KWT,
LOGOPE_MOR, LOGOPE_OMN, LOGOPE_QAT, LOGOPE_SAU,
LOGOPE_TUN

Automatic selection of lags based on SIC: 0 to 4

Newey-West bandwidth selection using Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-13.3293	0.0000	9	160
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-11.3683	0.0000	9	160
ADF - Fisher Chi-square	133.749	0.0000	9	160
PP - Fisher Chi-square	152.865	0.0000	9	165

Pool nit root test: Summary
Series: LOGPOP_ALG, LOGPOP_EGY, LOGPOP_JOR, LOGPOP_KWT,
LOGPOP_MOR, LOGPOP_OMN, LOGPOP_QAT, LOGPOP_SAU,
LOGPOP_TUN

Automatic selection of lags based on SIC: 0 to 4

Newey-West bandwidth selection using Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.00387	0.0000	9	166
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.44298	0.0073	9	166
ADF - Fisher Chi-square	57.2722	0.0000	9	166
PP - Fisher Chi-square	77.3904	0.0000	9	180

Table 3: Panel data Unit root Test - continued

Pool unit root test: Summary 1st dif
Series: LOGPOP_ALG, LOGPOP_EGY, LOGPOP_JOR, LOGPOP_KWT,
 LOGPOP_MOR, LOGPOP_OMN, LOGPOP_QAT, LOGPOP_SAU,
 LOGPOP_TUN

Automatic selection of lags based on SIC: 0 to 4

Newey-West bandwidth selection using Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.63994	0.0000	9	157
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-7.23001	0.0000	9	157
ADF - Fisher Chi-square	87.7363	0.0000	9	157
PP - Fisher Chi-square	113.978	0.0000	9	171

Pool unit root test: Summary
Series: LOGSCH_ALG, LOGSCH_EGY, LOGSCH_JOR, LOGSCH_KWT,
 LOGSCH_MOR, LOGSCH_OMN, LOGSCH_QAT, LOGSCH_SAU,
 LOGSCH_TUN

Automatic selection of lags based on SIC: 0 to 1

Newey-West bandwidth selection using Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.78791	0.0027	9	111
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.56758	0.7148	8	108
ADF - Fisher Chi-square	37.2872	0.0048	9	111
PP - Fisher Chi-square	36.1477	0.0068	9	112

Pool unit root test: Summary 1st dif
Series: LOGSCH_ALG, LOGSCH_EGY, LOGSCH_JOR, LOGSCH_KWT,
 LOGSCH_MOR, LOGSCH_OMN, LOGSCH_QAT, LOGSCH_SAU,
 LOGSCH_TUN

Automatic selection of lags based on SIC: 0

Newey-West bandwidth selection using Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.02799	0.0012	8	94
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.55367	0.0601	8	94
ADF - Fisher Chi-square	23.6683	0.0970	8	94
PP - Fisher Chi-square	23.9230	0.0912	8	94

** Probabilities for Fisher tests are computed using an asymptotic Chi
 -square distribution. All other tests assume asymptotic normality.

The Relationship Between R&D and Patent:
A Panel Data Analysis[1]

Ilker Murat Ar

Department of Business Administration
Karadeniz Tecnical University, Trabzon/Turkey
E-mail:ilkerar@ktu.edu.tr
Tel: +90-462-3778780; Fax: +90-462-3257280

Murat Can Genc

Department of Economics
Karadeniz Tecnical University, Trabzon/Turkey
E-mail: mcgenc@ktu.edu.tr
Tel: +90-462-3778793; Fax: +90-462-3257280

Abstract

Innovation is one of the most important issues in today's competitive environment. R&D and patent were used in the measurement of innovation activities. The objective of this paper is to investigate the relationship between R&D and patent for countries. Therefore, annual data on patent applications and R&D expenditures from 1996 to 2009 were collected for various countries. By using a panel of forty-two countries from 1996 to 2009 a panel causality analysis has been performed. Econometric results indicate that there is a unidirectional causality running from R&D expenditures to the patent applications of the residents. As a result, R&D activities have caused to the patent applications of the residents. However, R&D expenditures do not have a causality effect on patent in terms of the number of the applications of nonresidents and also the applications of the sum of nonresidents and residents. The importance of the causality findings indicates that R&D expenditures increase the patent applications of the residents. It was also provided many government policy recommendations to keep the effective relationships between R&D and patent.

Keywords: Innovation, R&D, Patent, Causality Analysis.

1. Introduction
Innovation related term with technological capabilities is a strategic weapon for firms and countries in today's competitive environment. However, there is no perfect way to assess innovation effort. In spite of frequently criticized, the most common indicators are the level of R&D expenditure and the number of patents (Pottelsberghe and Rassenfosse, 2008).

R&D is a basic input into the innovation process, and innovation is a strategic factor that influences competitiveness (1993). Since technological capabilities are critical for competitive advantage, countries and firms make investment in R&D to develop its technological capabilities.

---

[1]   This paper is a revised and expanded version of the study presented in International Eurasian Academic Conference on 14-16 January 2013 in Antalya/Turkey.

Thus, R&D activities are also critical to the profitability, and R&D effort is the most critical driving force behind successful innovation (Wang, Lu and Huang, 2013).

Patent is also interpreted as a measure of innovation activity (Acs and Audretsch, 1989). It is defined as "the right to secure the enforcement power of the state in excluding unauthorized persons, for a specified number of years, from making commercial use of a clearly identified invention" by Machlup (1958: 1). Economic theory already suggests that the case for patents advancing innovation is not straightforward (Arora, Ceccagnoli and Cohen, 2008). Research scholars specializing in the empirical analysis of innovation systems generally consider patents as an imperfect indicator of R&D efforts (Pottelsberghe and Rassenfosse, 2008). It is also used as some measure of the effectiveness of R&D activity (Papadakis, 1993). Lev (2001) indicated the patent as an important output of R&D investment.

Reinforcement of research within a company's R&D activities leads to important patents and hence future, more sustained success in the market place (Ernst, 1998). Patent ownership is also perceived as an incentive to the technological advancement that leads to economic growth (Schact and Thomas, 2007). In this regard, technological innovations, patent and R&D are important issues to trigger economic growth for countries and firms (Romer, 1990; Inoue, Souma and Tamada, 2010). It can be said that R&D investment resulted in patent increases innovation and, innovation leads to permanent increases in per capita GDP based on the endogenous growth model (Ulku, 2004). Moreover, the related literature has provided evidence of the important role played by R&D in economic growth and market value (Feeny and Rogers, 2001; Del Monte and Papagani, 2003). Therefore, most countries are trying to develop many R&D activities and these activities are expected to come to end with the patent application. As a result, the use of R&D and patent information is gaining an increasing attention in the fields of innovation and technology management (Pilkington, Dyerson and Tissier, 2002) due to these data represents a valuable source of innovation activities. In this point, the main purpose of this study is to determine the relationships between R&D expenditure and patent application based on the data from various countries.

The remainder of the paper is organized as follows. Section 2 provides an overview of the previous theoretical and empirical literature discussion on the relationship among R&D activities and patents. Section 3 lays out the model and data, while Section 4 introduces the econometric method and presents the findings. Section 5 discusses the results. Finally, Section 6 presents our conclusions and the implications of the research.

2. Literature Review

In the literature, many researchers (Pakes and Griliches, 1984; Hausman, Hall and Griliches, 1984; Hall, Griliches and Hausman, 1986; Crepon, Duguet and Mairesse, 1998; Zhongquan, Bin and Tao, 2004; Arora et al., 2008) investigated the relationship between R&D and patent. They have frequently used innovation surveys of firms to examine the link between R&D and patents in order to understand how firms appropriate the returns to R&D, and how policymakers think about patent systems as a mechanism for stimulating innovation (Nicholas, 2011). However, these relationships were examined at the firm level, but this study focuses on this relationship in terms of country level. Therefore, the studies including country data were evaluated within the framework of the literature review.

Among them, Roy, Tuch and Clark (1997) analyzed comparable international data on R&D investment, patents and GDP. They purposed to compare and contrast the competitive position of G7 nations. Crepon and Duguet (1997) focused on the relationship between R&D expenditures undertaken by firms and the number of patents claimed by them. Meliciani (2000) estimated the effect of research and investment activities on patents across countries, industries and over time, using Poisson and negative binomial distribution models. Bottazzi and Peri (2007) estimated the dynamic relationship between employment in R&D and generation of knowledge as measured by patent applications across OECD countries. Felix (2008) examined the correlation the relationship between patent applications to the European Patent Office (EPO) per million inhabitants (log scale) and R&D personnel as share of

total employment for EU 27 and selected countries. The results of the analysis indicated that the evolution of patent activity does not necessarily follow that of R&D personnel. Rassenfosse and Pottelsberghe (2009) tested an empirical model that formally accounts for the productivity and the propensity component of the R&D-patent relationship. They showed that cross-country variations in the number of patents per researcher do not only reflect the differences in the propensity to patent but also signals differences in research productivity. Danguy, Rassenfosse and Pottelsberghe (2010) tested the link between R&D efforts, and patent counts at the industry level based on a unique panel dataset composed of 18 industries in 19 countries over 19 years. Their results confirmed that the R&D-patent relationship is affected by research productivity, appropriability, propensity and strategic propensity factors. Kirankabeş (2010) which examined the relationship between gross domestic expenditure on R&D and number of patent applications per million inhabitants found positive and significant correlation between these two variables by using panel data analysis for EU countries and some other selected countries. Similarly, R&D spending is positively related to the number of patents according to the results of the Artz, Norman, Hatfield and Cardinal (2010)'s survey using longitudinal data from a cross-industry study of 272 firms over a recent 19-year period (1986–2004). Kirankabeş and Erçakar (2012) analyzed the relationship between R&D personnel and numbers of patents applications of countries by using panel data analysis. They found positive and significant correlation between R&D personnel as share of total employment (head count, % of the labour force) and numbers of patents application per million inhabitants.

This study employs data on forty-two countries which is distinguished from the previous works by several ways. First, it investigates the relationships for countries from various income groups. Second, it distinguishes the number of patent applications of residents and nonresidents.

3. The Model Specification and Data

R&D expenditures were used as a measurement factor indicator for innovation inputs by many researchers (Graves and Langowitz, 1996; Zhong, Yuan, Li and Huang, 2011). It specifies current and capital expenditures (both public and private) for research and development activities such as basic research, applied research, and experimental development. It is reasonable to presume that the numbers of patents in a country are positively related to the national expenditures on R&D because the patent applications are the result of research efforts by individuals and corporations (Hingley, 1997). Hence, many researchers (Scherer, 1983; Pakes and Griliches, 1984; Bound, Cummins, Griliches, Hall and Jaffe, 1984; Hausman et al., 1984; Jensen, 1987; Acs and Audretsch, 1988; Macher, Mowery and Minin, 2007; Sohn, Hur and Kim, 2012) focused on the relationship between R&D and patent. In these studies, patent was used as a result or measure of the R&D activities. According to Ernst's (1998) empirical results, high shares of research within total R&D expenditures lead to higher patent quality. Takalo and Kanniainen (2000) indicated the impact of a commitment to an R&D project on patenting. The number of patent applications by firms was explained by current and lagged levels of R&D expenditures and technological spillovers (Cincera, 1997). According to Rassenfosse and Pottelsberghe (2009), research efforts lead to inventions, and inventions lead to patents. Research expenditures were found to be more effective in generating patents in science based industries by Meliciani (2000).

Usually figures on R&D expenditures are used as input to the production process, and patents are the output (Czarnitzki, Kraft and Thorwarth, 2009). Hovever, Griliches, Pakes and Hall (1986), and Griliches (1998) criticized the relationship that it is conceptually limited and empirically missing. According to them, patent should also be considered as an input measure for R&D applications. Additionally, patent information and statistics can be used as feedback mechanisms in order to develop business research policies as well as for further improvement (Dereli and Durmusoglu, 2010).

Following the relevant researches cited above, it is obvious that there is causality between R&D and patent. Therefore, the model used in this study can be described as follows:

Patent Applications = f (R&D Activities)

Three proxies are used for the patent applications in the model. These are the applications of the sum of nonresidents and residents (PAT), patent applications of nonresidents (PATNR), and patent applications of residents (PATR). On the other side, real research and development expenditure (RRD) is chosen for the proxy of R&D activities. The data were taken from the World Bank's Development Indicators online database, which is available on http://www.worldbank.org. The panel data consist of fourty-two countries presented in Table 1 for the period between 1996 and 2009. These countries are chosen out of the different income levels. All variables are used in natural logarithms in econometric analyses. The data set of the study is unbalanced.

Table 1: Countries in the Sample

Argentina	Finland	Portugal
Armenia	France	Romania
Austria	Germany	Russian Federation
Belarus	Hungary	Singapore
Belgium	Israel	Slovak Republic
Bulgaria	Japan	Slovenia
Canada	Korea Rep.	Spain
Chile	Latvia	Sweden
China	Lithuania	Thailand
Colombia	Madagascar	Trinidad and Tobago
Croatia	Mexico	Turkey
Czech Republic	Netherlands	Ukraine
Denmark	Norway	United Kingdom
Estonia	Poland	United States

4. The Econometric Method

In the study, the relationships among RRD, PAT, PATNR, and PATR have been determined by using panel causality approach of Holtz-Eakin, Newey, and Rosen (1988) which has a VAR system including two sets of models as follows:

$$Y_{it} = \alpha_{0t} + \sum_{l=1}^{m} \alpha_{lt} Y_{it-l} + \sum_{l=1}^{m} \delta_{lt} X_{it-l} + \pi f_{yi} + u_{it} \qquad \text{(Model 1)}$$

$$X_{it} = \beta_{0t} + \sum_{l=1}^{m} \beta_{lt} X_{it-l} + \sum_{l=1}^{m} \gamma_{lt} Y_{it-l} + \theta f_{xl} + \varepsilon_{it} \qquad \text{(Model 2)}$$

where Y denotes the proxies of patent applications, which are PAT, PATR, and PATNR, X refers to the RRD, N is the number of the cross-section unit of panel (i=1,…,N), t is the time period (t=1,…,T), f_{yi} and f_{xi} symbolize the fixed effects unique to cross-section units. At the same time, these effects are time-invariant. For eliminating the cross-section unit fixed effects the first differences of the two sets of models have been taken. After taking the differences of models, the models have been turned to be as follows:

$$\Delta Y_{it} = \sum_{l=1}^{m} \alpha_l \Delta Y_{it-l} + \sum_{l=1}^{m} \delta_l \Delta X_{it-l} + \Delta u_{it} \qquad \text{(Model 3)}$$

$$\Delta X_{it} = \sum_{l=1}^{m} \beta_l \Delta X_{it-l} + \sum_{l=1}^{m} \gamma_l \Delta Y_{it-l} + \Delta \varepsilon_{it} \qquad i = 1,2,3,\ldots\ldots.42 \qquad l = 1,2 \qquad \text{(Model 4)}$$

Lags of the dependent variables have been linked to residuals in Models (3) and (4). To remove this problem, instrumental variables is needed to use in the estimations. Therefore Models (3) and (4) have been estimated with the Generalized Method of Moment (GMM). To test the causality in this system, Wald test have been carried out. First, Models (3) and (4) have been estimated. Second, Wald test have been applied for the coefficients of independent variables estimated with GMM. If all δ_l

different from zero, there is a unidirectional causality running from X to Y. There is a unidirectional causality running from Y to X if all γ_l different from zero. There is bidirectional causality between X and Y if all δ_l and γ_l different from zero.

Whether the instrumental variables of the GMM estimations consist of which of dependent and independent lag variables in levels are valid or not have been tested by the Sargan test. The Sargan test has been carried out for the null hypothesis which says that the instrumental variables are not related to residuals (Liang and Liang, 2009).

5. Empirical Findings

The results obtained from GMM estimations and the panel causality test for R&D expenditures and patent applications proxies are shown in Appendix generally. Summary for the direction of causality is also shown in Table 2. According to the Sargan test p-values, the null hypothesis cannot be rejected in all GMM estimations. Therefore, instrumental variables are valid in all GMM estimations. Moreover, causality tests have been carried out by the Wald test, and the results have been shown in Table 2. According to these results, the null hypothesis cannot be rejected except for the GMM estimation that RRD and PATR are respectively independent, and dependent variables shown in the first line of the Table 2. Thus, a unidirectional causality has been detected running from RRD to PATR at the 10% significance level. As a result, R&D activities have caused to patent applications which are proxy of PATR.

Table 2: Summary for the direction of causality

Estimated Models	Null Hypothesis	Wald Test χ2 Statics	Sargan Test P-Value	Direction of Causality
$\Delta PATR_{it} = \sum_{l=1}^{2} \alpha_l \Delta PATR_{it-l} + \sum_{l=1}^{2} \delta_l \Delta RRD_{it-l} + \Delta u_{it}$	$\delta_1 = \delta_2 = 0$	5.500977 [0.0639]	0.215420	RRD → PATR
$\Delta RRD_{it} = \sum_{l=1}^{2} \beta_l \Delta RRD_{it-l} + \sum_{l=1}^{2} \gamma_l \Delta PATR_{it-l} + \Delta \varepsilon_{it}$	$\gamma_1 = \gamma_2 = 0$	3.210796 [0.2008]	0.746240	PATR ↛ RRD
$\Delta PATNR_{it} = \sum_{l=1}^{2} \alpha_l \Delta PATNR_{it-l} + \sum_{l=1}^{2} \delta_l \Delta RRD_{it-l} + \Delta u_{it}$	$\delta_1 = \delta_2 = 0$	3.646854 [0.1615]	0.992900	RRD ↛ PATNR
$\Delta RRD_{it} = \sum_{l=1}^{2} \beta_l \Delta RRD_{it-l} + \sum_{l=1}^{2} \gamma_l \Delta PATNR_{it-l} + \Delta \varepsilon_{it}$	$\gamma_1 = \gamma_2 = 0$	0.470016 [0.7906]	0.204600	PATNR ↛ RRD
$\Delta PAT_{it} = \sum_{l=1}^{2} \alpha_l \Delta PAT_{it-l} + \sum_{l=1}^{2} \delta_l \Delta RRD_{it-l} + \Delta u_{it}$	$\delta_1 = \delta_2 = 0$	1.409470 [0.4942]	0.524410	RRD ↛ PAT
$\Delta RRD_{it} = \sum_{l=1}^{2} \beta_l \Delta RRD_{it-l} + \sum_{l=1}^{2} \gamma_l \Delta PAT_{it-l} + \Delta \varepsilon_{it}$	$\gamma_1 = \gamma_2 = 0$	0.608311 [0.7377]	0.347650	PAT ↛ RRD

Notes: (i) All GMM estimations instrumental variables are lags from two to four of dependent and independent variables in levels (ii) The values in brackets indicate the significance level of Wald Test χ^2 statistics.

6. Discussion and Concluding Remarks

The objective of this paper is to try to better understand the relationship between R&D and patent. Therefore, R&D expenditure was used as the measure of R&D and patent applications by residents, nonresidents and both were utilized as patent measure. The empirical analysis is performed with a data obtained from the World Bank for forty-two countries.

The results suggest that R&D expenditures have caused to patent applications of residents. It can be said that R&D expenditures lead to patent applications of residents in developed, developing, and less developed economies, while the results are interpreted for the sample. Besides, effective

relationships between R&D and patent require right government policies to keep the nation at the leading edge of the technological competitiveness. Therefore, all countries should focus on this relationship and design the various policies support the R&D activities. Many policy recommendations can be taken into account may be as follows. In order to encourage patent applications, regulate intellectual property rights such that innovation is maximized while protecting innovator's rights.

Econometric results show that R&D expenditures do not have a causality effect on patent in terms of the number of applications of nonresidents and also the applications of the sum of nonresidents and residents. However, nonresident patent grants are important at least for two reasons according to Gökovalı (2004). Firstly, nonresident patent applications in a country can be an indicator of attributed importance of that country in terms of the production possibilities. Secondly, nonresident applicants apply for protection to maintain their market shares in destination countries in order to block the production and import new products or processes for which patents are applied. Therefore, national institutions might regulate some specific arrangements for nonresident firms.

While this study has shed some light on how the relationship between R&D and patent is, further investigation should be done. First, analysis should be performed to country groups in terms of their gross national income or their geographical locations. Thus, valuable information can be presented to the policy makers. Furthermore, as the countries presented in this publication vary in terms of economic size and innovative structure, the analysis should accordingly take these aspects into consideration. Second, similar studies are needed to be done by other econometric methods in order to see whether the results differ by the other methods. Third, analysis should be conducted for different time segments and also alternative time lags. Fourth, future studies should focus on developing a measure of the profitability and marketability efficiency of the R&D activities because R&D expenditures and patents do not explain the market value of these R&D activities. Lastly, patent applications should be considered by group of applicants such as private enterprises, single authors, universities, and public bodies.

Although these analyses adopted R&D expenditure and patent as innovation indicators, the existence of other possible factors such as patent commercialization were realized. The involvement of patent commercialization will further help to explain how patent commercialization links to R&D expenditures.

References

[1] Acs, Z.J., & Audretsch, D.B. (1988). Innovation in Large and Small Firms: An Empirical Analysis. *The American Economic Review*, 78(4), 678-690.

[2] Acs, Z.J., & Audretsch, D.B. (1989). Patents as a Measure of Innovation Activity. *Kyklos*, 42(2), 171-180.

[3] Arora, A., Ceccagnoli, M., & Cohen, W.M. (2008). R&D and the Patent Premium. *International Journal of Industrial Organization*, 26, 1153-1179.

[4] Artz, K.W., Norman, P.M., Hatfield, D.E., & Cardinal, L.B. (2010). A Longitudinal Study of the Impact of R&D, Patents, and Product Innovation on Firm Performance. *Journal of Product Innovation Management*, 27, 725-740.

[5] Bottazzi, L., & Peri, G. (2007). The International Dynamics of R&D and Innovation in The Long Run and in The Short Run. *The Economic Journal*, 117, 486-511.

[6] Bound, J., Cummins, C., Griliches, Z., Hall, B.H., & Jaffe, A.B. (1984). Who does R&D and Who Patents?. (Ed) Griliches, Z., *R&D, Patents and Productivity* (pp.21-54). University of Chicago Press, Chicago.

[7] Chu, C.A. (2008). *Patent Policy, R&D and Economic Growth,* Postgraduate Dissertation in the University of Michigan, USA.

[8] Cincera, M. (1997). Patents, R&D, and Technological Spillovers at The Firm Level: Some Evidence From Econometric Count Models for Panel Data. *Journal of Applied Econometrics*, 12, 265-280.

[9]   Crepon, B., & Duguet, E. (1997). Research and Development, Competition and Innovation Pseudo-Maximum Likelihood and Simulated Maximum Likelihood Methods Applied to Count Data Models with Heterogeneity. *Journal of Econometrics,* 79, 355-378.

[10]   Crepon, B., Duguet, E., & Mairesse, J. (1998). Research, Innovation, and Productivity: An Econometric Analysis at the Firm Level. *Economics of Innovation and New Technology*, 7(2), 115-158.

[11]   Czarnitzki, D., Kraft, K., & Thorwarth, S. (2009). The Knowledge Production of 'R' and 'D'. *Economics Letters*, 105, 141-143.

[12]   Danguy, J., Rassenfosse, G., & Pottelsberghe, B. (2010). *The R&D-Patent Relationship: An Industry Perspective*. ECARES Working Papers No.2010/038.

[13]   Del Monte, A., & Papagani, E. (2003). R&D and the Growth of Firms: Empirical Analysis of a Panel of Italian Firms. *Research Policy*, 32, 1003-1014.

[14]   Dereli, T., & Durmusoglu, A. (2010). Alerting Companies Through On-Line Patent trend Analysis. *Cybernetics and Systems: An International Journal*, 41(5), 371-390.

[15]   Ernst, H. (1998). Industrial Research as a Source of Important Patents. *Research Policy*, 27, 1-5.

[16]   Feeny, S., & Rogers, M., (2001). *Innovation and Performance: Benchmarking Australian Firms*. Melbourne Institute of Applied Economic and Social Research, Working Paper No. 7/01,

[17]   Felix, B. (2008). Patents and R&D Personnel. *Statistics in Focus,* Eurostat, 107/2008.

[18]   Graves, S.B., & Langowitz, N.S., (1996). R&D Productivity: A Global Multi-industry Comparison. *Technological Forecasting and Social Change*, 53, 125-137.

[19]   Griliches, Z., Pakes, A., & Hall, B.H. (1986). *The Value of Patents as Indicators of Inventive Activity*. Harvard Institute of Economic Research, Discussion Paper No. 1285.

[20]   Griliches, Z., (1998). Patent Statistics as Economic Indicators: A Survey. (Ed) Griliches, Z., *R&D, Patents and Productivity* (pp.287-343). University of Chicago Press, Chicago.

[21]   Gökovalı, U. (2004). Survival Analysis of Non-Resident Patents in Turkey, 1985-98. *Yapi Kredi Economic Review*, 15(2), 95-110.

[22]   Hall, B.H., Griliches, Z., & Hausman, J.A. (1986). Patents and R&D: Is There A Lag?. *International Economic Review*, 27(2), 265-283.

[23]   Hausman, J., Hall, B.H., & Griliches, Z. (1984). Econometric Models for Count Data With an Application to the Patents-R&D Relationship. *Econometrica*, 52(4), 909-938.

[24]   Hingley, P. (1997). The Extent to which National Research and Development Expenditures Affect First Patent Filings in Contracting States of the European Patent Convention. *World Patent Information*, 19(1), 15-25.

[25]   Holtz-Eakin, D., Newey, W., & Rosen, H.S. (1988). Estimating Vector Autoregressions with Panel Data. *Econometrica,* 56(6), 1371-1395.

[26]   Inoue, H., Souma, W., & Tamada, S. (2010). Analysis of Cooperative Research and Development Networks on Japanese Patents. *Journal of Informetrics*, 4, 89-96.

[27]   Jensen, E.J. (1987). Research Expenditures and the Discovery of New Drugs. *Journal of Industrial Economics*, 36 (1), 83-95.

[28]   Kirankabeş, M.C. (2010). Relationship Between Gross Domestic Expenditure on R&D (GERD) and Patent Applications: A Panel Data Analysis for EU Countries and Some Other Selected Countries. *Middle Eastern Finance and Economics*, 8, 161-171.

[29]   Kirankabeş, M.C., & Erçakar, M.E. (2012). Importance of Relationship between R&D Personnel and Patent Applications on Economics Growth: A Panel Data Analysis. *International Research Journal of Finance and Economics*, 92, 72-81.

[30]   Lev, B. (2001). *Intangibles: Management, Measurement, and Reporting*, Brookings Institution Press, Washington, USA.

[31] Liang, C-C., & Liang, J-M. (2009). Re-examining Causal Relationship between Stock Prices and Fundamentals: Evidence Based on Dynamic Panel Data Model. *The Business Review, Cambridge*, 12(2), 148-154.

[32] Link, A. (1993). Methods for Evaluating the Return on R&D Investments. (Eds) Bozeman, B., Melkers, J., *Evaluating R&D Impacts: Methods and Practice* (pp. 1-16.). Kluwer Academic Publishers.

[33] Macher, J.T., Mowery, D.C., & Minin, A.D. (2007). The Non-Globalization of Innovation in the Semiconductor Industry. *California Management Review,* 50, 217-242.

[34] Machlup, F. (1958). *An Economic Review of The Patent System*, Study commission by the Subcommittee on Patents, Trademarks, and Copyrights of the Committee on the Judiciary, US Senate, 85th Congress, Second session, Washington, D.C., US Government Printing Office.

[35] Meliciani, V. (2000). The Relationship Between R&D, Investment and Patents: A Panel Data Analysis. *Applied Economics*, 32(11), 1429-1437.

[36] Nicholas, T. (2011). Did R&D Firms Used to Patent? Evidence from the First Innovation Surveys. *The Journal of Economic History*, 71(4), 1032-1059.

[37] Pakes, A., & Griliches, Z. (1984). Patents and R&D at the Firm Level: A First Look. (Ed.) Griliches, Z., *R&D, Patents and Productivity* (pp.55-72). University of Chicago Press.

[38] Papadakis, M. (1993). Patents and the Evaluation of R&D. (Eds) Bozeman, B., Melkers, J. *Evaluating R&D Impacts: Methods and Practice* (pp.99-122). Kluwer Academic Publishers.

[39] Pilkington, A., Dyerson, R., & Tissier, O. (2002). The Electric Vehicle: Patent Data as Indicators of Technological Development. *World Patent Information*, 24, 5-12.

[40] Pottelsberghe, B. & Rassenfosse, G. (2008). Policymakers and the R&D-Patent Relationship. *Intereconomics,* November/December, 377-380.

[41] Rassenfosse, G., & Pottelsberghe, B. (2009). A Policy Insight into the R&D-Patent Relationship. *Research Policy*, 38, 779-792.

[42] Romer, P.M. (1990). Endogenous Technological Change. *Journal of Political Economy*, 98(5), S71-S102.

[43] Roy, U., Tuch, R.D., & Clark, J.E. (1997). Global Assessment of Patents, R&D Investment and Economic Output (Part 1 Macro Comparisons at the Country Level). *Journal of the Patent and Trademark Office Society*, 79(2), 110-137.

[44] Schact, W.H., & Thomas, J.R. (2007). Patent Reform: Innovation Issues. (Ed) Branes, J.M. *Patent Technology:Transfer and Industrial Competition* (pp.1-37). Nova Science Publishers.

[45] Scherer, F.M. (1983). The Propensity to Patent. *International Journal of Industrial Organization*, 1, 107-128.

[46] Sohn, D-W., Hur, W., & Kim, H.J. (2012). Effects of R&D and Patents on the Financial Performance of Korean Venture Firms. *Asian Journal of Technology Innovation*, 18(2), 169-185.

[47] Takalo, T., & Kanniainen, V. (2000). Do Patents Slow Down Technological Progress? Real Options in Research, Patenting, and Market Introduction. *International Journal of Industrial Organization*, 18, 1105-1127.

[48] Ulku, H. (2004). *R&D, Innovation and Economic Growth: An Empirical Analysis*. *IMF Working Paper*, WP/04/185.

[49] Wang, C-H., Lu, Y-H., Huang, C-W., & Lee, J.Y. (2013). R&D, Productivity, and Market Value: An Empirical Study from High-Technology Firms. *Omega*, 41, 143-155.

[50] Zhong, W, Yuan, W., Li, S.X., & Huang, Z. (2011). The Performance Evaluation of Regional R&D Investments in China: An Application of DEA Based on The First Official China Economic Census Data. *OMEGA,* 39, 447-455.

[51] Zhongquan, G., Bin, Z., & Tao, J. (2004). An Empirical Study on the Relationship between Input of R&D and Patent in China. *Proceedings of International Conference on Management Science and Engineering*, August 8-10, Harbin, China.

Appendix. Panel Causality and GMM Estimations Results						
Independent Variables	**Dependent Variables**					
	PATR	**RRD**	**PATNR**	**RRD**	**PAT**	**RRD**
RRD_{it-1}	0.283920 (0.241087)	1.129444[a] (0.137792)	-0.293989 (0.368881)	0.929790[a] (0.176036)	-0.034639 (0.185693)	1.148347[a] (0.156534)
RRD_{it-2}	0.232375[a] (0.105978)	-0.128073 (0.116087)	-0.072175 (0.234323)	-0.086941 (0.101803)	-0.080883 (0.167387)	-0.24006[b] (0.128372)
$PATR_{it-1}$	-0.193678 (0.492043)	-0.195074 (0.131874)	----------	----------	----------	----------
$PATR_{it-2}$	-0.066791 (0.088684)	-0.022498 (0.026893)	----------	----------	----------	----------
$PATNR_{it-1}$	----------	----------	1.011197[a] (0.270312)	-0.036066 (0.075032)	----------	----------
$PATNR_{it-2}$	----------	----------	-0.045643 (0.076420)	0.014499 (0.021324)	----------	----------
PAT_{it-1}	----------	----------	----------	----------	0.99011[a] (0.292499)	-0.02928 (0.144964)
PAT_{it-2}	----------	----------	----------	----------	-0.162796 (0.120766)	-0.00705 (0.048463)
Null Hypothesis	$\delta_1=\delta_2=0$	$\gamma_1=\gamma_2=0$	$\delta_1=\delta_2=0$	$\gamma_1=\gamma_2=0$	$\delta_1=\delta_2=0$	$\gamma_1=\gamma_2=0$
Wald Test χ^2 Statistics	5.500977 [0.0639]	3.210796 [0.2008]	3.646854 [0.1615]	0.470016 [0.7906]	1.409470 [0.4942]	0.608311 [0.7377]
Sargan P-Value	0.215420	0.746240	0.992900	0.204600	0.524410	0.347650

Notes: (i) All variables are first differences in GMM estimations. (ii) All GMM estimations instrumental variables are lags from two to four of dependent and independent variables in levels. (iii) The values in parentheses and brackets respectively indicate the standard errors of the relevant coefficients and the significance level of Wald Test χ^2 statistics. (iv) a and b indicate the significance levels of the relevant coefficients at the 1% and 10% respective

The Perceived Critical Success Factors (CSFs) of ERP Adoption in Emerging Countries: An Emperical Study on the Jordanian Organizations

Khalifeh Ziadat
Assistant Prof, Zytouna University

Mahmoud Al-Jabali
Associated Prof, Zytouna University

Abstract

The aim of this paper is to investigate the factors that critically affect the success of (ERP) adoption in developing countries by providing empirical evidence on the Jordanian organizations, motivated by the recent trend in DOI studies which emphasis the implied assumption that ERP technology faces additional and different range of economic, cultural and basis infrastructure challenges in developing countries compared to developed countries.

Moreover, this study looks at how the perceived relative criticality of these factors differs across managerial level versus user level employees.

The research identifies potential critical success factors (CSFs) which were then lumped into 13 logical groupings inclusive of all the sub-factors identified in the review of relevant literature. To assess the relative degree of criticality of each of the potential CSFs factors, a survey questionnaire was mailed to the respondents. 180 copy of the questionnaire were mailed to 90 non-financial companies listed at Amman Stock Exchange (two questionnaire copies were mailed to each involved company; one of them to be considered by the chief information officer as a representative of the managerial level employees, while the other questionnaire was supposed to be considered by the user level employees).

The results show that "Top Management Support", "Organizational Readiness", and "Change Management Culture & Program," have been proven to be perceived as the most important and critical factors for successful ERP adoption.

Significant differences in the perceptions of CIOs-group and the end-users-group concerning "Communication", "Top management support" and "Change management culture and user education and training" were detected.

Keywords: Enterprise resource planning; Critical success factors; Accounting information systems.

1. Introduction
Enterprise Resource Planning (ERP) systems are commercial software packages composed of several modules, such as accounting, human resources, finance and production, providing cross-organization integration of data through embedded business processes.

Since the early 1990s firms have rushed to implement enterprise resource planning systems (ERP). One study found more than 60 percent of Fortune 500 companies had adopted of ERP systems (Stewart et al., 2000). The appeal of the ERP systems is clear; although most organizations typically have software systems that performed much of the component functions of ERP, the standardization and integrated ERP software provides a degree of interoperability that was difficult and expensive to achieve with stand-alone, custom-built systems (Yingjie, 2005).

However, according to Davenport (1998), Although ERP systems can bring competitive advantage to organizations; the high failure rate in implementing such systems is a major concern. According to Olson (2004), the percentage of ERP system failures was rated by one study as ranging from 40 to 60 percent, and by another study as between 60 and 90 percent. The high failure rate of ERP implementation calls for a better understanding of its critical success factors (Somers, Nelson, and Ragowsky, 2000) Such percentage of ERP system failures motivated many scholars and IT researchers in western Europe and North America to investigate, identify and discuss the critical issues or key success factors in ERP implementation to provide a better understanding of the key factors leading to implementation success.

This research is a trial to answer the following research questions:
1. What are the factors that critically affect the success of enterprise resource planning (ERP) software in developing countries such as Jordan?
2. How does the perceived relative criticality of these factors differ across managerial level versus end-user level employees?

The reminder of this paper is organized as follows. The next section presents and discusses the relevant previous studies and identifies the potential CSFs. This is followed by the statement of the motives of the present study. The methodological aspects are then described. The final section of this paper provides the research's major conclusions and recommendations for further research.

2. Literature Review &Identification of Potential CSFs

In order to identify the potential CSFs, we use the 11 potential factors identified by Nah et al. (2003), and expanded the content of the literature by carrying out an extensive literature review; we found more than 20 articles that provide either normative/prescriptive or empirical answers to the question: what are the key critical factors for initial and ongoing ERP implementation success?. These articles were identified through an extensive search of databases of published works and conference proceedings such as Emerald and Ebscohost. However, 12 of these articles were considered by Nah et al. (2003), whilst The following articles were added to the literature that was considered by Nah et al. (2003): Dong (2001), Aladwani (2001), Huang and Palvia (2001), Umble and Umble (2001), Stratman and Roth (2002), Gargeya and Brady (2005), Yu (2005) Amoako-Gyampah (2004), Verville et al. (2005), Sammon and Adam (2005), Umble et al (2003), Mabert et al (2003). Previous studies that are based on a synthesis of prior studies were excluded to avoid duplicate consideration of the same study. The expansion of the literature led to the identification of two additional potential CSFs (organizational readiness and pre-implementation attitudes toward ERP implementation) and their respective subfactors.

The following discussion concentrates mainly on those recent articles which have not been considered by Nah et al (2003).

Sammon and Adam (2005) was motivated by the findings of Sammon and Adam (2004) that the literature on CSFs concentrate on the implementation process and, in effect, does not extend to the inclusion of factors of critical importance prior to the ERP planning phase. Sammon and Adam (2005) theoretically presents the concept of organizational prerequisites for ERP implementation by putting forward a model to be further tested and validated by ERP researchers. However, they do not provide empirical evidence on the critical importance of prerequisites for ERP-software.

Dong (2001) proposed a conceptual model exploring the impact of top management on enterprise systems implementation. Aladwani (2001) described an integrated, process-oriented approach for facing the complex social problem of workers' resistence to ERP systems.

Huang and Palvia (2001) proposed ten factors (at the national/environmental and organizational level) concerning ERP implementation by making a comparison of advanced and developing countries.

The national/environmental factors identified by them are:
1. economy and economic growth,
2. infrastructure,
3. regional environment,
4. government regulations,
5. and manufacturing strengths.

They also noted that the organizational level factors are:
1. information technology maturity,
2. computer culture,
3. business size,
4. business process re-engineering experience,
5. and management commitment.

However, Huang and Palvia (2001) did not categorize the factors into those that contribute to success and those that contribute to failure.

Nah et al. (2001), based on a study of earlier papers, identified 11 factors that were critical to ERP implementation success. The 11 factors noted by them are

(1) ERP teamwork and composition;
(2) Change management program and culture;
(3) Top management support;
(4) Business plan and vision;
(5) Business process re-engineering and minimum customization;
(6) Effective communication;
(7) Project management;
(8) Software development, testing, and trouble shooting;
(9) Monitoring and evaluation of performance;
(10) Project champion; and
(11) Appropriate business and information technology legacy systems.

Umble and Umble (2001) expressed their views on 14 success factors and nine failure factors.

The success factors in their point of view are:
1. Definition of business goals,
2. Establishment an executive management planning committee,
3. Thinking of implementation as research and development,
4. Use of cross-functional teams,
5. Stocking implementation teams with the best and smartest workers,
6. Alignment of everyone's interest by giving mid-level management hands-on responsibility,
7. Constant communication with teams and end users,
8. Excellent project management,
9. Choice of partners,
10. Extensive education and training,
11. Management with data,
12. Measurement of the right things,
13. Establishment of aggressive achievable schedules, and
14. No fear for change

It appears that the work of Umble and Umble (2001), though normative/prescriptive for failure and success of ERP implementations, is not based on a systematic analysis of ERP implementations in different organizations.

None of the above papers (Huang and Palvia, 2001; Nah et al. 2001; Dong, 2001; Aladwani, 2001; Umble and Umble, 2001; Sammon and Adam, 2005) provided empirical evidence based on any primary empirical data (in the form of survey or case research) or secondary data (content analysis of reported cases or survey studies).

In an attempt to analyze the cultural influence on the differences in critical success factors in ERP systems implementation in Australia and China, Shanks et al. (2000) considered potential CSFs such as top management support, sufficient allocation of resources, existence of project champion, and business process reengineering, etc. In addition, Shanks et al. (2000) highlighted the issue that the decision-making process prior to ERP software selection is not considered within the scope of the implementation process models in the current literature.

Themistocleous et al. (2001), based on a survey of 50 respondents, underscored the need for integration of existing systems with ERP applications in ERP implementation. Stratman and Roth (2002) through a questionnaire survey of 79 North American manufacturing users of ERP systems identified eight generic constructs: (1-strategic information technology planning,2- executive commitment, 3-project management, 4-information technology skills, 5-business process skills, 6-ERP training, 7-learning, and 8-change readiness) that are hypothesized to be associated with successful ERP adoption. However, the works of Nah et al. (2001), Themistocleous et al. (2001) and Stratman and Roth (2002) do not focus on factors of failure.

Umble et al. (2003) integrated these findings into 10 categories:

1. Clear understanding of strategic goals.
2. Commitment by top management.
3. Excellent implementation project management.
4. Great implementation team.
5. Successful coping with technical issues.
6. Organizational commitment to change.
7. Extensive education and training.
8. Data accuracy.
9. Focused performance measures.
10. Multisite issues resolved.

Items 1 and 2 are classical information systems critical success factors for any IS project.

(Clear statement of project objectives is inherently present in ERP implementations, and the scope of investment holds management attention).

Item 3 relates to project management. Implementation project management should include accurate estimates of project scope, size, and complexity. There should be a match between the business requirements set forth by management and the selected ERP system.

Item 6 is associated with item 2, top management commitment. ERP systems will usually involve significant change in the way un which almost everyone in the organization works. This requires people to change, something that we all tend to resist. For as little productivity disruption as possible, the organization must be committed to carry through the project.

Mabert et al (2003) analyzed survey data to identify those variables key to successful ERP implementation. Seven issues were considered.

1. Use of a single ERP package versus use of multiple packages. Both approaches have been successfully implemented, and neither was found significant in either ERP implementation time or budget performance.
2. ERP systems can be implemented at one time across the organization (the big-bang approach) or in phases (as well as other variation in between). Again, a variety of approaches have been used in successful ERP implementations, and the variants were not found significant for either time or budget performance.

3. The number of modules implemented was examined, with no significant found.
4. The order of module implementation also did not prove to be significant.
5. Application of major BPR initially, as opposed to limited reengineering, did not make a significant difference in time or budget.

The two variables that did prove significant were:

6. Modifications to the system, which were significant in both time performance and budget performance. If vendor systems are modified, it will cost more and take longer (but will likely provide a better system).
7. Use of accelerated implementation strategy, which was significant in implementing ERP systems on time (but not significant with respect to budget). Vendors have been successful in expediting implementation of their systems.

Nah et al. (2003) provides empirical evidence on the CIOs' perception of the CSF for ERP implementation by using the 11 factors identified by Nah et al. (2001) as being critical to the successful implementation of ERP systems through an extensive literature review. Nah et al. (2003) assessed the degree of criticality of each of these factors in a survey questionnaire that was mailed to the CIOs of Furtune 1000 companies. For each of the 11 factors, a brief description of the factors and a 5-level rating scale ranging from "extremely critical and important for successful " to "neither critical nor important for success" was provided. The 5 most critical factors identified by the CIOs were:

(1) Top management support;
(2) Project champion;
(3) ERP teamwork and composition;
(4) Project management;
(5) Change management program and culture;

Amoako-Gyampah (2004) compared the perception of senior managers and end-user on selected ERP implementation success factors in order to ascertain if there are differences in the perception of decision makers and end-users on the effectiveness of the implementation activities. The method of data gathering for this study was through surveys and interviews with selected employees within a MNC with over 20,000 employees that was implementing an ERP system, a total of 1,562 questionnaire were sent to different employees, 571 usable responses were obtained representing a response rate of 37%. Seven CSF were identified and selected as being of interest in the comparison of user-managers and end-user perspectives:

1. The argument for changing the technology
2. The perceived personal relevance of the technology
3. The perceived ease of use
4. Satisfaction with the technology
5. Project communications
6. Training, and
7. Shared beliefs about the benefits of the technology.

The results confirmed that significant differences do exist in the perceptions of these groups. The largest differences in perceptions were with regard to shared beliefs, satisfaction with the technology, and project communications. The smallest differences in perceptions were on training, ease of use of the technology, and personal relevance. In particular, user-managers had more favorable perceptions on the benefits of the technology, the effectiveness of communication mechanisms and their level of satisfaction with the technology than end-users. Also differences exist on the perceived effectiveness of the training provided as part of the implementation effort, personal satisfaction with the technology and the perceived ease of use of the technology.

An extensive review of the literature by Gargeya and Brady (2005) shows that there is not much of research done on identifying the factors of ERP implementation success and failure based on the content analysis of published articles. Their study was based on a content analysis of published articles reporting ERP implementation in 44 companies. In their study, all the identified critical success factors were lumped into the following six logical groupings:

1. Worked with SAP functionality/maintained scope
2. Project team/management support/consultants
3. Internal readiness/training
4. Deal with organizational diversity
5. Planning/development/budgeting
6. Adequate testing

Their analysis shows that the primary factors (working with SAP functionality and maintained scope, and project team/management support/consultants) for successful implementation of SAP are different from the primary factors (inadequate internal readiness and training, and inappropriate planning and budgeting) that contribute to failure of SAP implementation. Hence, it can be noted that the factors that contribute to the success of SAP implementation are not necessarily the same as the factors that contribute to failure. This points out that management should be focusing on one set of factors of avoid failure and another set of factors to ensure success.

Yu (2005) criticizes prevailing ERP implementation research in that it may be considered factor research, which identifies the CSF for implementing ERP. From his point of view, Factor research is valuable in certain contexts, but suffers a major drawback in being limited to a rather static view that cannot explain the dynamics of the implementation process. Hence, unlike most existing ERP researches, his work is a process-oriented approach and aims to provide a moving picture of an end-to-end causal relation chain starting from pre-, to during-, to post-implementation. The research methodology used here is borrowed from the belief-attitudes-behavior-performance literature that evolved from the research on social and cognitive psychology. The identified potential critical success factors were lumped into 4 logical groupings; five belief variables (such as top and middle management commitment and involvement), seven attributes variables (such as entire MIS department commitment and involvement), 12 behavior (performance) variables (such as effectiveness of the education and training programs), and five result (effectiveness) variables (such as degree of data accuracy). His sample consists of 14 Taiwanese companies. In order to mitigate the potential bias introduced relying on the responses of a single individual representing an entire company. Accordingly, the correspondents from each of the 14 companies included seven to nine people including the CEO and/ or top management, the MIS leader, and five to seven randomly selected end users from different departments. Through a semi structured interviews, the investigation measures each variable using a five-point Likert-type scale ranging from 1, representing strongly negative, to 5, representing strongly positive. At least seven valid respondents were obtained for each of the responding firms.

The major conclusion that can be drawn from Yu (2005) is that end-users across the organization must be educated from the onset of ERP implementation. Although education is a corner-stone of ERP implementation, the user training is usually only emphasized and the courses are centered on computer/system operation rather than on understanding the ERP concept and spirit.

Verville et al. (2005) criticized the literature in that previous work has extensively and explicitly concentrated on the CSF as implementation and post-implementation issues, and hence, the issue of the acquisition process for ERP software is for the most part being ignored. Their study was designed as a multiple-case study applied at three organizations that had completed the purchase of ERP software. Data was collected from 15 individuals through a semi-structured interview questions. CSF were divided into two groups:

2.1. Factors Related to the Acquisition as Process

a. Planned acquisition and well-defined structured for the acquisition process
b. Rigorous acquisition process
c. Assessment and definition of all current and desired requirements that are relevant to the packaged ERP
d. Establishment of the selection and evaluation criteria to determine the right fit
e. Accurate and reliable information used in the acquisition process

2.2. Factors Related to People within the Process

a. Clear and unambiguous authority for the acquisition process
b. Careful selection of the acquisition team members
c. "Partnership approach" with the vendors
d. Users participation in the acquisition process
e. User buy-in on the final choice of the ERP acquisition

The results indicate that for each of the three cases, the elements that stand out the most are as follows: clear and unambiguous authority, a structured, rigorous and user-driven process, its planning, the establishment of criteria, and the sense of partnership that the team works to establish not only with various user commitments, but also with the potential vendor.

According to Olson (2004), the most successful approach was to develop IT capabilities before adopting ERP. Willcocks and Sykes (2000) reported the nine core IT capabilities required for successful ERP implementation: this approach involves development of a competent internal IT organization, along with a systems view of the organization. A system view enables better understanding of what IT is needed for and how the organization's business processes can best be supported. Their core IT capabilities are presented in Table 2.1.

Table 2.1: Core IT Capabilities Needed for ERP Implementation Success

CAPABILITY	IMPACT
IT leadership	Develop strategy, structures, processes, and staff
Business systems thinking	Adopt system view
Relationship building	Cooperate with business users
Architecture planning	Create needed technical platform
Technology fixing	Troubleshoot
Informed buying	Compare vendor sources
Contract facilitation	Coordinate efforts
Contract monitoring	Hold suppliers accountable
Supplier development	Explore long-term mutual benefits

Source: Willcocks and Sykes (2000)

From the above discussion, we can notice that some of the recent papers provided empirical evidence based on primary empirical data (in the form of survey or case research) or secondary data (content analysis of reported cases or survey studies) (Rosario, 2000; Scheer and Habermann, 2000; Shanks et al., 2000; Stefanou, 1999; Sumner, 1999; Wee, 2000; Stratman and Roth, 2002; Nah, et al., 2003; Umble et al., 2003; Amoako-Gyampah, 2004; Gargeya and Brady, 2005; Yu, 2005; Verville et al., 2005; among others). In the other hand, other papers present normative/prescriptive view based on ;' (Dong, 2001; Aladwani, 2001; Huang and Palvia, 2001; Nah et al., 2001; Umble and Umble, 2001; Sammon and Adam, 2005: among others)

Table 2.2: Review of Previous Studies on Critical Success Factors for ERP Implementation

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
Nah, et al. (2003)													
Bingi, et al. (1999)													
Buckhout, et al. (1999)													
Falkowski, et al. (1998)													
Holland, et al. (1999)													
Murray & Coffin, (2001)													
Roberts & Barrar, (1992)													
Rosario, (2000)													
Scheer & Habermann, (2000)													
Shanks et al., (2000)													

Table 2.2: Review of Previous Studies on Critical Success Factors for ERP Implementation - continued

Stefanou, (1999)													
Sumner, (1999)													
Wee, (2000)													
Stratman and Roth (2002)													
Amoako-Gyampah (2004)													
Gargeya and Brady (2005)													
Yu (2005)													
Verville et al. (2005)													
Umble et al. (2003)													

Indicates that the respective factor was empirically identified as being critical for successful ERP implementation

F1: Appropriate Business and IT Legacy Systems, **F2:** Business Plan and Vision, **F3:** BPR with Minimum Customization, **F4:** Change Management Culture and Program, **F5:** Communication, **F6:** ERP Teamwork and Composition, **F7:** Monitoring and Evaluation of Performance, **F8:** Project Champion, **F9:** Project Management, **F10:** Software Development, Testing and Troubleshooting, **F11:** Top Management Support, **F12:** Organizational Readiness, **F13:** Pre-implementation Attitudes toward ERP adoption.

Each of these 13 factors can be broken down into detailed subfactors. According to Cooke and Peterson (1998), quoted in nah et al., 2003, it is worthwhile to note that many of the factors are interrelated; thus, overlooking one factor can affect other factors and the project as a whole.

Table 2.3 presents the subfactors of each factor along with the related previous studies:

Table 2.3: Subfactors Along With the Related Literature.

SUB-FACTORS	PREVIOUS STUDIES
Factor 1: Appropriate Business and IT Legacy Systems.	
1. Business setting	Holland, Light, and Gibson, 1999; Roberts and Barrar, 1992; Nah et al. (2003); Yu (2005)
2. Legacy system	Holland et al., 1999; Nah et al. (2003)
Factor2: Business Plan and Vision,	
1. Business plan or vision	Buckhout, Freya, & Nemec, 1999; Holland et al., 1999; Rosario, 2000; Wee, 2000; Umble et al (2003); Nah et al. (2003); Gargeya and Brady (2005); Yu (2005)
2. Project mission or goals	Roberts and Barrar, 1992; Shanks et al., 2000; Umble and Umble (2001); Yu (2005)
3. Justification for investment in ERP	Falkowski, Pedigo, Smith, and Swanson, 1998; Yu (2005)
Factor 3: BPR with Minimum Customization,	
1. Business Process Reengineering (BPR)	Bingi, Sharma, and Godla, 1999; Holland et al., 1999; Murray and Coffin, 2001; Roberts and Barrar, 1992; Shanks et al., 2000; Wee, 2000; Nah et al. (2003); Yu (2005)
2. Minimum customization	Murray and Coffin, 2001; Rosario, 2000; Shankset al., 2000; Sumner, 1999; Yu (2005)
Factor 4: Change Management Culture and Program, and user education and training	
1. Recognizing the need for change	Falkowski et al., 1998; Umble and Umble (2001)
2. Enterprise-wide culture and structure management	Falkowski et al., 1998; Rosario, 2000; Nah et al. (2003); Yu (2005)
3. User education and training	Bingi et al., 1999; Holland et al., 1999, Murray and Coffin, 2001; Roberts and Barrar, 1992; Shanks et al., 2000; Umble and Umble (2001); Stratman and Roth (2002); Umble et al (2003); Nah et al. (2003); Amoako-Gyampah (2004); Gargeya and Brady (2005); Yu (2005)
4. User support organization and involvement	Wee, 2000; Nah et al. (2003); Yu (2005)
5. IT workforce re-skilling	Sumner, 1999
6. Commitment to change; perseverance and determination	Shanks et al., 2000; Nah et al. (2003); Yu (2005)

Table 2.3: Subfactors Along With the Related Literature**. -** continued

Factor 5: Communication,	
1.Targeted and effective communication	Falkowski et al., 1998; Wee, 2000; Nah et al. (2003); Amoako-Gyampah (2004); Yu (2005)
2. Communication among stakeholders	Holland et al., 1999; Shanks et al., 2000; Umble and Umble (2001); Nah et al. (2003); Yu (2005)
3. Expectations communicated at all levels	Holland et al., 1999; Rosario, 2000; Shanks et al., 2000; Sumner, 1999; Nah et al. (2003); Yu (2005)
4. Project progress communication	Holland et al., 1999; Sumner, 1999; Nah et al. (2003)
5. User input	Rosario, 2000
Factor 6: ERP Teamwork and Composition,	
1. Best people on team	Bingi et al., 1999; Buckhout et al., 1999; Falkowski et al., 1998; Rosario, 2000, Shanks et al., 2000; Wee, 2000; Umble and Umble (2001); Umble et al (2003); Nah et al. (2003); Yu (2005)
2. Balanced or cross-functional team	Holland et al., 1999; Shanks et al., 2000; Sumner, 1999
3. Full-time team members	Shanks et al., 2000; Nah et al. (2003)
4. Partnership, trust, risk-sharing, and incentives	Stefanou, 1999; Wee, 2000; Yu (2005)
5. Empowered decision makers	Shanks et al., 2000; Nah et al. (2003)
6. Business and technical knowledge of team members and consultants	Bingi et al., 1999; Shanks et al., 2000; Sumner,1999; Nah et al. (2003); Yu (2005)
Factor 7: Monitoring and Evaluation of Performance,	
1. Track milestones and targets	Murray and Coffin, 2001; Roberts and Barrar, 1992; Rosario, 2000; Sumner, 1999; Nah et al. (2003)
2. Performance tied to compensation	Falkowski et al., 1998
3. Analysis of user feedback	Holland et al., 1999
Factor 8: Project Champion,	
1. Existence of project champion	Shanks et al., 2000; Stefanou, 1999; Sumner,1999; Nah et al. (2003); Yu (2005)
2. High level executive sponsor as champion	Falkowski et al., 1998; Murray and Coffin, 2001; Nah et al. (2003); Yu (2005)
3. Project sponsor commitment	Rosario, 2000; Nah et al. (2003); Yu (2005)
Factor 9: Project Management,	
1. Assign responsibility	Rosario, 2000; Nah et al. (2003)
2. Clearly establish project scope	Holland et al., 1999; Shanks et al., 2000
3. Control project scope	Rosario, 2000; Shanks et al., 2000
4. Evaluate any proposed change	Sumner, 1999; Wee, 2000; Nah et al. (2003)
5. Control and assess scope expansion requests	Sumner, 1999
6. Define project milestones	Holland et al., 1999; Yu (2005)
7. Set realistic milestones and end dates	Murray and Coffins, 2001; Shanks et al., 2000; Umble and Umble (2001); Stratman and Roth (2002); Umble et al (2003); Nah et al. (2003)
8. Enforce project timeliness	Rosario, 2000
9. Coordinate project activities across all affected parties	Falkowski et al., 1998; Umble and Umble (2001); Yu (2005)
F 10: Software Development, Testing & Troubleshooting,	
1. Configuration of overall ERP architecture	Wee, 2000
2. Appropriate modeling methods/techniques	Murray and Coffin, 2001; Scheer and Habermann, 2000
3. Vigorous and sophisticated testing	Rosario, 2000
4. Troubleshooting	Holland et al., 1999; Nah et al. (2003)
5. Integration	Bingi et al., 1999
Factor 11: Top Management Support,	
1. Approval and support from top management	Bingi et al., 1999; Buckhout et al., 1999; Murray and Coffin, 2001; Shanks et al., 2000; Sumner, 1999; Nah et al. (2003); Yu (2005)
2. Top management publicly and explicitly identified project as a top priority	Shanks et al., 2000; Wee, 2000; Umble et al (2003); Nah et al. (2003); Yu (2005)

Table 2.3: Subfactors Along With the Related Literature. - continued

3. Allocate resources	Holland et al., 1999; Roberts and Barrar, 1992; Shanks et al., 2000; Nah et al. (2003); Yu (2005)
Factor 12: Organizational Readiness	
1. IT capabilities and readiness 2.non IT capabilities and readiness	
Factor 13: Pre-implementation Attitudes toward ERP adoption.	
1. Attitudes of users 2. Attitudes of project leaders	

3. Research Motives and Added Value

Most empirical studies on success factors have been based on the perceptions of the managerial level employees and senior members within the organizations under the implied assumption that the senior managers will be the most knowledgeable respondent. And hence, previous studies ignored studying how the perceived relative criticality of these factors may differ across implementation partners (mainly managerial level versus user level employees). This study aims to look at how the perceived relative criticality of these factors differs across managerial level versus user level employees.

Moreover, In order to overcome the shortcoming of previous studies concentrating mainly in critical success factors related to the implementation stage only, this study adds to the literature by investigating factors related to implementation stage as well as pre-implementation attitudes and organizational readiness and pre-request capabilities before adopting ERP.

In addition, the vast majority of previous empirical evidences are limited to western European and North American environments. Our study aims at providing empirical evidence in a different cultural environment motivated by the recent trend in DOI studies which emphasis the implied assumption that ERP technology faces additional and different range of economic, cultural and basis infrastructure challenges in developing countries compared to developed countries.

4. Research Methodology

As mentioned earlier, the aim of our study is to investigate the factors that critically affect the success of ERP-software in developing countries by providing empirical evidence on the Jordanian organizations. This section addresses the methodological aspects that are proposed to be adopted to achieve the aims of the present study. And it is organized as follows: Subsection 4.1 address the procedures that were adopted to identify the CSFs, Subsection 4.2 reports the sampling and data collection procedures, while Subsection 4.3 discusses the identification of targeted groups.

4.1. Identification of Potential CSFs'

In order to identify the potential CSFs, we use the 11 potential factors identified by Nah et al. (2003), and expanded the content of the literature by carrying out an extensive literature review through an extensive search of databases of published works and conference proceedings such as Emerald and Ebscohost. However, the expansion of the literature led to the identification of two additional potential CSFs (organizational readiness and pre-implementation attitudes toward ERP implementation) and their respective subfactors. Then, all the potential factors were lumped into 13 logical groupings; each of these factors can be broken down into detailed sub-factors. These 13 factors were identified after careful analysis and grouping of related sub-factors. These 13 factors are inclusive of all the sub-factors identified in the review of the relevant literature. The resulted potential CSFs and their respective subfactors will be used as a benchmark to investigate and assess the perception of targeted groups on the CSFs of ERP.

4.2 Identification of Targeted Groups.

Davids (1980) criticized the CSF approach because relying on the response of a single person may be insufficient and incorrect if some of these responses are irrational, fail to identify reasonable causality, and are biased. Similar bias discussion provided by Munro (1983) and Boyton and Zmud (1984), quoted in Yu (2005). However, building on human rational behavior, it may be inappropriateness to exhume the truth greatly depends on a single individual representing an entire company.

Although this issue is still debatable, to avoid prejudice, it may be better to conduct sampling from various levels of the subject organization in order to collect more balanced, fair and objective information (Yu, 2005). Besides, in Taiwan and other developing nations, most MIS leaders tend to praise themselves and attribute mistakes to users while the CEO or upper management either undervalue or overvalue the effectiveness of the post-implementation ERP systems, or alternatively attribute its failure to other factors besides themselves. Accordingly, the correspondents from each firm should include.

Two groups were surveyed. One group, which we refer to as "managerial level employees" consisted of chief information officers (CIOs). The second group consisted of the end-users of ERP-software in different departments and functional areas within the organization.

4.3. Sampling and Data Collection

The survey method was chosen as the appropriate methodology for this study. There are two dominant reasons why the survey method was chosen: First, the objective of this study requires the collection of data from a large statistically testable sample. One of the main strengths of the survey questionnaire approach is its ability to collect data from a large number of organizations, located in a spread of locations. Secondly, much of the previous work in the area of CSFs is based on questionnaire and has used similar variables as the ones that are proposed in this study. This enhances the cross study comparability of the study and its results.

A pre-test was conducted and feedback was obtained to improve questionnaire quality and readability. However, since most if the variables have been broadly tested in corresponding literature, the content validity appears sufficient. Moreover,

Before the actual data collection took place, a pilot study was undertaken. The pilot participants were interviewed on a face-to-face basis using a kind of semi-structured interview approach to determine whether there are any interpretations or other problems with the questionnaire.

To assess the relative degree of criticality of each of these factors, a survey questionnaire was mailed to the targeted respondents. 180 copy of the questionnaire were mailed to 90 non-financial companies listed at Amman Stock Exchange (two questionnaires were mailed to each involved company; one of them to be considered by the chief information officer as a representative of the managerial level employees, while the other questionnaire supposed to be considered by the end-user level employees).

A typical questionnaire asked respondents to indicate their agreement or disagreement on the question posed on a seven-points Likert-type scale ranging from 1, representing "neither critical nor important for ERP success", to 7, indicating "extremely critical and important for ERP success".

180 questionnaires have been distributed to a randomly selected non-financial companies (manufacturing, extraction, retail merchandizing, and others) listed at Amman Securities Exchange (ASE). After the solicitation phone-call follow up, 83 questionnaires; representing 46% initial response rate; had been collected. However, 9 incomplete questionnaires of the collected ones have been excluded from the analysis. Another 2 questionnaires had not been considered in the data analysis. After excluding the incomplete and invalid responses, the research ended with 72 (44 of which were considered by CIOs) valid and usable questionnaires, representing 40 percent final response rate.

The *t*-test was used to indicate the statistical significance of the difference in the perception between the managerial level and end-users employees.

5. Results, Conclusions and Suggestions for Future Research.

The final section of this paper provides the research's major conclusions and recommendations for further research.

The following table presents a comparison of mean responses on critical success factors as provided by the two targeted groups (CIOs and end-users)**.**

Table5.1: Comparison of Mean Responses on Critical Success Factors

SUCCESS FACTOR	FULL SAMPLE RESULTS		DIFFERENCE IN MEAN RESPONSES
	Overall responses Average	Relative Importance	
Appropriate Business & IT Legacy Systems,	5.15	10th	+0.64
Business Plan & Vision,	4.65	12th	+0.55
Business Process Reengineering (BPR)	4.88	11th	-0.66
Change Management Culture & Program, and user education and training	5.84	3rd	-1.14 ***
Communication,	5.38	9th	+1.02***
ERP Teamwork & Composition,	5.73	5th	+0.72
Monitoring and Evaluation of Performance,	5.68	7th	+0.59
Project Champion,	5.71	6th	+0.73
Project Management,	5.51	8th	-0.46
Software Development, Testing & Troubleshooting,	4.62	13th	+0.38
Top Management Support,	6.21	1st	+0.98***
Organizational Readiness,	6.06	2nd	-0.74
Pre-implementation Attitudes toward Adoption	5.81	4th	+0.57

Notes: 1-seven-points Likert-type scale was used with 1 representing "neither critical nor important for ERP success"and 7 indicating "extremely critical and important for ERP success".
2-The Difference in mean responses for each factor was calculated as: (end-users mean minus CIOs mean)
3- ***: Indicates statistically significant difference.

Generally, the results reported in Table 4 for the full sample proves that each of the potential CSFs has been proven to be important for successful ERP adoption with means of responses ranging from 6.21 to 4.62 on a 7-points scale. Such supportive results of the full sample are largely consistent with the findings of previous empirical work (Nah et al., 2003 and Yingjie, 2005), however, the relative criticality of some factors is not consistent with literature, e.x "Project Champion" was rated by Nah et al. (2003) as second most important success factor, however, it has been ranked 6th in the present study.

The results reported for the full sample in the above table show that "Top Management Support", "Organizational Readiness", and "Change Management Culture & Program," have been proven to be perceived as the most important and critical factors for successful ERP adoption. While the factors of "Software Development, Testing & Troubleshooting,", and "Business Plan & Vision," were perceived as least critical and important for successful ERP adoption.

"Top management support" has been perceived as the most critical factor for successful ERP adoption, such result is consistent with previous findings in the literature (Nah et al., 2003 and Yingjie, 2005). According to Dong (2001) top management support influences other factors which are necessary for successful ERP adoption. In addition, Sarker and Lee (2000) demonstrated the key role of top management support by pointing out that it compensates for the absence of other key factors.

The low rank of "Business Process Reengineering (BPR)" as provided by the full sample results can be attributed to the lack of experience of the respondents concerning ERP systems and the required BPR because of the low adoption rate of ERP systems in Jordan.

According to Olson (2004) three factors consistently appear as critical success factors for information systems projects: top management support, client consultation (user involvement), and clear project objectives.

The second aim of this research is to investigate how does the perceived criticality of each of the potential CSFs differ among the two targeted respondent groups; a closer examinations of the differences of mean responses of the CIOs-group and the end-users-group suggest that they have statistically significant differences in their perception of the importance of some factors. In particular, end-users have more favorable perception of "Communication" and "Top management support" than CIOs. On the other hand CIOs have shown more favorable perception of "Change management culture and user education and training".

The higher score of the perception of the importance of "Communication" which is provided by the end-users comparing to CIOs might be explained by the fact that the CIOs as part of ERP project team leadership might have more favorable attitudes toward the ERP and its related activities, and hence, their realization of the importance of "Communication" is lower than that of the end-users who are not being part of project leadership and desire more effective communication mechanism to justify the implementation of the ERP software and expect IT managers to explain and justify their decision of ERP-software adoption.

The relatively higher end-users perception of the importance of the "Top management support", as evidenced by the relatively higher average score provided by end-users group in Table 5.1 might confirm Yu (2005) in that in developing countries, most IT leaders such as CIOs tend to praise themselves and attribute the risks and responsibilities of the mistakes and failure of ERP projects to other factors besides themselves, leading them to underestimate the importance of their support and commitment to new enterprise systems.

The fector of "Change management culture and user education and training" has proven to be perceived more important and critical by the CIOs group comparing to the group of end-users reflecting that the end-users felt more confident about their ability to use the new system and that they did not realize their need for further education and training.

Suggestions for Further Research

Given the findings of Gargeya and Bradly (2005) that the factors that contribute to the success of ERP implementation are not necessarily the same as the factors that contribute to failure, another new worthwhile research wave is to concentrate on exploring ERP failure factors. In addition, it will be worthwhile to look at how the perceived importance of these factors may differ across other implementation partners such as vendors, consultants, internal IT specialists, and project team members. Moreover, given that many previous works (Davison, 2002; Sheu et al, 2003: among others) have discovered that language, culture, nation, and politics also influence ERP implementation. Accordingly, the findings of previous work in western countries cannot be inferred directly to developing countries such as Jordan. Since relatively little research attention has focused on understanding CSFs in developing countries, future research needs more empirical studies conducted in various cultural environments, given the results of our study, in order to provide a cultural analysis of the differences in the perceptions of CSFs across different countries.

References

[1]   Abdinnour-Helm, S., Lengnick-Hall, M. L., & Lengnick-Hall, C. A. (2003). Pre-implementation Attitudes and Organizational Readiness for Implementing an Enterprise Resource Planning System. European Journal of Operational Research, 146, 258-73.
[2]   Aladwani, A.M. (2001), "Change management strategies for successful ERP implementation", Business Process Management Journal, Vol. 7 No. 3, pp. 266-75.
[3]   Amoake-Gyampah, K. (2004) ERP implementation factors: a comparison of managerial and end-user perspectives, Business Process Management Journal, Vol. 10 No. 2, pp. 171-183.
[4]   Bancroft, N. H., Seip, H., & Sprengel, A. (1997). Implementing SAP R/3. Greenwich, CT: Prentice Hall.

[5]   Bingi, P., Sharma, M. K., & Godla, J. (1999). Critical issues affecting an ERP implementation. Information Systems Management, 16(2), 7–14.
[6]   Block, R. (1983). The politics of projects. Englewood Cliffs, NJ: Yourdon.
[7]   Boehm, B. W. (1991). Software risk management: Principles and practices. IEEE Software, 8, 32–41.
[8]   Boynton, A.C. and Zmud, R.W. (1984), "An assessment of critical success factors", Sloan Management Review, Vol. 25 No. 4, pp. 17-27.
[9]   Buckhout, S., Frey E.,&Nemec, J., Jr. (1999). Making ERP succeed: Turning fear into promise. IEEE Engineering Management Review, 19, 116–123.
[10]   Cooke, D., & Peterson, W. (1998). SAP implementation: Strategies and results. New York: The Conference Board, Inc.
[11]   Davenport, T. H. (1998). Putting the enterprise in the enterprise system. Harvard Business Review, 76, 121–131.
[12]   David, G.B. (1979), "Comments on the critical success factors method for obtaining management requirements in article by John F. Rockart, 'Chief executives define their own data needs'", Harvard Business Review, Vol. 57 No. 2, pp. 81-93.
[13]   David, G.B. (1980), "Letter to the editor", MIS Quarterly, Vol. 4 No. 1, pp. 51-61.
[14]   Dong, L. (2001). Modeling top management influence on ES implementation. Business Process Management Journal, 7, 243–250.
[15]   Esteves, J., & Pastor, J. (2001). Analysis of critical success factors relevance along SAP implementation phases. Proceedings of the Seventh Americas Conference on Information Systems, Boston, 1019–1025.
[16]   Falkowski, G., Pedigo, P., Smith, B., & Swanson, D. (1998, September). Arecipe for ERP success. Beyond Computing, 44–45.
[17]   Gargeya, V. B., and Brady, C. (2005), Success and Failure Factors of Adopting SAP in ERP system implementation, Business Process Management Journal, Vol. 11 No. 5, pp. 501-516.
[18]   Haines, M. N., & Goodhue, D. L., (2000). ERP implementations: The role of implementation partners and knowledge transfer. Proceedings of the Information Resources Management Association (IRMA) International Conference, Anchorage, AK, 34–38.
[19]   Holland, C. P., Light, B., & Gibson, N. (1999). A critical success factors model for enterprise resource planning implementation. Proceedings of the 7th European Conference on Information Systems, 1, 273–297.
[20]   Huang, Z. and Palvia, P. (2001), "ERP implementation issues in advanced and developing countries", Business Process Management Journal, Vol. 7 No. 3, pp. 276-84.
[21]   Jiang, J. J., Klein, G., & Balloun, J. (1996). Ranking of system implementation success factors. Project Management Journal, 27, 49–53.
[22]   Mabert, V. A., Soni, A., & Venkataramanan, M. A. (2003). Enterprise Resource Planning: Managing the Implementation Process. European Journal of Operational Research, 146, 302-14.
[23]   Motwani, J., Michandani, D., Madan, M. and Gunasekaran, A. (2002), "Successful implementation of ERP projects: evidence from two case studies", International Journal of Production Economics, Vol. 75 No. 1, pp. 83-94.
[24]   Munro, M.C. (1983), "An opinion comment on critical success factors work", MIS Quarterly, Vol. 7 No. 3, pp. 67-8.
[25]   Murray, M., & Coffin, G. (2001). A case study analysis of factors for success in ERP system implementations. Proceedings of the Seventh Americas Conference on Information Systems, Boston, 1012–1018.
[26]   Nah, F., Faja, S., & Cata, T. (2001). Characteristics of ERP software maintenance: A multiple case study. Journal of Software Maintenance, 13(6), 1–16.
[27]   Nah, F., Lau, J., & Kuang, J. (2001). Critical factors for successful implementation of enterprise systems. Business Process Management Journal, 7, 285–296.

[28]   Nah, F., Zuckweiler, K., Lau, J. (2003). ERP implementation: chief information officers' perceptions of critical success factors. International Journal of Human-Computer Interaction, 16 (1), 5-22.

[29]   Olson, D. L. (2004). Managerial Issues of Enterprise Resource Planning Systems. 1st edition, McGraw-Hill/Irwin.

[30]   Roberts, H. J., & Barrar, P. R. N. (1992). MRPII implementation: Key factors for success. Computer Integrated Manufacturing Systems, 5(1), 31–38.

[31]   Rogers, E. M. (1995). Diffusion of innovations (4th ed.). New York: The Free Press.

[32]   Rosario, J. G. (2000, May 17). On the leading edge: Critical success factors in ERP implementation projects. Business World (Philippines), 27. Perceptions of Critical Success Factors 19

[33]   Ross, J. W. (1999, July/August). Surprising facts about implementing ERP. IT Professional, 1(4), 65–68.

[34]   Sammon, D. and Adam, F. (2004), "ERP software selection – widening the debate", in Adam, F. and Sammon, D. (Eds), The Enterprise Resource-Planning Decade: Lessons Learned and Issues for the Future, Idea Publishing Group, Hershey, PA.

[35]   Sammon, D. and Adam, F. (2004) Towards a model of organizational prerequisites for enterprise-wide systems integration; Examining ERP and data warehousing, Journal of Enterprise Information Management Vol. 18 No. 4, pp. 458-470.

[36]   Sarker, S.,&Lee, A. S. (2000). Using a case study to test the role of three key social enablers in ERP implementation. International Conference on Information Systems, Brisbane, Australia, 414–425.

[37]   Scheer, A., & Habermann, F. (2000). Enterprise resource planning: Making ERP a success. Communications of the ACM, 43(4), 57–61.

[38]   Shanks, G., Parr, A., Hu, B., Corbitt, B., Thanasankit, T., & Seddon, P. (2000). Differences in critical success factors in ERP systems implementation in Australia and China: Acultural analysis. Proceedings of the 8th European Conference on Information Systems, Vienna, Austria, 537–544.

[39]   Slooten, K., & Yap, L. (1999). Implementing ERP information systems using SAP. Proceedings of the Americas Conference on Information Systems, Milwaukee, WI, 226–228.

[40]   Soliman, F., Clegg, S. and Tantoush, T. (2001), "Critical success factors for integration of CAD/CAM systems with ERP systems", International Journal of Operations & production Management, Vol. 21 No. 5, pp. 609-29.

[41]   Somers, T. M., Nelson, K., & Ragowsky, A. (2000). Enterprise Resource Planning (ERP) for the next millennium: Development of an integrative framework and implications for research. Proceedings of the Americas Conference on Information Systems, Long Beach, CA, 998–1004.

[42]   Stefanou, C. J. (1999). Supply Chain Management (SCM) and organizational key factors for successful implementation of Enterprise Resource Planning (ERP) systems. proceedings of the Americas Conference on Information Systems, Milwaukee, WI, 800–802.

[43]   Stewart, G., Milford, M., Jewels, T., Hunter, T., & Hunter, B. (2000). Organizational Readiness for ERP Implementation. Proceeding of the American Conference on Information Systems, 966-971.

[44]   Stratman, J.K. and Roth, A.V. (2002), "Enterprise resource planning (ERP) competence constructs: two-stage multi-item scale development and validation", Decision Sciences, Vol. 33 No. 4, pp. 601-28.

[45]   Sumner,M. (1999). Critical success factors in enterprise wide information management systems projects. Proceedings of the Americas Conference on Information Systems, Milwaukee, WI, 232–234.

[46]   Themistocleous, M., Irani, Z. and O'Keefe, R.M. (2001), "ERP and application integration", Business Process Management Journal, Vol. 7 No. 3, pp. 195-204.

[47]   Umble, E.J. and Umble, M. (2001), "Enterprise resource planning systems: a review of implementation issues and critical success factors", Proceedings of the 32nd Annual Meeting of the Decision Sciences Institute, pp. 1109-11.

[48]   Umble, E. J., Haft, R. R., & Umble, M. M. (2003). Enterprise Resources Planning: Implementation Procedures and Critical Success Factors. European Journal of Operational Research, 146, no 2, 241-57.

[49]   Verville, J., Bernards, C., and Halingten, A. (2005) "So you're thinking of buying an ERP? Ten critical factors for successful acquisitions", Journal of Enterprise Information Management Vol. 18 No. 6, pp. 665-677

[50]   Wee, S. (2000, February). Juggling toward ERP success: Keep key success factors high. ERP News. Retrieved June 1, 2000, from

[51]   http://www.erpnews.com/erpnews/erp904/02get.html

[52]   Welti, N. (1999). Successful SAP R/3 implementation. Essex, England: Addison Wesley.

[53]   Willcocks, L. P., & Sykes, R. (2000). The Role of the CIO and IT Function in ERP. Communications of the ACM 43, no. 4, 22-28.

[54]   Yingjie, J (2005), Critical Success Factors in ERP implementation in Finland, M.Sc. thesis, The Swedish School of Economics and Business Administration.

[55]   Yu, C. (2005), Causes influencing the effectiveness of the post-implementation ERP system, Industrial Management & Data Systems, Vol. 105 No. 1, pp. 115-132

Evaluating the Impact of Listing on the Ghana Stock Exchange on Financial Performance using Data Envelopment Analysis

Robert A Baffour

PhD, Ghana Technology University College
PMB 100, Accra North, Ghana
E-mail: rbaffour@gtuc.edu.gh
Tel: +233 302200602

Da-Costa Adjei

MSc, Ghana Technology University College
PMB 100, Accra North, Ghana

Abstract

The purpose of this study was to examine the extent to which listing on GSE impacts on the financial performance of listed companies by examining the performance of listed banks against that of unlisted banks. The efficiency performances of seven banks were examined from 2004 to 2010 using non-parametric Data Envelopment Analysis (DEA) both longitudinally and cross-sectionally. The DEA analysis was supplemented by, and compared to, traditional financial ratio analysis which provided additional insight into the financial performance of the banks. The findings show that the listed banks on the average performed better than the unlisted banks albeit not statistically significant. The out-performance of the listed banks to the unlisted banks was generally due to the strong financial performance of a particular international subsidiary bank. This result was also consistent with the ratio analysis.

Keywords: Stock Exchange, Financial Performance, Data Envelopment Analysis, Banking Performance

1. Introduction

All over the world, from developed economies to the developing economies, companies are encouraged to list on the stock market because of the benefits to the individual companies and to the general economy of the country as a whole. It has been argued that "even with sound management and strong product demand, the lack of credit constrains management capacity to respond to the market and expand" (Cook and Nixson 2005). Thus, access to capital to undertake investments projects has a major influence on companies that list on the Stock Exchange and is one of the major benefits of listing on the stock exchange. Companies also enjoy other benefits such as brand awareness and an improved company's profile which increases the capacity to access other financing options when required. Yet in Ghana since the establishment of the Ghana Stock Exchange in 1990, only thirty-six (36) companies are currently listed after twenty years of existence despite the obvious gains there is, to the listed companies. The quest therefore is to discover the degree to which listing on the GSE facilitates a company's financial performance.

The study covered the stock market and in particular, the GSE in respect of its impact on listed companies. Data collection was restricted to secondary data and was gathered from GSE fact-book and the annual reports of the sampled banks. The data covered a period of seven (7) years from 2004 to 2010.

2. Approach

The data for this research was primarily secondary data made up of a seven year consolidated accounts of the sampled firms. The research evaluated the financial performance of listed financial (banking) institutions on the GSE compared to unlisted banking institutions via a cross-sectional and longitudinal comparison of a financial performance measure developed using Data Envelopment Analysis. The initial design was to use financial ratios to determine the performance of the sampled firms. However this idea was given up during the review of the literature. It was discovered that the financial ratio has previously been used on a cross section of industries on the GSE, (Asantewaa 2008) and (Martey 2007), assessing their financial performance before and after listing on the GSE. It was also discovered that the use of DEA is becoming very popular as a performance analysis tool because of its several attractive characteristics that are not readily available in other more traditional financial analysis methodologies like the ratio analysis and regression. Considering its attractive characteristics and the fact that it has not been applied to assess financial performance of listed companies on the GSE before I decided to opt for this method.

It is worth noting that, the DEA model has been applied to analyze the financial statement of many industries such as the brewing industry in the USA, (Day et al. 1995), Turkish banking industry (Oral and Yolalan 1990), United Kingdom grocery industry, (Athanassopoulos and Ballantine 1995), and the United States defense industry, (Bowlin 1995, 1999), apart from the banking industries, Sherman and Gold (1985), Berg et al. (1991),

A cluster sampling method was used in this research. Only banking institutions listed on the GSE were considered in this research. The data for seven years, from 2004 to 2010 were collected from the financial statements of the banks. The initial plan was to collect data expanding ten years from 2001 to 2010. This was however reduced to seven (7) years because of lack of availability of data. The reason for the initial plan to use ten year period of data was to ensure that the time period was sufficiently long enough to accommodate business and product cycles. The results of comparison over a shorter period of time may be misleading because the firm's products and business cycles may differ from commercial cycles and this may affect the results. In order to get the consolidated account for the seven year period under consideration, banking firms which have been listed for at least ten years on the GSE were considered. Six out of the eight listed banks met the ten year period requirement out of which only seven consecutive years of data for four of them were obtained. Of the remaining twenty banks which are not listed, only eight have been in operation for ten (10) years. Out of the eight unlisted banks that met the 10 years criteria, only three were selected based on convenience, accessibility and availability of information. The data for the listed banks were collected from the GSE fact-book and annual reports whiles that of the unlisted banks were obtained from their company's annual general reports. The cash flow value of Standard Chartered Bank for the year 2010 was not available and therefore a simple average of its cash flow was calculated and used for that year. There was a re-denomination of the cedi in July 2007 resulting in the substitution of one Ghana Cedi (GH¢1.00) for ten thousand old Cedis (¢10,000). As a result the comparative figures for the years before 2007 have all been restated in the new Ghana Cedis (GH¢).

3. Stock Market Development in Africa

Proponents of stock market development, (Ross and Sara 1996), (Hughes and Gary 1992) argue that a well-functioning stock market is regarded by many as a core component of the financial sector and that such markets play a critical role in realizing sustainable economic growth. Indeed, an efficient stock market is a source of finance for corporations to attract inflows of foreign capital and strengthens linkages between

domestic and international capital markets. According to (Isimbabi 1997), equity market development can facilitate privatization programs and encourage domestic savings and investment. It also requires good financial reporting practices and exerts market discipline through disclosure and managerial accountability, and thus stock market can add to the stability of domestic firms.

In Africa the stock market development has become an important component of economic growth. But it remains largely illiquid, volatile, and fragmented, with low turnover ratio and capitalization as compare to others. The reasons for these are wide and varied as the review of the literature below has shown

Although the stock markets in Sub-Saharan Africa is not comparable to that of the U.S and the Western stock markets in terms of market capitalization and period of existence, the emergence and expansion of stock markets represents a significant trend toward attracting private capital investment and integration into the global financial marketplace. Despite the fact that the stock markets are growing rapidly and has become an increasing important part of many sub-Saharan African economies, according to Kenny and Moss (1998), it remains small and illiquid. Kenny and Moss (1998) further posit that as a result of their small size, illiquidity and often unstable political and economic environments, these infant markets have been extremely volatile.

However, policy change has improved regulations and economic environments on many sub-Saharan African countries. This has led to an improved market expansion and liquidity. In spite of these head ways, the market development in sub-Saharan Africa still remains weak and inefficient and highly dispersed due to a number of reasons such as what Pagano et al. 1998 refers to as 'cultural resistance.' They argued that practitioners talk about a cultural resistance of many entrepreneurs to take their companies public and further postulate that if this entrepreneurial resistance is more widespread in traditional businesses, which happen to be associated with low market-to-book value. Another possible explanation to this observation is that the lack of enforcement of minority property rights in most Africa countries including Ghana makes it more difficult for young and small companies to capture the investors' trust. As in (Chemmanur and Fulghieri 1995), small independent companies find it hard to become known to the investing public, and thus incur a large adverse selection cost in selling equity on public markets and a host of other hindrances which have been catalogue in many literatures, (Levine 1990), (Demirgùc-Kunt and Levine 1993), (Pardy 1992).

4. The Ghana Stock Exchange (GSE)

The Ghana Stock Exchange (GSE) was incorporated in July 1989 as a company limited by guarantee. The need for a stock exchange for Ghana had been considered as far back as 1968, although a rudimentary market that was set up in 1971 experienced a false start. Trading on the GSE actually commenced on November 12, 1990 with eleven (11) listed companies. This number has grown to 36 after twenty years of operation, a listing rate of about one company per year. The slow pace of listing on the GSE reflects the pace of growth of the capital market of Ghana.

5. Results

This research tested the hypothesis of whether listing on the Ghana Stock Exchange actually impacts on financial performance of the listed companies. The input and output variables of the Decision Making Units (DMU's) for a seven year period (2004 – 2010) were extracted from the financial statements of the sampled banks except the cash flow value of Standard Chartered Bank for the year 2010 which was not available and therefore a simple average of its cash flow was calculated and use for that year.

Several efficiency studies of commercial banks and bank branches, such as Sherman and Gold (1985), Ferrier and Lovell (1990), Berg et al. (1991), have used different production outputs keeping the input (such as labor, fixed assets, capital) remaining the same. Sherman and Gold (1985), for

example, used the number of transaction as the output while Ferrier and Lovell (1980) used the total number of accounts and account size as the output.

This study uses the production approach with two (2) inputs: Total Asset and Operating Expenses. The outputs are three (3) and they are; Operating Profit, Operating Income and Cash Flow. These provided productivity measurement of both the listed and unlisted banks.

Table 1: The results of the DEA analysis from 2004 to 2010 within each DMU (bank) – intra company performance efficiency analysis
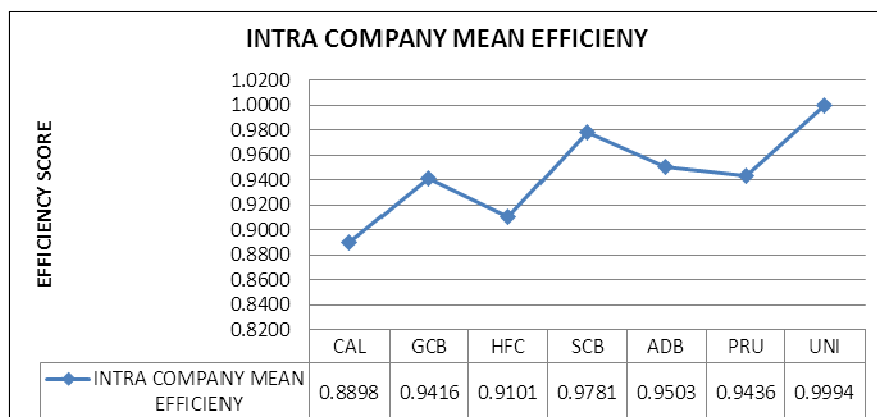
		INTRA COMPANY EFFICIENCY TREND								
	DMU's	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**Mean**	**Rank**
Listed banks	CAL	1.0000	1.0000	0.9236	0.8578	0.8540	0.7854	0.8078	**0.8898**	7
	GCB	1.0000	1.0000	1.0000	0.8583	0.9695	0.7634	1.0000	**0.9416**	5
	HFC	1.0000	0.8793	0.7812	0.8944	0.8294	0.9867	1.0000	**0.9101**	6
	SCB	1.0000	1.0000	1.0000	0.8992	1.0000	1.0000	0.9472	**0.9781**	2
Unlisted banks	ADB	1.0000	1.0000	1.0000	0.8794	0.9054	0.8674	1.0000	**0.9503**	3
	PRU	1.0000	1.0000	1.0000	1.0000	0.9515	0.8157	0.8379	**0.9436**	4
	UNI	1.0000	0.9980	1.0000	0.9980	1.0000	1.0000	1.0000	**0.9994**	1
	Mean	1.0000	0.9825	0.9578	0.9125	0.9300	0.8884	0.9418	**0.9447**	
	Max	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9994	
	Min	1.0000	0.8793	0.7812	0.8578	0.8294	0.7634	0.8078	0.8898	

Cross-Sectional Efficiency Performance Analysis

The first analysis was an intra company analysis, where the performance of each company was analyzed over the period to see whether their performances were improving, decreasing or being maintained.

On the self-comparison DEA analysis, Unibank had the highest average score of approximately 0.9994 in a scale of 0 to 1 where 0 is the least efficient rating and 1 is the highest efficient rating. This indicates that Unibank, by its own criteria did well year-on-year compare to the other banks during the same period. The bank with the least average efficient score on self comparison was CAL Bank. CAL Bank had an average score of 0.8898 and was ranked seventh out of seven. From Table 1 it can be seen that CAL Bank did well in 2004 and 2005 by attaining an efficiency rate of 1.0, but its performance started declining afterwards until it got to its lowest point in 2009 with an efficiency rate of 0.7854 and started picking up again in 2010. Figure 1 is a graph that shows the mean efficiency score of each bank over the entire period, with the lowest score of 0.8898 by CAL Bank and the highest score of 0.9994 by Unibank.

Figure 1: Showing a graph of the intra bank average efficiency score

	CAL	GCB	HFC	SCB	ADB	PRU	UNI
INTRA COMPANY MEAN EFFICIENY	0.8898	0.9416	0.9101	0.9781	0.9503	0.9436	0.9994

In all, each bank performed relatively well in 2004 as the mean performance of all the banks in 2004 had an efficient rating of 1.0. The average performance of the banks however, decline steadily until 2008 when it began to fluctuate. The outcome of this measure indicated that given the resources (inputs) available to each bank at any particular period, their best output was in 2004. This result is consistent with the ratio analysis in Table 2. The average Return on Asset (ROA) for the banks over the period was highest in 2004 with a value of 4.06, fluctuated in 2005 and 2006 and then decline steadily to the lowest in 2009.
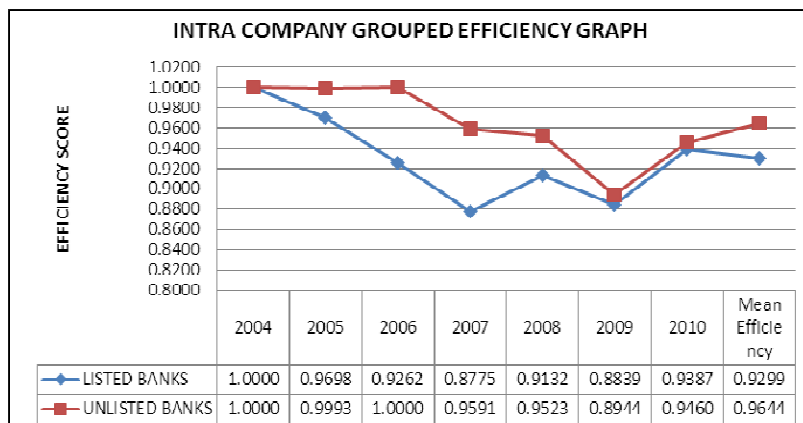
With the exception of 2004, where the listed banks and the unlisted banks all had an average score of 1.0 on a self comparison basis as explained earlier, the unlisted banks had higher mean score than the listed banks for the rest of the years as can be seen in

Figure 2 and the overall mean of the unlisted banks lie above that of the listed banks.

Table 2:   The results of Return on Asset (ROA) ratio analysis of both the listed and unlisted banks from 2004 – 2010 measured in percentages

		RETURN ON ASSET (%)						
	Banks	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Listed banks	CAL	5.53	4.59	4.33	3.55	3.39	2.32	2.47
	GCB	4.17	3.97	5.03	3.45	3.01	1.07	4.32
	HFC	4.07	1.38	1.70	2.68	2.20	2.70	3.66
	SCB	6.93	6.89	6.56	5.34	4.45	5.96	6.09
Unlisted B banks	ADB	4.00	2.35	2.84	2.46	2.39	1.82	3.43
	PRU	2.89	2.94	1.82	2.09	2.40	1.07	1.43
	UNI	0.85	0.48	1.61	1.15	1.64	1.44	1.74
	Mean	4.06	3.23	3.41	2.96	2.78	2.34	3.31

Figure 2: Shows the graph of the average intra bank efficiency score of the listed and unlisted banks

	2004	2005	2006	2007	2008	2009	2010	Mean Efficiency
LISTED BANKS	1.0000	0.9698	0.9262	0.8775	0.9132	0.8839	0.9387	0.9299
UNLISTED BANKS	1.0000	0.9993	1.0000	0.9591	0.9523	0.8944	0.9460	0.9644

Longitudinal Efficiency Performance Analysis

The main focus of this research was the inter-bank efficiency performance. The results of the DEA analysis of the inter-bank efficiency performance are contained in Table 3. The lowest efficiency score was recorded by HFC in 2005 (0.6231), which contributed significantly in making 2005 the least efficient year for the entire period under scrutiny. 2008 was the best performing year for the entire period with efficiency score of 0.9618.

Between the banks, Standard Chartered Bank recorded the highest average score over the entire period with efficiency score of 1.0 and ranked the highest (1st) of all the banks under study. Indeed it can be observed that Standard Chartered Bank recorded 100% efficiency year-on-year and can be

concluded as the most successful (efficient) bank to use its resources (inputs) efficiently to generate its outputs (Operating profit, operating income, operating cash flow). See Figure 3. This result is corroborated by the ratio analysis that was also performed and compared to the outcome of the DEA analysis. It was observed that Standard Chartered Bank obtained the highest value for Return on Assets and had the least Expense Ratio value. In all SCB had a better ratio than the other banks and it confirms the outcome of the DEA analysis. The ratios did not necessarily favoured any one particular bank apart from SCB which was quite clear. This highlights the difference between ratio analysis and data envelopment analysis and reflects how DEA might complement ratio analysis by providing information not readily available from ratio analysis.

Table 3: The results of the DEA analysis of both listed and unlisted banks from 2004 to 2010 Inter- company performance efficiency rating (Longitudinal analysis of the data)

		INTER COMPANY EFFICIENCY - LISTED AND UNLISTED								
		2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**Mean**	**Rank**
Listed banks	CAL	0.9513	0.8334	0.8732	0.9622	0.9564	1.0000	0.7813	0.9083	4
	GCB	1.0000	0.7368	1.0000	0.9694	0.9352	0.6625	0.9897	0.8991	5
	HFC	1.0000	0.6231	0.7069	0.8612	1.0000	0.8810	1.0000	0.8674	6
	SCB	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1
Unlisted banks	ADB	0.9937	1.0000	0.8605	0.9784	0.9581	0.8064	1.0000	0.9424	3
	PRU	0.7760	1.0000	0.7947	0.8992	0.8826	0.8332	0.8684	0.8649	7
	UNI	1.0000	0.7387	1.0000	1.0000	1.0000	1.0000	0.9039	0.9489	2
	Mean	0.9601	0.8474	0.8908	0.9529	0.9618	0.8833	0.9348	0.9187	
	Min.	0.7760	0.6231	0.7069	0.8612	0.8826	0.6625	0.7813	0.8649	
	Max	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

Figure 3: Shows the average inter-bank efficiency score of both listed and unlisted banks

	CAL	GCB	HFC	SCB	ADB	PRU	UNI
Mean Efficiency	0.9083	0.8991	0.8674	1.0000	0.9424	0.8649	0.9489
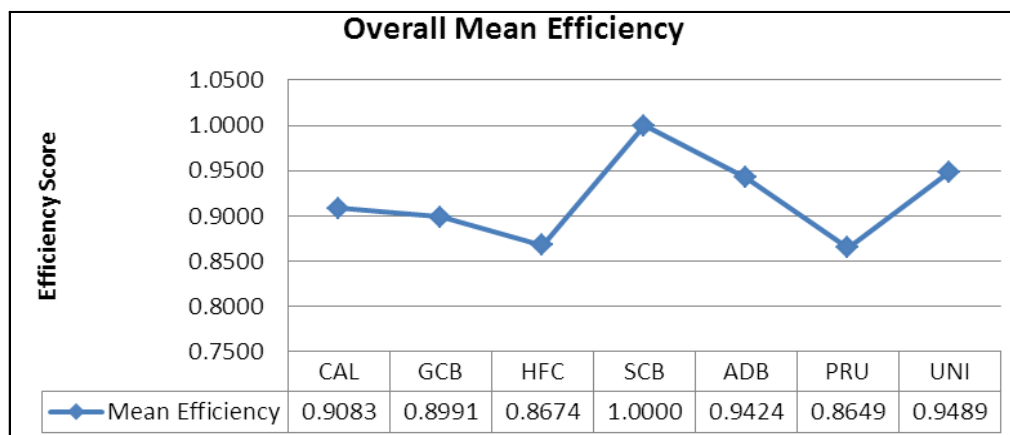
It was observed that, whiles the average performance of listed banks out performed that of the unlisted banks in 2004, 2006, 2008, 2009 and 2010, the unlisted banks out performed that of the listed banks in 2005 and 2007 although in both cases the difference in performances are marginal except in 2005 which was quite significant. It can be deduced that although the listed banks were more efficient in most of the years compare to the unlisted banks, this achievement was largely attributed to the contribution by Standard Chartered Bank. This can be argued from the fact that although the listed banks had outperformed the unlisted banks on five out of seven years, two out of the three unlisted banks, Unibank and ADB were ranked the second and third respectively behind Standard Chartered Bank on the overall efficiency performance score.

Figure 4: Shows the graph of average banking performance of all the sampled banks from 2004 to 2010
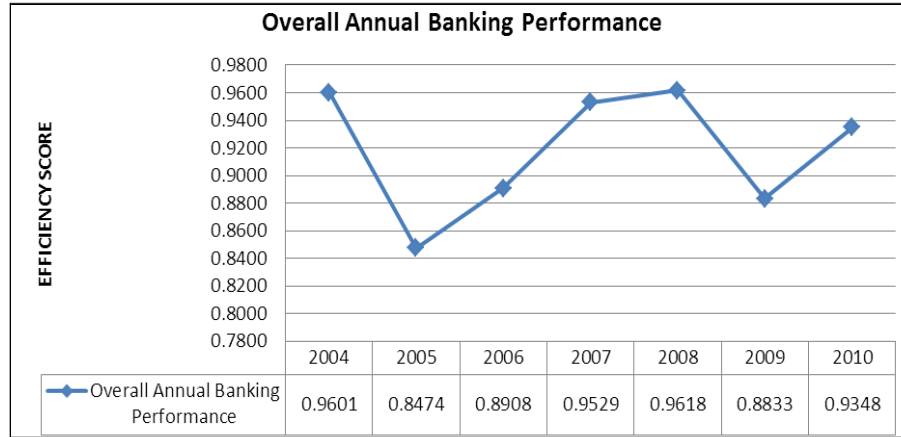
The average banking performance from 2004 to 2010 is presented in figure 4. The performance dropped from a high of 0.9601 in 2004 to its lowest in 2005 with a performance score of 0.8474. The performance picked up steadily to another peak in 2008 with a score of 0.9618 and dropped to another minimum 2009 to 0.8833. It began to rise again in 2010. This observation was quite interesting and will require further studies to actually confirm if a performance pattern does exist in the Ghanaian banking sector performance efficiency.

The average efficiency score of both listed and unlisted banks are shown in Figure 5 and it represent the general performance of the listed banks and the unlisted banks. It can be observed that the figures are very close to call and therefore it is not so clear whether the listed banks outperformed the unlisted banks.

Figure 5: Shows the average efficiency score of listed and unlisted banks from 2004 to 2010
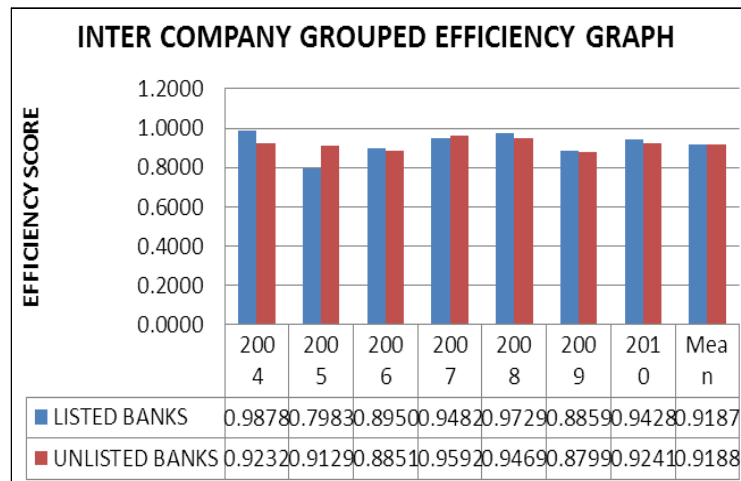

Table 4:   The results of the t-Test statistical test of the means of the listed and unlisted banks from 2004 to 2010

t-Test: Paired Two Sample for Means		
	Variable 1	**Variable 2**
Mean	0.918699	0.918757
Variance	0.004216	0.00086
Observations	7	7
Pearson Correlation	**0.519558**	

Table 4: The results of the t-Test statistical test of the means of the listed and unlisted banks from 2004 to 2010 - continued

Hypothesized Mean Difference	0	
df	6	
t Stat	-0.00272	
P(T<=t) one-tail	**0.498959**	
t Critical one-tail	1.94318	
P(T<=t) two-tail	0.997917	
t Critical two-tail	2.446912	

In order to ascertain if there is any significant difference in the performance of the listed banks and the unlisted banks, a one-tailed t-score statistical test was performed at an alpha (α) of 0.05 and the results is shown in Table 44. The Pearson correlation value is $0.519558 \approx 51.96\%$ which is far greater than the α value of 0.05 and this indicates that there is not enough evidence to support the alternative hypothesis and therefore the null hypothesis cannot be rejected. The statistical results therefore indicate that there is no significant difference between the performance of the listed banks and the unlisted banks.

6. Findings

The findings show that Standard Chartered Bank, a listed bank on the GSE, was the most efficient out of the seven banks followed by two unlisted banks Unibank and ADB respectively. Year-on-year the average efficient score by the banks show a drop from 0.9601 in 2004 to 0.8474 in 2005. There was steady increase in performance from 2006 until 2009 when it drop again from 0.9618 to 0.8833 and it started picking up again in 2010.

Furthermore, it was observed that although GCB had more assets and generated more operating income than Standard Chartered Bank, and they are both listed, Standard Chartered Bank was ranked first whiles GCB was ranked fifth out of seven on the efficiency score. This indicates that the levels of efficiency has much more to do with efficient utilization of resources such as decreasing operating expenses to increase outputs such as operating profit and cash flow rather than scale of production. It was observed that the difference in operating expenses between Standard Chartered Bank and GCB was the main factor accounting for the vast difference in their efficiency scores and hence their ranks.

Finally, it was also realized that the year 2004 was the most efficient year for all the banks. This high efficiency performance repeated in 2008. Immediately following these high efficiency years are the lowest performance years with 2005 as the least efficient year followed by 2009. Interestingly the years 2004 and 2008 were election years in Ghana and it was associated with high depreciation of the Ghana cedi against it major trading currencies. It could be argued that the high efficiency performances of these two years (2004 and 2008) are as a result of the high profits and improved operational cash flow made by the banks as a result of gains made in trading in foreign currencies in these years. This may suggest some form of pattern in the efficiency performance of banks in Ghana for both listed and unlisted banks as can be seen in the graph showing the average financial performance of all the sampled banks in Figure 4.

Practical and Policy Direction of DEA

In a relatively short period of time DEA has grown into a powerful quantitative analytical tool for measuring and evaluating performance. DEA has been successfully applied to a host of different types of entities engaged in a wide variety of activities in many contexts worldwide. As the findings of this studies attests, DEA is independent on the scale of production but rather scores entities on their relative efficiency performance. This is very useful and overcomes most of the challenges encountered with other forms of performance analysis when comparing the performances of entities in the same industry but of relatively different sizes.

Practically, DEA has proven to be a very powerful analytical tool for assessing the relative performance of entities within an industry and also for benchmarking and can also complement other performance analysis. DEA is receiving a lot of policy attention from industry regulators and professionals especially in the U.S, Japan, China and some other developed countries. It is believed that regulators and professionals in Ghana should begin looking at DEA as an alternative quantitative analytical tool and tap it potentials.

Limitations of Data Envelopment Analysis (DEA)

Despite its strength and power as a performance analysis tool, DEA has its limitations and shortcomings that need to be highlighted. Firstly DEA has been designed to compute efficiency scores only when one or more inputs and one or more outputs are used for the analysis. It would be better if the methodology has the flexibility to allow for one or more or even zero input and outputs as sometimes experienced practically.

Additionally the application of DEA requires solving a separate linear program for each DMU. This creates an intensive computational challenge when DEA is applied to problems which have many DMU's. However, this computational challenging can be overcome by the power of present day computers.

Further, since DEA is an extreme point technique, errors in measurement can cause significant problems. DEA efficiencies are very sensitive to even small errors making sensitivity analysis an important component of post-DEA procedure.

7. Conclusion

The purpose of this study was to examine the extent to which listing on the GSE impacts on the financial performance of the listed companies. Seven banks (four listed and three unlisted) were selected based on set criteria and availability of data and their financial efficiency performance studied. Using a non-parametric Data Envelopment Analysis (DEA) the efficiency performance of the banks were examined using data extracted from their financial statements from 2004 to 2010.

The results of the analysis indicated that although the listed banks outperformed the unlisted banks in years 2004, 2006, 2008, 2009 and 2010, whiles the unlisted banks outperformed the listed banks in 2005 and 2007. These out performances were very marginal and a statistical test indicated that the gap between the mean performances of the listed banks and the unlisted banks is not statistically significant. Thus this study concludes that there is no difference between the financial performances of listed banks and unlisted banks.

References

[1]   Asantewaa Stella (2008), The Effect of Listing on the Ghana Stock Exchange, University of Ghana Business School Library
[2]   Asli Demirgüç-Kunt and Ross Levine, 1996, "Stock Market Development and Financial Intermediaries: Stylized Facts" World Bank Economic Review pg. 291 - 321
[3]   Athanassopoulos, A.D., Ballantine, J.A., 1995. Ratio and Frontier Analysis for Assessing Corporate Performance: Evidence from the Grocery Industry in the UK. Journal of the Operational Research Society 46 (4), 427-440
[4]   Berg, S. A., Førsund, F. R. & Jansen, E. S. (1991). Technical efficiency of Norwegian banks: the non-parametric approach to efficiency measurement. The journal of productivity analysis, volume 2, 127-142
[5]   Bowlin, W.F., 1995. A characterization of the financial condition of the United States aerospace defense industrial base. Omega, the international journal of management science 23 (5), 539-555

[6]   Cook P, Nixson F. 2005. Finance and small and medium-sized enterprise development. In Finance and Development: Surveys of Theory, Evidence and Policy, Green CJ, Kirkpatrick CH, Murinde V (eds). Edward Elgar: Cheltenham

[7]   Charnes, A., Cooper, W. W. and Rhodes, E. (1978). Measuring the efficiency of decision making units. European journal of operational research, volume 2, 429-444

[8]   Day, D.L., Lewin, A.Y., Li, H., (1995). Strategic leaders or strategic groups: a longitudinal data envelopment analysis of the U.S brewing industry. European journal of operational research 80 (3), 619-638

[9]   Ferrier, Gary D and Lovell Knox C. A., 1980, "measuring cost efficiency in banking econometric and linear programming evidence, journal of econometrics 46 (1990) 229-245.

[10]   Kenny, Charles, and Todd D. Moss, 1998, "stock markets in africa: emerging lions or white elephants?" world development, Vol. 26, pp. 829-43.

[11]   Knox C. A. Lovell, 1990, "production frontier and productive efficiency" Oxford University Press

[12]   Isimbabi, Michael J. "stock markets, foreign investment, and economic growth in Africa", SAIS Review - volume 17, number 2, summer-fall 1997, pp. 141-152

[13]   Martey Alfred (2007), measuring the impact of listing on the Ghana stock exchange, balm library, university of Ghana.

[14]   Oral, M., Yolalan, R., (1990). An empirical study on measuring operating efficiency and profitability of bank branches. European journal of operational research 46 (3), 282-294

[15]   Pagano M. Panetta, F. And Zingales, (1998) 'why do companies go public? An empirical analysis. The journal of finance, volume 53 pp27-64

[16]   Robert Pardy, 1992, "Institutional reform in emerging securities markets" world bank policy research working paper

[17]   Ross Levine and Sara Zervos, 1996, "stock market development and long-run growth", world bank economic review, pg. 323-339

[18]   Sherman, H. D. & Gold, F. (1985), Bank branch operating efficiency. Evaluation with data envelopment analysis. Journal of banking and finance, volume 9, 297-315

[19]   Thomas J. *Chemmanur*; Paolo *Fulghieri.* The review of financial studies, Vol. 12, No. 2. (Summer, 1999), pp. 249-279

[20]   William. F. Bowling, 1999, "An analysis of the financial performance of defense segments using data envelopment analysis", the journal of accounting and business public policy, volume 18, issue 4-5, Pages 287–310.
          .

Integration Financiere Maghrebine: Defis ET Perspectives

Taleb Fatima
Université de Mascara
E-mail: fatimataleb2000@yahoo.fr

Benhabib Abderrezak
Université de Tlemcen

Hachemaoui Kamel
Université de Mascara

Résumé

Dans le contexte maghrébin, deux raisons peuvent être avancer pour justifier l'intérêt qui doit être accordé à l'intégration régionale notamment sous son aspect financier, à savoir, la mondialisation et la réussite du modèle européen.

L'objectif de ce travail est d'évaluer le potentiel d'intégration financière régionale maghrébine et ce à la lumière de l'expérience européenne. L'évaluation va se faire à travers trois paramètres à savoir: la libéralisation des marchés financiers, le contrôle prudentiel et l'harmonisation fiscale. Ces paramètres représentent, selon Plihon (2002), les politiques autours desquelles le modèle d'intégration européenne s'est articulé.

Mots clé: intégration financière régionale, Union du Maghreb Arabe, contrôle prudentiel, harmonisation fiscale.

Abstract

In the Maghreb context, two reasons can be advanced to justify the interest which must be granted to the regional integration in particular with its financial aspect, namely, the globalization and the success of the European model.

The objective of this work is to estimate the potential of Maghreb financial integration in the light of the European experience. The evaluation is going to be made through three parameters namely: the liberalization of financial markets, the prudential control and the fiscal harmonization. These parameters represent, according to Plihon (2002), the policies of which the model of European integration was articulated.

Keywords: regional financial integration, Arab Maghreb Union, prudential control, fiscal harmonization.

Introduction

Impulsée par la proximité géographique, la tendance de regroupement économique ne cesse de prendre de l'ampleur dans la plupart des régions au monde. En effet, la majorité des pays ayant opté pour un processus d'intégration régionale ont pour objectifs le soutien de la prospérité économique et la

présence dans la scène économique mondiale. Depuis les années quatre vingt, on assiste à une résurgence de l'intégration régionale dans le monde. Ce regain d'intérêt s'explique par le succès de l'Union Européenne et la monté en puissance du phénomène de mondialisation.

Le projet maghrébin doit être abordé sous ses différents aspects, politique, social, culturel et économique. Notre intérêt va vers l'économie dans son volet financier que la littérature n'a pas manqué de souligner l'effet de l'intégration financière régionale sur la croissance économique (Levine, 1997; Gianetti et al., 2002; CEA, 2008; BAD, 2010)

Dans ce sens, l'intégration financière au Maghreb peut générer une croissance économique dans la mesure où elle facilite les réformes financières dans le cadre national, permet des gains en termes d'économie d'échelle et accroît la compétitivité.

Dans cet écrit, il sera question de voir si une intégration financière régionale au sein du Maghreb est envisageable et ce à la lumière de l'expérience européenne.

2. Le Maghreb: une vue D'ensemble

La première tentative de libéralisation des échanges intermaghrébins remonte à 1964, date du lancement à Tunis du Comité Permanent Consultatif du Maghreb (CPCM). Mais se fut l'échec en 1970 pour cause, la divergence des politiques économiques adoptées par les différents pays après leur indépendance. En février 1989, un nouveau projet d'intégration a vu le jour avec la signature du traité portant création de l'Union du Maghreb Arabe par l'Algérie, la Libye, la Mauritanie, la Tunisie et le Maroc. Ce dernier a pour objectif la constitution d'un espace d'échange et de circulation des hommes, des biens, des services et des capitaux comme le souligne l'article 02 du Traité[1].

Cependant, bien qu'un nombre considérable d'accords bilatéraux[2] soit signés entre les pays de la région, leur mise en œuvre reste bloquée par l'absence d'une volonté politique. En effet, les commerciaux et financiers restent en deçà des aspirations. Selon la CNUCED, en 2011, le commerce intra- zone n'a représenté s que moins de 4% du commerce avec le reste du monde (*cf*. tableau N° 01).

Tableau n 1:   Commerce intra-UMA (importations-exportations) (2005-2011)

ANNEE		2005	2006	2007	2008	2009	2010	2011
ECONOMIE	**MESURE**							
UMA (Union du Maghreb arabe)	**IMPORTATIONS**							
	Dollars des États-Unis aux prix courants et taux de change courants en millions	1853	2312	2856	4138	3078	3239	5010
	Pourcentage par destination	3,00	3,46	3,30	3,52	3,00	2,92	3,95
	EXPORTATIONS							
	Dollars des États-Unis aux prix courants et taux de change courants en millions	1895	2355	2842	4540	3241	3789	4689
	Pourcentage par destination	1,91	1,97	2,11	2,49	2,89	2,71	3,55

CNUCED, UNCTADstat (2011)

Nous considérons que la construction maghrébine a été entravé par un certains nombres de causes objectives tel que l'arrivée d'autres projets concurrents comme le partenariat euro-méditerranéen et l'insertion à l'économie mondiale à travers l'adhésion à l'OMC. D'autres causes d'ordre politique, ralentissent l'aboutissement du projet maghrébin tel que le conflit maroco-algérien sur le Sahara Occidental.

Cela n'écarte pas le fait que la région ait un potentiel non négligeable de commerce entre les pays membres (Achy, 2007; Millogo, 2011) vu leur richesse en ressources naturelles, leur rapprochement géographique et leur histoire, langue et religion communes. Dans le même ordre d'idées, les pays du Maghreb ont accompli des progrès remarquables dans la réforme de leurs secteurs financiers et ce pour un même objectif celui de s'aligner aux normes internationales pour une meilleure

---

[1]   www.maghrebarabe.org
[2]   Rares sont les accords multilatéraux entre les pays de la région.

insertion dans l'économie mondiale. Tant d'atouts, qui ne font que renouveler l'intérêt pour l'intégration maghrébine.

3. Fondements de L'intégration Financière Européenne

L'intégration financière est un processus de création d'un marché unique des services financiers et de capitaux à court, moyen et long terme caractérisé par la loi du prix unique pour des biens semblables (Caesar, 1989).

La Banque Centrale Européenne (BCE), considère qu'un marché financier est intégré s'il est régit par la « Loi du Prix Unique » et où l'offre et la demande réagissent instantanément aux prix transfrontaliers.

Inspiré par les travaux de la BCE, (Pop, 2008) stipule qu'un marché intégré signifie que tous les opérateurs exerçants des activités financières bénéficient d'un traitement équitable et de la non discrimination quant à l'accès aux différents services financiers. Une démarche d'intégration financière régionale (IFR) n'est envisageable que dans un contexte de marché ouvert, régulé et harmonisé dans la zone intégrée.

L'intégration financière européenne s'inscrit dans un processus d'intégration économique qui a débuté dans le milieu des années cinquante (Caesar, 1989; Plihon, 2000), pour (Plihon, 2002), l'IFR s'articule autour de trois politiques fondamentales:

1. une régulation des marchés financiers qui comporte la libéralisation des systèmes financiers nationaux, permettant une concurrence saine ;
2. un contrôle prudentiel qui garantie la sécurité des usagers et la stabilité du système financier et monétaire ;
3. enfin, une harmonisation de la fiscalité des revenus financiers.

Il ne faut pas manquer de signaler que l'intégration financière européenne est avant tout un processus politique qui s'est inscrit dans le cadre de la volonté de créer une union économique et monétaire.

4. Quelles Perspectives Pour L'intégration Financière Maghrébine?

Dans la détermination du potentiel d'intégration financière du Maghreb, il ne sera pas pris en compte les problèmes politiques inter maghrébins qui existent essentiellement entre l'Algérie et le Maroc à cause du Sahara Occidental parce que le contexte mondial actuel ne laisse pas beaucoup de choix aux pays maghrébins. Face à la vague déferlante de la mondialisation et où les actions solitaires ne sont pas de mise (Bacconnier, 2003), l'intégration régionale constitue, à n'en pas en douter, un moyen incontournable pour s'engager dans le commerce mondial.

En outre, une analyse précise nécessite la prise en considération de l'écart de développement entre les pays européens et maghrébins.

4.1. La Régulation des Marchés Financiers

La régulation des marchés financiers englobe la libéralisation bancaire et financière, accompagnée d'une harmonisation de la réglementation entre les pays de la zone intégrée.

Le secteur bancaire dans les pays maghrébins a connu des mutations importantes en matière de législation surtout après les années 1980, dans le cadre de la restructuration économique dictée par le FMI et qui s'est imposée comme une nécessité du passage de ces pays à l'économie du marché et l'intégration à l'économie internationale (Keramane, 1996). En effet, sous l'égide du FMI, la porte était grande ouverte au processus de privatisation (Bras, 1999), donc aux opérateurs privés et étrangers et ce dans une volonté d'assainir les portefeuilles des banques et d'encourager une concurrence saine et loyale, après des décennies du monopole de l'Etat. C'est dans ce cadre qu'on peut envisager le rapprochement entre le secteur financier des pays en question.

Cette ouverture du secteur bancaire aux différents opérateurs a permis, dans les trois pays maghrébins, une évolution de sa structure. Ceci s'est manifesté principalement dans l'augmentation du nombre de banques privées et étrangères opérant sur leurs sols respectifs.

La réglementation de chacun des trois pays maghrébins autorise à toute banque étrangère d'exercer sur son sol à condition de respecter les lois dictées par les autorités nationales et qui sont généralement conformes aux normes internationales (Knight, 1999).

En effet toute banque maghrébine ayant obtenue l'agrément dans son pays peut, après autorisation, exercer dans les autres pays maghrébins sans aucune discrimination. Ceci, peut être considéré, dans un premier temps un acquis fondamental en attendant d'autres initiatives vers une coordination des politiques maghrébines.

En ce qui concerne le mouvement des capitaux, il est possible aussi bien aux résidents qu'aux non-résidents d'opérer des transferts (Abed, 2003). Ainsi, pour le financement des activités à l'étranger complémentaires à leurs activités dans leur pays respectifs, les agents résidents sont autorisés de transférer des capitaux à l'extérieur. Cette mesure est valable pour l'Algérie (Khennas, 1992), le Maroc[3] et la Tunisie (Abbate, 2001). Il est également reconnu le droit aux entreprises étrangères (maghrébines soient-elles ou non) de transférer leurs profits.

En reconnaissant le rôle important de la bourse au développement et à la diversification du mode de financement de l'économie, les autorités maghrébines ont adopté plusieurs mesures pour améliorer la capacité de ce marché dans la mobilisation des ressources. Des avantages fiscaux et de nouvelles réglementations ont été mises en place afin d'encourager les investisseurs, nationaux et étrangers, de pénétrer les marchés boursiers maghrébins.

Malgré ces mesures, le rapport entre la capitalisation boursière et le PIB reste en deçà des attentes surtout en Algérie où ce taux ne dépasse pas les 0.1%. Pour les deux autres pays maghrébins, la situation est meilleure dans la mesure où ce taux dépasse, respectivement, les 20% et 50% en Tunisie et au Maroc. Cette situation est due de prime abord au nombre très limité des titres cotés permettant la mobilisation de l'épargne nationale et étrangère et aux difficultés financières qui touchent les secteurs des assurances (*cf.* tableau n° 02).

Tableau 2: Évolution des marchés boursiers maghrébins, 2007 et 2011**.**

Pays	Nombre de sociétés cotées		Capitalisation du marché (% du PIB)	
	2007	**2011**	**2007**	**2011**
Algérie	2	3	0.07	0.09
Maroc	73	75	100.95	59.95
Tunisie	51	57	13.72	20.85

Sources: élaboré par l'auteur selon les sources: Bourses d'Alger, de Casablanca et de Tunis, CNUCED, UNCTADstat (2011)

Certes, les systèmes financiers maghrébins se trouvent à des niveaux différents de développement, mais l'analyse effectuée dans le cadre de ce travail montre une convergence des politiques adoptées en matière de libéralisation bancaire et financière. Faut-il noter que cette convergence n'est pas l'aboutissement d'une démarche volontariste visant à rapprocher les systèmes financiers maghrébins, mais elle résulte des exigences des institutions internationales notamment, le FMI et l'OMC. Cependant, une possibilité d'intégration financière maghrébine est de mise.

4.2. Le contrôle Prudentiel

La démarche prudentielle est au cœur du suivi de l'activité bancaire par les instances de contrôle, notamment les banques centrales et les autorités de supervision tant au niveau national, régional ou encore international.

---

[3] www.animaweb.org/

Dans les pays du Maghreb, vu leur implication avec le FMI, suivent les mêmes directives qui leur sont imposées. En effet, dans le cadre du contrôle prudentiel, l'Algérie, le Maroc et la Tunisie suivent la même politique, à des différences près. Les banques et établissements financiers maghrébins sont contrôlés selon deux modalités (tout comme les européens): le contrôle sur place effectué par des missions d'inspections et sur pièces à partir des documents envoyés à l'autorité de tutelle.

En plus, dans les trois pays, les autorités de contrôle ont mis en place des règles de prévision contre les risques d'insolvabilité, d'illiquidité et le risque de marché. Deux instruments sont utilisés sur ce sujet: l'application de ratio prudentiel obligeant les acteurs à avoir des niveaux de fonds propres adéquat qui tient compte des risques encourus et l'application d'un système d'assurance des dépôts destiné à protéger les déposants contre les défaillances bancaires.

En effet, la mise en place des accords de Bâle I et II dans les pays du Maghreb permet aux banques maghrébines de converger vers les standards internationaux ainsi un rapprochement entre les trois pays du Maghreb en terme de régulation et de contrôle. Ces convergences dans la réglementation (avec d'autres mesures complémentaires propres à chaque pays) sont dues comme dans le premier cas de régulation aux engagements des pays maghrébins avec les institutions internationales. On peut reprocher au Maghreb une atonie quant à l'application de ces réglementations à cause de la défaillance du système judiciaire[4] qui, notons le, est au cœur de la réforme dans les trois pays en question. Cette initiative renforcera l'application des règles prudentielles.

Force est de constater que ce deuxième point a constitué la cheville ouvrière de l'intégration financière européenne et qui sera de même pour une éventuelle intégration maghrébine.

4.3. Analyse de L'harmonisation Fiscale

L'absence d'harmonisation des politiques fiscales n'a pas freiné le processus d'intégration financière en Europe (Plihon, 2002). En effet, il a fallu attendre la réalisation de l'intégration pour voir apparaître les premières tentatives d'harmonisation fiscale. A titre d'exemple, l'UE envisage d'instaurer une assiette commune de taxation[5].

Au Maghreb, parler à ce stade d'une harmonisation fiscale serait prématuré, dans la mesure où les politiques fiscales de chaque pays dépendent de leurs caractéristiques économiques, ce qui est tout à fait normal. Néanmoins, l'absence d'une telle harmonisation ne constituera pas un frein à un éventuel processus d'intégration financière, du moins à court terme, si les opérateurs maghrébins perçoivent de réels avantages à intégrer le marché de la région.

5. Conclusion

Malgré la spécificité de chacun des systèmes économiques des pays maghrébins, l'analyse que nous avons effectuée laisse apparaître une possibilité d'adoption du modèle européen d'intégration, sans pour autant être sur mesure.

En effet, en matière de régulation, de libéralisation financière et de contrôle prudentiel, l'Algérie, la Tunisie et le Maroc suivent les mêmes politiques qui ont constitué la pierre angulaire de l'intégration financière européenne. Mais faut-il le mentionner, les pays candidats à l'intégration doivent être en mesure de renforcer et de veiller à la bonne application de ces politiques et surtout de promouvoir les relations intermaghrébines en matière de coordination et d'harmonisation et de faire table rase de tous les conflits qui peuvent exister entre eux.

En plus, l'intégration maghrébine s'impose comme une solution inévitable face à la montée en puissance du courant de mondialisation et en parallèle le phénomène des groupements régionaux qui ne font que minimiser les chances des pays en développement d'avoir une part du marché mondial et de subsister à la concurrence.

---

[4]   Peterson Institute for International Economics (2008), Banking and Insurance Sector Study Prospects for Greater Global and Regional Integration in the Maghreb, Washington, DC

[5]   www.euronews.net.

En dépit d'être un rêve ou une nécessité, l'intégration maghrébine est une demande solennelle faite par les « partenaires » européens et américains.

Bibliographie

[1] Abbate F., (2001), « L'intégration de la Tunisie dans l'économie mondiale: opportunités et défis», Rapport présenté au cours d'un atelier de travail organisé à Tunis le 25/26 Septembre par CNUCED- PNUD.

[2] Abed G-T., (2003), « croissance et mondialisation, Pourquoi la région du Moyen Orient et de l'Afrique du Nord est à la traîne ? », Finances et Développement, Vol 40, n°1-3 pp. 10-14.

[3] Achy L., (2007), « Le commerce intra-régional: l'Afrique du Nord est-elle une exception ? » Economie du Maghreb n°III

[4] Bacconnier E., (2003), « Le régionalisme en Afrique », Grain de sel, n°25, Décembre.

[5] BAD (2010), « Intégration du secteur financier dans trois régions d'Afrique: Comment l'intégration financière régionale peut soutenir la croissance, le développement et la réduction de la pauvreté ?»

[6] Bras J-Ph. (1999), « Ces mutations administratives si nécessaires… », Panoramiques, Editions Ediff

[7] Caesar R., (1989), « Europe 92: l'intégration financière », IFRI, MASSOURI, Paris.

[8] Commission Economique pour l'Afrique, (2008), « Etat de l'intégration régionale en Afrique III, vers l'intégration monétaire et financière en Afrique »

[9] ECB, (2003), *Monthly Bulletin*, October.

[10] Gianetti, M.et al. (2002), « Financial market integration, corporate financing and economic growth, » European Commission Economic Papers No. 179, Brussels.

[11] Keramane A., (1996), « L'économie algérienne entre stabilisation et ajustement structurel. », L'économie, n°38, pp. 11-18, Novembre.

[12] Khennas S., (1992), « La régulation de l'économie algérienne: de bureaucratie rentière à l'Infitah », NAQD n°4, pp. 90-99.

[13] Knight M., (1999), « Les pays en développement ou en transition devant la libéralisation financière », Finances et Développement, Vol 36 n°2-6, pp 32-35.

[14] Levine, R. (1991). « Stock Markets, Growth, and Tax Policy.» The Journal of Finance 46(4)

[15] Millogo A., (2011), « Estimation du potentiel de commerce dans l'Union du Maghreb Arabe (UMA) par un modèle gravitationnel » Université du Sud Toulon Var.

[16] Peterson Institute for International Economics (2008), Banking and Insurance Sector Study Prospects for Greater Global and Regional Integration in the Maghreb, Washington, DC

[17] Plihon D., (2002), « Les politiques d'intégration des marchés financiers européens. », Thematic network EPOC, Mars.

[18] Plihon, D. (2000): « Quelle surveillance financière pour l'industrie des services financiers », Revue d'économie financière, n°60.

[19] Pop A., 2008, « Le processus d'intégration financière en Europe: Quo Vadis ? », Regards croisés sur l'économie, n°3

[20] www.animaweb.org/

[21] www.euronews.net.

[22] www.maghrebarabe.org

National Health Insurance and Tax Smoothing in Taiwan

Su-Hsing Hung

Corresponding Author, Department of Marketing and Distribution Management
Fortune Institute of Technology, Taiwan
E-mail: suhsinghung@gmail.com

Ming-Jang Weng

Department of Applied Economics
National University of Kaohsiung, Taiwan
E-mail: mjweng@nuk.edu.tw

Abstract

Are the budget policies of Taiwan's National Health Insurance (NHI) consistent with tax-smoothing theory? According to Ghosh (1995), when the surplus of a health insurance budget equals the expected present discount value of a change in health expenditure in later periods, the budget policy of NHI remains consistent with the assumptions inherent in tax-smoothing theory. The current study adopts Campbell's (1987) vector autoregressions model to estimate the expected discount value of health insurance expenditure variations; it also uses the Wald test to determine whether the NHI's actual budget surpluses are consistent with the expected present discount value of health insurance spending variations in the theoretical model. Empirical results indicate that the surplus in the actual health insurance budget is not consistent with optimal health insurance budget surpluses. In other words, the budget policies for NHI on Taiwan are not consistent with the optimal tax-smoothing path. These results remain as it was even the factor of structure breaks is included in the testing model.

Keywords: Time-Series Models, Government Expenditures and Health, Public Economics

1. Introduction

Taiwan implemented its National Health Insurance (NHI) program on 1 March 1995, and the coverage rate has approached 99%; the program is easily accessed by virtually all citizens in Taiwan.[1] NHI began suffering from financial deficits in 1998 and thus began to rely on the NHI Reserve Fund. To alleviate financial pressure, the NHI program increased the premium rate slightly, from 4.25% to 4.55%, in September 2002. This measure helped alleviate the pressure of this financial dilemma temporarily: according to estimates from the NHI Bureau, this premium-rate adjustment could cover the income-expenditure balance, but only until the end of 2004.[2] As the Bureau sought to suppress wasteful medical spending and actively promote income-increasing measures, officials implemented

---

[1]   NHI is compulsory insurance intended to ensure that all citizens, aside from convicted criminals, have the right to equal medical services. As of 2009, the NHI covered a total of 22 918 144 individuals, of the 23 119 772 citizens in Taiwan (Source: National Health Insurance Bureau).

[2]   When implemented in August 2002, the NHI premium rate was 4.25%; the rate was raised in September 2002, to 4.55%. At the time, studies predicted that a fiscal balance could be sustained until 2004, as a result.

the 'diversified fine-tuning' program in 2005, successfully delaying until 2008 the exhaustion of its Reserve Fund.

In 2009, the Bureau reintroduced policies to increase premiums. It intended to increase the prevailing premium rate of 4.55% to 5.18%—a 13.8% increase. However, the proposed increase in premium rates died in the Legislative Yuan, due to the economic recession and widespread unemployment. The serious financial deficit of the NHI program will not improve, due to popular opposition to premium-rate increases. However, the sustainable operation and development of the NHI system is critical to promoting popular welfare and benefits. In addition, making provisions for the sustainable development of NHI finances should be a high-priority goal for Taiwan's national policymakers, especially in the face of the government's increasing fiscal burdens.

Studies related to the NHI budget tend to take one of three foci: the income side, expenditure side and budget side. There is currently a dearth of literature related to NHI budgetary policy. Su et al. (2003) apply a cross-sectional model to estimate reasonable annual premium rates for the first 15 years after 2001, based on empirical data pertaining to inpatient care, surgical operation services, outpatient care, ambulatory care, Chinese herbal medicine and dentistry, as well as several assumptions under adjusted gender and age and population-growth trends. Their results predict that the premium rate would exceed 6% in 2003. Yang (2004) uses an intervention model featuring the inclusion of a co-payment and a regressive physician-payment policy. The result showed that co-payment intervention had a one-month delayed effect. Results using the intervention models suggest that a regressive physician-payment policy would have a greater impact than the co-payment policy in the month in which the policy was implemented, but predictions for one year using the time-series models produced different results. Zhang (2002) uses both a growth medical expenditure stochastic time-series model and a macroeconomic model to simulate the next 25 years of macroeconomic variables and medical expenditure growth rates. His research results indicate that if NHI premium rates were to remain at approximately 4.25%, the probability of NHI becoming bankrupt due to financial imbalance was 78.6%. The probability of this financial imbalance decreased as the premium rate increased; however, a 25-year estimation period seems too long for use in policy recommendations.[3] Nonetheless, frequent and small-scale adjustments to the premium rate were queried as appropriate NHI policy.

The optimization of NHI premium rates is an important issue that the current study seeks to examine further. This study uses assumptions inherent in tax-smoothing theory, as culled from an economic model, to examine whether NHI premiums are on an optimized path.

Optimized tax-rate planning plays an extremely important role in public economics and macroeconomic models. Barro (1979), Kydland and Prescott (1980) and Lucas and Stokey (1983) each assert that the term 'tax-smoothing theory' suggests that tax rates should be equalized in the long term. The empirical research of Barro (1979) indicates that tax rates imposed by the American federal government are consistent with tax-smoothing theory; he suggests that a tax-smoothing budget can be affected by expected and permanent expenditures and that change in temporary health expenditures and income can only affect NHI surpluses or deficits. Huang and Lin (1993) and Ghosh (1995) each suggest that when governments engage in tax smoothing, budget surpluses or deficits equal the net total discount present value of the expected change in government expenditures at a later period. Strazicich (1997) applies data from different frequencies to test the tax-smoothing hypothesis for the United States and a number of individual states; in a later study (2002), he also examines the tax-smoothing hypothesis in industrialized countries. The test results support the null hypothesis that tax variations are random-walk (i.e. they cannot predict tax variations). Fisher and Kingston (2004, 2005) study tax-smoothing theory for small-scale open economies, as well as the common implications of consumption-smoothing assumptions. Kula (2004) applies the two-stage least squares method to test whether the permanent expenditures of each American state requires accompanying equal measures of tax-rate change; he does so by using panel data of the United States for the 1978–1994 period.

---

[3]   Liu (2000) uses multiple regressions to empirically analysis NHI policy financial management capabilities, in order to provide a basis for policy recommendations. This encourages fiscal balancing and medical service efficiency.

The primary purpose of the current study is to examine whether NHI premium-rate policies in Taiwan are consistent with tax-smoothing theory. We apply the perspective of the optimal time-path for government taxes (Barro, 1979) and build on Ghosh's (1995) model of intertemporal tax smoothing and government budget surplus. The results indicate that NHI premium policies in Taiwan are not consistent with assumptions inherent in tax-smoothing theory; instead, those policies exhibit a tax-rate bias effect of 0.96. These results indicate that the government has relatively high subjective discount rates, which in turn implies that health care policies in Taiwan remain biased towards a behavioral model that emphasizes current consumption, as well as future increases in premium rate to support consumption. In addition, the optimal NHI budget surpluses calculated by the predictive model are inconsistent with actual budget surpluses. These results suggest that NHI premium rates are currently not consistent with the optimal path.

The research framework of this study is divided into five sections. The first section comprises the introduction, which explains this study's research purpose and includes a literature review. The second section discusses the theoretical model, explains the theoretical basis of the model and develops an intertemporal model for NHI budget surpluses under tax smoothing. The third section outlines the current study's empirical steps and results and discusses the testing of whether NHI budgetary policies are consistent with tax-smoothing theory. The results of a check for robustness are reported in the fourth section and a research conclusion is provided by the last section.

2. Theoretical Model

This section initially constructs a minimum distortion cost function for the NHI premium rate; it then uses this cost function to determine a NHI budget-surplus constraint equation under optimal tax smoothing. This study then uses a Vector Autoregressions (VAR) model to test the consistency between the optimal NHI tax-smoothing budget surplus and the actual NHI budget surplus.

2.1. Model Construction

According to the assumption of Bohn (1990), the distortion costs of NHI taxation can be shown as being proportional to the square of tax premiums; the target function for NHI taxation is found to be

$$V = \text{Max} - (\frac{1}{2})\sum_{i=0}^{\infty}\beta^i E\{\tau_{t+i}^2 | \Omega_t\}, \quad 0 < \beta < 1 \tag{1}$$

In this formula, β represents the subjective discount factors for the NHI program. Symbol $E\{. | \Omega_t\}$ denotes the conditional expected value of the information sets of the NHI Bureau in period t. Maximizing (1) obtains the NHI intertemporal dynamic budget constraint. The equation below illustrates this calculation:[4]

$$(1+n)d_{t+1} = (1+r)d_t + g_t - \tau_t \tag{2}$$

The current study uses a GDP deflator to modify the above variables. d_t is the NHI's total debt, g_t represents NHI expenditures, r is the NHI's constant actual interest rate, τ_t represents premium rates and n is the output growth rate. In addition, if g_t is treated as an exogenous variable, then n is a constant. By solving the optimization problem of equation (1) under the budget constraint equation (2), we obtain the result

$$\tau_t = \gamma\{(1-R)\sum_{i=0}^{\infty}R^i E[g_{t+i} | \Omega_t] + (r-n)d_t\} \tag{3}$$

---

[4] Please see Ghosh (1995; pp. 1035–40) for details on model derivation.

where $R \equiv (1+n)/(1+r)$ and $\gamma = [(1-(R/\beta)R)/(1-R)]$. The formula above in equation (3) indicates that premium rates are the proportional of γ on the conditional expected value of information sets of NHI expenditures, plus the proportional of effective actual interest rate for initial debt. The effective interest rate of NHI, $\frac{1}{R} (\cong r-n)$, is different from normal market rates. When $\beta = R$ (so that γ is equal to unity), the subject discount rate for the NHI bureau equals the effective interest rates for NHI. This implies that NHI budget policies are consistent with the tax-smoothing hypothesis. When $\beta > R$ (so that γ is larger than unity), the NHI Bureau has a lower subjective discount rate; the NHI Bureau prefers to implement high premium rate policies in order to accumulate surpluses, rather than lower premium rates in the future. Conversely, $\beta < R$ (γ is smaller than unity) indicates that the government has a higher subjective discount rate and the that the NHI Bureau tends to choose low health premium rate policies early on, with a view to increasing health premium rates in the future to support deficits produced earlier.

The current study follows Ghosh (1995) in emphasizing the examination of NHI budget constraints under the tax-smoothing hypothesis. The initial assumption of the tax-tilting effect γ in the NHI budget constraint equals 1 for deriving the NHI budget surplus under optimal tax smoothing. This study defines the NHI budget surpluses as $SUR_t = (1+n)(d_t - d_{t+1})$. This calculation then substitutes the definition into equation (2) and rewrites it for equation (3).

$$SUR_t = \tau_t - [g_t + (r-n)d_t]$$
$$= \sum_{j=1}^{\infty} R^j E\{\Delta g_{t+j} \mid \Omega_t\} \tag{4}$$

It is now possible to determine whether the NHI budget surplus becomes $\Delta g_{t+j} = g_{t+j} - g_{t+j-1}$ under optimal tax smoothing. This formula expresses Ghosh's suggestion that, under tax smoothing, NHI budget surpluses (or deficits) should absorb changes in short-term NHI expenditures. Therefore, tax-smoothing theory assumes that NHI budget surpluses will equal the total expected discounts of NHI expenditure variations in future periods. In summary, it is possible to obtain actual NHI budget surpluses as well as theoretical optimal NHI budget surpluses. Equations (5) and (6) below illustrate the actual NHI budget surpluses and the theoretical optimal NHI budget surpluses, respectively:[5]

$$SUR_t^* = \frac{1}{\gamma}\tau_t - (g_t + (r-n)d_t) \tag{5}$$

$$\hat{SUR}_t = \sum_{i=j}^{\infty} R^j E\{\Delta g_{t+j} \mid \Omega_t\} \tag{6}$$

2.2. Estimation of Theoretical NHI Budget Surpluses

To estimate the theoretical optimal budget surplus, this study uses an estimation method developed by Campbell (1987) that uses VAR models to estimate theoretical budget surpluses. The current study inputs changes in NHI expenditure and actual budget surpluses into the VAR (P) model to estimate the expected value of changes in NHI expenditure $E\{\Delta g_{t+j}\}$. In addition, we also test the causality between changes in NHI expenditure and budget surpluses. The VAR (P) estimation model can be expressed as follows:[6]

$$z_t = \Psi z_{t-1} + v_t$$

---

[5]   This actual NHI budget surplus refers to NHI budget surpluses that include tax bias effects.
[6]   Please see Campbell (1987; pp. 1257–58) for a detailed model derivation process for the VAR (P) estimation model.

$$\text{Where } z_t = \begin{bmatrix} \Delta g_t \\ \vdots \\ \Delta g_{t-P+1} \\ SUR_t^* \\ \vdots \\ SUR_{t-P+1}^* \end{bmatrix}_{2P \times 1}, \quad v_t = \begin{bmatrix} v_{1t} \\ 0 \\ \vdots \\ v_{2t} \\ 0 \\ \vdots \end{bmatrix}_{2P \times 1} \quad \text{and} \quad \Psi = \begin{bmatrix} a_1 & \cdots & \cdots & a_P & b_1 & \cdots & \cdots & b_P \\ 1 & 0 & \cdots & \cdots & 0 & \cdots & \cdots & 0 \\ 0 & 1 & 0 & \cdots & 0 & \cdots & \cdots & 0 \\ \ddots & & & & & \ddots & & \\ c_1 & \cdots & \cdots & c_P & d_1 & \cdots & \cdots & d_P \\ 0 & \cdots & \cdots & 0 & 1 & 0 & \cdots & 0 \\ 0 & \cdots & \cdots & 0 & 0 & 1 & 0 & \cdots \\ \ddots & & & & & \ddots & & \end{bmatrix}_{2P \times 2P}$$
(7)

By using matrix conversion, the current study is able to derive an estimate for optimal budget surpluses:

$$\hat{SUR} = [1,0,...,0]_{1\times 2P}[R\Psi]_{2P\times 2P}[I_{2P} - R\Psi]^{-1}_{2P\times 2P} z_t$$
$$= [\Gamma_{\Delta g}(L)\Gamma_{SUR}(L)]_{1\times 2P} z_t$$
(8)

Where I_{2P} is a $(2P \times 2P)$ unit matrix. After estimating the theoretical budget surplus, we can compare the result with actual budget surpluses, to test whether the theoretical optimal tax-smoothing budget surplus is consistent with the actual tax-smoothing budget surplus. The assumptions inherent in tax smoothing imply that $[\Gamma_{\Delta g}(L) \quad \Gamma_{SUR}(L)] = [0,...,0 \quad 1,0,...,0]$. Therefore, the coefficient of $\Gamma_{\Delta g}(L)_{1\times P}$ for changes in NHI expenditures equals 0, and the first item of the vector for the coefficient of $\Gamma_{SUR}(L)_{1\times P}$ —in which the actual budget surplus equals 1—and the other items in the vector matrix are equal to 0.

3. Empirical Procedure and Results

When estimating the tax-smoothing hypothesis *vis-à-vis* NHI premium rates, it is necessary first to determine whether the actual budget surpluses constitute a stationary time series; we can then estimate the level of bias among the NHI premium rates. We use the VAR model to estimate the time series of the change of NHI expenditures and the budget surpluses. Finally, the current study determines whether actual NHI budget premiums are consistent with the optimal NHI budget surpluses derived from the theoretical model.

3.1. Empirical Data

The data used in this study come from two primary sources: monthly data on NHI revenues and expenditures and data on NHI surpluses (deficits); all are obtained from the NHI Bureau's statistical database. This study converts quarterly GDP data using Chow and Lin's (1971) method for temporally disaggregating low-frequency quarterly data into high-frequency monthly data. Liu (2007) compares the differences among the estimation results produced using nine types of temporal disaggregation methods and actual data and evaluates the performance of each method. Liu finds that Chow and Lin's (1971) method performs the best in disaggregating actual quarterly GDP data into monthly data.[7] As a result, this study utilizes Chow and Lin's (1971) temporal disaggregation method and uses monthly data on industrial production as a reference series to disaggregate domestic GDP into monthly data. We obtain quarterly GDP data and monthly industrial production index data from statistical data published by the Directorate-General of Budget, Accounting and Statistics (DGBAS); we also obtain interest rates information by using commercial paper rates over monthly periods from global financial databases. (Monthly data on commercial paper rates were obtained by dividing annual commercial paper rates by 12.) The sampling period spanned May 1995 to December 2009.

---

[7] To remain consistent with previous data on NHI expenditure and revenue, as well as NHI budget surplus data expressed in monthly form, this study converts the quarterly GDP information into monthly data.

3.2. Empirical Results

The primary purpose of this study is to test whether actual NHI budget surpluses are consistent with the optimal NHI budget surpluses posited by a theoretical model. It is necessary first to estimate the bias taxation effect γ, to derive the actual NHI budget surpluses and examine the behavioral model for NHI budget surpluses under tax smoothing. According to Otto's (1992) method X_{dt} denotes the NHI's total expenditure, which includes real debt interest payments, and τ_t denotes NHI premium rates. This study evaluates $1/\gamma$ via Ordinary Least Squares (OLS)—namely, via Fully Modified OLS (FM-OLS) and Dynamic OLS (DOLS)—and the results thereof are shown in Table 1. We use the coefficient of $1/\gamma$, which is calculated via FM-OLS to produce SUR_t^*.[8] We then use the unit-root tests of augmented Dickey–Fuller (ADF, 1976) and Kwiatkowski, Phillips, Schmidt and Shin (KPSS, 1992) for the variable SUR_t^*. If the calculation result is I(0), the problem of spurious regression will not be seen, since the hypothesis of co-integration exists is true, otherwise the two variables are stationary.

Table 1: Tax distortion estimator

Statistic	OLS	FM-OLS	DOLS
$1/\gamma$	1.040^{**} (0.011)	1.045^{**} (0.015)	1.045^{**} (0.013)
$H_0 : \gamma = 1$	13.17^{**}	2.88^{**}	11.37^{**}

Notes: 1. $1/\gamma$ is the regression estimation coefficient of x_{dt} for τ_t ; parentheses enclose the estimation SE.

2. '*' and '**' reject the null hypothesis at the 5% and 1% significance levels, respectively.

The results in Table 1 indicate that policies *vis-à-vis* the NHI premium rate are not consistent with the tax-smoothing hypothesis. The $1/\gamma$ value is 1.04 for OLS and 1.045 for each of FM-OLS and DOLS; this indicates that the effective interest rate for NHI is higher than the NHI Bureau's subjective discount rate. In other words, variable γ is less than 1. The hypotheses test of $H_0 : \gamma = 1$ is rejected via all OLS methods, including FM-OLS and DOLS. These results imply that the NHI premium rate has a bias effect with regard to consumption. Therefore, the NHI Bureau plans to initially implement low premium rate policies and then increase premium rates later on.

This study calculates the unit-root tests of ADF and KPSS for the variables SUR_t^* and Δg_t; the results thereof are in Table 2. In summary, those results indicate that the time-series variables Δg_t and SUR_t^* are I(0), regardless of whether ADF or KPSS had been used. Therefore, we use the VAR (P) model to estimate the time-series variables Δg_t and SUR_t^*.

Table 2: Unit-root test results for ADF and KPSS

Test	Variable	No constant and time trend	Constant included	Constant and time trend included
ADF Test Statistic	$\text{SUR}_t^*(12)$	-2.562^*	-2.696^{**}	-3.366
	$\Delta g_t(13)$	-7.646^{**}	-7.812^{**}	-7.794^{**}
KPSS Test Statistic	$\text{SUR}_t^*(3)$	–	0.104	0.701^*
	$\Delta g_t(3)$	–	0.074	0.074

Notes: 1. The optimal lag numbers appear within parentheses. According to the principle of simplification, the optimal lag period number of the ADF unit-root test is set according to Akaike's Information Criterion.

2. '*' and '**' reject the null hypothesis at the 10% and 5% significance levels, respectively.

---

[8] An article by Phillips (1995) suggests that FM-OLS estimation could correct within a regression model the problems associated with endogeneity and series auto-correlation.

The actual budget surplus is estimated as the residuals of equation (5). Equation (6) shows that the optimal NHI budget surpluses can be estimated via the present discount value of change in future NHI expenditures. If the tax-smoothing hypothesis holds *vis-à-vis* policies regarding Taiwan's NHI premium rates, then increases in NHI budget surpluses in the early period will indicate that the later period of NHI expenditures will increase. The opposite is also true.

Table 3: VAR (P) model and Granger causality test

Regressand	Regressors	$t-1$	$t-2$	$t-3$	$t-4$
SUR_t^*	SUR_t^*	0.119 (0.141)	0.063 (0.175)	0.313 (0.174)	0.159 (0.149)
	Δg_t	0.052 (0.137)	0.030 (0.134)	−0.119 (0.136)	−0.061 (0.076)
Δg_t	SUR_t^*	−0.702** (.143)	0.121 (.178)	0.101 (.178)	0.224 (0.150)
	Δg_t	−0.055 (0.139)	−0.202 (0.136)	−0.158 (0.138)	−0.173* (0.077)
Δg_t Granger causality to SUR_t^*		0.494 (0.74)			
SUR_t^* Granger causality to Δg_t		7.746** (0.00)			

Notes: 1. Symbol t – 1 indicates a lag of one period, t – 2 indicates a lag of two periods and so on. Parentheses indicate an SD of the estimator for the VAR (P) model and the p-value for the Granger Causality test.
2. '*' and '**' reject the null hypothesis at the 5% and 1% significance levels, respectively.
3. Lag numbers for the VAR (P) model are determined with Akaike's Information Criterion.
4. H0: A Granger causality relationship does not exist.

Table 3 shows the estimate of the VAR (P) model and the Granger-causality test. The estimation results of the VAR (P) model indicate that the lag terms do not significantly affect the dependent variable. However, the first-period lag of SUR_t^* increases will only significantly decrease NHI expenditures Δg_t. In addition, the null hypothesis of Δg_t does not exist, and so Granger causality to SUR_t^* is not rejected. Nevertheless, at the 1% significance level, the null hypothesis of SUR_t^* does not exist, and so Granger causality to Δg_t is rejected. These results indicate that SUR_t^* can provide information needed to predict Δg_t.[9] Finally, this study performs additional testing for the stability conditions of the VAR (P) model. The research results prove that the model does meet the stability condition of the characteristic root, because the values are less than 1. Therefore, all characteristic roots are located in a circumference with a radius of 1.[10]

The primary purpose of this study is to test whether optimal NHI budget surpluses estimated by the predictive model are consistent with actual budget surpluses, as $H_0 : SUR^* = S\hat{U}R$. Simplifying equation (8) can lead to the auxiliary regression test expression:

$$\Delta g_t + SUR_t^* - \frac{1}{R}SUR_{t-1}^* = \varsigma_{1i}\Delta g_{t-i}(L) + \varsigma_{2i}SUR_{t-i}(L) + v_t \tag{9}$$

In this formula, ς_{1i} and ς_{2i} constitute a $1 \times P$ coefficient vector matrix; $\Delta g_{t-i}(L)$ and $SUR_{t-i}(L)$ constitute a $P \times 1$ variable matrix and $i = 1, 2, ..., P$ and the null hypothesis of the Wald test is $H_0 : \varsigma_{1i} = \varsigma_{2i} = 0$. If the null hypothesis is accepted, then the estimate prediction of the model is

---

[9] Campbell (1987) suggests that it is a possible condition for testing the null hypothesis of tax smoothing, which would prompt the existence of Grange causality on SUR_t^* and Δg_t under the null hypothesis of tax smoothing.

[10] In the current study, we performed testing for the stability conditions of the VAR (P) model. The figure shows that all characteristic roots fall within a circumference with a radius of 1.

consistent with actual NHI budget surpluses. Therefore, the difference between the optimal NHI budget surplus and actual NHI budget surpluses contains only random-walk terms. Table 4 displays the Wald test results. The test results of the estimation model lead to a rejection of the null hypothesis and indicate that expected values are inconsistent with actual values. All coefficients in column (4) should be 0 if the Permanent Health Revenue Hypothesis holds without a transitory consumption error. However, Table 3 shows that NHI expenditures Δg_t is only significantly affected by the first-period lag of SUR_t^*. It indicates the circumstances under which SUR_t^* can provide the additional single period of information needed to predict Δg_t. In addition, we also did some relation tests whose results are not presented in the Table 3: the correlation coefficient of both SUR_t^* and $S\hat{U}R$ is –0.822, and the ratio of the variances of the two variables is 0.935.

Table 4:   Test of the tax-smoothing hypothesis: health expenditures

	(1)	(2)	(3)	(4)
	Δg_t	SUR_t^*	$\Delta g_t + SUR_t^*$ $-\dfrac{1}{R} SUR_t^*$	$\Delta g_{t+1} + SUR_{t+1}^*$ $-\dfrac{1}{R} SUR_{t+1}^*$
Δg_{t-1}	–0.112 (0.082)	–0.132 (0.089)	–0.244 (0.165)	–0.051 (0.101)
SUR_{t-1}^*	–0.479[**] (0.089)	0.441[**] (0.085)	–1.078[**] (0.162)	–0.281 (0.191)
Joint test for all coefficients equal 0	26.19[**]	14.38[**]	38.02[**]	1.26

Notes: 1. Parentheses indicate Newey–West SEs
          2. '*' and '**'reject the null hypothesis at the 5% and 1% significance levels, respectively.
          3. Wald tests report the hypothesis in which the endogenous variables at a given lag are 0 for each equation, as well as for all equations jointly.

4. Robustness Check
4.1. Unit-Root Test with Structural Changes

A traditional unit-root test cannot determine the time series of the variable that is generated by a variant stationary model in which the effect of a structural break is present. Perron (1989) tests the performance of the unit-root hypothesis against the alternative hypothesis of trend stationarity, with a break in the trend occurring at the Great Crash of 1929 or at the 1973 oil-price shock. Zivot and Andrews (1992) argue against the assumption of Perron (1989), that the Great Crash and the oil-price shock can be treated as being exogenous; in other words, they believe the breakpoint to be estimated, rather than fixed. Otherwise, Clemente et al. (1998) extend the statistics of Perron and Vogelsang (1992) to the case of two breakpoints in the mean.

It is known that the Taiwan governor sought to alleviate the country's financial pressure, and to that end, the NHI program slightly increased its premium rate from 4.25% to 4.55% in September 2002. In addition, the global budget system for medical expenditures was implemented in each service subsector at different time periods: the global budget system for dental care was implemented on 1 July 1998; that for Chinese medicine outpatient care, on 1 July 2000; that for Western medicine primary care, on 1 July 2001; and that for hospital care, on 1 July 2002. Policy performance has changed as a result of structural changes to Taiwan's NHI program, and so it may affect the results of unit-root testing in the current study.

In this study, we use the statistics of Zivot and Andrews (1992) and Clemente et al. (1998) to test the unit root of the time-series variables Δg_t and SUR_t^*. The testing results are presented in Table 5; in summary, variable Δg_t in the test of Zivot and Andrews (1992) and Clemente et al. (1998) is

stationary, and the variable SUR_t^* does not provide a unit root in Zivot and Andrews's (1992) test, nor does it reject the unit root in the test of Clemente et al. (1998). Therefore, if we apply the results of Zivot and Andrews (1992), we will use the VAR (P) test.

Table 5:   Unit-root Test with Structural Changes

Test	Model	SUR_t^*	Δg_t
Zivot and Andrews (1992)	Model A	−4.909[*] (2002:9)	−10.353[**] (2006:3)
	Model B	−4.436[*] (2008:3)	10.310[**] (1997:4)
	Model C	−5.664[**] (2000:2)	−10.471[**] (1997:7)
Clemente et al. (1998)	One breakpoint	−2.814 (1997:4)	−10.224[**] (1997:10)
	Two breakpoints	−3.790 (1997:4, 2005:12)	−10.213[**] (1997:10, 1999:12)

Notes: 1. The parentheses indicate the time period of the breakpoint in the test results of Clemente et al. (1998).
2. '*' and '**'reject the null hypothesis at the 5% and 1% significance levels, respectively.
3. Lag numbers for the variables are determined with Akaike's Information Criterion.

4.2. Test of Tax Smoothing with Structural Changes

In Table 5, model A of Zivot and Andrews (1992) shows a breakpoint in 2002:9; this accords with the fact that Taiwan's governor slightly increased the premium rate from 4.25% to 4.55% in September 2002, in order to alleviate the financial pressure felt by the NHI program. On the other hand, the breakpoint of 1997:4 appears three times when using the methods of Zivot and Andrews (1992) and Clemente et al. (1998). In the current study, hence, we check the two breakpoints of 1997:4 and 2002:9 by using the Wald test. Table 6 presents the results of the Wald test with structural changes to the null hypothesis of tax smoothing. One should compare these results with those in Table 4, which presents the Wald test results for the tax-smoothing hypothesis without structural changes. In any case, the structural-change variables cannot alter the outcome that the NHI program in Taiwan does not follow the tax-smoothing hypothesis.

Table 6: Test of the Tax-Smoothing Hypothesis, with Structural Changes: Health Expenditures

Column number	(1)	(2)	(3)	(4)
Time breakpoint	Δg_t	SUR_t^*	$\Delta g_t + SUR_t^* - \frac{1}{R} SUR_t^*$	$\Delta g_{t+1} + SUR_{t+1}^* - \frac{1}{R} SUR_{t+1}^*$
1997:4	26.62[**] (0.00)	12.06[**] (0.00)	39.25[**] (0.00)	1.25 (0.29)
2002:9	26.99[**] (0.00)	13.66[**] (0.00)	40.44[**] (0.00)	1.27 (0.28)
1997:4 &2002:9	26.56[**] (0.00)	12.18[**] (0.00)	39.41[**] (0.00)	1.24 (0.29)

Notes: 1. Column numbers (1)–(4) are regressand; the regressors are Δg_{t-1} and SUR_{t-1}^*.
2. The Wald test results of all coefficients equal to 0 are displayed in column numbers (1)–(4). The parentheses under the testing results contain p-values.
3. '*' and '**'reject the null hypothesis at the 5% and 1% significance levels, respectively.
4. Lag numbers for the regressors are determined by AIC criteria.

5. Conclusions

Taiwan's NHI premium rates exhibit bias effects: the γ value is 0.96 that is less than 1. This result suggests that in the current NHI budget, there is a government bias towards consumption. The government allows deficit budgets and may adopt policies to raise NHI premium rates in the future.

Results from the VAR (P) model SUR_t^* can provide the information needed to predict Δg_t; NHI expenditures Δg_t is significantly affected only by the first-period lag of SUR_t^*. The Wald test of the regression function of Δg_t indicates that the actual NHI budget surpluses are inconsistent with optimal NHI budget surpluses—in other words, NHI premium rates are not consistent with the optimized path. The NHI program was implemented in 1995, and deficits began appearing in its reserves in 1998. To relieve financial pressure, the NHI increased the premium rates to 4.55% in September 2002, which temporarily alleviated the pressure incurred by budget deficits. For this reason, the current study examined the unit root with structural change for the variables SUR_t^* and Δg_t. The test results did not change greatly; for the Wald test on the hypothesis of tax smoothing, there were one or two random breakpoints when using the methods of Andrews and Zivot (1992) and Clemente et al. (1998).

References

[1]   Barro, R., 1979. "On the determination of the public debt", Journal of Political Economy 87, pp. 1086–1121.

[2]   Bohn, H., 1990. "Tax smoothing with financial Instruments", American Economic Review 80, pp. 1217–1230.

[3]   Campbell, Y., 1987. "Does saving anticipate declining labor income? An alternative test of the permanent income hypothesis", Econometrica 55, pp. 1249–73.

[4]   Chow, C. and A. Lin, 1971. "Best linear unbiased interpolation, distribution, and extrapolation of time series by related series", The Review of Economics and Statistics 53, pp. 372–5.

[5]   Clemente, J., A. Montanes and M. Reyes, 1998. "Testing for a unit root in variables with a double change in the mean", Economics Letters 59, pp. 175–82.

[6]   Dickey, D.A. and W. A. Fuller, 1981. "Likelihood ratio statistics for autoregressive time series with a unit root", Econometrica 49, pp. 1057-1072.

[7]   Fisher, L. and G. Kingston, 2004. "Theory of tax smoothing in the small open economy", Economics Letters 85, pp. 1–7.

[8]   Fisher, L. and G. Kingston, 2005. "Joint implications of consumption and tax smoothing", Journal of Money Credit and Banking 37, pp. 1101–19.

[9]   Hansen, E., 1992. "Tests for parameter instability in regressions with I(1) processes", Journal of Business and Economic Statistics 10, pp. 321–35.

[10]   Huang, C. and K. Lin, 1993. "Deficits, government expenditures, and tax smoothing in the United States: 1929–1988", Journal of Monetary Economics 31, pp. 317–39.

[11]   Kwiatkowski, D., P. C. B. Phillips, P. Schmidt and Y. Shin, 1992. "Testing the null of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root?", Journal of Econometrics 54, pp. 159–178.

[12]   Kula, M., 2004. "US States, the Medicaid program, and tax smoothing", Southern Economic Journal 70, pp. 490–511.

[13]   Kydland, F. and E. Prescott, 1980. "A competitive theory of fluctuations and the feasibility and desirability of stabilization policy", in Stanley Fischer (Ed), Rational Expectations and Economic Policy, University of Chicago Press, Chicago, pp. 169–98.

[14]   Liu, R., 2007. "Temporal disaggregation from static to dynamic—Taiwan industrial department real GDP monthly estimates", Taiwanese Economic Prediction and Policy 38, pp. 75–125.

[15]   Liu, Y., 2000. "Assessment of National Health Insurance policy implementation in Taiwan—Analysis of national institutions, policy networks, and financial management capabilities", doctoral thesis, Taipei University.

[16]   Lucas, R. and N. Stokey, 1983. "Optimal fiscal and monetary policy in an economy without capital", Journal of Monetary Economics 12, pp. 55–93.

[17]   Otto, G., 1992. "Testing a present-value model of the current account: Evidence from US and Canadian time series", Journal of International Money and Finance 11, pp. 414–30.

[18]   Perron, P., 1989. "The Great Crash   the Oil Price Shock and the Unit Root Hypothesis, Econometrica 57, pp. 1361-1401.

[19]   Perron, P. and T. Vogelsang, 1992. "Nonstationary and level shifts with an application to purchasing power parity", Journal of Business and Economic Statistics 10, pp. 301–320.

[20]   Phillips, B., 1995. "Fully modified least squares and vector autoregression", Econometrica 63, pp. 1023–78.

[21]   Strazicich, M., 1997. "Does tax smoothing differ by the government? Time series evidence from Canada and the United States", Journal of Macroeconomics 19, pp. 305–26.

[22]   Strazicich, M., 2002. "International evidence of tax smoothing in a panel of industrial countries", Applied Economics 34, pp. 2325–31.

[23]   Su, S., S. H. Hsiao and Y. C. Chuang, 2003. "Establishing optimum premium prediction model and national health insurance financial revenue and expenditure", Taiwan Journal of Public Health 22, pp. 43–54.

[24]   Yang, M.C., C. T. Lee and S. J. Chiou, 2004. "Time series analysis of the impact of supply and demand side cost containment policies on NHI medical expenditure", Taiwan Journal of Public Health 23, pp. 377–87.

[25]   Zhang, S., 2002. "A financial actuarial study of National Health Insurance". Report sponsored by Taiwan's National Health Insurance Bureau.

[26]   Zivot, E. and D. Andrews, 1992. "Further evidence on the Great Crash, the oil price shock, and the unit-root hypothesis", Journal of Business and Economic Statistics 10; pp. 251–70.

Relationship between Institutional Ownership and Audit Delay and Impact of Information Asymmetry for the Companies Listed in Tehran Stock Exchange

Mahshid Jozi

MA Accounting, Department of Accounting, Science and Research Branch
Islamic Azad University, Guilan, Iran

Mehdi Meshki

Assistant Professor, Department of Accounting
Payame Noor University

Mahmoud Samadi Largani

Department of Accounting
Tonekabon Branch Islamic Azad University, Tonekabon, Iran

Abstract

In this research it has been tried to review the effect of company's institutional ownership on the degree of conservatism and the effect of conservatism of the delay in the audit of a company and also the effect of institutional ownership on this volume. For this study multiple regressions was used. The study was conducted in the period 2006-2011 in the Tehran Stock Exchange. Results show that there is no significant relationship between institutional ownership and audit delay but by surplus this kind of ownership this relation is better.

Keywords: Institutional ownership, delays in auditing, information asymmetry, conservatism

Introduction

Timeliness of financial reporting for business users is of great importance. One of the main reasons for non-publication of annual reports is requiring of to be audited by the company (wermert et al, 1997). The effect on the willingness of investors and information asymmetry on the strength of this relationship will be studied. Timeliness of financial reporting for users of these companies, including investors is important. By the separation of ownership and management, managers as representative of the owners or shareholders run the company.

An external control mechanism affecting corporate governance, which is increasingly important, is the emergence of institutional investors. According to Gillan and Astarks (2003) the main role of institutional investors shaping corporate governance systems in many variations.

Literature Review

Floods of recent financial scandals around the world, from America to Enron and WorldCom, cause financial reporting is to be condemn. Financial statements comprise the financial reporting of the core.

Financial statements and specially profit and losses are on focus of investors' attention. Topic in recent years the quality of reported earnings has attracted attention of many researchers. Timeliness is one aspect of earnings quality; institutional owners have a strong motivation for overseeing financial reporting. Financial statements and the income statement are important source of information about the company. Accordingly, in this paper, the relationship between institutional ownership and timeliness as one of and earnings quality criteria are considered. Furthermore, some empirical evidence on this relationship is provided.

In a survey Abdul Salam et.al (2008) in emerging markets showed there is a direct correlation between institutional ownership and some company policies. These results are similar to R Wiberg (2008). Also Alyasyany Vjya (2007) in a study found that institutional shareholders have a positive relationship with firm performance. Coronet et al. (2008), argues that institutional investors, as those who play a role in the company's organizational structure, can also provide control mechanisms to limit managers' behavior. It shares with majority ownership opportunity and has the ability to monitor managers.

Hillary Gill (2009) stated that there is a relationship between investment performance and reporting mechanism and reporting quality high and the wrong choice will lead to a reduction of moral hazard. Aubert (2009), study the managers of the business interests of different reasons for the delay in French companies annual financial reporting. He came to the conclusion that there is a positive relationship between delay of annual financial reporting and financial leverage but there is a negative one with the time delay before. Moreover, the results showed that the mediation days of delay in Aubert study in Company 250 is 116.05 days.

Methodology

Classification scheme based research study in terms of the type of applied research. Applied research is the study of the theory, Laws, principles and techniques for solving real problems. The present study uses analytical correlation is emphasized.

This study in terms of data collection, is descriptive and non-experimental research and aimed to examine the relationship between variables and the significance of the model to explain the dependent variable, and used the regression analysis.

Research Hypothesis

According to the theoretical literature mentioned above assumptions, the following is recommended:
First hypothesis: "there is a significant relationship between the percentage of institutional investors and audit delays."

Second hypothesis: "the reduction of information asymmetry between cause better effect on the relationship of investors and audit delay."
For this purpose, the model and shivakumar and ball (2005) is used to measure conservatism corporate profits.

shivakumar and ball model

According to Ball and shivakumar (2005) Economic losses are recognized faster than profits. Even before realizing losses are recognized as an obligation, but profits are recognized when realized. Ball and shivakumar recognized role of accruals in reduction of cash flows impairment loss. They predicted the existence of conservatism factor $\beta 3$ should be positive and significant.

$$ACC = \alpha + \beta 1\, CFO + \beta 2\, DCFO + \beta 3\, CFO * DCFO + \varepsilon$$

In this model:
Dependent variable:
ACC: subtracting cash operating profit before Extraordinary Items divided by market value of equity at the beginning of the year

Independent variables:

CFO: operating cash flow divided by market value of equity at the beginning of the year

DCFO: is a dummy variable for firms with CFO <0, equal to one and otherwise zero.

In this model, cash flow positive, negative cash flow represent good news, bad news agency. If cash flow is positive, the equation:

ACC = α + β1 CFO + ε is obtained in which β1 showed allergic reactions to earnings news is good. If cash flow is negative, the relationship:

$$ACC = \alpha + \beta2 + (\beta1 + \beta3)\,CFO + \varepsilon$$

Is obtained where β1 + β3 will show allergic reaction to bad news. Ball and shivakumar believe that Earnings response to bad news is timeliness than earnings good news. Namely B1 <β1 + β3 and the β3> 0. In order to assess the impact of institutional ownership and its types (active and passive) on conservatism, the variables in the model is added:

Model 1 - Ball and shivakumar Model

$$ACC = \alpha + \beta1\,CFO + \beta2\,DCFO + \beta3\,CFO * DCFO + \beta4\,INST + \beta5\,INST * CFO + \beta6\,INST$$
$$* DCFO + \beta7\,INST * CFO * DCFO + \varepsilon$$

Independent variables:

Inst: institutional owners

Positive (negative) and significant increase of β7 shows that more(less) institutional ownership, greater conservatism in reported earnings (below).

To achieve the expected results expressed in Hypothesis 1 is proposed to study the following model:

The proposed model:

AD = α + β1 CFO + β2 DCFO + β3 CFO * DCFO + β4 INST + β5 INST * CFO + β6 INST * DCFO + β7 INST * CFO * DCFO + ε

In this model we try to make the relationship (significant or not significant) delay in audited financial statements reporting and the percentage of institutional ownership be investigated.

AD: Audit Delay to delay the day of reckoning variable that represents the end of the fiscal year prior to the publication of financial statements.

Model 2:

ACC = α + β1 CFO + β2 DCFO + β3 CFO * DCFO + β4 AD + β5 AD * CFO + β6 AD * DCFO + β7 AD * CFO * DCFO + ε

In models 1 and 2 variables are as previously defined.

In Model 1 R positive (negative) and significant increase of the variable INST shows that institutional ownership, conservatism in reported earnings increases (decreases) increases.

Expected that correlation between the percentages of institutional ownership and audit delay be significant. In this study, the partial coefficients for each student and for the significant regression models of t-test at 95% (F) regression that the Fisher statistic will be used to ensure.

To achieve the expected results expressed in Hypothesis 2, two models and two following groups are offered:

The Group I: year – companies that owned firms percent less than the obtained first quartile from statistical tables.

Group II: age - the percentage of companies those obtained institutional owners more than the third quartile from statistical tables.

Model

AD = α + β1 CFO + β2 DCFO + β3 CFO * DCFO + β4 INST + β5 INST * CFO + β6 INST * DCFO + β7 INST * CFO * DCFO + ε

In this study the period 2006 to 2011 (six years) to be examined. Tehran Stock Exchange is the place to do this research.

In order to homogenize the sample surveyed in the years before 2006, are listed on the Tehran Stock Exchange.

- Due to increased compared to fiscal periods, companies are selected that are ending March.
- In fiscal year of the fiscal year have not changed or altered activity.

Method or Methods of Sampling

Sampling based on purposive sampling (judgment) and the method of elimination.

Methods for Data Analysis and Hypothesis Testing

After calculating the slope coefficients to test hypotheses and significance of the regression coefficients, t-student tests will be used.

Results
Descriptive Statistics and Pearson

Table 1 contains descriptive statistics of the variables for the years 2006-2011. Table 2 presents the Pearson correlation coefficients between the main variables of the test.

Table 1: shows the descriptive statistics of variables (2006-2011)

	variables	accruals	CFO	DCFO	Audit delay	INST
N	Valid	296	296	296	296	296
	Missing	0	0	0	0	0
	mean	-.0156	.1690	.1081	137.8074	46.6806
	mid	.0074	.1193	.0000	135.5000	31.3000
	Standard deviation	.34461	.34116	.31104	48.33948	67.29717
	minimum	-1.90	-2.70	.00	60.00	.00
	maximum	2.35	1.16	1.00	387.00	662.00
quantile	first	-.0871	.0150	.0000	113.0000	8.1950
	second	.0074	.1193	.0000	135.5000	31.3000
	third	.1096	.2859	.0000	148.0000	77.4950

Table 2: Pearson correlation coefficients of variables

		ACC	CFO	DCFO	AD	INST
ACC	Pearson Correlation	1	-.545**	.263**	.035	.034
	Sig. (2-tailed)		.000	.000	.546	.560
	N	296	296	296	296	296
CFO	Pearson Correlation	-.545**	1	-.494**	-.074	-.011
	Sig. (2-tailed)	.000		.000	.203	.854
	N	296	296	296	296	296
DCFO	Pearson Correlation	.263**	-.494**	1	-.014	.004
	Sig. (2-tailed)	.000	.000		.811	.951
	N	296	296	296	296	296
AD	Pearson Correlation	.035	-.074	-.014	1	.046
	Sig. (2-tailed)	.546	.203	.811		.432
	N	296	296	296	296	296
INST	Pearson Correlation	.034	-.011	.004	.046	1
	Sig. (2-tailed)	.560	.854	.951	.432	
	N	296	296	296	296	296

**. Correlation is significant at the 0.01 level (2-tailed).

First hypothesis testing research

First hypothesis: "there is a significant relationship between the percentage of institutional investors and audit delays."

Model 1:

$$ACC = \alpha + \beta1\ CFO + \beta2\ DCFO + \beta3\ CFO * DCFO + \beta4\ INST + \beta5\ INST * CFO + \beta6\ INST * DCFO + \beta7\ INST * CFO * DCFO + \varepsilon$$

Table 3: Present the regression results obtained from the mod

Model		Unstandardized coefficients		Standardized coefficients	T - statistic	Sig.
		B	Std. Error	Beta		
1	(Constant)	.123	.029		4.171	.000
	CFO	-.749	.080	-.742	-9.378	.000
	DCFO	.046	.075	.042	.615	.539
	CFO*DCFO	-.114	.157	-.066	-.723	.470
	INST	-.001	.000	-.098	-1.089	.277
	INST*CFO	.003	.001	.158	1.693	.091
	INST*DCFO	.002	.001	.124	1.756	.080
	INST*CFO*DCFO	.032	.006	.407	5.048	.000

a. Dependent Variable: ACC

Expectations expressed in hypothesis 1 are proposed to study the model following:

Model:

$$AD = \alpha + \beta1\ CFO + \beta2\ DCFO + \beta3\ CFO * DCFO + \beta4\ INST + \beta5\ INST * CFO + \beta6\ INST * DCFO + \beta7\ INST * CFO * DCFO + \varepsilon$$

In this model we try to make the relationship (significant or not significant) audit delay

Table 4: The coefficients in Table

model		Unstandardized coefficients		Standardized coefficients	T -statistic	Sig.
		B	Std. Error	Beta		
1	(Constant)	140.649	5.249		26.795	.000
	CFO	-18.825	14.222	-.133	-1.324	.187
	DCFO	-6.042	13.317	-.039	-.454	.650
	CFO*DCFO	30.135	27.980	.125	1.077	.282
	INST	.081	.082	.113	.987	.325
	INST*CFO	-.223	.266	-.099	-.841	.401
	INST*DCFO	-.052	.160	-.029	-.321	.748
	INST*CFO*DCFO	-.253	1.126	-.023	-.225	.822

a. Dependent Variable: AD

The Second Hypothesis of Testing Research

Second hypothesis: "the reduction of information asymmetry between cause better effect on the relationship of investors and audit delay."

Two groups are as follows:

Group I- companies that are less than the lower quartile of institutional ownership is obtained from Table 1 that the percentage of those institutional ownership less than 8.195 percent.

Group II: year – companies the percentage of firms with institutional ownership are obtained from Table 1 is greater than the third quartile, those institutional ownership percent more than 77.495 percent.

Model 2:

$$ACC = \alpha + \beta1 \, CFO + \beta2 \, DCFO + \beta3 \, CFO * DCFO + \beta4 \, AD + \beta5 \, AD * CFO + \beta6 \, AD * DCFO + \beta7 \, AD * CFO * DCFO + \varepsilon$$

The model 1 and 2 variables as previously defined.
Table 2 Regression results obtained from the model study are listed below.

Table 5: Coefficients of Model, standardized coefficients are not standardized T statistic - Sig.

model	Unstandardized coefficients		Standardized coefficients	T -statistic	Sig.
	B	Std. Error	Beta		
(Constant)	.144	.061		2.356	.019
CFO	-.810	.304	-.802	-2.667	.008
DCFO	.435	.229	.392	1.898	.059
CFO*DCFO	5.036	.970	2.922	5.194	.000
AD	.000	.000	-.037	-.664	.507
AD*DCFO	.001	.002	.131	.437	.662
AD*DCFO	-.003	.002	-.334	-1.667	.097
AD*CFO*DCFO	-.035	.007	-2.705	-4.854	.000

a. Dependent Variable: ACC

Hypothesis 2 stated in the proposed research model and the following two examples:

Proposed Model

$$AD = \alpha + \beta1 \, CFO + \beta2 \, DCFO + \beta3 \, CFO * DCFO + \beta4 \, INST + \beta5 \, INST * CFO + \beta6 \, INST * DCFO + \beta7 \, INST * CFO * DCFO + \varepsilon$$

Table 6: The coefficients of Group I

model	Unstandardized coefficients		Standardized coefficients	T -statistic	Sig.
	B	Std. Error	Beta		
(Constant)	154.106	16.382		9.407	.000
CFO	-34.818	56.340	-.149	-.618	.539
DCFO	33.810	36.880	.207	.917	.363
1 INST	-.006	.147	-.012	-.039	.969
INST*CFO	-.041	.498	-.030	-.082	.935
INST*DCFO	-.226	.260	-.223	-.871	.387
INST*CFO*DCFO	.051	3.517	.002	.014	.988

a. Dependent Variable: AD

Table 7: The coefficients of Group II

model	Unstandardized coefficients		Standardized coefficients	T -statistic	Sig.
	B	Std. Error	Beta		
(Constant)	141.511	7.190		19.680	.000
CFO	-22.409	15.238	-.236	-1.471	.146
DCFO	-28.609	20.957	-.279	-1.365	.177
CFO*DCFO	5.670	47.680	.021	.119	.906
1 INST	-4.096	2.834	-.321	-1.445	.153
INST*CFO	7.331	10.335	.188	.709	.481
INST*DCFO	8.801	5.852	.404	1.504	.137
INST*CFO*DCFO	8.911	16.990	.138	.524	.602

a. Dependent Variable: AD

The second hypothesis is accepted, which shows that it is probably the subject of more extensive research has been further confirmed by the higher percentage of institutional ownership.

Conclusions and Recommendations
Suggestions for Further Studies

In order to carry out further studies related to this research, the following topics are suggested:
1. We have more than one operational definition of variables, conservative measure in different methods.
2. It can be the subject of study in various industries and expected - Due to the nature of the companies in different industries.
3. A 6-year study period (2006-2011) covered, researchers can do it in more interval.
4. The relationship between the conservative and type of audit report companies can be researched.
5. The relationship between the delays in reporting the type of issued audit report by the auditing firm.

Resources

[1]   Abdelsalam, Omneya, El-Masry, ahmed and Elsegini, Sabri (2008). Board composition, ownership structure and dividend policies in an emerging market, further evidence from CASE 50. manageral finance, 12: 953-964.
[2]   Aubert, François (2009). "Determinants of corporate financial reporting lag: The French empirical evidence", Journal of Accounting and Taxation, Vol.1 (3), pp. 053-060.
[3]   Bushee B. J, Carter M. E, Gerakos J. Institutional Investor Preferences for Corporate Governance Mechanisms. Working paper, University of Pennsylvania; 2008.
[4]   Dogan, Mustafa; Coskun, Ender and Orhan Çelik (2007). "Is Timing of Financial Reporting Related to Firm Performance? An Examination on Ise Listed Companies". International Research Journal of Finance and Economics, Issue 12, 221-233.
[5]   Gillan, S.G. and L.T. Starks (2003). "A Survey of Shareholder Activism: Motivation and Empirical Evidence", Contemp Finance Dig, 10-38.
[6]   Schroeder, Richard G.; Clark Myrtle W. And Jack M. Cathey (2008). "Financial Accounting Theory and Analysis: Text and Cases", 9th Edition, John Wiley & Sons.
[7]   Wermert, J G.J L, Dodd. T A, Doucet (1997). " An Empirical Examination of Audit Reporting Lag Using Client and Cycle Firm Cycle Times."

Redefining the Non-Cash Working Capital Formula, for Cash-Flow, Capital Budgeting, and Firm Valuation Calculations

Fernando Llano-Ferro
Private Consultant, Calle 126 No.52A-75
Bogotá- Colombia
E-mail: llanoluisfernando@gmail.com

Abstract

This paper revisits and analyses the Working Capital concept and calculations, concluding that a change is warranted in the Working Capital formula used for cash-flow, capital budgeting, and firm valuation purposes. In the traditional Working Capital formula, Accounts Receivable are calculated at "price-of-goods-sold" instead of at "price-of-goods-bought". This leads to an over-estimation of Working Capital of the firm. The correction can be implemented with a very simple relationship. A numerical example is provided.

Keywords: Working Capital, Cash-Flow, Capital Budgeting, Firm Evaluation
JEL: G31

1. Background Information

Working Capital is a term that initiated a century ago with the day to day needs of capital - of ambulant salesmen - in the United States of America.

With time, it has found application in the financial analysis of all types of firms everywhere.

The traditional Net Working Capital formula is:

Net Working Capital = Current Assets – Current Liabilities

It is a measure of the short term financial health of a company.

Investment in a firm is allocated to:

- Capital Expansion ("CapEx")
- Working Capital

Working Capital is involved in cash-flow, financial analysis of investment projects, and firm valuation calculations.

2. Working Capital for Cash-Flow, Capital Budgeting, and Firm Evaluation

For cash-flow, capital budgeting and firm evaluation purposes the Net Working Capital formula is modified [1].

In Current Assets, cash, and marketable securities are removed.

In Current Liabilities, debt - and any interest bearing liabilities - are also removed.

"Other Current Assets", and "Other Current Liabilities" are left in.

The Working Capital formula, so modified, is called Non-cash Working Capital and it is considered a more accurate measure of capital tied up in day–to-day operations.

The data, to calculate Non-cash Working Capital, is all extracted from the Balance Sheet Statement of the company.

For the sake of simplicity, lets consider that "Other Current Assets" and "Other Current Liabilities" are not significant, and can be ignored. Then, we are left with the following Non-cash Working Capital formula:

Non-cash Working Capital = Accounts Receivable + Inventory – Accounts Payable

Is there anything wrong with this formula?

Inventory and Accounts payable are expressed in terms of "cost of goods", while Accounts Receivable is expressed in terms of "cost of goods" times mark-up.

Let us imagine two identical firms with the same investment, the same production volume, the same production and sales costs, etc. The only difference being the price of goods sold.

Does it mean that if there is the same increase in production volume in both firms, the one with the higher mark-up will require a higher Non-cash Working Capital ? Of course, not.

Therefore, the Non-cash Working Capital formula, for this application, is wrong and Accounts Receivable shall be expressed as "cost of goods" not as Cost of Goods times mark up.

The traditional Non-cash Working Capital formula overestimates the cash requirements of day-to-day operations.

Our simplified (without Other Assets and Other Liabilities) Non-cash Working Capital formula becomes:

Non-cash Working Capital = [Accounts Receivable * (1-Gross Margin)] + Inventory – Accounts Payable

3. Working Capital Structure

It is standard financial practice to express Accounts Receivable, Accounts Payable, and Inventory, in days.

That is:

Days Sales of Inventory = 365 * (Inventory / Cost of Sales)

Days Sales of Accounts Payable = 365 * (Accounts Payable / Cost of Sales)

Days Sales of Accounts Receivable = 365 * (Accounts Receivable / Sales)

Non-cash Working Capital can be expressed in Days.

Days Sales of Non-cash Working Capital = Days Sales of Accounts Receivable + Days Sales of Inventory - Days Sales of Accounts Payable.

The higher the number of days of Non-cash Working Capital, the "heavier" the Working Capital structure of the firm will be, and, in case of growth in sales, the higher the capital that will be tied up in day-to-day operations.

Expressing the Non-cash Working Capital in days, facilitates Working Capital bench-marking with other companies.

4. Numerical Example

A company has a Non-cash Working Capital of 40 days. If Free-cash Flow was $2400 and Cost of Goods sold was $40000 during the year, how much growth can be internally financed?

Non-cash Working Capital = 40*40000/365= $4383.6

2400/4383.6 = 54.75 %.

Therefore, the company could grow 54.75 % without requiring external sources of financing.

If the company has 28 days Accounts Receivable and a gross margin of 17 %, the Non-cash Working Capital calculated by the traditional formula would be overestimated by 11.9 % (= 17% *28/40).

5. Conclusion

The traditional Non-cash Working Capital formula overestimates the requirements of Working Capital of a firm.

This paper presents a formula that estimates the Non-cash Working Capital more accurately.

Through a simple mathematical model the correct Working Capital of the firm can be calculated.

References

[1] Damodaran, Aswath – Working Capital in Valuation – Stern School of Business – New York University

[2] R. Charles Moyer, James R. McGuigan, William J. Kretlow Contemporary Financial Management – 10th Edition 2005 – ISBN: 0324289081.

Why Does Finance Matter for Economic Growth?[1]

Giseok Nam
Associate Professor, College of Business
Hankuk University of Foreign Studies, Seoul, Korea, 130-791
E-mail: gsnam05@hufs.ac.kr
Tel: +82-2-2173-3029, Fax: +82-2-2173-3029

Abstract

In this study I explain why finance matters for the economic growth. I describe the relationship between financial system and economic growth through the link between financial policy and financial structure, financial structure and financial functions, and financial functions and economic growth. The policy of financial institutions and financial markets financial sector policy determines the financial structure. In turn, the kind of the financial structure developed would affect the nature and magnitude of the financial services or financial functions. Finally these financial functions or services may affect the long run economic growth by influencing the mobilization of domestic and external resources for investments, and at the same time influencing the optimal allocation of these investment resources. In sum, efficient financial systems promote long-run economic growth through the encouragement of good corporate governance.

1. Introduction

I attempt to define the relationships between various activities in the financial sector to provide a better understanding of the roles of financial markets and institutions in economic growth. First of all, financial sector policy (for instance, financial liberalization policy versus financial repression) determines the financial structure, which is comprised of the combination of a country's financial institutions (for instance, banks, investment banks, insurance companies, pension funds, mutual funds, etc.) and financial markets (for instance, money markets, equity markets, bond markets or capital markets etc.). In turn, the kind of the financial structure developed would affect the nature and magnitude of the financial services or financial functions offered such as mobilizing domestic savings, facilitating transactions, and risk management. Put differently, financial intermediaries and markets should be viewed as vehicles for providing financial services. Finally these financial functions or services may affect the long run economic growth by influencing the mobilization of domestic and external resources for investments, and at the same time influencing the optimal allocation of these investment resources. Graphically these linkages can be summarizes as follows.

| Financial Policy | Financial Structure (Institutions and Markets) | Financial Functions (Financial Services) | Economic Growth |

In sum, different linkages are defined at different stages of development for analytical convenience, namely the first links between the financial policy and the financial structure, the next links between the financial structure and the financial functions or services, and the last links between the financial functions and economic growth. It is important to underscore, therefore, that the links between the financial system and economic growth must be examined through various intermediate linkages defined above. For instance, if a country pursues a policy of financial repression for development expediency, such a policy is likely to contribute to the development of a financial structure characterized by shallow financial markets. Moreover, when financial markets are thin and narrow with the virtual non-existence of capital markets, credit allocation through indirect finance, namely bank financing as opposed to equity financing of investment projects becomes the most important financing mechanism, and hence the banks play the predominant role in financial markets in this case. When I discuss the role that the financial markets play in economic growth hereafter, I should comprehend the financial markets in the broader context of the overall working of a financial system starting from the formulation and implementation of a financial sector policy to economic growth progressing through various successive linkages described above.

Financial markets are a set of institutional arrangements that provide various growth-enhancing financial services such as facilitating the transfer of funds from those with excess supply of funds (or savers) to those with excess demand for funds (or investors). More specifically, the financial markets are where claims on financial assets of various types and maturities originate and are traded. Roughly speaking, financial markets deal with four product types and each of these product types can be further classified into various financial instruments as follows[4]. A more complete and detailed explanation of the structure and special features of various financial markets trading specific products and instruments is given by McInish (Chapter 1, 2000).

Equities represent capital contributed to the firm for which there is no legal obligation to repay, and also the limited liabilities, namely, the investors can lose only the amount of investment. Equities include all types of stock issued by the firm. Shares of common stock represent ownership interest in a firm, and the owners of stock or shareholders are the owners of the firm. By contrast, preferred stock has a claim priority to earnings over the common stock, but that comes after all other obligations of the firm. A warrant is a security issued by a firm with the right to obtain stock in the issuing firm or sometimes in another firm in a specified price for a specified period. Usually warranties are considered as equities and hence the funds raised from the sale of warrants are regarded as part of the capital of the firm.

Fixed-income securities are debt obligations that prescribe the payment of a predetermined sum at a predetermined date. They include a bond, which is a debt instrument issued by firms and various levels of governmental bodies ranging from local governments, and federal governments to international organizations such as World Bank. A money market instrument is a debt obligation with an initial maturity date of less than one year. Capital market instruments are financial instruments with an initial maturity of one year or longer. Money market instruments are traded in the money market, whereas bonds, equities, and warrants are traded in the capital market.

A derivative is a contractual arrangement that legally binds one party to the contract to transfer the assets, including cash, to the other party during the specified contract period. The derivative contract may entail the transfer of a wide variety of items ranging from cash payments or financial assets or real commodities such as precious metals, agricultural products, industrial commodities, and so on. An option is a contractual arrangement for a prescribed period during which one party to the contract acquires the right to receive some thing for the payment of a fee, for instance the right to purchase the common stock at a predetermined price. Futures are a contractual arrangement by which one party to the contract is obligated to deliver a predetermined type and quantity of an asset in a predetermined future date in a predetermined price. A swap is a financial arrangement that permits two

---

[4]   This classification system is taken from T.H. McInish (2000).

parties to exchange one or more periodic payments based on the value or change in the value of the items specified in the contract such as interest rates and exchange rates change.

Theoretically money is defined anything which can be used as a medium of exchange. In practice, money consists of coins and paper currency printed by government, and demand deposits, liabilities of the banking sector, which are commonly accepted as a medium of exchange. The trading of money between countries is executed in the foreign exchange market and the foreign money traded is called foreign exchange.

Moreover, a wide variety of financial instruments such as stocks, bonds, and warrants are initially sold in the primary markets, where the investment banker is involved to help the initial sale of the securities. Then all trade of these securities following the initial sale are regarded secondary market transactions. In sum, there are many different types of financial institutions that operate in different financial markets specializing in the creation and trade of different financial instruments. For instance, commercial banks and investment banks engage in the initial offer of stocks and bonds. The banking sector and government create money, and affect money supply. Various organized secondary trading arrangements including foreign exchange markets facilitate the further circulation of these financial assets created, permitting investors to sell their investment if desired. Non-bank financial institutions such as insurance companies, pension funds, and mutual funds as well as banks facilitate the transfer of the financial resources from the savers to investors. The more efficient the financial markets in mobilizing financial resources and in allocating them to most productive investments, the greater is economic growth. It is the sound financial policy that shapes the kind of financial system or financial institutions and financial markets conducive to economic growth. The crucial link between finance and economic growth is the subject matter of the next section.

2. The Importance of the Financial System for Economic Growth[5]

I attempt to clarify here why finance matters for economic growth. More specifically, I attempt to explain why a well-functioning financial system is essential to economic growth and furthermore identify various characteristics of such a well-functioning financial system. As described earlier, the type of financial policy affects the kind of financial structure, namely financial intermediaries and financial markets they support, and the type of financial functions or services that the financial intermediaries and financial markets provide affects economic growth. I can categorize the following essential financial functions or services that an efficient financial system can provide to firms, households, and the government. Well-functioning financial institutions or intermediaries provide

1. Efficient mobilization of savings with liquidity and risk diversification,
2. Efficient allocation of investment resources with a close monitoring of firms' investment activities and sound corporate governance
3. Payments and other transaction-facilitating services.

These functions or services are essential to long-run economic growth, since these functions may influence significantly the savings propensities and affect investment activities.

The endemic nature of market failures in the financial sector encumbered by information asymmetry, adverse selection, and moral hazard gives rise to the high transaction costs of monitoring and information transfer. If these market imperfections are not removed or mitigated, the smooth savings flows and efficient investment allocation would be greatly impeded and hence affect adversely economic growth. The financial intermediaries and markets they support such as interbank, money, bond, equity, and insurance markets provide exactly the kind of services that overcome or at least alleviate the adverse effects of market failures inherent to the financial sector. Evidently, savers face great difficulties and risks if they try to lend money directly without financial intermediation. First, they incur the high search costs of potential borrowers. Even if they succeed in finding potential clients, they will still face the problem of asymmetric information as described earlier, namely, having

---

[5] The discussion in this section draws considerably on Ross Levine (1997).

no sufficient information about them and the likelihood of their loan repayment, which borrowers or investors may know more. As a result, savers may be highly reluctant to part with their liquid money, and potential savings and productive investments may not materialize. Here financial intermediaries can step in and help solve the problem of both savers and investors arising from information asymmetry. Financial intermediaries, say banks, can provide savers with a wide array of savings instruments with varying risks and liquidity, ranging from demand deposits to time deposits with varying maturities and returns, dovetailed to the risk and liquidity preferences of different savers. Here liquidity is defined to be the degree of ease with which one asset is traded for other assets. Liquidity risk is the risk associated with selling an asset. The availability of a wide range of saving instruments would considerably reduce this type of risk. However, there is another type of risks facing investors, namely firm- or industry-specific risks. For instance, there is the risk associated with a given firm going under, an industry being depressed, or a country in deep recession. Financial systems provide mechanisms for pooling, diversifying and trading risky assets, for example, options and future contracts to hedge and trade interest rate and exchange rate risks. Well-developed equity markets would permit claims on investments to be easily traded. As a result of the trading of risk and pooling resources, transaction costs of both savings and investment would be reduced. Moreover, financial intermediaries aid markets to extend the range of feasible investment projects by pooling resources, particularly those with a large potential of economies of scale but requiring large capital inputs.

Now turning to the other side of a scissor, investment allocation, the efficient financial intermediaries play an equally important role in directing the investment flows to most productive and profitable projects. Obviously it would be costly and difficult for individual savers to monitor the investment activities of their borrowers, namely firms. Even if they are capable of doing, they may neither have time nor resources to collect, process and analyse a wide range of information about investment returns, enterprise management, markets and economic conditions. Efficient financial intermediaries can remedy this type of market failure. Financial intermediaries and banks in most cases collect and evaluate a whole host of information on the enterprises soliciting loans and other borrowers including the past business performance, their expected future cost and revenue flows and profitability, management quality and business strategy, and many other pertinent information. Based on these assessments, the intermediaries select the most profitable projects for capital allocation. Needless to say, to the extent that capital is allocated more efficiently to the most productive investment projects through a rigorous selection process, economic growth will be greater.

One of the most important functions that the financial intermediaries provide in conjunction with the vetting process of investment allocation is the improvement of corporate governance (R. Levine, 1997). The financial intermediaries correct or alleviate the adverse effects of another form of market failure, namely, the principal-agent problem. The principal-agent problem arises from the divergence of motivation between the agent (managers of the firm in this case) and the principal (owners and other claimholders of the firm). The primary duties of managers are to serve the interest of the owners and other claimholders by maximizing profit and capital valuation of the firm. But managers may advance their own personal interests, not the interests of shareholders and debt-holders, and allocate firm resources accordingly. Of course, it should be the major duties of equity-holders to monitor and evaluate the performance of firm managers, but small, outside owners often have the limited resources in playing this role on their own, and hence the demand for the financial intermediaries arises, since they are better prepared to carry out the task of monitoring the performance of firm managers in terms of information base, human resources and analytical capacity developed in conjunction with the investment screening process. Therefore, the financial intermediaries are in a better position to implement the supervisory function of compelling firm managers to act in accordance with the best interest of shareholders, debt-holders and other claim-holders. Different financial intermediaries have different means of disciplining firm managers. For instance, banks usually exert the pressure of sound corporate governance with the threat of not renewing loans. Liquid equity markets discipline corporate managers by revealing the market's valuation of the firm's performance,

and exert the pressure on management by the final threat of management dismissal or takeover in case of a firm's value falling too low. Their direct intervention of this type improves the firm's corporate governance.

It is evident that in the absence of corporate governance enforced by the financial intermediaries and other claimholders, the abuse of corporate power by the corporate management to further their own interests is likely to occur. This may result in less efficient resource allocation and slower economic growth. Moreover, savers become less inclined to invest in big corporations. This reluctance may reduce the overall size of savings or redirect savings flows to smaller enterprises that can be more easily monitored but may mean less economically efficient. In sum, efficient financial systems promote long-run economic growth through the encouragement of good corporate governance.

It is important, however, to recognize that there are an equally, if not more, serious problem of corporate governance endemic to the financial intermediaries themselves and particularly the banks, and the associated principal-agent problem that arise in the context of prudential regulation and supervision to improve the corporate governance of the financial sector. For instance, the motivation of an agent (a financial regulator or supervisor) often diverges from that of the principal (the taxpayer he serves). Regulatory forbearance is a good example of the problem. Undoubtedly, this question is of crucial importance to the development of sound and efficient institutions and markets.

The role of finance in facilitating transactions through the provision of the means of payments and clearance, the unit of account and the store of value functions is always taken for granted. Just as the priceless value of the life-supporting air or water is deeply felt when they are scarce as in the case of natural calamities or extreme high altitudes, the immeasurable value of the role of finance in executing smoothly the myriad of payments and clearance, thus realizing the astronomical quantity of daily business transactions, is deeply appreciated only when these functions are severely impaired as in the case of hyperinflation or early barter economies without finance or even the recent experiences in the command economies in the Eastern Europe in transition to a market economy. In short, money as the medium of exchange obviates the need for barter and increase gains from trade by encouraging specialization. The payments and clearance mechanisms simplify an extremely large quantity of economic interactions. The absence of such an effective payments and clearance system would hinder economic transactions and hence impede economic growth.

I have so far some selected theoretical arguments of why a sound and efficient financial system is a prerequisite to long-run economic growth. Obviously I need also empirical evidence to support theoretical explanation of a critical link between finance and economic growth. It has been argued that a sound and efficient financial system matters a lot for economic growth, but the kind of a financial system that promotes economic growth has not been specified. In other words, the successful financial system needs to be characterized clearly. Unfortunately, there seems to be no unique ideal financial system, toward which different financial systems in different countries converge. Different financial systems have evolved in different ways in different parts of the world, despite some notable convergences of different systems in recent years. For instance, the evolution of financial systems in some countries such as Japan and Germany has been dominated by the banking sector, while others like the United States and the United Kingdom have greater reliance on capital markets for the financial sector development. (Caprio and Classens, 1997).

Despite marked differences between financial systems across the world, one could glean some factors common to all relatively successful financial systems in different countries at the very rudimentary levels. They include, among other things, sound economic fundamentals as measured by various macroeconomic indicators, a fairly well-developed legal framework, a high standard of accounting and auditing commensurate to the global standards, the adequate availability of skilled manpower including those needed for the financial sector development, limited government interventions in credit allocation, an infrastructure for a sound regulation and prudential supervision of the financial intermediaries and the widespread application of information technologies in the financial sector.

Moreover, one pioneering empirical work (King and Levine,1993) attempted to provide plausible empirical evidence of crucial links between finance and growth, and articulated the structure of a successful financial system in process of empirical testing. The study uses a cross-country data of 80 cases over the period of 1960-1989 to test various hypotheses. At the risk of oversimplification, the major findings of the study can be summarized as follows. Real per capita GDP growth is positively correlated with the following five variables; (1) The overall size of financial system measured by the variable called DEPTH, which is currency held outside financial institutions plus demand deposits and interest-bearing liabilities of banks and non-bank financial institutions (M3 money supply) divided by GDP. Non-bank assets include insurance companies, pension funds, mutual funds, brokerage houses and investment banks; (2) the importance of banks relative to the central bank in allocating credit as measured by bank credit divided by bank credit plus central bank credit; (3) the relative importance of private sector credit as opposed to public sector credit as measured by the variable representing credit issued to private sector firms divided by total credit; (4) the quantitative importance of non-bank financial institutions as measured by the ratio of non-bank assets over GDP; and (5) The level of stock market development measured by a composite measure of various variables reflecting the liquidity of the market and the degree of integration with world capital markets.

3. Conclusion

The above empirical results characterize a distinct pattern of successful financial sector development in process of economic growth. As the country's per capita income increases, financial systems expand; private banks become more important relative to the central bank in allocating credit; the greater share of total credit is allocated to the private sector; non-bank financial institutions grow in importance; and stock markets become more important and sophisticated. It should be cautioned, however, that these results are subject to numerous data limitations, which are common to most empirical investigations, and hence they are less conclusive than it would seem otherwise. Apart from data problems, there is a serious problem of finding the direction of causation, since the results show an indication of statistical association between financial structure and economic growth. For example, whether financial deepening is the cause or the result of rapid economic growth is not clear. The results do not suggest that the transformation of financial structure in a particular pattern would somehow lead to rising per capita incomes. However, the empirical results not only help to describe the common characteristics of successful financial systems, but also lend themselves to certain policy interpretations. For instance, the pattern of financial sector development shown in the study may suggest a policy sequence that the developing countries at the early stages of development should focus on the banking sector development, while the middle-income developing countries may adopt policies that facilitate stock market development.

References

[1]   Ajakaiyea, O. and F. Tarpb, 2012. "Finance and Economic Development in Africa: Introduction and Overview", *Journal of African Economies*, vol. 21 (supplement 1), pp. 3-9

[2]   Caprio, Gerald, Jr. and Stijn Classens, 1997. *The Importance of the Financial System for Development: Implications for Egypt.* A paper presented at the Egyptian Center for Economic Studies in April 1997.(mimeo.).

[3]   Caprio, Gerald Jr. and Damela Klingebiel, 1997. " Bank Insolvency: Bad Luck, Bad Policy or Bad Banking?" in Bruno, Michael and Boris Pleskovic (eds.) *Proceedings, World Bank Annual Conference on Developing Economies.*

[4]   Chandavarkar, A. 1992. " Of Finance and Development", *World Development*, vol.20, pp. 133-142.

[5]   Diamond, D. W. and R. G. Rajan, 2000. *Banks, Short-Term Debt and Financial Crises: Theory, Policy, Implications and Applications.* NBER Working Paper No. 7764.

[6]   King, Robert G. and Ross Levine, 1993. "Finance, Entrepreneurship, and Growth: Theory and Evidence," *Journal of Monetary Economics,* 32 (December), pp. 513-42.

[7]   Levine, Ross, 1997. "Financial Functions, Institutions, and Growth," in Harwood, Alan and Bruce L. R. Smith (eds.) *Sequencing Financial Strategies for Developing Countries,* Washington D. C.: Brookings Institution Press.

[8]   McKinnon, R. I. 1973. *Money and Capital in Economic Development,* Washington D. C.: Brookings Institution.

[9]   McInish, Thomas H., 2000. *Capital Markets,* Malden Mass.: Blackwell.

[10]   Stiglitz, J. and A.W. Weiss, 1981. "Credit Rationing in Markets with Imperfect Information," *American Economic Review,* vol. 71, pp. 133-52.

[11]   Stiglitz, J., 1994. "The Role of the State in Financial Markets," *Proceedings of the World Bank Conference on Development Economics in 1993:* Supplement to World Bank Economic Review and World Bank Research Observer: 1, pp. 19-62.

[12]   Sundararajan, V., 1992. *Financial Reforms and Their Appropriate Sequencing*, Washington D.C., IMF Monetary and Exchange Affairs Department (September)

[13]   Wade, R., 1988. "The Role of Government in Overcoming Market Failure: Taiwan, Republic of Korea and Japan," in Hughes, H.(ed.) *Achieving Industrialization in Asia,* Cambridge: Cambridge University Press.

Are Government Bond Net Wealth? Empirical Evidence for Canada, Japan and US

Tito Belchior S. Moreira
Catholic University of Brasília: Brazil
E-mail: tito@pos.ucb.br

Michel Angelo Constantino de Oliveira
Catholic University of Brasília: Brazil
E-mail: Michel.oliveira@ipea.gov.br

George Henrrique de Moura Cunha
Catholic University of Brasília: Brazil
E-mail: George@ucb.br

Ricardo Coelho de Faria
Catholic University of Brasília: Brazil
E-mail: rcoelho@ucb.br

Carlos Vinícius Santos Reis
Catholic University of Brasília: Brazil
E-mail: vreis@ucb.br

Abstract

This paper aims to investigate of impact of fiscal variables on aggregated macroeconomic based on two distinct models. The first model tests the impact of government debt/M1 ratio on nominal interest rate. The second model tests the impact of interest payments on government debt/GDP ratio on demand for money. Both models are tested for a balanced panel of Canada, Japan and US over the period 1980-2006. We found evidence that Ricardian Equivalence does not holds for both models.

Keywords: Bond/money ratio; Ricardian equivalence; demand for money.

1. Introduction

The empirical evidence for Ricardian Equivalence proposition (REP)[1] is usually investigated following two approaches. The first seeks effects of government deficits on interest rates, while the second analyses the impact of a fiscal policy variable, e.g., public debt, on the behavior of an aggregated macroeconomic variable, which could be either consumption or savings (Moreira, Souza e Soares, 2011). Both approaches assume that the private agents perceive a fraction of government bonds as a net wealth. In this context, our paper aims to investigate the effect of fiscal variables on aggregated macroeconomic based on two distinct models. The first model tests the impact of government debt/M1

---

[1] Based on Barro (1974), the REP is said to hold if households do treat future servicing taxes as an exact offset to the government debt.

ratio on nominal interest rates based on Martins (1980). The second model tests the impact of interest payments on government debt/GDP ratio on demand for money based on Kneebone (1989). Both models are tested for a balanced panel of Canada, Japan and US over the period 1980-2006.

Ora, the main purpose of this article is to use non-Ricardian models to empirically determine whether fiscal policies had effects on aggregated macroeconomic variables such as the demand for money and the nominal interest rate. In the case of fiscal dominance, the fiscal variables affect macroeconomic variables.

Blanchard (2004) argues that discussion of the dominance of fiscal over monetary policy is not new, but spans from the modern literature of Sargent and Wallace (1981), as exemplified by "Some unpleasant monetarist arithmetic", to the fiscal theory of the price level propounded by Woodford (2003)[2].

Our discussion proceeds as follows. Section II shows the model of Martins (1980). Section III shows the model of demand for money based on Kneebone (1989). Section IV presents the empirical results and, finally, in section V, we present a summary and the final remarks on our findings.

2. Martins's Model

Martins (1980) develops a simple theory of nominal income and interest determination under the assumption that the only relevant distinction between money and bonds lies in their holding periods. Individuals take full account of the government budget constraint and do not concern themselves with discounting future tax liabilities associated with the issue of government bonds. According to this theory, the price of bonds is analogous to the price level, and the nominal rate of interest is determined by the bond/money ratio and bears no close relationship to the rate of expansion of the price level.

The most important implication of the Martins's model is that in a world which the decisions to accumulate wealth are associated with spending decisions, and in which the only difference between money (M) and bonds (B) lies in their holding periods, the nominal interest rate (i) is basically determined by the bonds/money ratio. In this sense, the nominal rate of interest is determined by the relative supply of bonds with respect to money, and bears no relationship to the rate of inflation. This result implies that the Fisherian theory of nominal interest rate (Fisher [1930], chaps. 2 and 19) does not hold. This article tests the positive association between nominal rate of interest and bond/money ratio given by the follow equation:

$$i_t = \frac{B_t}{M_t} - 1 \,.$$ (1)

Now by rewriting (1), where $(1 + i_t) = R_t$, we get a stochastic equation for panel data

$$R_{it} = \beta_0 + \beta_1 \frac{B_{it}}{M_{it}} + u_{it}$$ (2)

which we test if the bond/money ratio in fact affects the nominal interest rate in a context of balanced panel of Canada, Japan and US over the period 1980-2006. If the estimated coefficient $\hat{\beta}_1$ (equation 2) is statistically significant, then the Fisherian theory of nominal interest rate and the REP do not hold.

---

[2]   In that regard, there has been renewed interest in the discussion on coordination and interaction between monetary and fiscal policies. See Moreira, 2011 and Moreira, Souza e Almeida (2007).

3. Kneebone's Model (Demand for Money)

Kneebone (1989) defines the real demand for money balances to be a negative function of the nominal interest rate and a positive function of output and real wealth[3]. The definition of real net wealth is given by

$$W = M / P + \beta(B / P) \tag{3}$$

where W = private agents' subjective value of real net wealth; β = the fraction of governments bonds that private agents perceive to be net wealth ($0 \le \beta \le 1$); B = nominal stock of outstanding government bonds; Y = real output; i = the nominal interest rate; P = the price level and M = the nominal money supply. Hence, the definition of the real demand for money balances is given by

$$M / P = L_1 Y + L_2 R + L_3 [M / P + \beta(B / P)] \tag{4}$$

Following Kneebone[4] (1989), after dividing equation (4) by Y we have

$$m = L_1 + L_2 R + L_3(m + \beta b) \tag{5}$$

where $L_1 > 0$, $L_2 < 0$ and $L_3 > 0$; $m = M / PY$; $b = B / PY$.
We rearrange equation (5) such as

$$m = (L_1 / 1 - L_3) + (L_2 / 1 - L_3)R + (L_3 / 1 - L_3)\beta b \tag{6}$$

Now, we get a stochastic equation for panel data rewriting equation (6) as

$$m_{it} = \beta_0 + \beta_1 R_{it} + \beta_2 b_{it} + \eta_{it} \tag{7}$$

where $\beta_0 = (L_1 / 1 - L_3)$; $\beta_1 = (L_2 / 1 - L_3)$; $\beta_2 = (L_3 / 1 - L_3)\beta$. If $\beta_2 = 0$, we impose the Ricardian equivalence hypothesis. We use a version of Kneebone (1989) such that

$$m_{it} = \beta_0 + \beta_1 R_{it} + \beta_2 (ib)_{it} + \eta_{it} \tag{8}$$

Hence, we test if the interest payments on government debt as proportion of GDP in fact affect the real demand for money in a context of balanced panel of Canada, Japan and US over the period 1980-2006 as well. If the estimated coefficient $\hat{\beta}_2$ (equation 8) is statistically significant, then the REP does not hold.

4. Empirical Results

We use annual data from 1980 to 2006 for Canada, Japan and United States to assess the Ricardian equivalence and the nature of the association between government debt/M1 and nominal interest rate and between interest payments on government debt/GDP and demand for money.

As a proxy for nominal interest rate (i_t) we use the "Lending interest rate (%)" and for the stock of money ($M1_t$) we use the "Money (Current LCU)". The source of data is the World Development Indicators, WDI 2008. As a proxy for government debt or bonds (B_t) we use the "General government gross debt", for the index price we use "Gross domestic product, deflator" and for GDP we use "Gross domestic product, constant prices" and "Gross domestic product, current prices". The source of data is the International Monetary Fund, World Economic Outlook Database, April 2008. We use dummy variables to differentiate the countries. The basis is US.

Table 1 shows the summary of the following panel unit root tests: Levin, Lin and Chu (2002), Breitung (2000), Im, Pesaran and Shin (2003), and Fisher-type tests using ADF and PP tests – Maddala

---

[3]   Scarth (1996) defines a similar approach for the real demand for money balances in a context of non-Ricardian equivalence.

[4]   In fact, the author uses in his model two government budget constraints, federal and non-federal government. For our interest, we use just the general government.

and Wu (1999). Note that all the unit root tests on the level of F do not reject the null hypothesis. These results show unit root processes. Then, it is necessary analyze panel cointegration tests.

Table 1: Panel Unit Root Test Summary

Unit Root Tests	R: Nominal Interest Rate	(*) B/M: Bond/Money	(**) m: Money/GDP	(**) b: Interest Payment/GDP
	Statistic (Prob.)	Statistic (Prob.)	Statistic (Prob.)	Statistic (Prob.)
Levin, Lin & Chu (a)	-0.755 (0.225)	-0.721 (0.235)	0.411 (0.659)	1.888 (0.970)
Breitung t-stat (a)	-1.037 (0.150)	0.301 (0.618)	1.740 (0.959)	1.263 (0.897)
Im, Pesaran, and Shin W-stat (b)	-0.543 (0.294)	-0.803 (0.211)	0.912 (0.819)	1.174 (0.880)
ADF – Fisher Chi-square (b)	6.798 (0.340)	10.038 (0.123)	1.986 (0.921)	1.536 (0.957)
PP - Fisher Chi-square (b)	6.582 (0.361)	4.660 (0.588)	1.977 (0.922)	7.316 (0.293)

Note: Exogenous variables – individual effects, individual linear trends. (*) current prices; (**) constant prices;
(a) Null: Unit root - assumes common unit root process; (b) Null: Unit root - assumes individual unit root process.

4.1. Martins's Model

We employee panel cointegration tests with Fisher-type test using an underlying Johansen methodology according to Maddala and Wu (1999). Table 2 shows that both statistics tests (trace test and max-eigen test) indicate at most 1 cointegrating relations since they do not reject the null hypotheses at the 41.3%[5]. Thus, we can estimate the cointegrating equations according to table 3.

Table 2: Johansen Fisher Panel Cointegration Test

Hypothesized No. of CE(s)	Fisher Statistics Trace Test	*p*-value	Fisher Statistics Max-Eigen Test	*p*-value
None	15.470	0.017	14.710	0.023
At most 1	6.088	0.413	6.088	0.413

Table 3 shows two cointegrating equation. The first one, denoted by (CE.1), shows the estimated coefficients of $R_{it} = \hat{\beta}_o + \hat{\beta}_{i1}(B/M1)_{it}$ and the second one, (CE.2), shows the estimated coefficients of $R_{it} = \hat{\beta}_o + \hat{\beta}_{i1}(B/M1)_{it} + \hat{\beta}_2(B/M1)_{it}D_{Can} + \hat{\beta}_3(B/M1)_{it}D_{Jap}$. All the parameters are statistically significant. The equation (CE.1) presents the expected sign. In this sense, the increment of the bond/money ratio results in an increment of the nominal interest rate. This result does not corroborate with the hypotheses of Ricardian equivalence.

Table 3: Cointegrating Equation (CE)

$R_t = \hat{\beta}_o + \hat{\beta}_1(B/M1)_t + \hat{\beta}_2(B/M1)_t D_{Can} + \hat{\beta}_3(B/M1)_t D_{Jap}$

Coefficients	Estimated Coefficients (CE.1)	Statistics	Estimated Coefficients (CE.2)	Statistics
$\hat{\beta}_0$	0.995	(0.028) [36.022]	1.440	(0.109) [13.242]
$\hat{\beta}_1$	0.045	(0.021) [2.171]	-0.186	(0.074) [-2.502]
$\hat{\beta}_2$	–	–	0.231	(0.096) [2.417]
$\hat{\beta}_3$	–	–	0.418	(0.219) [1.910]

Standard errors in ( ) and t-statistics on [ ]

---

[5] We use the same statistics tests (trace test and max-eigen test) for all estimated equations and all of them indicate at most 1 cointegrating relation.

The estimative denoted (CE.2) assumes different coefficients of bond/money ratio for each country with a common nominal interest rate component structure. Hence, based on results of table 3, we can analyze better the signs of the variable $(B/M1)_t$ of each country as follow:

Canada: $R_t = 1.440 + 0.045(B/M1)_t$

Japan: $R_t = 1.440 + 0.232(B/M1)_t$

US: $R_t = 1.440 - 0.186(B/M1)_t$

Hence, the increment of the bond/money ratio results in an increment of the nominal interest rate, except to US. For all countries, the empirical results do not accept the hypotheses of Ricardian equivalence.

4.2. Kneebone's Model (Demand for Money)

We employee here panel cointegration tests with Fisher-type test using an underlying Johansen methodology according to Maddala and Wu (1999) as well. Table 4 shows that both statistics tests (trace test and max-eigen test) indicate at most 2 cointegrating relations since they do not reject the null hypotheses at the 94.1%. Therefore, we can estimate the cointegrating equations according to table 5.

Table 4: Johansen Fisher Panel Cointegration Test

Hypothesized No. of CE(s)	Fisher Statistics Trace Test	*p*-value	Fisher Statistics Max-Eigen Test	*p*-value
None	43.410	< 0.001	33.760	< 0.001
At most 1	17.260	0.008	19.510	0.003
At most 2	1.758	0.941	1.758	0.941

Table 5 shows two cointegrating equation. The first on, denoted by (CE.3), shows the estimated coefficients of $m_{it} = \hat{\beta}_o + \hat{\beta}_1 i_{it} + \hat{\beta}_2 (ib)_{it}$ and the second one, (CE.4), shows the estimated coefficients of $m_{it} = \hat{\beta}_o + \hat{\beta}_1 i_{it} + \hat{\beta}_2 (ib)_{it} + \hat{\beta}_3 (ib)_{it} D_{Can} + \hat{\beta}_4 (ib)_{it} D_{Jap}$. All the parameters are statistically significant and present the respective expect signs.

The equation (CE.3) presents the expected sign. The empirical results show a negative association between demand for money and nominal interest rate and a positive association between demand for money and the interest payment/GDP ratio.

Table 5: Cointegrating Equation

$m_{it} = \hat{\beta}_o + \hat{\beta}_1 R_{it} + \hat{\beta}_2 (ib)_{it} + \hat{\beta}_3 (ib)_{it} D_{Can} + \hat{\beta}_4 (ib)_{it} D_{Jap}$				
Coefficients	Estimated Coefficients (CE.3)	Statistics	Estimated Coefficients (CE.4)	Statistics
$\hat{\beta}_0$	62.593		51.436	
$\hat{\beta}_1$	-51.678	(5.525) [-9.353]	-39.324	(4.086) [-9.623]
$\hat{\beta}_2$	1.762	(0.448) [3.934]	2.528	(0.468) [5.399]
$\hat{\beta}_3$	–	–	-1.510	(0.448) [-3.367]
$\hat{\beta}_4$	–	–	-0.047	(0.024) [-1.931]

Standard errors in ( ) and t-statistics on [ ]

The estimative denoted (CE.4) assumes different ratio of interest payment/GDP coefficients for each country with a common demand for money component structure. Hence, based on results of table 5, we can analyze better the signs of the variable $(ib)_{it}$, interest payment/GDP, for each country as follow:

Canada: $m_{it} = 51.436 - 39.324R_{it} + 1.018(ib)_{it}$

Japan: $m_{it} = 51.436 - 39.324R_{it} + 2.481(ib)_{it}$

US: $m_{it} = 51.436 - 39.324R_{it} + 2.528(ib)_{it}$

In this sense, the increment of the interest payment/GDP ratio results in an increment of the demand for money. This result does not accept the hypotheses of Ricardian equivalence.

5. Summary and Concluding Remarks

The empirical results show that the nominal interest rate is not independent of public debt/M1 ratio and that the Ricardian Equivalence hypothesis is not valid for US, Canadian and Japan. However, the result for US does not follow a positive association between the nominal interest rate and the public debt/M1 ratio according to Martins's model (1980).

In the same vein, the empirical results show a negative association between demand for money and nominal interest rate for all countries and a positive association between demand for money and the interest payment/GDP ratio. In this sense, there is empirical evidence that the Ricardian Equivalence hypothesis is not valid for US, Canadian and Japan as well.

References

[1]   Barro, R. J. (1974). Are government bond net wealth? *Journal of Political Economy* 91: 1095-1117.
[2]   Blanchard, O. (2004). "Fiscal dominance and inflation targeting: lessons from Brazil". NBER Working Paper, No. 10389, Cambridge, Massachusetts, March.
[3]   Breitung, Jorg (2000). "The Local Power of Some Unit Root Tests for Panel Data", in B. Baltagi (ed.), *Advances in Econometrics, Vol.15: Nonstationary Panels, Panel Cointegration, and Dynamic Panels*, Amsterdam: JAI Press, p.161-178.
[4]   Fisher, Irving (1930). "The Theory of Interest", Reprint. New York: Kelly, 1970.
[5]   Im, K.S., M. H. Pesaran, and Y. Shin (2003). "Testing for Unit Roots in Heterogeneous Panels", *Journal of Econometrics*, 115, 53-74.
[6]   Kneebone, Ronald D. (1989). "On Macro-Economic Instability under a Monetarist Policy Rule in a Federal Economy", *The Canadian Journal of Economics*, Vol.22, No. 3, Aug., pp.673-685.
[7]   Levin, A., C. F. Lin, and C. Chu (2002). "Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties", *Journal of Econometrics*, 108, 1-24.
[8]   Maddala, G.S. and S. Wu (1999). J. Choi, 2003. "A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test", Oxford Bulletin of Economics and Statistics, 61, 631-52.
[9]   Moreira, Tito Belchior S. (2011). "Brazil: an empirical study on fiscal policy transmission". *CEPAL Review*, 103, April, pp. 187-205.
[10]   Moreira, Tito Belchior S., Geraldo da S. e Souza and Charles Lima de Almeida (2007). "The fiscal theory of the price level and the interaction of monetary and fiscal policies: the Brazilian case". *Brazilian Review of Econometrics*, vol. 27, No. 1, Rio de Janeiro, SBE, May.

[11]   Moreira, Tito Belchior S., Geraldo da Silva e Souza and Fernandeo A. R. Soares (2011). Are government bonds net wealth? Some empirical evidence. *Modern Economy*, vol. 2, pp: 412-415.

[12]   Martins, Marco A. C. (1980). "A Nominal Theory of the Nominal Rate of Interest and the Price Level", *The Journal of Political Economy*, Vol. 88, No. 1, Feb., pp. 174-185.

[13]   Sargent, T.J. and N. Wallace (1981). "Some unpleasant monetarist arithmetic", *Federal Reserve Bank of Minneapolis Quarterly Review*, vol. 5, no. 3, Minneapolis, Federal Reserve Bank of Minneapolis.

[14]   Scarth, William M. (1996). Macroeconomics: An Introduction to Advanced Methods, 2nd edition, Harcourt Brace & Company, Canada, pp. 140-164.

[15]   Woodford, M. (2003). Interest and prices. Princeton, Princeton University Press

Measuring Technical Efficiency of Bank Branches:
A Stochastic Frontier Analysis

Saâd Benbachir

Department of Management- Faculty of Juridical
Economical and Social Sciences, University of Mohamed 5
Avenue des Nations-Unies, B.P. 721 Agdal – Rabat, Morocco

Anas Benbachir

Department of Management- Faculty of Juridical
Economical and Social Sciences, University of Mohamed 5
Avenue des Nations-Unies, B.P. 721 Agdal – Rabat, Morocco

Yassine El Haddad

Department of Management- Faculty of Juridical
Economical and Social Sciences, University of Mohamed 5
Avenue des Nations-Unies, B.P. 721 Agdal – Rabat, Morocco

Abstract

The aim of this paper is to estimate the stochastic frontier production function for panel data on bank branches and the technical inefficiency effects during the period 2007-2010. The parameters of a stochastic production frontier and the determinants of the inefficiency for a panel of 78 bank branches belonging to a regional Moroccan bank are estimated simultaneously using a maximum likelihood method proposed by Battese and Coelli (1992,1995). Empirically, the results of the analysis of the branches technical efficiency during the period considered have been conclusive. Indeed all the parameters of the production function and the coefficients of the factors explaining the inefficiencies were statistically significant. This suggests that the production frontier is stochastic and the variables chosen to explain technical inefficiencies have a significant effect except the revenue per employee variable. The analysis showed also that the mean efficiencies have varied very slowly during the period covered and reached just 1% almost every year.

1. Introduction
The interest in stochastic frontier methods started since the seminal papers of Meeusen and van den Broeck (1977) and Aigner et al. (1977). Afterward, these methods have become a popular tool for efficiency analysis of firms in different areas. Since then, a stream of research has followed which reformulate and extend the original models leading to a relatively large number of empirical studies.

The first work on the concept of productive efficiency is attributed to Koopmans (1951) and Debreu (1951). Koopmans was the first to define the concept of efficiency and Debreu the first to

measure it empirically. Debreu proposed the coefficient of resources utilization, which focused on measures of output-input ratio. Farrell (1957) expanded the definition of Koopmans and provides a measure of productive efficiency that distinguishes two components of efficiency: allocative efficiency and technical efficiency. According to Farrell, allocative efficiency (or price efficiency) evaluates the ability of a firm to combine different inputs optimally given market prices, assuming the market is competitive. Theoretically, the production process is said allocatively efficient if the marginal rate of substitution between each pair of factors is equal to the proportion of the price of these factors.

According to Koopmans (1951), technical efficiency is defined by "a feasible input-output vector is said to be technically efficient if it is technologically impossible to increase any output and/or reduce any input without simultaneously reducing another output and/or one other input". A company is said technically efficient if, for the levels of inputs used and outputs produced, it is impossible to increase the amount of output without increasing the amount of one or more inputs or if it is impossible to reduce the amount of an input without reducing the amount of one or more outputs. Thus, a company technically inefficient could produce the same outputs with at least one input less, or could use the same resources for producing at least one additional output.

Technical efficiency is divided in turn into scale efficiency and pure technical efficiency. The scale efficiency permit to relate the measurement of technical efficiency to the returns to scale obtained for the optimal levels of activity. It characterizes the gap between the actual performance and that would be obtained in a situation of long-term competitive equilibrium where profit is zero, that is to say, in a situation where returns to scale are constant. Thus, a company is scale inefficient if its initial situation is characterized by increasing or decreasing returns to scale.

The pure technical efficiency reflects the ability of a company to optimize its output for a given level of inputs and, symmetrically, to minimize resources consumption for a given level of production. It reflects the organization of work within the production unit, the ability to organize, to motivate employees and supervisors or the ability to avoid mistakes and bad decisions.

Since Koopmans (1951) and Farrell (1957), economists simply seek to measure relative efficiency of similar decision units which use the same production technologies and which are facing the same market conditions and the same goals. Therefore, the identification of the most efficient units within a homogenous group is performed from the available observations. This means to find methods which identify the 'best' units and measure the deviations of others units with respect to these 'best practices'.

The most efficient units serve as references to others. The efficiency of each unit is thus evaluated by reference to the "best practices" observed and not in relation to an absolute technical or economic objective. Efficiency scores are thus measures of relative efficiency.

Literature and empirical research provide numerous examples of the use of techniques to measure efficiency in a variety of fields.

In our work, we apply an econometric method known as "Stochastic Frontier Analysis" in order to measure the scores of technical efficiencies of bank branches belonging to a regional Moroccan bank.

2. A Review of Stochastic Frontier Models

The SFA method is an econometric method for the measurement of the efficiency frontier. Contrary to the nonparametric methods based on the linear programming techniques, the SFA method necessitates a certain functional form relating inputs and outputs.

Aigner and Chu (1968) were the first who estimate a deterministic frontier production function using Cobb-Douglas production function.

Nevertheless, this initial model was deterministic, and explains the deviations from the frontier as a result of technical inefficiency and doesn't take into account any measurement errors (errors related to the choice of functional form) or any statistical noise.

The stochastic frontier method was the response to the shortcomings of this deterministic frontier approach. In the decade of 1970, Afriat (1972) extended the deterministic frontier model. Aigner et al (1977) and Meeusen and van den Broeck (1977). expand more systematically the deterministic frontier approach by taking into account the technical inefficiency, the measurement errors and the statistical noise. Afterward, the stochastic frontier approach was developed in several directions: cross-sectional or panel data, production or cost frontier, time-invariant or varying inefficiency. The parametric stochastic models are traditionally estimated by the maximum likelihood methods.

Below, we first describe the stochastic cross-sectional model and then review the extension to the panel data model.

2.1. Cross-Sectional Model

Suppose we have N decision making units (firms) and consider the following cross-sectional stochastic frontier model

$$Y_i = \alpha + X_i'.\beta + V_i - U_i \; i = 1, \cdots, N \tag{1}$$

$$V_i \sim \mathcal{N}(0, \sigma_V^2) \tag{2}$$

where Y_i represents the logarithm of the output of the ith decision making unit; $X_i = (X_{i1} \;\; X_{i2} \;\; \cdots \;\; X_{iK})$ is a $1 \times K$ matrix of inputs and $\beta = (\beta_1 \;\; \beta_2 \;\; \cdots \;\; \beta_K)'$ is a $K \times 1$ matrix of unknown technology parameters; V_i are random variables which are assumed to be independently and identically distributed $\mathcal{N}(0, \sigma_V^2)$ and independent of U_i which are nonnegative random variables that account for technical inefficiencies in production. Concerning the distribution of U_i, Aigner et al. (1977) assumed a Half-Normal distribution, $U_i \sim \mathcal{N}^+(0, \sigma_U^2)$, whereas Meeusen and van den Broeck (1977) assumed an Exponential distribution, $U_i \sim \mathcal{E}(\sigma_U)$. Stevenson (1980) opted for a Truncated Normal distribution and Greene (2003) chose the Gamma distribution.

The distributional assumption made for the identification of the technical inefficiency term, U_i, usually entails the use of the Maximum Likelihood method for estimating the model parameters. Generally, the stochastic frontier analysis is divided in two sequential steps, the first one estimates the model parameters $\hat{\theta} = (\hat{\alpha} \;\; \hat{\beta}' \;\; \hat{\sigma}_U^2 \;\; \hat{\sigma}_V^2)$ by maximizing the log-likelihood function $\mathcal{L}(\theta)$, while the second step estimates inefficiency by using the mean or the mode of the conditional distribution $f(U_i|\varepsilon_i)$, where $\hat{\varepsilon}_i = Y_i - \hat{\alpha} - X_i'.\hat{\beta}$.

We can derive the likelihood function using the independence assumption between U_i and V_i. Starting from the definition of the composite error $\varepsilon_i = V_i - U_i$, we deduce the *probability density function (p.d.f.) of* ε_i as a convolution of the two component densities of U_i and $\varepsilon_i + U_i = V_i$:

$$f_{\varepsilon_i}(\varepsilon_i) = \int_0^{+\infty} f_{U_i}(u_i) f_{V_i}(\varepsilon_i + u_i) du_i \tag{3}$$

The log-likelihood function corresponding to a sample of n decision making units is given by:

$$\mathcal{L}(\theta) = ln\left(\prod_{i=1}^{n} f_{\varepsilon_i}(\varepsilon_i)\right) = \sum_{i=1}^{n} ln\left(f_{\varepsilon_i}(\varepsilon_i)\right) \tag{4}$$

where $\theta = (\alpha \;\; \beta' \;\; \sigma_U^2 \;\; \sigma_V^2)$ is the parameters to estimate.

The integral form (3) leads to a closed-form if the distributions of the couple (V_i, U_i) are Normal-Half Normal, Normal-Exponential or Normal-Truncated Normal. In all other cases (e.g., the Normal-Gamma distributions) numerical techniques must be used.

In the second step, we use the residual $\hat{\varepsilon}_i = Y_i - \hat{\alpha} - X_i'.\hat{\beta}$ obtained from the first step to determine the inefficiency estimates. Some authors were interested in the problem of separating the unobserved component U_i from the compounded error ε_i. Jondrow et al. (1982) and Battese and Coelli (1988) proposed a solution to this problem by using the conditional distribution of U_i given ε_i. Thus, an estimate of the inefficiencies can be deduced using the mean $\mathbb{E}(U_i|\hat{\varepsilon}_i)$ or the mode $\mathbb{M}(U_i|\hat{\varepsilon}_i)$. Once the estimate of U_i is obtained, we derive the technical efficiency by:

$$TE_i = exp\left(-\hat{U}_i\right) \tag{5}$$

where $\hat{U}_i$ is either $\mathbb{E}(U_i|\hat{\varepsilon}_i)$ or $\mathbb{M}(U_i|\hat{\varepsilon}_i)$.

2.2. Panel Data Model

The utilization of a panel data permits the relaxation of the distributional assumptions of the cross-sectional model.

Pitt and Lee (1981) were the first who extend the cross-sectional model to a longitudinal data. They proposed the following Normal-Half Normal stochastic frontier model

$$Y_{it} = \alpha + X'_{it}.\beta + \varepsilon_{it} \ i = 1, \cdots, N; \ t = 1, \cdots, T \tag{6}$$

$$\varepsilon_{it} = V_{it} - U_i \tag{7}$$

$$V_{it} \sim \mathcal{N}(0, \sigma_V^2) \tag{8}$$

$$U_i \sim \mathcal{N}^+(0, \sigma_U^2) \tag{9}$$

Battese and Coelli (1988) have generalized this model to the Normal-Truncated Normal model. The time invariance of the inefficiency term has been challenged and several authors proposed some solutions by introducing the time variable in the inefficiency term. For example, Cornwell et al. (1990) have proposed the following stochastic model:

$$Y_{it} = \alpha + X'_{it}.\beta + V_{it} - U_{it} \ i = 1, \cdots, N; \ t = 1, \cdots, T \tag{10}$$

$$U_{it} = \omega_{i0} + \omega_{i1}.t + \omega_{i2}.t^2 \tag{11}$$

The parameters of this model are estimated by using the extension of the conventional fixed and random effects panel data estimators. In the Lee and Schmidt (1993) model, the inefficiency U_{it} has been specified in the form

$$U_{it} = g(t).U_i \tag{12}$$

Kumbhakar (1990) was the first to propose the Maximum-Likelihood method of a time-varying stochastic frontier model in which $g(t)$ is specified as

$$g(t) = \left(1 + \exp(\gamma.t + \delta.t^2)\right)^{-1} \tag{13}$$

2.2.1. Battese and Coelli Specification (1992)

Battese and Coelli (1992) proposed a stochastic frontier production function for panel data where the inefficiencies are assumed to be distributed as truncated normal random variables and are also supposed vary with time. The model is specified as:

Battese and Coelli (1992) proposed a similar model, known as "time decay" model, by choosing the specification:

$$Y_{it} = X'_{it}.\beta + V_{it} - U_{it} \ i = 1, \cdots, N; \ t = 1, \cdots, T \tag{14}$$

where Y_{it} is the (logarithm of the) production of the ith decision making unit in time period t; $X_{it} = (X_{it}^1 \quad X_{it}^2 \quad \cdots \quad X_{it}^K)$ is a $1 \times K$ matrix of inputs; $\beta = (\beta_1 \quad \beta_2 \quad \cdots \quad \beta_K)'$ is a $K \times 1$ matrix of unknown parameters; V_{it} are random variables which are assumed to be independently and identically distributed $\mathcal{N}(0, \sigma_V^2)$ and independent of U_{it}. Battese and Coelli (1992) choose U_{it} in the form

$$U_{it} = \exp(-\eta.(t - T)).U_i \tag{15}$$

Where the U_i are non-negative random variables which account for technical inefficiency in production and are assumed to be independent and identically distributed as truncations at zero of the $\mathcal{N}(\mu, \sigma_U^2)$ distribution; η is a parameter to be estimated.

We utilize the parameterization of Battese and Corra (1977) by replacing σ_V^2 and σ_U^2 by the new parameters $\sigma^2 = \sigma_V^2 + \sigma_U^2$ and $\gamma = \frac{\sigma_U^2}{\sigma^2}$. The parameter γ is between 0 and 1 and an initial value can be chosen in this range and used as a starting value for an iterative maximization process such as the Davidon-Fletcher-Powell (DFP) algorithm.

2.2.2. Battese and Coelli Specification (1995)

Kumbhakar, Ghosh and McGukin (1991) and Reifschneider and Stevenson (1991) proposed stochastic frontier models in which the inefficiency effects are expressed as an explicit function of a random error and of variables specific to firms. Battese and Coelli (1995) proposed a model which is equivalent to the specification of Kumbhakar, Ghosh and McGukin (1991). The Battese and Coelli (1995) model specification may be expressed as:

$$Y_{it} = X'_{it}.\beta + V_{it} - U_{it}, \; i = 1, \cdots, N; \; t = 1, \cdots, T \tag{16}$$

where Y_{it} is the (logarithm of the) production of the ith decision making unit in time period t; $X_{it} = (X^1_{it} \; X^2_{it} \; \cdots \; X^K_{it})$ is a $1 \times K$ matrix of inputs; $\beta = (\beta_1 \; \beta_2 \; \cdots \; \beta_K)'$ is a $K \times 1$ matrix of unknown parameters; V_{it} are random variables which are assumed to be independently and identically distributed $N(0, \sigma^2_V)$ and independent of U_{it} which are nonnegative random variables that account for technical inefficiencies in production; U_{it} are assumed to be independently distributed as truncations at zero of the $N(m_{it}, \sigma^2_U)$ distribution. The mean inefficiency m_{it} is a deterministic linear function of P explanatory variables:

$$m_{it} = Z'_{it}.\delta \tag{17}$$

where $Z_{it} = (Z^1_{it} \; Z^2_{it} \; \cdots \; Z^P_{it})$ is a $1 \times P$ matrix of explanatory variables which influence the efficiency of the ith decision making unit in time period t; $\delta = (\delta_1 \; \delta_2 \; \cdots \; \delta_P)$ is a $P \times 1$ matrix of parameters to be estimated.

The technical inefficiency effect U_{it} in the stochastic frontier model is specified as follows:

$$U_{it} = Z'_{it}.\delta + W_{it} \tag{18}$$

where the random variable W_{it} follows a truncated normal distribution with mean zero and variance σ^2, such that the point of truncation is $-Z'_{it}.\delta$, i.e $W_{it} \geq -Z'_{it}.\delta$. The parameters β of the stochastic frontier given by equation (15) and the parameters δ of the inefficiency model given by equation (17) are simultaneously estimated by using the maximum likelihood estimation (Battese and Coelli, 1992).

Once the estimate of U_{it} is obtained, we derive the technical efficiency by:

$$TE_{it} = exp(-\hat{U}_{it}) \tag{19}$$

$$TE_{it} = exp(-Z'_{it}.\hat{\delta} - W_{it}) \tag{20}$$

Restricting some parameters to certain values leads to a number of special cases. If we set to zero, we obtain the time-invariant model of Battese, Coelli and Colby (1989). The additional restriction provides the model of Pitt and Lee (1981). If we add the restriction we obtain the cross-sectional model of Aigner, Lovell and Schmidt (1977), with a half-normal formulation.

3. Data and Choice of Inputs and Outputs of Bank Branches

Bank branches are retail banks and their mission is to adapt to the market around them by collecting and processing information about the needs and expectations of local demand, enhance relationships with customers, and so develop and maintain existing customers.

Bank branches provide a business function on behalf of the bank. To describe this function, we use balance sheet variables (deposit and credit activities) and off-balance sheet variables (non-life insurance, life insurance ...). The use of such variables implies that the estimated production function has similarities with the production function of the bank itself.

However, the bank production function cannot be used to describe the activity of a branch. The latter does not "produce" per se banking products, its role is to distribute them. Indeed, the branch produces information, proximity and accessibility services.

The economic literature has developed numerous measures for inputs of the points of sale. Human resources can be measured by the number of full-time equivalent employees or by the personnel costs they entail. In the same manner, operating resources can be measured by operating

costs caused by the exploitation of physical capital, by the number of square meters, by the number of computers or by fixed assets.

Similarly, the customer capital can be measured in different ways: the amount of deposit accounts or interest paid to customers, as it can be measured by the number of active current accounts approaching the number of actual customers of a branch.

Table 1: Input variables

3 inputs		Variables
Humann resources	⟶	Number of full-time equivalent employees
Operating resources	⟶	Operational costs
Customer capital	⟶	Number of active current accounts

Concerning the outputs in the activity of bank branches the literature presents some described in the following table:

Table 2: Outputs

Six outputs	Variables
Loans to individuals	Asset value of loans to individuals
Loans to professionals	Asset value of loans to professionals
Liquid savings	Asset value of interest-bearing deposits
Services related to the means of payment	Commissions amount for management services of means payment
Products for damage insurance	Amount of damage insurance premiums
The financial savings products	Value of financial savings

In our paper, we adopt three inputs, namely:
- The labor capital (LC): measured by *the number of employees* by branch,
- The physical capital (PC): measured by *the general operating costs*,
- The customer capital (CC): measured *by the number of customers* by branch

The diversity of the bank branches outputs and the adoption of the input-oriented approach led us to retain a single variable for the output that could synthesize the entire production of bank branches. This variable chosen is *the Operating Gross Product* of bank branches considered as the turnover

In addition, we identified four explanatory variables of bank branches inefficiencies:
- The share of enterprises-portfolio (EP): measured by *the proportion of the enterprises relative to the number of total clients;*
- The branch age (BA): measured by *the number of years since the creation of the branch;*
- The employment coefficient (EC)*: the ratio between employments and resources;*
- The employee revenue (ER): *the average annual revenue per employee.*

Our study focuses on a sample of 78 branches of a Moroccan regional bank during the period 2007-2010.

4. Results
Descriptive Statistics

We give below the descriptive statistics of the output and the inputs during the period 2007-2010.

Table 3: Descriptive statistics of the output and the inputs during the period 2007-2010

		Output	Inputs of the production function			Explanatory variables of inefficiencies			
		Operating Gross Product	Customer Portfolio	The number of employees	General operation costs	The share of enterprises-portfolio	Branch age	Employment Coefficient	Revenue per empoyee
2007	Minimum	559578.69	734.00	2.00	192203.41	0.01	1.28	0.06	74777.78
	Average	**9136974.64**	**4811.49**	**5.87**	**724662.43**	**0.09**	**15.80**	**0.49**	**146797.87**
	Maximum	47832227.60	17421.00	16.00	2261820.19	0.71	76.55	1.25	410800.00
2008	Minimum	988865.65	1030.00	3.00	229888.47	0.01	2.28	0.14	74166.67
	Average	**10575653.91**	**5228.69**	**6.15**	**720146.68**	**0.08**	**16.80**	**0.60**	**130046.30**
	Maximum	53986011.24	17645.00	13.00	2095697.00	0.70	77.55	1.62	207400.00
2009	Minimum	1188419.72	1560.00	3.00	258620.58	0.01	3.28	0.16	69429.77
	Average	**11464845.15**	**5656.23**	**6.27**	**878723.34**	**0.08**	**17.80**	**0.64**	**134042.85**
	Maximum	57146097.34	17538.00	15.00	2577715.70	0.70	78.55	2.12	319125.95
2010	Minimum	1493802.84	1774.00	3.00	395960.39	0.01	4.28	0.17	77976.73
	Average	**11332855.30**	**5872.10**	**5.76**	**1015791.17**	**0.07**	**18.80**	**0.63**	**149421.83**
	Maximum	48282608.53	16838.00	13.00	2814729.52	0.68	79.55	1.84	239074.57

We give in the following table and figure the variation rate in % of the average output and of the average inputs of the bank branches during the period 2008-2010 relative to 2007.

Table 4: Variation rate in % of the average output and of the average inputs

	The average Operating Gross Product	The average Customer Portfolio	The average Number of Employees	The average General Operation Costs
2008	15,75%	8,67%	4,80%	-0,62%
2009	25,48%	17,56%	6,77%	21,26%
2010	24,03%	22,04%	-1,97%	40,17%

**Figure 1**: Variation rate in % of the average output and of the average inputs
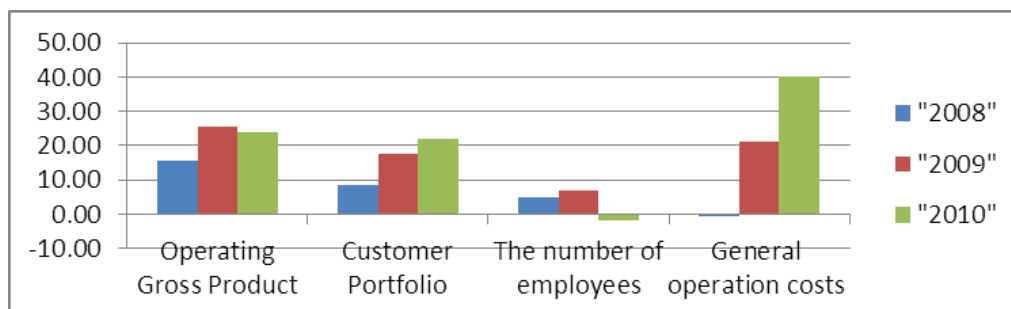
The table and figure above show a positive change in the average values of the operating gross product relative to 2007. The general operating costs recorded the largest average increase (40%) passing from 724MDH in 2007 to 1015MDH in 2010. This increase exceeds largely that of the Operating Gross Product which the evolution does not exceed 26% relative to the year 2007.

We give in the following table and figure the variation rate in % of the average values of the inefficiencies variables of the bank branches during the period 2008-2010 relative to 2007.

Table 5: Variation rate in % of the average values of the inefficiencies variables

	The share of enterprises-portfolio	Branch age	Employment Coefficient	Revenue per empoyee
2008	-4.84 %	6.35 %	22.17 %	-11.41 %
2009	-8.24 %	12.67 %	31.64 %	-8.69 %
2010	-14.11 %	19.00 %	28.92 %	1.79 %

Figure 2: Variation rate in % of the average values of the inefficiencies variables3
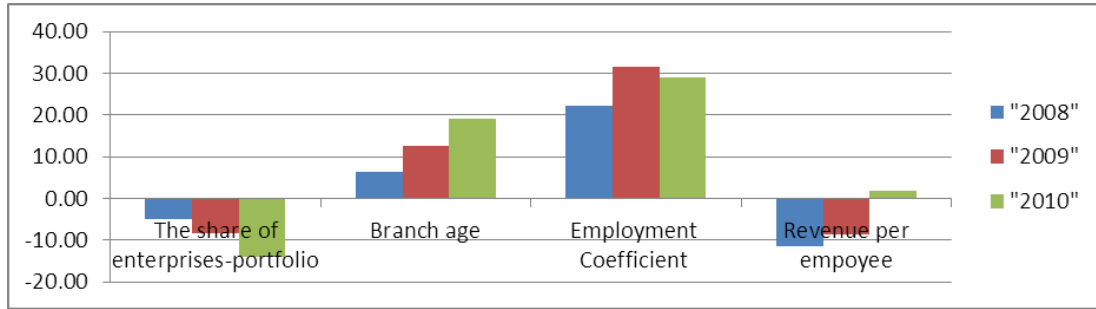
The table and the figure above show that the share of enterprises-portfolio has seen an average decline more and more important between 2007 and 2010. The employment coefficient shows a significant average increase over the period 2007-2010. The average increase reached its highest level in 2009 (32% compared to 2007). The revenue per employee has recorded a negative average evolution in 2008 and 2009 and an average improvement in 2010 compared to 2007.

Estimation Results

We give below the results concerning the estimation of the parameters of the stochastic production function and that of the inefficiencies.

Table 6:   Estimation Results

Parameters of the production function	Values	Standard Deviation	t-student
β_0	2.6241	0.9573	2.7412
β_1	0.3356	0.0631	5.3160
β_2	0.7284	0.0872	8.3493
β_3	0.6911	0.0988	6.9982
Inefficiencies Parameters	**Values**	**Standard Deviation**	**t-student**
δ_0	1.0915	0.1472	7.4152
δ_1	1.4336	0.2974	4.8202
δ_2	-0.0166	0.0035	-4.7223
δ_3	-0.2492	0.0672	-3.7073
δ_4	0.0000	0.0000	-4.2624
$\sigma^2 = (\sigma_u^2 + \sigma_v^2)$	0.1006	0.0097	10.3774
$\gamma = \sigma_u^2/\sigma^2$	0.1356	0.0608	2.2291
Log de la fonction de vraisemblance = -78.9507			
LR test = 60.8872			

Interpretation of the Results

The number of constraints is equal to 6, corresponding to the number of constraints of the null hypothesis .

The first important result to interpret is the likelihood ratio which is equal to LR = 60.8872. The critical value of chi-square test with 6 degrees of freedom with a significance level of 1% is equal to à. As, we deduce that the production frontier is stochastic and the inefficiencies effects are present.

The second deduction from the table is that the values of t-student of all parameters are in absolute value greater than 2. Therefore, the parameters of the production function and the parameters of the inefficiency are significantly different from zero.

From the table, we obtain the model:

$$\ln(PBE) = 2.6241 + 0.3356\ \ln(LC) + 0.7284\ \ln(PC) + 0.6911\ \ln(CC) + V_{it} - U_{it}$$

$$U_{it} = 1.0915 + 1.4336. -0.0166\ BA_{it} - 0.2492\ EC_{it} + 0.0000\ ER_{it} + W_{it}$$

$$m_{it} = E(U_{it}) = 1.0915 + 1.4336\,PE_{it} - 0.0166\,AA_{it} - 0.2492\,CE_{it} + 0.0000\,RA_{it}$$

We deduce from these equations:

- If the labor capital measured by the number of employees increases by 10% then the turnover measured by the gross operating product increases by 3.34%.
- If the physical capital (PC) measured by the general operating costs increased by 10% then the turnover measured by the gross operating product increased by 7.28%.
- If the customer capital (CC) measured by the number of customers increased by 10% then the turnover measured by the gross operating product increased by 6.91%.

Analysis of the Bank Branches Efficiency over the Period 2007-2010

Table 7:   Efficiency Scores of bank branches numbered from 1 to 20

Branch	N°	2007	2008	2009	2010
A.BENABALLAH	1	0.98	0.98	0.98	0.99
MLY ISMAIL	2	0.98	0.97	0.93	0.96
ARTISANAT	3	0.63	0.42	0.63	0.57
16 NOVEMBRE	4	0.88	0.80	0.88	0.85
T. HASSAN	5	0.92	0.86	0.92	0.97
SAKNIA	6	0.99	0.88	0.89	0.95
IBNOU ROCHD	7	0.72	0.65	0.91	0.81
AKKARI	8	0.95	0.97	0.97	0.97
DIOUR JEMAA	9	0.95	0.96	0.95	0.96
MOHAMED V	10	0.95	0.95	0.97	0.97
Y.EL MANSOUR	11	0.97	0.94	0.96	0.97
BAB JDID	12	0.80	0.82	0.74	0.81
OCEAN	13	0.89	0.94	0.92	0.92
HAY RYAD	14	0.70	0.90	0.94	0.98
AGDAL	15	0.89	0.83	0.68	0.93
KHEMISSET	16	0.94	0.92	0.96	0.96
KHEMISSET ENT	17	0.64	0.48	0.48	0.58
ESSAADA	18	0.59	0.69	0.57	0.72
BIR ANZARANE	19	0.67	0.76	0.62	0.77
ROMMANI	20	0.79	0.80	0.74	0.85

Figure 3: Evolution of the efficiency scores of bank branches numbered from 1 to 20
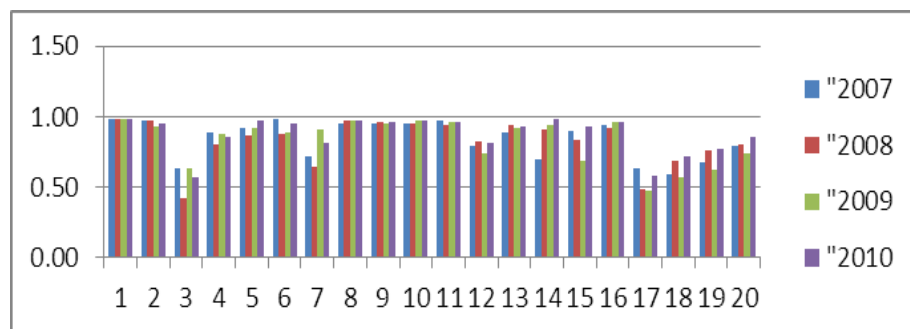
Table 8:   Efficiency Scores of bank branches numbered from 1 from 21 to 40

Branch	N°	2007	2008	2009	2010
TARIK IBN ZYAD	21	0.93	0.89	0.84	0.84
AL WAHDA	22	0.80	0.94	0.80	0.92
TEMARA	23	0.90	0.94	0.93	0.95
AL KAHIRA	24	0.71	0.65	0.67	0.90
AL AMAL	25	0.67	0.74	0.81	0.90
AL MASSIRA	26	0.87	0.79	0.81	0.92

Table 8:   Efficiency Scores of bank branches numbered from 1 from 21 to 40 - continued

SKHIRATE	27	0.77	0.81	0.89	0.94
MLY.A.CHRIF	28	0.63	0.74	0.73	0.77
GUICH OUDAYA	29	0.63	0.65	0.61	0.79
AIN AOUDA	30	0.56	0.67	0.63	0.70
MAGHRIB AL ARABI	31	0.57	0.56	0.59	0.70
SALE	32	0.96	0.84	0.90	0.88
KARIMA	33	0.61	0.65	0.62	0.90
TABRIQUET	34	0.90	0.96	0.95	0.94
BETTANA	35	0.89	0.92	0.91	0.96
KARIA	36	0.64	0.66	0.68	0.89
IZDIHAR	37	0.74	0.78	0.68	0.79
IBNOU AL HAYTAM	38	0.69	0.79	0.62	0.61
SIDI MOUSSA	39	0.66	0.86	0.93	0.92
NAHDA	40	0.79	0.72	0.69	0.73

Figure 4: Evolution of the efficiency scores of bank branches numbered from 21 to 40
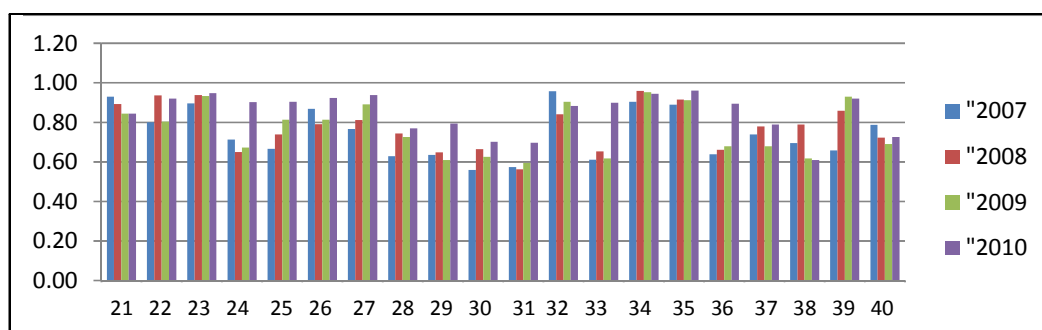
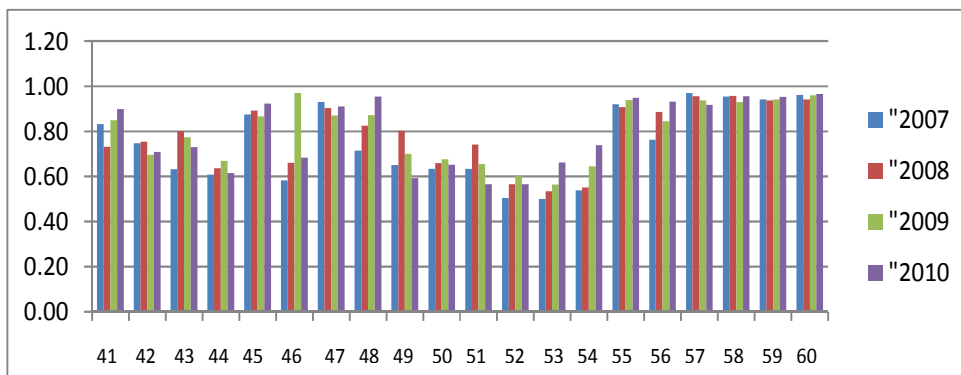**Table 9:**   Efficiency Scores of bank branches numbered from 1 from 41 to 60

Branch	N°	2007	2008	2009	2010
ABI- RAQRAQ	41	0.83	0.73	0.85	0.90
SALAM	42	0.75	0.75	0.70	0.71
OQBA	43	0.63	0.80	0.77	0.73
MABELLA	44	0.61	0.64	0.67	0.61
PATRICE LUMUMBA	45	0.87	0.89	0.87	0.92
HOUMMANE FETOUAKI	46	0.58	0.66	0.97	0.68
CHELLAH	47	0.93	0.90	0.87	0.91
ANNASR	48	0.71	0.83	0.87	0.95
HAY EL FETH	49	0.65	0.80	0.70	0.59
AL AYOUBI	50	0.63	0.66	0.68	0.65
DAR HAMRA	51	0.63	0.74	0.65	0.57
AL IRFANE	52	0.50	0.57	0.60	0.57
NOUR	53	0.50	0.53	0.56	0.66
AL KIFAH	54	0.54	0.55	0.64	0.74
ARBAA GHARB	55	0.92	0.91	0.94	0.95
OUAZZANE	56	0.76	0.89	0.85	0.93
BAB FES	57	0.97	0.96	0.94	0.92
MAAMORA	58	0.95	0.96	0.93	0.96
SEBOU	59	0.94	0.94	0.94	0.95
KHABBAZATE	60	0.96	0.94	0.96	0.97

Figure 5: Evolution of the efficiency scores of bank branches numbered from 41 to 60

Table 10: Efficiency Scores of bank branches numbered from 1 from 61 to 78

Branch	N°	2007	2008	2009	2010
HADADA	61	0.77	0.85	0.74	0.89
MANAL	62	0.58	0.60	0.71	0.71
TIFLET	63	0.92	0.91	0.90	0.93
AG. AL BOUSTANE	64	0.98	0.95	0.96	0.95
IBN KHATTAB	65	0.96	0.88	0.95	0.94
OUM EL KHEIR	66	0.97	0.96	0.96	0.96
SID ALLAL TAZI	67	0.54	0.56	0.66	0.60
KAMOUNI	68	0.58	0.56	0.59	0.61
DAR DMANA	69	0.70	0.52	0.58	0.68
CHRARDA	70	0.45	0.52	0.88	0.83
HASSAN EL OUAZZANI	71	0.65	0.54	0.78	0.74
SIDI SLIMANE	72	0.98	0.93	0.90	0.90
SIDI KACEM	73	0.80	0.84	0.92	0.87
SIDI YAHIA	74	0.76	0.82	0.87	0.83
JORF EL MELHA	75	0.81	0.79	0.88	0.79
KHENECHETE	76	0.61	0.67	0.61	0.68
M.BEL KSIRI	77	0.83	0.83	0.83	0.85
BENI HSSEN	78	0.53	0.59	0.59	0.70

Figure 6: Evolution of the efficiency scores of bank branches numbered from 61 to 78
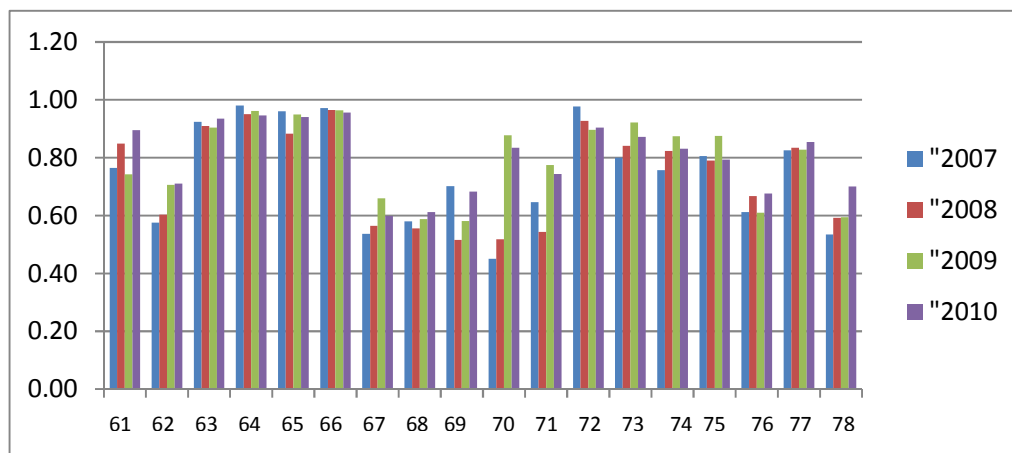
The following table gives the efficiency scores in ascending order of the two years 2009 and 2010.

Table 11: The efficiency scores in ascending order of the two years 2009 and 2010

Branch	N°	Efficiency Scores 2009		Branch	N°	Efficiency Scores 2010
KHEMISSET ENT	17	0.48		DAR HAMRA	51	0.57
NOUR	53	0.56		AL IRFANE	52	0.57
ESSAADA	18	0.57		ARTISANAT	3	0.57
DAR DMANA	69	0.58		KHEMISSET ENT	17	0.58
KAMOUNI	68	0.59		HAY EL FETH	49	0.59
BENI HSSEN	78	0.59		SID ALLAL TAZI	67	0.60
MAGHRIB AL ARABI	31	0.59		IBNOU AL HAYTAM	38	0.61
AL IRFANE	52	0.60		KAMOUNI	68	0.61
GUICH OUDAYA	29	0.61		MABELLA	44	0.61
KHENECHETE	76	0.61		AL AYOUBI	50	0.65
IBNOU AL HAYTAM	38	0.62		NOUR	53	0.66
KARIMA	33	0.62		KHENECHETE	76	0.68
BIR ANZARANE	19	0.62		DAR DMANA	69	0.68
AIN AOUDA	30	0.63		HOUMMANE FETOUAKI	46	0.68
ARTISANAT	3	0.63		MAGHRIB AL ARABI	31	0.70
AL KIFAH	54	0.64		BENI HSSEN	78	0.70
DAR HAMRA	51	0.65		AIN AOUDA	30	0.70
SID ALLAL TAZI	67	0.66		SALAM	42	0.71
MABELLA	44	0.67		MANAL	62	0.71
AL KAHIRA	24	0.67		ESSAADA	18	0.72
AL AYOUBI	50	0.68		NAHDA	40	0.73
KARIA	36	0.68		OQBA	43	0.73
IZDIHAR	37	0.68		AL KIFAH	54	0.74
AGDAL	15	0.68		HASSAN EL OUAZZANI	71	0.74
NAHDA	40	0.69		BIR ANZARANE	19	0.77
SALAM	42	0.70		MLY.A.CHRIF	28	0.77
HAY EL FETH	49	0.70		IZDIHAR	37	0.79
MANAL	62	0.71		JORF EL MELHA	75	0.79
MLY.A.CHRIF	28	0.73		GUICH OUDAYA	29	0.79
ROMMANI	20	0.74		BAB JDID	12	0.81
BAB JDID	12	0.74		IBNOU ROCHD	7	0.81
HADADA	61	0.74		SIDI YAHIA	74	0.83
OQBA	43	0.77		CHRARDA	70	0.83
HASSAN EL OUAZZANI	71	0.78		TARIK IBN ZYAD	21	0.84
AL WAHDA	22	0.80		ROMMANI	20	0.85
AL MASSIRA	26	0.81		M.BEL KSIRI	77	0.85
AL AMAL	25	0.81		16 NOVEMBRE	4	0.85
M.BEL KSIRI	77	0.83		SIDI KACEM	73	0.87
TARIK IBN ZYAD	21	0.84		SALE	32	0.88
OUAZZANE	56	0.85		KARIA	36	0.89
ABI- RAQRAQ	41	0.85		HADADA	61	0.89
PATRICE LUMUMBA	45	0.87		KARIMA	33	0.90
CHELLAH	47	0.87		ABI- RAQRAQ	41	0.90
ANNASR	48	0.87		AL KAHIRA	24	0.90
SIDI YAHIA	74	0.87		AL AMAL	25	0.90
JORF EL MELHA	75	0.88		SIDI SLIMANE	72	0.90
16 NOVEMBRE	4	0.88		CHELLAH	47	0.91
CHRARDA	70	0.88		BAB FES	57	0.92
SAKNIA	6	0.89		AL WAHDA	22	0.92
SKHIRATE	27	0.89		SIDI MOUSSA	39	0.92
SIDI SLIMANE	72	0.90		PATRICE LUMUMBA	45	0.92
TIFLET	63	0.90		AL MASSIRA	26	0.92
SALE	32	0.90		OCEAN	13	0.92

Table 11: The efficiency scores in ascending order of the two years 2009 and 2010 - continued

IBNOU ROCHD	7	0.91	OUAZZANE	56	0.93
BETTANA	35	0.91	AGDAL	15	0.93
OCEAN	13	0.92	TIFLET	63	0.93
T. HASSAN	5	0.92	SKHIRATE	27	0.94
SIDI KACEM	73	0.92	IBN KHATTAB	65	0.94
MLY ISMAIL	2	0.93	TABRIQUET	34	0.94
SIDI MOUSSA	39	0.93	AG. AL BOUSTANE	64	0.95
MAAMORA	58	0.93	TEMARA	23	0.95
TEMARA	23	0.93	ARBAA GHARB	55	0.95
BAB FES	57	0.94	SEBOU	59	0.95
ARBAA GHARB	55	0.94	SAKNIA	6	0.95
SEBOU	59	0.94	ANNASR	48	0.95
HAY RYAD	14	0.94	MAAMORA	58	0.96
IBN KHATTAB	65	0.95	MLY ISMAIL	2	0.96
TABRIQUET	34	0.95	OUM EL KHEIR	66	0.96
DIOUR JEMAA	9	0.95	BETTANA	35	0.96
KHABBAZATE	60	0.96	DIOUR JEMAA	9	0.96
Y.EL MANSOUR	11	0.96	KHEMISSET	16	0.96
AG. AL BOUSTANE	64	0.96	Y.EL MANSOUR	11	0.97
KHEMISSET	16	0.96	KHABBAZATE	60	0.97
OUM EL KHEIR	66	0.96	MOHAMED V	10	0.97
MOHAMED V	10	0.97	T. HASSAN	5	0.97
HOUMMANE FETOUAKI	46	0.97	AKKARI	8	0.97
AKKARI	8	0.97	HAY RYAD	14	0.98
A.BENABALLAH	1	0.98	A.BENABALLAH	1	0.99

The following table shows the minimum, average and maximum efficiency scores in 2007-2010.

Table 12: Evolution of the minimum, average and maximum efficiency scores in the period 2007-2010

	Evolution of minimum, average and maximum efficiency scores			
	2007	**2008**	**2009**	**2010**
Minimum	0,45	0,42	0,48	0,57
Average	0,77	0,78	0,80	0,83
Maximum	0,99	0,98	0,98	0,99

We note that the efficiency scores rose slightly from one year to another: 1% from 2007 to 2008, 2% from 2008 to 2009 and 3% from 2009 to 2010.

5. Conclusion

In this paper we have adopted the model of Battese and Coelli (1992,1995) to estimate the stochastic frontier production and the other technical inefficiency effects during a period 2007 - 2010. We got through this model the technical efficiency scores of 78 bank branches belonging to a Moroccan regional bank.

Empirically, the analysis of the efficiency of the bank branches over the period 2007-2010 by the SFA approach was concluding. Our study showed that the production frontier is stochastic and that the inefficiency effects of the explanatory variables are statistically significant except the effect of the revenue per employee.

Empiriquement, l'analyse de l'efficience des agences de la BPR-Rabat Kénitra sur la période 2007-2010 par l'approche SFA a été très concluante. L'adoption de cette approche nous a permis de faire une analyse détaillée pour les agences de notre échantillon en étudiant l'évolution temporelle des

niveaux d'efficience, tout en spécifiant les facteurs explicatifs de l'inefficience. Notre étude a révélé que la frontière de production est stochastique et que les effets des variables explicatives de l'inefficience sont statistiquement significative sauf l'effet de la rémunération par agent qui est pratiquement nul.

References

[1]   **Afriat S.,** 1972: Efficiency Estimation of Production Functions, International Economic Review Vol. 13, No. 3 (Oct.), pp. 568-598.

[2]   **Aigner D., Chu S.,** (1968): On Estimating the Industry Production Function, The American Economic Review Vol. 58, No. 4 (Sep.), pp. 826-839.

[3]   **Aigner D., Lovell C., Schmidt P.,** (1977): Formulation and estimation of stochastic Frontier production Function models. Journal of Econometrics, 6, pp 21-37.

[4]   **Albanes**, (1978)*: La performance de l'entreprise,* Economica, Paris.

[5]   **Ali A., Seiford M.,** (1993): The Mathematical Programming Approach to Efficiency Analysis, in Fried HO and SS Schmidt (eds.) the Measurement of Productive Efficiency: Techniques and Applications, Oxford U.K.: 120-159.

[6]   **Antreas D. et Dimitris G.,** (2000): The Use of Data Envelopment Analysis in Banking Institutions: Evidence from the Commercial Bank of Greece, *Interfaces*, Vol. 30, No. 2 (Mar. - Apr., 2000), pp. 81-95.

[7]   **Ariadna M., (2008):** Technical efficiency of microfinance institutions: evidence from Mexico, Master of Science in the Graduate School of The Ohio State University.

[8]   **Banker R., Charnes R., Cooper W.,** (1984): Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis, Management Science vol. 30, pp. 1078-1092.

[9]   **Battese G., Corra G.,** (1977): Estimation of a Production Frontier Model: With a Generalized Frontier Production Function and Panel Data, Australian Journal of Agri-cultural Economics, 21, 169-179.

[10]   **Battese G., Coelli T.,** (1988): Prediction of Firm-Level Technical Efficiencies with a Generalized Frontier Production Function and Panel Data. Journal of Econometrics.

[11]   **Battese G., Coelli T.**, (1992): Frontier production functions, technical efficiency and panel data: with application to paddy farmers in India. Journal of Productivity Analysis 3, pp: 153–169.

[12]   **Battese G., Coelli, T.,** (1995): A model for technical inefficiency effects in a stochastic frontier production function. Empirical Economics 20, p.: 325–332.

[13]   **Berger A., Hunter W., Timme S.** (1993): The efficiency of financial institutions: A review of preview of research past, present and future. Journal of banking and Finance, p 221-249.

[14]   **Berger A., Humphrey D.,** 1992; Measurement and efficiency issues in commercial banking, In output measurement in the service sectors, university of Chicago press: 245-279, Chicago.

[15]   **Berger A., Hunter W., Timme S.,** (1993): « the efficiency of financial institutions: A review of preview of research past, present and future», Journal of banking and Finance, p 221-249.

[16]   **Berger A., Humphrey D.,** (1997): Efficiency of financial institutions », international surveys and directions for future research, European Journal of Operational Research, vol. 98, pp 175-212.

[17]   **Becker D., Gattoufi S., Chandel J., Sander M.,** (2011): deabib.org, a bibliography about data envelopment analysis (DEA), v0.8.1, (http://www.deabib.org/deabib.pdf).

[18]   **Bi Z., Pandey S.,** (2011): Comparison of performance of microfinance institutions with commercial banks in India, Australian Journal of Business and Management Research Vol.1 No.6 [110-120], September.

[19]   **Coelli T.,** (1996): A Guide to FRONTIER Version 4.1: A Computer Program for Stochastic Frontier Production and Cost Function Estimation. Centre for Efficiency and Productivity Analysis, University of New England, Armidale, NSW, 2351, Australia. Web: http://www.une.edu.au/econometrics/cepa.htm; CEPA; Working Paper 96/07.

[20]   **Coelli T., Prasada D., Battese E.**, (1998)**:** An Introduction To Efficiency And Productivity Analysis» Edition kluwer Academic Publishers, 1998.

[21]   **Colwell R., Davis E.,** (1992): Output and productivity in banking, Scandinavian. Journal of economics, 111-129.

[22]   **Cornwell C., Schmidt P., Sickles R.,** (1990): Production frontiers with cross-sectional and time-series variation in efficiency levels. Journal of Econometrics 46: 185-200.

[23]   **Debreu G.,** (1951): The Coefficient of Resource Utilization. Econometrica 19, pp 273-292.

[24]   **Farrell M.,** (1957): The measurement of productive efficiency. Journal of the Royal Statistical Society Series, A General, Vol. 120, N° 3, (1957). pp: 253-290.

[25]   **Ferrier G., Lovell C.,** (1990): Measuring cost efficiency in banking: Econometric and linear programming evidence, Journal of Econometrics, p 229-245.

[26]   **Greene W.**, (2003): Simulated Likelihood Estimation of the Normal-Gamma Stochastic Frontier Function. Journal of Productivity Analysis 19: 179{190.

[27]   **Koopmans T.,** (1951): An analysis of production as an efficient combination of activities, in T.C Koopmans, (Ed) Activity analysis of production and allocation, Cowles Commission for Research in Economics, Monograph n°13, Wiley, New York, pp 33-97.

[28]   **Kumbhakar S., Lovell C.,**(2003): Stochastic frontier analysis. Cambridge University Press.

[29]   **Little J.**, (1979): Models and managers: the concept of a decision calculus. Management Science, vol. 16 (5), April, B-466 – B-485.

[30]   **Jondrow J., Lovell C., Materov I., Schmidt P.**, (1982): The Estimation of Technical Inefficiency in the Stochastic Frontier Production Function Model . Journal of Econometrics, 19, pp. 233-238.

[31]   **Lee Y., Schmidt P.**, (1993): The measurement of productive efficiency: techniques and applications, chap. A production frontier model with flexible temporal variation in technical inefficiency. Oxford University Press.

[32]   **Lee L., Tyler W.,** (1978): A Stochastic Frontier Production Function and Average Efficiency: An Empirical Analysis", Journal of Econometrics*, 7, 385-390.

[33]   **Meeusen W., Broeck V.**, (1977): Efficiency Estimation from Cobb-Douglas Production Functions with Composed Errors, International Economic Review, vol. 18, pp. 435-444.

[34]   **Pi L., Timme S.,** (1993): Corporate control and bank efficiency, Journal of banking and Finance, p 515-530.

[35]   **Pitt M., Lee L.**, (1981): The Measurement and Sources of Technical Inefficiency in the Indonesian Weaving Industry. Journal of Development Economics, 9, pp. 43-64.

[36]   **Reifschneider D., Stevenson R.** (1991): Systematic Departures from the Frontier: A Framework for the Analysis of Firm Inefficiency, International   Economic Review, 32, 715-723.

[37]   **Schmidt P., Sickles R.,** (1984): Production Frontiers and Panel Data. Journal of Business and Economic Statistics, 2, pp. 367-374.

[38]   **Stevenson R.,** (1980): Likelihood Functions for Generalized Stochastic Frontier Estimation, Journal of Econometrics, 13, 57- 66.

[39]   **Reifschneider D., Stevenson R.** (1991): Systematic Departures from the Frontier: A Framework for the Analysis of Firm Inefficiency, International Economic Review, 32, 715-723.

Energy Consumption and Economic Growth Relationship in the E7 Countries

Ferhat Pehlivanoğlu
Department of Economics, Kocaeli University
41380 Umutepe, Kocaeli, Turkey
E-mail:fpehlivanoglu@gmail.com
Tel: +902623031578; Fax: +902163031503

Burcu Yavuz Tifikçigil
International Trade Department
Gedik University, 34876, Istanbul, Turkey
E-mail: burcuyavuz79@hotmail.com
Tel: +90216445438; Fax: +902164528717

Tezcan Abasız
Department of Economics, Kocaeli University
41380 Umutepe, Kocaeli, Turkey
E-mail: fpehlivanoglu@gmail.com
Tel: +902623031575; Fax: +902623031503

Abstract

Since energy is one of the most important sources of industrialization and of the economic and social development, the researches on relationship between economic growth and energy consumption have become an important field of study. Energy is in a close relationship with all sectors in the economy and used as the main input in the production of almost all goods. In this context since 1990s, significant increases in energy consumption and economic growth have been observed in the E7 countries (China, India, Brazil, Russia, Indonesia, Mexico and Turkey). Various academic studies on E7 countries estimate that economic sizes of the E7 countries will pass in a large extent the economic sizes of the G7 countries' in the middle of the 21th century. The ultimate aim of this study is to find the causal relationship between energy consumption and economic growth and the direction of this causality by using Holtz-Eakin Panel Causality Test regarding the E7 countries. In this study, energy consumption and gross national product data for the years 1990 - 2009 have been used. As a result, bi-directional relationship between economic growth and energy consumption has been found: While energy consumption affects economic growth, economic growth affects energy consumption in the E7 countries.

Keywords: E7 Countries, Energy Consumption, Economic Growth, Holtz-Eakin Panel Causality Test, JEL: D92

1. Introduction
The relationship between economic growth and energy use is subject to many studies. A positive and bi-directional correlation between economic growth and energy use has determined in many studies.

Energy consumption has increased over time in close association with national income both globally and in individual countries. According to International Energy Outlook of 2011, world energy use will increase about 53% from 2008 to 2035. In this framework, energy is in a close relationship with all sectors in the economy and used as the main input in the production of almost all goods. Since 1990s, significant increases in energy consumption and economic growth have been observed in the E7 countries (China, India, Brazil, Russia, Indonesia, Mexico and Turkey), which are all included in G20. In this context, the aim of this study is to measure the causal relationship between energy consumption and economic growth and the direction regarding the E7 countries. In the first part of the study an economic growth models, world economic growth and energy consumption and E7 countries economic growth and energy consumption will be explained briefly. In the second part of the study the causal relationship between energy consumption and economic growth and the direction of this causality will be analyzed by using Holtz-Eakin Panel Causality Test.

2. A Brief Review of Models of Economic Growth

Economic growth models can be classified as Exogenous Growth Models (Neo-classical Growth Models) and Endogenous Growth Models. Almost all growth studies emphasize on accumulation of physical and human resources, improvement of production technology, and sound monetary and fiscal policies are the main propulsive factors of economic growth. (Ramsey (1928), Harrod (1939), Domar (1947), Solow (1956), Swan (1956), Cass (1965), Koopman (1965), Lucas (1988), Romer (1989), Barro (1998) and Barro and Sala-i Martin (1995), Quah (1997), Rodrik (1999)). Additionally, international trade accordingly specialization, allocation of skilled and unskilled labor force across countries have a major impact on economic growth (Bhattarai, 2004).

The "neo-classical" model of growth was first devised by Nobel Prize winning Economist Robert Solow (1956). According to Neo-classical growth model long run economic growth depends on the productivity, capital accumulation, population growth, and technological progress. They assume that capital accumulation is the most important variable for economic growth. The classical economists had explained growth process in terms of rates of technological progress and the population growth. According to Neo-Classical growth model, growth rate equal to the sum of growth rates of labor force, measured in physical units, and of the technical process which is exogenous (labor augmenting). Neo-classical production function is written as $Y = f(K, L, N, S)$ which means that output is a function of the stock of capital (K), labor (L), land (N) and the level of technology (S) (Bhattarai, 2004; Stern, 2011; Ercan, 2000; Cesaratto, 1999).

Although neoclassical growth models offer valuable insights but have important limitations: First of all they take technology into consideration exogenously from the economic system and they do not explain how progresses in technology occur (Stern, 2003). Therefore, the new growth theory developed models of endogenous growth which explicitly model the production of technological progress, human capital, knowledge, investment in education, innovation capacity, innovating entrepreneurs and R&D applications etc. (Cesaratto, 1999). Endogenous growth theory emerged in 1990s as 'New Growth Models'. The new growth models accounting for technical progress in the production function. Long run economic growth depends on the growth rate of total factor productivity, which is determined by the rate of technological progress. Technological progress takes place through innovations, in the form of new products, processes and markets. Thus endogenous growth model's production function is written as $Y = f(A, K, L, H)$ where Y is growth rate of GDP, K is growth rate of physical capital, L is g growth rate of labor, H is growth rate of human capital (activities as education and training, R&D, etc.), A is growth rate of technology level (Izushi, 2007; Hamid and Pichler, 2011).

3. The Relationship between Economic Growth and Energy Consumption

To understand the impact of energy on the growth, the role of energy in the production must be determined. Economic growth theories refer little to the role of energy factor on production. According to the Neoclassical theory, capital, land and labor are the primary factors of production while goods such as fuels are intermediate inputs. The prices paid for other than primary inputs are seen as eventually being payments to the owners of the primary inputs for their services for providing produced intermediate inputs for the production process. Natural scientists and some ecological economists pay more attention to role of energy and its availability in production process while capital, labor, and even natural resources in the long run are reproducible factors, energy is a non-producible factor of production though of course energy vectors – fuels – are reproducible factors. In addition whole production processes involve transformation or movement. This means that all production steps need energy. In this framework, it can be concluded that energy is not an endogenous factor of production as neo-classical theory specifies (Stern 2003). Thus Solow model consisting of capital, labor and land as primary factors is organized so as to include constant amount of land input firstly, and renewable energy resources such as petrol, natural gas and coal, secondly (Günenek and Alptekin, 2010).

The association between energy consumption and economic growth has been analyzed in various studies. While some studies dealt with countries individually, others were based on groups of countries. Subject of the latter group of studies were often the developed countries. In almost all studies a significant correlation between energy consumption and economic growth has been found.

Kraft and Kraft (1978), Abosedra and Baghestani (1989) have found in their studies a causal relation towards energy consumption from economic growth in the U.S.A. Stern (1993), in his study for U.S.A., found a causal relation towards economic growth from energy consumption. In Akarca and Long (1980), Erol and Yu (1987), Yu and Choi (1985), Yu and Hwang (1984) and Cheng B.S.'s (1995) studies for U.S.A., there is no relationship between energy consumption and economic growth (Günenek and Alptekin, 2010).

Güvenek and Alptekin (2010), using Panel Data Analysis of 25 OECD member countries, have estimated final energy consumption and the relation in between. As a conclusion they reached that there is a significant correlation between energy consumption and economic growth.

S. H.-Yoo (2006) investigates the causal relationship between electricity consumption and economic growth among the Association of South East Asian Nations (ASEAN) 4 members (Indonesia, Malaysia, Singapore, and Thailand). The results indicate that there is a bi-directional causality between electricity consumption and economic growth in Malaysia and Singapore. However, uni-directional causality runs from economic growth to electricity consumption in Indonesia and Thailand without any feedback effect.

Mucuk and Uysal (2009) analyzed the causal relationship between energy consumption and economic growth for Turkey, and found that energy consumption and economic growth are co-integrated and there is a causality running from energy consumption and economic growth.

Oh and Lee (2004) examining Korea over the period 1970–1999 suggest a long run bi-directional causal relationship between energy and GDP, and short run unidirectional causality running from energy to GDP.

Soytaş and Sarı (2003) estimated the time series properties of energy consumption and GDP in the top 10 emerging markets—excluding China due to lack of data—and G-7 countries. They discovered bi-directional causality in Argentina, causality running from GDP to energy consumption in Italy and Korea, and from energy consumption to GDP in Turkey, France, Germany and Japan.

Aqeel and Butt (2001) investigated the energy consumption and economic growth in Pakistan. They found that economic growth causes total energy consumption.

Asafu-Adjaye (2000) estimated the causal relationships between energy consumption and income for India, Indonesia, the Philippines and Thailand. The results indicate that, in the short-run,

unidirectional Granger causality runs from energy to income for India and Indonesia, while bidirectional Granger causality runs from energy to income for Thailand and the Philippines.
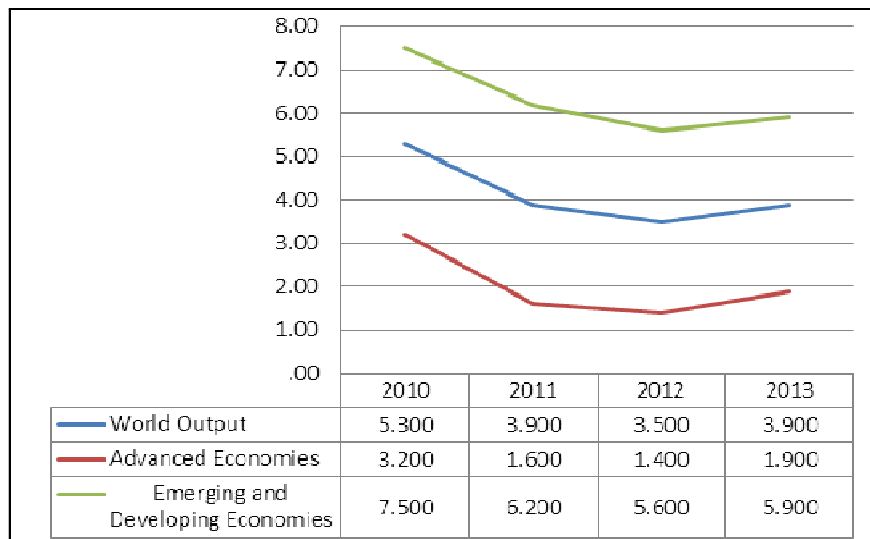
Benjamin S. Cheng and Tin Wei Lai (1997) evaluated the causality between energy and GNP and energy and employment for the 1955–1993 period for Taiwan. Their study found causality running from GDP to energy consumption without feedback in Taiwan. It was also found that causality runs from GDP to energy but not vice versa.

4. Economic Growth and Energy Consumption of the E 7 Countries

According to IMF World Economic Outlook (2012); world production increased 5.3% in 2010 and 3.9% in 2011. According to estimations, the expected growth rate was 3.5% for 2012 whereas3.9% for 2013. In advanced economies, the expected increase in the production rate was 1.4% for 2012, and 1.9% for 2013. The rate for the emerging and developing economies including Russia, China, India, Brazil, Mexico, Turkey and Indonesia was 5.6% for the year 2012, and 5.9% for 2013. This shows that E7 countries highly expanded their share in world production (Figure 1).

PricewaterhouseCoopers Report (2011) reveals that the E7 economies are set to overtake the G7 economies before 2020. The report states that measured by GDP in purchasing power parity (PPP) terms, which adjusts for price level differences across countries, the largest E7 emerging economies seem likely to be bigger than the current G7 economies by 2020, and China seems likely to have overtaken the US by that date. India could also overtake the US by 2050 on this PPP basis.

Figure 1: World Output (Percent Change)

|	2010	2011	2012	2013
World Output	5.300	3.900	3.500	3.900
Advanced Economies	3.200	1.600	1.400	1.900
Emerging and Developing Economies	7.500	6.200	5.600	5.900

Source: IMF, World Economic Outlook, 2012.

World primary energy consumption grew by 2.5% in 2011. Consumption in OECD countries fell by 0.8%, meaning the third decline in the past four years. Non-OECD consumption grew by 5.3%, in line with the 10-year average (BP, 2012). According to IEA World Energy Report (2012); global energy demand will increase by one-third from 2010 to 2035, with China & India accounting for 50% of the growth. According to British Petrol (BP) Energy Outlook (2012), World primary energy consumption is projected to grow by 1.6% p.a. over the period 2010 to 2030, adding 39% to global consumption by 2030. Apparently, E7 countries have also closed the gap with developed countries in their data about energy usage (Figure 1 and 2).

Figure 2: World Energy Usage (kg of oil equivalent per capita)
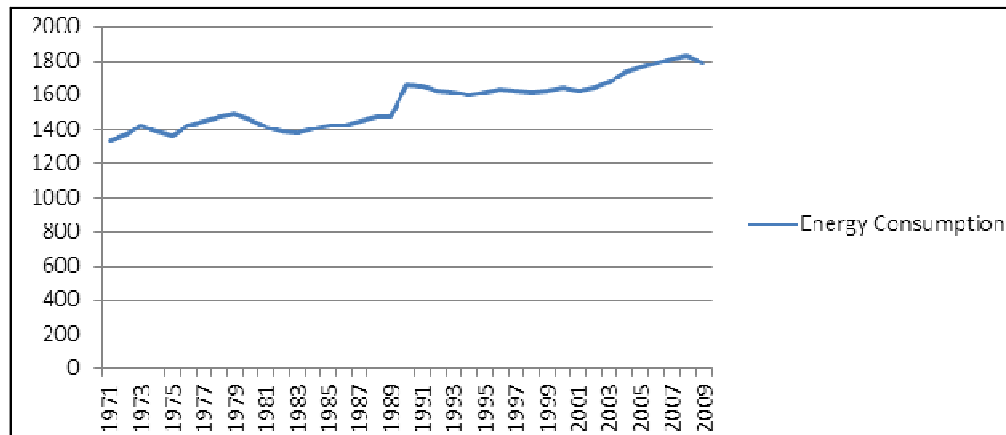
Source: World Bank Statistics
*Energy usage refers to the use of primary energy before transformation to other end-use fuels, which is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transport.

Figure 3: Energy usage (kt of oil equivalent)
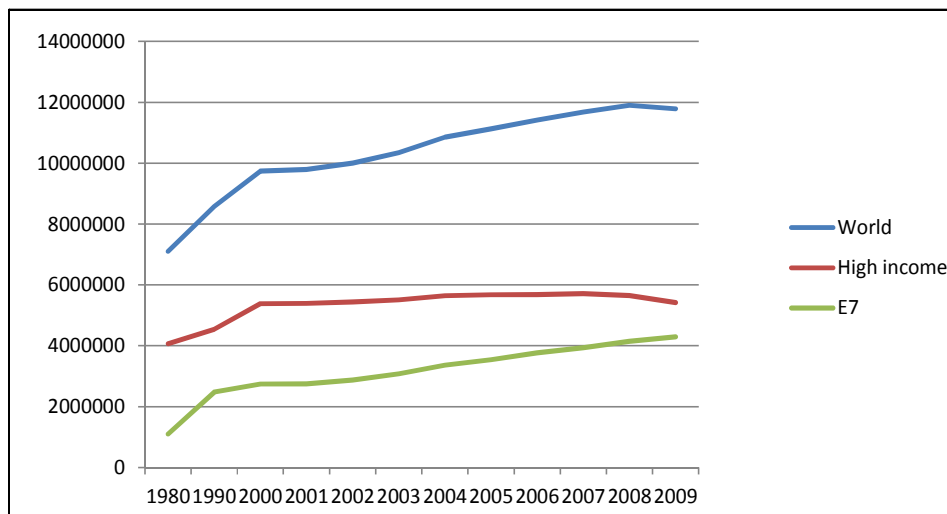
Source: World Bank Statistics
* Energy usage refers to the use of primary energy before transformation to other end-use fuels, which is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transport.

5. Data Set and Econometric Model

Investigating the causal relationship between energy and growth, this study uses Holtz-Eakin Panel causality test, which is based on VAR system, using annual data for the period of 1990-2009 for E-7 countries (China, India, Brazil, Russia, Indonesia, Mexico and Turkey). The data used in the study were provided from the World Bank WDI database and were used in analysis using logarithmic transformation.

The following table shows descriptive statistics for variants of energy (energy consumption on petrol and similar products; which stands for carat) and growth (gdp) used in the study.

Table 1: Descriptive Statistics

	LGDP	LENERGY
Mean	27.8514	12.5121
Median	27.8534	12.1602
Maximum	29.7428	14.6295
Minimum	26.6374	10.8607
Std. Dev.	0.6375	0.9529
Observations	140	140

In the group of countries covered by the study, the average values of GDP and ENERGY for the period of 1990-2009 are 27.8514 and 12.5121, respectively. Within the countries of analysis, Indonesia has the lowest GDP level while China has the highest GDP level. In addition, the lowest energy consumption took place in Turkey whereas China maintained the highest energy consumption.

Panel causality test and standard Granger causality test work in the same systematic structure. Accordingly, with the assumption that two variables, called X and Y, followed a stationary process in the system, the model can be written as in the equation 1.

$$Y_{it} = \alpha_0 + \sum_{k=1}^{m} \lambda_{it} Y_{it-k} + \sum_{k=1}^{m} \phi_{it} X_{it-k} + u_{it} \tag{1}$$

Equation 1 reflects the general variations on time dimension ''t'' of X and Y variances, which belong to each ''i'' section. In the models of Panel regression, parameters vary as a result of modeling through artificial variables of section-specific differentiation. Thus, equality 1 can be re-written as follows:

$$Y_{it} = \alpha_0 + \sum_{k=1}^{m} \lambda_{it} Y_{it-k} + \sum_{k=1}^{m} \phi_{it} X_{it-k} + v_{it} \tag{2}$$

$v_{it} = u_{it} + \varpi_i$ heterogeneity of parameters within the model and ensures differentiation across the section. Here, ϖ_i parameter is also called as latent variable. Equality 2 in this form transforms into the model of fixed effects. This model assumes that the section-specific differences can be captured with changes in fixed term or with the ϖ_i parameter. Estimation of equality 2 in this way leads to biased and unstable parameters. This reveals the problem of independent variables being in association with the erroneous term due to the expiration of assumption that the section-specific difference is homogeneous across the section and time (Tarı, 2012). In this case, difference or Chamberlain (1983) techniques are implemented to remove the problems led by the ϖ_i parameter. This study attempted to eliminate the fixed effect of equality 2 by way of extracting the differential, as in the process of Holtz-Eakin. The model which removed the fixed effect is the same as in equation 3:term among in equality 2 represents a structure that allows:

$$Y_{it} - Y_{it-1} = \sum_{k=1}^{m} \lambda_k (Y_{it-k} - Y_{it-k-1}) + \sum_{k=1}^{m} \phi_k (X_{it-k} - X_{it-k-1}) + e_{it} \tag{3}$$

In equation of 3, the correlation between e_{it} error term and $(Y_{it} - Y_{it-1})$ dependent variable causes acquired parameters to be biased and consistent at the same time. Even though the long-term information of the series is removed using the difference transformation only, it is possible to get the unbiased predictors if independent variables are certainly exogenous. The correlation between e_{it} and $(Y_{it} - Y_{it-1})$ also reveals the issue of changing variance. Using instrument variables, 2SOLS and GMM methods are implemented to remove these problems. According to equation 3, causality relationship can be tested by restricting the autoregressive parameters acquired on the ''m'' length of delay of ϕ_k parameters towards Y variable from X variable. Stability of the series needs to be ensured before the

causality test results. The presence of unit root process for the energy and growth variables is investigated with the IPS test. The findings obtained are shown in Table 2 below.

Table 2:   Im, Peseran and Shin Unit Root Results

Variables	Model			
	Constant		Constant+Trend	
	Parameter	Probability Value	Parameter	Probability Value
GDP	2.43919	0.9926	-1.14298	0.1265
Energy	3.0083	0.9987	-1.24155	0.1072
ΔGDP	**-4.3952**	**0.0000**	-1.42791	0.0767
ΔEnergy	**-5.8495**	**0.0000**	-3.89975	0.0000

Note: Optimal length of delay is defined in terms of AIC criteria.

In reference to Table 2, the unit root results are given for the energy and GDP variables. Hereunder, the GDP variable proves to be constant in the first difference. On the significance level of 1%, this variable is detected to be difference-constant. Similarly, there is also a unit root for the energy variable. This variable proves to be constant in its first difference, and the first difference of the related series ensured constancy of the variables. The causality relationship between energy and GDP variables is given in Table 3 below.

Table 3:   Panel 2AEKK Estimation Results and Causality Finding

Independent Variable	Dependent Variable			
	ΔGDP		ΔEnergy	
	coefficient	std.error	coefficient	std.error
Δenergy(-1)**	0.7062	0.2719	1.0453*	0.1780
Δenergy(-2)**	-0.6271	0.2576	-0.0711	0.1687
ΔGDP(-1)*	0.9216	0.2266	0.3133**	0.1484
ΔGDP(-2)	0.0439	0.2197	-0.3013**	0.1439
Causality Findings				
limit parameters	test statistic		probability value	
Δenergy(-1)= Δenergy(-2)	24.1011*		0.0000	
ΔGDP(-1)= ΔGDP(-2)	8.6958**		0.0129	

NOTE: * and ** show that related parameters are different from zero at the significance level of 1% and 5%, respectively.

Table 3 shows that there is a bidirectional causality relationship between the energy and GDP variables. In other words, growth affects energy consumption and vice versa. In consideration of statistical test values, the extent to which energy usage affects growth (Wald test statistic 24.2011) is greater than that of growth over energy usage. In the model that investigated causality, probability value of the J statistic value calculated for instrument variables is found 0.9702 for the and it is concluded that there is no association between an instrument variable in use and the erroneous term.

6. Conclusion

Any energy source is one of the most important inputs of development both for the industry and for the entire economy. Every unit of energy must be allocated optimally to the sectors in the economy, especially in this century where the main purpose is to use scarce resources more cautiously for alternative needs. Energy resources are extremely limited and differ by region. The increasing world population and the related increase in consumption needs are expected over the years to result in the increased use of energy resources as the basic input of any production.

The E7 countries consisting of China, India, Brazil, Russia, Indonesia, Mexico and Turkey constitute the group of rapidly growing countries in the world economy. Economic development level of the E7 countries is anticipated to outpace the G7 countries in the 21st century. As the economies grow, the production and energy need and usage in these countries will also increase. A great number of studies are held to explain the relationship between energy consumption and growth. Some found that energy consumption affects the economic growth while others concluded vice versa. However, in addition to these two counter-effects, some studies obtained findings regarding the presence of a bilateral causality relationship.

In an attempt to test the direction of causality in the relation between energy consumption and economic growth in the E7 countries, this study concluded that there is a bidirectional causality relationship in addition to the two counter-effects. Average GDP and ENERGY values for the period of 1990-2009 are 27.8514 and 12.5121, respectively, in the E7 countries. Among the countries analyzed, China has the highest GDP level whereas Indonesia has the lowest. In addition, China maintains the first position in the maximum energy consumption while Turkey has the lowest energy consumption. This study conducted the causality analysis with the Holtz-Eakin Panel causality test based on the VAR system by using gross national income and annual energy consumption data of the E7 countries for the period of 1990-2009. The data used in the study were provided from the World Bank WDI database and they are included in the analysis with logarithmic transformation.

The study concluded that there is a bidirectional causality relationship between the energy consumption and GDP variables. In other words, economic growth affects energy consumption and vice versa. In consideration of statistical test values, the extent to which energy usage affects growth (Wald test statistic 24.2011) is greater (8.6958) than that of growth over energy usage. In the model that investigated causality, probability value of the J statistic value calculated for instrument variables is found 0.9702 for the and it is concluded that there is no association between an instrument variable in use and the erroneous term.

References

[1]   Aqeel, A. and S., Butt 2011. "The Relationship Between Energy Consumption and Economic Growth in Pakistan, *Asia-Pasific Development Journel*, Vol. 8, No. 2, pp. 101-110.
[2]   Asafu-Adjaye, J., 2000. "The Relationship Between Energy Consumption, Energy Policies and Economic Growth: Time Series Evidence from Asian Developing Countries", *Energy Economics*, 22, pp. 615-625.
[3]   Bhattarai, K. R., 2004. "Economic Growth: Models and Global Evidence", Business School, University of Hull Cottingham Road, HU6 7RX, United Kingdom, *http://www.hull.ac.uk/php/ecskrb/ecogrowth.pdf,* (September 2012).
[4]   British Petrol, Enrgy Outlook 2030, London, January 2012.
[5]   Cesaratto, S., 1999. "Saving and Economic Growth in Neoclassical Teheory", *Cambridge Journal of Economics*, 23, pp. 771-793.
[6]   Cheng, B. S. and T. W., Lai, 1997. "An investigation of Co-Integration and Causality between Energy Consumption and Economic Activity in Taiwan", *Energy Economics*, Volume 19, Issue 4, pp. 435-444.
[7]   Ercan, N. Y., 2000. "İçsel Büyüme Teorisi: Genel Bir Bakış", *http://ekutup.dpt.gov.tr/planlama/42nciyil/ercanny.pdf,* (September, 2012).
[8]   Güvenek, B. and V., Alptekin, 2010. "Enerji Tüketimi ve Büyüme İlişkisi: OECD Ülkelerine İlişkin Bir Panel Veri Analizi", *Enerji, Piyasa ve Düzenleme*, Cilt: Sayı:2, pp. 172-193.
[9]   Hamid, A. and J. H., Pichler, 2011. " Macro Determinants of Growth and Productivity in the Context of Endogenous Growth Theory" *Interdisciplinary Journal of Contemporary Research in Business*; Jun2011, Vol. 3 Issue 2, pp. 1850-1871.
[10]   International Energy Agengy (IEA), World Energy Report 2012.
[11]   International Monetary Fund (IMF), World Economic Outlook 2012.

[12]   Izushu, H., 2008. "What What Does Endogenous Growth Theory Tell about Regional Economies? Empirics of R&D Worker-based Productivity Growth", *Regional Studies*, Vol. 42.7, pp. 947–960.

[13]   Mucuk, M. and D., Uysal, 2009. "Türkiye Ekonomisinde Enerji Tüketimi ve Ekonomik Büyüme", *Maliye Dergisi*, Sayı 157, pp. 105-115.

[14]   PricewaterhouseCoopers (PWC), The World in 2050, January 2011.

[15]   Soytaş, U. and R., Sarı, 2003. "Energy Consumption and GDP: Causality Relationship in G-7 Countries and Emerging Markets", *Energy Economics*, 25, pp. 33-37.

[16]   Stern, D. I., 2003. "Energy and Economic Growth**,** Department of Economics, Sage 3208, Rensselaer Polytechnic Institute, 110 8th Street Troy, NY, 12180-3590, USA, *https://localenergy.org/~localene/pdfs/Document%20Library/Stern%20Energy%20and%20Economic%20Growth.pdf,* (September 2012).

[17]   Stern, D. I., 2011. "The Role of Energy in Economic Growth, *Ecological Economics Reviews,* Robert Costanza, Karin Limburg & Ida Kubiszewski, Eds. *Ann. N.Y. Acad. Sci.* 1219, pp. 26–51.

[18]   Tarı, R., 2010, "Ekonometri (Econometrics)", Umuttepe Publication, Kocaeli, pp 478.

[19]   World Bank Statitistics.

[20]   Yoo, S-H., (2006). "The Causal relationship between Electricity Consumption and Economic Growth in the ASEAN Countries", *Energy Policy*, Vol 34, Issue 18, pp. 3573-3582.

The Impact of Globalization on Government Size: Causality and Policy Implications for the Case of Greece

Andreas G. Georgantopoulos
Department of Public Administration
Panteion University of Political and Social Sciences
E-mail: ageorgantos@yahoo.com
Tel: +30-210-9228605; Fax: +30-210-9219209

Abstract

This study investigates the causal links between trade openness and government size for an EMU member country, Greece, during the period 1960-2009. For this purpose, cointegration test, error correction model and Granger-causality analysis are employed. Robust empirical findings on the long-term relationship between the tested variables support the validity of the "compensation hypothesis", since for the case of Greece trade openness granger-causes government size. Interpreting these results under this hypothesis, calculations could imply an increasing openness of the Greek economy, as globalization process requires, due to the fact that the government of Greece is under heavy pressure to support entities and social groups which have prejudiced from opening-up the national economy leading to a continuous increase of government spending. On the other hand, the increasing government size in Greece, created numerous fiscal and social problems (i.e. bureaucratization, corruption, declining competitiveness, state interventionism) leading to a severe financial crisis since 2009. One of the core problems of the Greek economy is the ever increasing government consumption, and various measures are under application at present (i.e. dismissal of public officers, budget cuts, privatization programs etc.) in order for the country to maintain economic prosperity. These contradictory evidence for the case of Greece could imply that an increasing government size may have positive effects protecting social groups against the threats of globalization, but on the other hand a continuously increasing government consumption that lacks of close monitoring, results in multiple negative consequences for the society and the national economy as a whole.

Keywords: Cointegration, Granger causality, error correction model, globalization, government size, Greece.

1. Introduction

During the last two decades academics, scholars and practitioners have increasingly focused their research attention on the relationship between a country's government size and its degree of economic openness presenting however controversial results.

Alesina and Perotti's (1997) influential study suggests that globalization has a negative effect on a country's fiscal policy, since the increase of government spending and taxation severely damages the competiveness of local industries. Moreover, the increasing international relocation of businesses and capital undermines greatly the revenue raising ability of national governments (efficiency hypothesis). This hypothesis however comes to opposition with two major trends that dominated the post-World War II period. The first is the process of international economic integration that resulted in

sharp increases in cross border flows of goods, services, capital and technology and the second is the expansion of government sectors both in industrialized and in developing countries and, particularly the growing role of the state as provider of social insurance.

On the other hand, Wood (1994) argues that economic globalization increases material inequality while Garrett (1998a) concludes that government spending increases since national governments are obliged to compensate the losers of globalization. Moreover, Rodrik's (1997) seminal work suggests that globalization increases economic insecurity and thus government size. This study uses cross-country data to investigate the nature of the relationship between 'trade-openness' and 'government size' – measured, respectively, by (Imports+Exports)/GDP averaged over the period 1980-1989 and Government Consumption/GDP averaged over the period 1990-1992 - and concludes that there is a strong positive causation from the former to the latter. Furthermore, Rodrik argues that this evidence suggests that there may be a degree of complementary between them. In particular, he suggests that the causal relationship between trade-openness and government size can be explained by what has become known as the "compensation hypothesis". His basic argument is that the increased volatility brought about by growing exposure to, and dependence on, developments in the rest of the world creates incentives for government to provide social insurance against internationally generated risk and economic dislocations.

In addition, Rodrik (1998a) supports a causal argument about why trade openness is associated with more government spending and highlights volatility in terms of trade and citizen insecurity that generates. In general, his conclusions regarding the relationship between trade and government size is important because it provides a theoretical and empirical approach interpreting the effects of trade competition on one of the most popular indicators of government economic activity, government spending. However, Rodrik (1998b) highlights that this relationship is undermined by capital mobility. Quinn's (1997) is the only empirical study on the links between capital mobility and government spending that extends outside the OECD reaching to the opposite conclusion that more capital mobility is related with more government spending.

In a more recent study, Garrett (2001) supports that the relationship between trade and government spending could be analyzed better by separating the short-run and long-run links between these two macroeconomic figures. In this essential study, Garrett analyses in comparison the results of regression models based on levels (i.e. averaged data during the period 1985-1995) with those based on changes (measured as the difference between 1970-1984 and 1985-1995 averages). The study's empirical results justify this distinction; while regressions based on levels support the positive link between trade openness and government size, those based on changes lead to the conclusion that government size grows at a slower pace in those countries in which trade openness grew faster.

On the other hand, studies of Rogwoski (1998) and Leamer (1996) question the associations between levels of trade and levels of spending, which is in line with the prevailing notion that globalization is a slow process rather that a steady state, so it is beneficial for researchers to focus on the increasing international market integration over time. On the contrary, levels of trade for different countries are relatively stable historically, mostly due to its dependence on variables such as country size and/or location that remain relatively constant. So, the marginal changes in trade could be very different from the changes of levels of trade openness.

Furthermore, Cameron (1978) suggests that the positive relationship between trade and government spending that OECD's countries present could be due to the development of strong labor movements in small open economies. According to this study, this phenomenon is probably the reason behind the increasing expansion of government spending in the long run. However, Garrett and Mitchell (1999) conclude that once country-fixed effects are taken into account (that is, whatever historical processes that shaped a country's level of trade and government spending), year-to-year increases in trade were associated with less, not more, government spending.

Taking into consideration the above analyzed studies the central objective of this research is to investigate the causal links between trade openness and government size for the case of Greece by

giving a special emphasis to test the validity of Rodrik's compensation hypothesis. According to Rodrik (1997a,b) argument, if the compensation hypothesis holds for the case of Greece then, our empirical findings should imply a positive unidirectional causal link running from trade openness to government size, provided that a) trade openness does increase exposure to external risk, as a result of the globalization process, and (ii) governments do fulfill their risk mitigating role by providing social insurance against internationally generated risk. To this respect, our study employs cointegration test followed by error-correction model (ECM) and Granger-causality analysis for the period 1960-2009 in order to test the effect of this hypothesis in Greece.

This survey is motivated by a number of factors. First, it tests the validity of the compensation hypothesis for the case of Greece. Second, it updates the existing literature by dealing with the causal links between trade openness and government size in Greece for the whole period 1960-2009. Third, it enriches the existing literature on the trade openness-government size relationship by providing exhaustive evidence for a EU and EMU member country, Greece, which at the present is under severe macroeconomic pressure due to the sovereign debt crisis of 2009. Forth, it covers a period, which includes some of the most important political, social, monetary and fiscal transformations leading to a more open, integrated and therefore more globalized Greek economy.

The rest of the paper is organized as follows. Section 2 describes the data set and methodology employed and specifies the model for estimation. Section 3 briefly reviews the trends in trade openness and government size in Greece. Section 4 presents the empirical results, while concluding remarks with some policy implications are presented in Section 5.

2. Data and Methodology

To investigate the relationship between globalization and government size, this study in the context of Greece employs secondary data for empirical analysis with annual frequency over the period 1960-2009. All data retrieved from reliable source (i.e. World Development Indicators, WDI) and transformed into logarithms (L) in order to achieve mean-reverting relationships, and to make econometric testing procedures valid. The survey uses the same measures of "globalization" and "government size" as those in Rodrik (1998) and Garrett (2001), which are (Imports+Exports)/GDP and Government Consumption/GDP respectively.

The econometric methodology firstly examines the stationary properties of the univariate time series. Augmented Dickey-Fuller (ADF) test has been used to test the unit roots of the concerned time series variables (Dickey and Fuller, 1979). It consists of running a regression on the first difference of the series against the series lagged once, lagged difference terms, and optionally, by employing a constant and a time trend. This can be expressed as:

$$\Delta y_t = \alpha_1 y_{it-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{it-j} + x_{it}^{'} \delta + \varepsilon_t \qquad \text{(Model 1)}$$

The test for a unit root is conducted on the coefficient of (y_{t-1}) in the regression. If the coefficient is significantly different from zero then the hypothesis that (y) contains a unit root is rejected. Rejection of the null hypothesis implies stationarity.

Furthermore, the time series has to be examined for cointegration. Cointegration analysis helps to identify long-run economic relationships between two or several variables and to avoid the risk of spurious regression. Cointegration analysis is important because if two non-stationary variables are cointegrated, a Vector Auto-Regression (VAR) model in the first difference is misspecified due to the effect of a common trend. In this stage, the Johansen (1988) cointegration test is used to identify a cointegrating relationship among the variables. Within the Johansen multivariate cointegrating framework, the following system is estimate

$$\Delta z_t = \Gamma_1 \Delta z_{t-1} + ... + \Gamma_{k-1} \Delta z_{t-k-1} \Pi z_{t-1} + \mu + \varepsilon_t : \text{ t = 1,.., T} \qquad \text{(Model 2)}$$

where, Δ is the first difference operator, z' denotes a vector of variables, $\varepsilon_t \sim$ n iid $(0, \sigma^2)$, μ is a drift parameter, and Π is a (p x p) matrix of the form $\Pi = \alpha\beta'$, where α and β are both (p x r) matrices of full rank, with β containing the r cointegrating relationships and α carrying the corresponding adjustment coefficients in each of the r vectors. The Johansen approach can be used to carry out Granger causality tests as well. In the Johansen framework, the first step is the estimation of an unrestricted, closed p-th order VAR in k variables. Johansen (1988) suggested two tests statistics to determine the cointegration rank. The first of these is known as the trace statistic:

$$N\{trace\left(r_0 / k\right) = -T \sum_{i=r_0+1}^{k} \ln(1 - \hat{\lambda}_i) \qquad \text{(Model 3)}$$

where, are the estimated eigenvalues $\lambda_1 > \lambda_2 > \lambda_3 > \dots > \lambda_k$ and r_0 ranges from zero to k-1 depending upon the $\hat{\lambda}_i$ stage in the sequence. This is the relevant test statistics for the null hypothesis $r \leq r_0$ against the alternative $r \geq r_0+1$. The second test statistic is the maximum eigenvalue test known as λ_{max}; we denote it as λ_{max} (r_0). This is closely related to the trace statistic, but arises from changing the alternative hypothesis from $r \geq r_0+1$ to $r = r_0+1$. The idea is trying to improve the power of the test by limiting the alternative to a cointegration rank which is just by one more than the null hypothesis. The λ_{max} test statistic is:

$$\lambda_{max}(r_0) = - \text{T in } (1 - \lambda_i) \text{ for } i = r_0 + 1 \qquad \text{(Model 4)}$$

The null hypothesis is that there are r cointegrating vectors, against the alternative of r + 1 cointegrating vectors. Johansen and Juselius (1990) indicated that the trace test might lack power relative to the maximum eigenvalue test. Based on the power of the test, the maximum eigenvalue test statistic is often preferred.

According to Granger (1969), Y is said to "Granger-cause" X if and only if X is better predicted by using the past values of Y than by not doing so with the past values of X being used in either case. In short, if a scalar Y can help to forecast another scalar X, then we say that Y Granger-causes X. If Y causes X and X does not cause Y, it is said that unidirectional causality exists from Y to X. If Y does not cause X and X does not cause Y, then X and Y are statistically independent. If Y causes X and X causes Y, it is said that feedback exists between X and Y. Essentially, Granger's definition of causality is framed in terms of predictability.

To implement the Granger test, a particular autoregressive lag length k (or p) is assumed and Models (5) and (6) are estimated by OLS:

$$X_t = \lambda_1 + \sum_{i=1}^{k} \alpha_{1i} X_{t-i} + \sum_{j=1}^{k} b_{1j} Y_{t-j} + \mu_{1t} \qquad \text{(Model 5)}$$

$$Y_t = \lambda_2 + \sum_{i=1}^{p} \alpha_{2i} X_{t-i} + \sum_{j=1}^{p} b_{2j} Y_{t-j} + \mu_{2t} \qquad \text{(Model 6)}$$

Furthermore, an F-test is carried out for the null hypothesis of no Granger causality; $H_0 : b_{i1} = b_{i2} = ... = b_{ik} = 0, i = 1, 2$ where, the F statistic is the Wald statistic of the null hypothesis. If the F statistic is greater than a certain critical value for an F distribution, then we reject the null hypothesis that Y does not Granger-cause X, which means that Y Granger-causes X.

A time series with a stable mean value and standard deviation is called a stationary series. If (d) differences have to be made to produce a stationary process, then it can be defined as integrated of order d. Engle and Granger (1987) state that if several variables are all I(d) series, their linear combination may be cointegrated, that is, their linear combination may be stationary. Although the variables may drift away from equilibrium for a while, economic forces are expected to restore equilibrium. Thus, they tend to move together in the long run irrespective of short run dynamics.

The definition of Granger causality is based on the hypothesis that X and Y are stationary or I(0) time series. Therefore, the fundamental Granger method for variables of I(1) cannot be applied. In the absence of a cointegration vector, with I(1) series, valid results in Granger causality testing are

obtained by simply first differentiating the VAR model. With cointegration variables, Granger causality will require further inclusion of an error term in the stationary model in order to capture the short term deviations of series from their long-term equilibrium path. Hassapis et al. (1999) show that in the absence of cointegration, the direction of causality can be decided upon via standard F-tests in the first differenced VAR. The VAR in the first difference can be written as:

$$N\left\{\Delta X_t = \lambda_1 + \sum_{i=1}^{k} \alpha_{1i}\Delta X_{t-i} + \sum_{j=1}^{k} b_{1j}\Delta Y_{t-j} + \mu_{1t}\right.$$ (Model 7)

$$N\left\{\Delta Y_t = \lambda_2 + \sum_{i=1}^{p} \alpha_{2i}\Delta X_{t-i} + \sum_{j=1}^{p} b_{2j}\Delta Y_{t-j} + \mu_{2t}\right.$$ (Model 8)

Therefore, if trade openness shares a long-run relationship with government size, the next step is to examine causality, since if two or more variables are cointegrated; there is causality in at least one direction. Moreover, we proceed to test the validity of the compensation hypothesis using Vector Error Correction Model (VECM). According to Engle and Granger (1987), if two variables are cointegrated, then a more comprehensive test of causality, which has become known as an error-correction model, should be adopted. The VEC specification restricts the long-run behavior of the endogenous variables to converge to their cointegrating relationships while allowing a wide range of short-run dynamics. The cointegration term is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments.

3. Globalization and Government Size in Greece
### 3.1. Globalization

During the last two decades, Greece, like many other eastern European countries is under structural reforms (e.g. privatization, deregulation, liberalization policies) in order to reach the living standards of the western developed economies. As literature indicates, one of the most important factors moving towards to a more globalized and integrated economy is the openness of trade.

3.1.1. Trade Openness
Greece is focusing on competitive trade for the last twenty years, presenting impressive growth especially in the last decade. As a measure of globalization, openness of foreign trade can be measured with the sum of imports and exports as a percentage of GDP for a specific country.

Figure 1 shows trends of trade openness in Greece for the period 1960 – 2009. This figure clearly illustrates that especially during the first two examined decades (i.e 1960-1980) trade openness in Greece presents a sharp increase from 24.67 percent of GDP in 1960 to 55.49 percent in 1981. However, during the next fifteen years a slow decrease has been recorded. Since 1997 the Greek economy continues to show signs of a more globalized trade policy, mostly due to the increasing concern of the government towards a more open foreign trade by reducing tariffs and focusing on macroeconomic reformations, which led to the historical pick of 63.22 percent in 2000. The last decade is characterized by uneven patterns of trade openness. Recent data show a sharp decrease of trade volume and openness in Greece, as a result of the continuously decreasing economic and trade activity due to the sovereign debt crisis emerged in the last three years.

Figure 1: Trade Openness in Greece (1960 – 2009)

Imports and Exports (% of GDP)
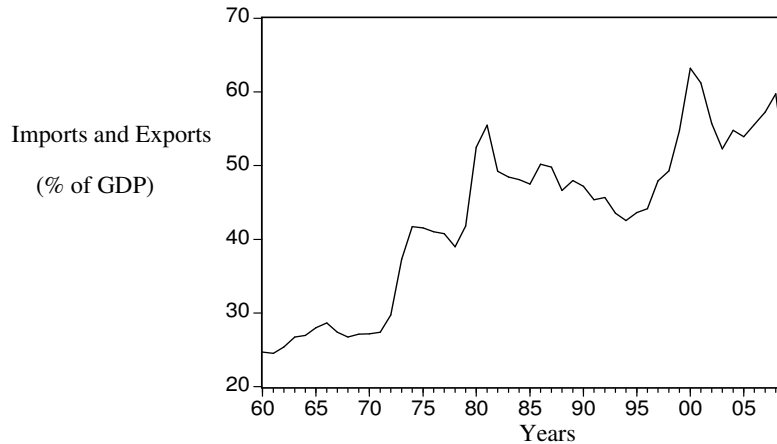
Source: World Bank (WDI) database

3.2. Government Size

Total spending and its components (i.e. transfer, subsidies, government consumption and government investment) as a percentage of GDP are used by researchers as a measure of government size. This study uses the definition of government size according to the seminal work of Rodrik (1998), which employs government consumption to GDP ratio as a measure of government size.

3.2.1. Government Consumption

General government final consumption expenditure (formerly general government consumption) includes all government current spending for purchases of goods and services (including compensation of employees). It also includes most expenditure on national defense and security, but excludes government military expenditures that are part of government capital formation.

Figure 2, illustrates that government consumption in Greece shows a sharp upward trend during the whole tested period. The first significant pick is recorded in 1985 reaching 16.74 percent of GDP from only 9.61 percent in 1973. Following a relative decrease until the mid-90's, a second pick is recorded in 2002 reaching 18.29 percent. Moreover, since the beginning of the sovereign debt crisis in 2008, government consumption continues to increase with an even more rapid pace despite the efforts of the Greek government to reduce public spending and to increase government revenue via limited privatizations and various tax reformations respectively. As a result, the highest historical pick is recorded in 2009 reaching 19.33 percent of GDP, in the middle of the severe financial crisis.

Figure 2: Government Consumption in Greece (1960 – 2009)

Gov. Consumption (% of GDP)

Source: World Bank (WDI) database

4. Empirical Results

Table 1 reports the descriptive statistics for the sample of the two macroeconomic variables for the case of Greece. Overall, calculations indicate that all variables are not normally distributed and are characterized as leptokurtic and skewed.

Table 1: Descriptive Statistics

Estimators	Trade Openness	Government Size
Mean	1.628502	1.157823
Median	1.668130	1.127365
Maximum	1.800868	1.246365
Minimum	1.389502	0.972777
Std. Dev.	0.123406	0.097659
Skewness	-0.813521	-0.487124
Kurtosis	1.032985	1.863644
Jarque-Bera	2.177720	3.817040
Probability	0.275106	0.148300

Table 2 displays the estimates of the Augmented Dickey – Fuller (ADF) test in levels and in first differences of the data with an intercept, with an intercept and trend and with no intercept or trend. The tests have been performed on the basis of 5 percent significance level, using the MacKinnon Critical Values (MacKinnon, 1996). The lag length was determined using Schwarz Information Criterion (Schwarz, 1978). Initially, ADF test with an intercept implies that all variables are not stationary at levels even at 10 percent level of significance. However, at 1st differences trade openness and government size are both stationary at an accepted significance level (i.e. 5 or 1 percent level) and for all tested countries. Similar results present the unit root test with an intercept and trend, since all variables present no significance at levels but at 1st differences all variables are integrated of order one. Finally, ADF test with no intercept or trend reports that at levels none of the examined variables have a unit root. However, at 1st differences all variables are stationary at 1 percent significance.

Collectively, all test results imply that both variables are not stationary at levels at any accepted level of significance. These are stationary at 1st differences. So, robust results derived from three forms of ADF test procedures all indicate that trade openness and government size for the sample of Greece are integrated of order one i.e. I (1).

Table 2:   Augmented Dickey – Fuller Unit Root Test Results

Variables and Critical Values (C.V.)	Test with Intercept		Test with Intercept and Trend		Test with no Intercept or Trend	
	Levels	1st Diff.	Levels	1st Diff.	Levels	1st Diff.
L(Trade Openness)	-1.8600	-5.0453	-1.3099	-5.2323	0.9756	-4.9326
C.V.*	-2.9252	-2.9252	-3.5085	-3.5085	-1.9480	-1.9480
C.V.**	-3.5777	-3.5777	-4.1658	-4.1658	-2.6151	-2.6151
L(Government Size)	-0.8705	-8.5061	-2.6354	-8.4124	1.8799	-8.0459
C.V.*	-2.9225	-2.9238	-3.5043	-3.5064	-1.9478	-1.9478
C.V.**	-3.5713	-3.5744	-4.1567	-4.1611	-2.6140	-2.6140

Notes: *McKinnon Critical Value at 5 percent significance level. **McKinnon Critical Value at 1 percent significance level.

Since it has been determined that the variables under examination are integrated of order one, the Johansen cointegration test is performed. The testing hypothesis is the null of non-cointegration against the alternative that is the existence of cointegration using the maximum likelihood procedure (Johansen, 1988; Johansen and Juselious, 1990; Johansen and Juselious, 1992). Table 3 provides the results from the application of the cointegration test among the data sets. Empirical findings show that

the maximum eigenvalue and the trace tests reject the null hypothesis of no cointegration at the 5 percent significance level. So, these calculations suggest that the number of statistically significant cointegration vectors is equal to one, which means that a long run relationship between trade openness and government size exists for the case of Greece.

Table 3:   Johansen Cointegration Test Results

Null Hypothesis	Trace Statistic	5% Critical Value	Maximum Eigenvalue Statistic	5% Critical Value
$r* = 0$	19.3786	15.4947	16.2987	14.2646
$r \leq 1$	3.0798	3.8415	3.0799	3.8415

Notes: *r is the number of cointegrating vectors under the null hypothesis.

After determining that the logarithms of the two variables are cointegrated, we must estimate then a VAR model in which a mechanism of error correction model (ECM) will be included. Table 4 displays the estimates regarding the form of the error correction model. The percentage of the total variation of the dependent variable that is described in this model is satisfactory (43.63%). The Error-Correction Term is negative and statistically significant, which confirms that there is no problem in the long-run equilibrium relationship between the independent and dependent variables. The relative price -0.4877 (-4.1374) implies a satisfactory convergence rate to equilibrium point per period. Moreover, it can be inferred that in the long-run an increase of 1 percent on Government Size will lead to an increase of 0.55 percent in Trade Openness, while the estimated value for the Durbin-Watson (DW) statistic (2.0168) rejects the presence of serial correlation in the residuals (Durbin and Watson, 1950, 1951).

Table 4:   ECM Estimates - Dependent Variable ΔL(Government Size)

Variable	Coefficient	Std. Error	T-Statistic
ΔL(Gov. Size)$_{t-1}$	-0.2352	0.1143	- 2.0585*
ΔL(Trade Op.)$_{t-1}$	0.5595	0.1301	1.9942*
U_{t-1}	-0.4877	0.1179	- 4.1374***
C	0.0068	0.0030	0.4957
R^2	0.4723	Mean dependent	0.0061
R^2 adjusted	0.4363	S. D. dependent	0.0259
Sum squared residuals	0.0166	Akaike criterion	-4.9653
Log likelihood	123.167	Schwarz criterion	-4.8094
Durbin-Watson stat	2.0168	F-statistics	13.1279

Notes: (Δ) is reported to first differences of variables; (*), (**), (***) denote significance at 10%, 5% and 1% respectively. This note also applies to the subsequent Table.

From the application of the Johansen cointegration test it is concluded that the selected macroeconomic variables are cointegrated. Furthermore, the Granger-causality analysis is employed in order to examine the causal links between the variables under investigation (Granger, 1969; Granger, 1988). As a testing criterion the F-statistic is used. Table 5 reports the estimations of the Granger causality tests. Results show that the null hypothesis (H_0) of "trade openness does not Granger-cause government size" is strongly rejected at one percent significance level and for all the tested (i.e. 1, 2, 3, and 4) year lags.

On the other hand, robust empirical results indicate that the null hypothesis of "government size does not Granger-cause trade openness" cannot be rejected since none significance is detected for any time year lags. So, causality testing procedure for the case of Greece implies that there are no bilateral relationships between these variables. However, results indicate the presence of unidirectional causal links running from trade openness to government size at the highest accepted significance level (i.e. one percent).

Table 5:   Granger Causality Test Results

Null Hypothesis	F - Statistics			
	Lag 1	Lag 2	Lag 3	Lag 4
Trade Openness does not Granger-cause Government Size	18.4821***	14.2521***	11.9440***	8.0237***
Government Size does not Granger-cause Trade Openness	1.3184	0.6524	0.6344	0.7381

5. Concluding Remarks and Policy Implications

The literature on the relationship between globalization and government size has presented contradictory evidence (Molana, Montagna and Violato, 2004; Iversen and Cusack, 2000; Iversen, 2001; Epifani and Gancia, 2007; Egger and Falkinger, 2006; Devereux, 1991; Anwar, 2001). For example, Rodrik (1998) finds that trade openness is associated with more government spending, and Quinn (1997) concludes that capital mobility is also positively associated with government size. Both studies used data from both the OECD and developing countries. On the other hand, Garrett's (2001) empirical results based on regression analysis using the changes data (rather than levels) show that rapid increases in trade openness and capital mobility have put downward pressures on government size internationally.

This survey has presented exhaustive evidence on the relationship between trade openness and government size for an EU and EMU member country, Greece for the period 1960-2009. On the methodology adopted and relevant empirical results it should be mentioned that firstly various forms of ADF test were employed reaching to the conclusion that both examined variables are integrated of order one. Furthermore, the application of the Johansen cointegration test suggests that one cointegration vector exists between the examined variables. After determining the number of cointegration vectors a VAR model with an Error Correction Mechanism was employed, which showed that there is no problem with the long-run equilibrium relationship between trade openness and government size. Finally, Granger-causality test was run, which presented robust evidence of a unidirectional causal link running from trade openness to government size.

Collectively, the analysis performed in this research has provided robust evidence that support the positive relationship between international trade openness and size of the government sector for the case of Greece. In this spectrum, this survey accepts the validity of the "compensation hypothesis" since empirical results imply that trade openness is positively associated with the size of the government and that trade openness granger-causes government size. Interpreting this hypothesis, the present empirical results for Greece could imply that the increased volatility brought about by the growing dependence on international markets creates incentives for the Greek government to provide social insurance against internationally generated risk and economic dislocations.

On the other hand, Greece is under severe sovereign debt crisis officially since 2009. According to the vast majority of economists and financiers, one of the most important factors that led Greece to the recent economic recession is the continuously increasing government size, which created bureaucratic conditions, corruption of public officials, drastically decreased competitiveness, and discouraged foreign investments leading to recession. In the last two years, the Greek government proceeded with tentative steps to various wage cuts of public employees, spending cuts on social welfare and at present is planning an ambitious privatization program in order to reduce government consumption.

Therefore, Greece is forced to make crucial decisions regarding government size; maintaining a large public sector in order to protect social groups and local entities from the negative impacts of globalization (i.e. compensation hypothesis) may also have serious negative consequences on the country's efforts to meet its debt liabilities and to maintain economic prosperity. So, this study's empirical evidence may note the validity and importance of the so called "compensation hypothesis" but on the other hand it argues that an unmonitored increasing government size has severe negative effects for the national economy and it tends to promote bureaucratization, corruption, declining competitiveness, state interventionism, barriers to foreign investments as occurred in the case of

Greece. In this respect, this paper suggests that government size can indeed protect a national economy from various threats that a country faces in its efforts towards economic integration and modernization. However, it seems that there is a limit to the positive impacts of increasing government consumption and if it is exceeded then various distortions in the economy may occur.

References

[1]   Alesina, A. and R., Perotti, 1997. "The Welfare State and Competitiveness", *American Economic Review* 87, pp. 921-939.
[2]   Anwar, S., 2001. "Government spending on public infrastructure, prices, production and international trade", *The Quarterly Review of Economics and Finance* 41, pp. 19-31.
[3]   Cameron, D. R., 1978. "The Expansion of the Public Economy: A Comparative Analysis", *American Political Science Review* 72, pp.237-269.
[4]   Devereux, M. B., 1991. "The terms of trade and the international coordination of fiscal policy", *Economic Inquiry* 29, pp. 720-736.
[5]   Dickey, D.A. and W.A. Fuller, 1979. "Distribution of the Estimators for Auto-Regressive Time Series with a Unit Root", *Journal of the American Statistical Association* 74, pp. 427-431.
[6]   Durbin, J. and G. S. Watson, 1950. "Testing for Serial Correlation in Least Squares Regression, I", *Biometrika* 37, pp. 409–428.
[7]   Durbin, J. and G. S. Watson, 1951. "Testing for Serial Correlation in Least Squares Regression, II", *Biometrika* 38, pp. 159–179.
[8]   Egger, H. and J. Falkinger, 2006. "The role of public infrastructure and subsidies for firm location and international outsourcing", *European Economic Review* 50, pp. 1993 -2015.
[9]   Engle, R.F. and C.W.J. Granger, 1987. "Co-integration and Error-correction: Representation, Estimation and Testing", *Econometrica* 55, pp. 251-256.
[10]   Epifani, P. and G. Gancia, 2007. "On Globalization and the Growth of Governments*", Discussion Paper No. 6065*, Centre of Economic Policy Research.
[11]   Garrett, G., 2001. "Globalization and Government Spending Around the World", *Studies in Comparative International Development* 35, pp. 3-29.
[12]   Garrett, G. and D. Mitchell, 1999. "Globalization and the Welfare State", *Mimeo*, Yale University.
[13]   Granger, C. W. J., 1969. "Investigating Causal Relations by Econometric Models and Cross-spectral Methods", *Econometrica* 37, pp. 424-438.
[14]   Granger, C. W. J., 1988. "Some Recent Developments in a Concept of Causality", *Journal of Econometrics* 39, pp. 199-211.
[15]   Hassapis, C., Pittis, N. and K. Prodromidis, 1999. "Unit Roots and Granger Causality in the EMS Interest Rates: The German Dominance Hypothesis Revisited", *Journal of International Money and Finance* 18, pp. 47-73.
[16]   Iversen, T., 2001. "The Dynamics of Welfare State Expansion: Trade Openness, Deindustrialization, and Partisan Politics", *The new Politics of the Welfare State*, P.
[17]   Pierson (ed.), Oxford University Press.
[18]   Iversen, T. and T.R. Cusack, 2000. "The Causes of Welfare State Expansion", *World Politics* 52, pp. 313-349.
[19]   Johansen, S., 1988. "Statistical Analysis of Co-integration Vectors", *Journal of Economic Dynamics and Control* 2, pp. 231-254.
[20]   Johansen, S. and K. Juselius, 1990. "Maximum Likelihood Estimation and Inference on Cointegration with Applications for the Demand for Money", *Oxford Bulletin of Economics and Statistics* 52, pp. 169-210.

[21] Johansen, S. and K. Juselius, 1992. "Testing Structural Hypotheses in a Multivariate Cointegration Analysis at the Purchasing Power Parity and the Uncovered Interest Parity for the U.K", *Journal of Econometrics* 53, pp. 211-244.

[22] Leamer, E., 1996. "In Search of Stolper-Samuelson Effects on US Wages", *Working Paper 5427*, NBER.

[23] MacKinnon, J.G., 1996. "Numerical Distribution Functions for Unit Root and Co-integration Tests", *Journal of Applied Econometrics* 11, pp. 601-618.

[24] Molana, H., Montagna, C. and M. Violato, 2004. "On the Causal Relationship between Trade-Openness and Government Size: Evidence from 23 OECD Countries", *Working Paper 2004/14*.

[25] Quinn, D., 1997. "The Correlates of Changes in International Financial Regulation", *American Political Science Review* 91, pp. 531-552.

[26] Rodrik, D., 1997a. "Trade, Social Insurance, and the Limits to Globalization", *Working Paper 5905*, NBER.

[27] Rodrik, D., 1997b. "Has Globalization Gone Too Far?", Washington, DC: Institute for International Economics.

[28] Rodrik, D., 1998a. "Why Do More Open Economies Have Bigger Government?", *Journal of Political Economy* 106, pp. 997-1032.

[29] Rodrik, D., 1998b. "Who Needs Capital Account Convertibility?", *Essays In International Finance No. 207*, International Finance Section, Economics Department, Princeton University.

[30] Rogowski, R., 1998. "Globalization and convergence: Getting the Theory and the Evidence Right", MS. UCLA.

[31] Schwarz, G., 1978. "Estimating the Dimension of a Model", *The Annals of Statistics* 6, pp. 461-464.