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THE KNOWLEDGE–BASED ECONOMY: MARKET–BASED DEVELOPMENT STRATEGIES FOR THE EU

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Abstract

Possibilities for the development of new forms of economic, social and technological headway designed to create and further improve economies based on knowledge are analyzed here. The ideas are imbedded in the idea of the market as a discovery procedure. The main emphasis is put on national and regional economic specialization in the situation of the development of the European Union. Clusterization oriented towards the increase of efficiency of various national and regional economies is a critical precondition –as is proved by historical examples– for the successful creation of a modern economy based on knowledge. The proposal creates a framework for freedom and underpins the conditions for a prosperous society, it does not generate them.

JEL classification: B25, D02, D85, O33, R11.

Keywords: Market economy, knowledge–based society, European Union.

1. Introduction

A market economy makes use of much more knowledge then ever possible will be used in a centrally planned economy. This for the reason that not only it makes use of scientific knowledge, which in principle can be centralized, but also of the unique knowledge in the possession of individuals. This last form of knowledge is impossible to centralize. Often just for the reason that individual do not know they possess it, before the problem arises to use it. By the price system, the system of profit and loss (competition), individuals are stimulated to use their knowledge. The whole organization of the market serves mainly the need of spreading the

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information on which buyers act (Hayek, 1982, Vol. I, pp. 15-17).

What is the role of the government in the market process, as far as the dissemination of knowledge is concerned? How, in particular, should the assistance of the government look in the multi-cultural environment of the European Union (EU)? The future of the EU lies in the recognition of the correct role of the EU in this process of creating possibilities for the development of new forms of economic, social and technological headway designed to create and further improve economies based on knowledge. This means that key issues are to be considered as issues of sustaining the knowledge based society. Striving to find answers determines the necessity of elaboration and implementation of appropriate strategies. An approach towards the way how long term strategies designed to create it should be prepared. The objective of the research is the proof that a priority is the urge of technological advancement and enhancement of compatibility and productivity using such opportunities as specialization of national and regional economies, creation of clusters and their networks, as well as the development of so called economic "oases" and hyper-clusters. The main result is the concept of strategies oriented towards integration and synthesis. The basis for which is the universal principle of creation of a new quality.

2. Theoretical background: the Austrian market-based vision on the role of knowledge

For the government it is impossible to know how to act in order to stimulate the knowledge economy. Indeed, the government can use scientific knowledge in its decision making, but never the decentralized knowledge every individual does possess of. The lack of knowledge is essential. A fact recognized and further expanded on in economic science, and especially Austrian economics. In 1871 Carl Menger's value theory turned the value theory of the classical economists upside down. The classi-cal (Ricardian) theory held that cost of production determines the normal value of consumption goods. In contrast, Menger's the-ory held that the value of consumption goods ultimately determines the cost of production. Value is an expression of judgements concern-ing future usefulness in meeting consumer wants. Prices are never determined by costs of production; the reverse is true. Think of it.

There is no reason to expect the producer to wait on, e.g., a general sales tax to increase his prices if he could have done so before. Since the selling price is already set at a "maximum"; a rise in costs, ic. an imposed general sales tax, cannot raise the price any further. Israel Kirzner describes modern Austrianism as an authen-tic extension of Menger's older static subjectivism: a consequent dynamic subjectivism. Its, the two central figures are Ludwig von Mises and Friedrich Hayek. Both authors focus on market adjustment processes. Kirzner, building his theory as Mises and Hayek did, believes that one of the greatest failures of neoclassical (equilibrium) analysis is that it assumes equilibrium is actually brought about.

The real problem for modern Austrians is to describe the possible realization of an equi-li-brium as the result of "the systematic way in which plan revisions are made as a consequence of the disappointment of earlier plans" (Kirzner, 1962, p. 381). For Mises and Hayek adjustment is a systematic sequence of decisions. The individual decision unit is not only maximizing, but is also finding out the relevant ends-means relation-ship. This opened the way for incorporating learning into our understanding of market pro-cesses. Hayek's extension of sub-jectivism was to describe the process as one of learning by discovery. Endogenous change in the ends-means relationship –says Kirzner– is possible with the entrepreneurial element in each individual market participant: alertness. Alertness is the propensity toward fresh goals and the discovery of hitherto unknown resources. A disequilibrium situation points to market ignorance. From it emerge profitable opportunities that are exploited by alertness. Alertness gives a more realistic image of human action (and hence real choice) and makes possible the description of the market as a unified discovery process. "[The] 'alertness' view of the entrepreneurial role rejects the thesis that if we attribute genuine novelty to the entrepreneur, we must neces-sarily treat entreprene-urially generated market events as not related to earlier market events in any systematic way. The genuine novelty [...] attribute[d] to the entrepreneur consists in his spontaneous discovery of the opportunities marked out by earlier market conditions (or by future market conditions as they would be in the absence of his own actions)" […] "[These] entrepreneurial discoveries are the steps through which any possible tendency toward market equilib-rium must proceed" (Kirzner, 1985, pp. 11-12).

3. Theoretical background: universal principle of "creation of the new quality"

The role of the government is spreading scientific knowledge: the knowledge infrastructure of the society. The concepts of the knowledge-based society and economy can be defined in a number of ways. (Boldrin and Canova, 2001; Cohendet and Stojak, 2005; David and Foray, 2002; Goeransson and Soederberg, 2005; Grace and Butler, 2005; Huseman and Godman, 1999). We suggest one of the most relevant versions. It is the society where social, economic and cultural progress is determined by the ability to create and efficiently apply new knowledge, and where creation of knowledge and promotion of innovations become priority. It is the economy where development is determined by creation of knowledge and technologies, implementation of high technologies in all spheres, along with the priority orientation towards the use of products created by the means of high technologies.

Creation of the knowledge based economy as a key priority of the further enlargement of the EU could be defined as an especially complex process towards formation of the brand new society and the qualitatively new life style. (Melnikas and Reichelt, 2004). What is more, this process is of "double" complexity. First, compared to the "traditional" economy it is considered as qualitatively new. Second, it is completed in the situation of the enlargement of the EU, which means that qualitative changes have been happening in the EU.

Examining possibilities and prospects we apply the "universal principle of the creation of new quality. New quality always develops by amalgamation when elements of different origin that never had belonged to the same system collide. The principle develops and uses the synergy effect, and demonstrates that qualitative transformations always require actions and means necessary to join elements of different origin to the common system. Applying the principle it is important that as a subsequence of amalgamation there is always a new quality created.

At the same time amalgamation can be very different and represents two types: integration and synthesis. Processes of the integration usually prove that in the course of amalgamation elements that collide never lose their major primordial features. The result of the integration making the new

quality can be disintegrated according to previous features of the amalgamated elements. Processes of synthesis demonstrate that elements colliding in the course of amalgamation miss their major primordial features. The result of the synthesis possessing new quality cannot be disintegrated according to the previous features of the collided elements. Qualitative changes within the synthesis are never recurrent, qualitative changes within the integration recur in some cases.

There are examples of integration and synthesis from history of multinational countries. The history, e.g., of the USA is the history of synthesis oriented processes of the amalgamation of different ethnical, regional and social cultures and of the creation and development of amalgamated nation and national culture. Other examples are the history of the Austrian–Hungarian Empire and of the Soviet Union with the predominance of integration. Both empires developed as the integrated systems of the national territorial structures. Most of the nations had their own territories, economies and infrastructures for the social and cultural development. The predominance of integration and the lack of the synthesis was the most important factor of disintegration of the both empires.

To see integration and synthesis as the creation of a new quality allows broadly applying the principle of the creation of the universal "new quality" when examining complex manifestations of the enlargement of the EU. Elaborating and implementing the strategies it is necessary to logically forecast various vehicles designed for expansion and development. Among them there should be those oriented towards integration and synthesis.

If it is sparking interest we are looking at (that is not changing relative attractiveness). We do focus on the effects of (unknown) entrepreneurial profit. Mainstream neoclassical analysis, however, focuses on changing the (known) relative preferability of the options the entrepreneur faces. Pure profit is a sum that cannot be described as necessary for production; the producer has already recovered all his expenses. But alertly noting hitherto unnoticed opportunities depend on the possibility of the emergence of pure profit: opportunities may simply not be noticed in the absence of it. For the Austrian, this is a valid description of the situation the entrepreneur faces. As Kirzner says, we must be warned not to change an open-ended world into a closed one (1999, p.109). If, in order to have a profit, it were luck we are counting on, no incentive whatsoever would be necessary. Neither are

profits wholly, as Frank Knight would say, the uncertainty-bred differences between the anticipated value of resource services and their actual value. We look at a potentially attractive outcome (on the basis of active, alert, searching entrepreneurial activity) in an open-ended world: an unknown possibility unconstrained by known constraints. *"The most impressive aspect of the market system is the tendency for [...] opportunities to be discovered"* (Kirzner, 1985, p. 30). Prices expressed in money show price discrepancies. Through the possibility of monetary profits, prices stimulate the discovery of valuable concrete information. And it is precisely the institutional setting of the market economy that translates utter error into prospective net gain. It is a social setting in which people are continuously pressed to improve.

4. Strategic EU-alternatives: a common space or an integrated system of various spaces?

Processes of the enlargement of the EU are very intense. They reflect a two-fold approach. On the one hand, the EU could be perceived as a multicultural, multi-economic and multi-social space. We suggest that the common cultural space is comprised by various ethnic, economic, social and cultural spaces represented by their regional, as well as *quantitative and qualitative* indicators. The development of a common cultural space imply processes of integration and synthesis. This means that an integral common culture develops.

On the other hand, the EU could be perceived as the organization of states: an organization of organizations. A modern state can be defined as a societal organization of the superior degree of the development. The enlargement of the EU as an organization of states is going in the way of integration of the new states. We suggest that the enlargement is followed by integration. At the same time it is important to notice that the EU as an organization has gradually started executing functions of the countries: it is turning into a super-state. This expresses synthesis typical to the enlargement of the EU as an organization.

Depending on whether in the future integration or synthesis dominate, it is possible to draft two visions. In the one the multicultural space of the EU

will manifest as a common space comprised by various national cultures and where various nations live. In this case the EU will continue functioning as the organization of various national states. In the other a new type of common European nation will gradually develop, whereas the EU itself will transform into the integral superstate. In this case states will become administrative and territorial sub-divisions possessing rather wide autonomy. Besides, we may assume that in the future, members of the EU will rather identify themselves with the integral European nation, rather than with its current nations.

Both of the alternatives are hypothetical. They can be considered as a hypothesis dedicated to the future of the EU. Two stages could be emphasized: integration and synthesis. Creation of the knowledge based economy requires elaboration and implementation of appropriate development strategies. Understanding that processes of the enlargement are two-fold it is possible to assume strategies towards integration and synthesis. It is critical that both can also be designed for the entire EU and particular spheres of social and economic life. One of the spheres is the development of national and regional economic systems and the creation of a new cluster-based economy (Steinmueller, 2002, Grace, Butler, 2005, Melnikas, 2002).

In short, innovation can never be the result of centralized decision making, e.g., a Brussels-based bureaucracy. Though innovation is possible in centralized and decentralized countries, it is competition in a decentralized economy that spreads and applies it. Competition is of the essence of innovation. The last is a useful by-product of the market process (Van de Velde, 2005, p. 63).

5. Cultural and political problems typical to the EU

Next for economic reasons, cultural and political reasons make it difficult to have a political economy in the sense of a democratic process. Concrete policies and democracy are hard to reconcile. It is an almost impossible combination to ask for. In the middle of the previous century Hayek (1949, pp. 255-72) wrote that democracy can only under very restricted conditions be transposed to a supra-national organization. A little later his American counter-ego Milton Friedman said the same. If you apply both ideas to the

situation in Europe we have to conclude that the EU is not only missing the necessary homogeneity to form clear policy goals in a democratic way, but it misses as well the stimuli not to waste the EU-money.

Why is it hard to expect concrete policy goals and fiscal constraint from the European parliament –the most democratic institution of the EU? Of course, general objectives (e.g., prosperity for everyone) will be easy to agree on. Concrete objectives, however, will be difficult to formulate. The countries of the EU differ too much in culture, history and economic development. Every choice supposes a balancing of the pros and cons. The service directive of the EU is an example thereof. This recently weakened service directive is supposed to show the social face of the EU. No worker from Eastern Europe, however, will be glad with how he is "protected". Within a relatively homogeneous country like the Netherlands, however, the original directive would be no problem. Every plumber from the north of the Netherlands is welcome in the south. Likewise the Netherlands is supporting with a low price of gas a national pride: the agriculture of vegetables in greenhouses. Every Dutchman is willing to pay for it. But the very same solidarity for a Spanish national pride is something different. And the other way around!

The solidarity that is necessary for concrete policy is within the EU tenuous. Even within one country if things do differ like language (Belgium), religion (North-Ireland) or economic development (North and South-Italy) solidarity is hard. These situations do characterize the European parliament. Hence, of an (in the future) democratically chosen Chinese parliament with its approximately 3000 members we can expect more priority setting then by the 700 members of the European parliament. China with its fifty minorities but overwhelming majority of almost 95 per cent Han-Chinese is more a unity then the 25 members of EU are. If a parliament can give no objectives for administration and, hence, cannot be asked for advice, the European Commission remains de facto the administration. Often below the guise that it concerns only a technical affair. But over a change in policy, no matter how technically, the parliament should decide. Moreover also the Commission has to do with various wishes.

The EU, also, has hardly any incentives not to waste money. The best guarantee not to waste money is that the same person both owns and does

spend the money (Friedman, [1979], 1981, p. 146). You do see to get value for your money. Members of parliaments or commissions, however, do spend others men's money, on behave of, often again, other men. That is almost a guarantee for ineffective and inefficient spending. Of each member of a local parliament some restraint in spending the taxpayers' money of his own citizens can be expected. But what to think of an Eastern-European member of the EU-parliament who does spend the money of West-European taxpayers at projects in Eastern-Europe? To satisfy the members of parliament of Western-European countries pork-barrel legislation will rise. Not much different as is the case in the US. Often the support of congressmen of several states has to be bought with financial presents (pet projects) for their local constituents. We will see more signs along the roads which state, "This project has been realized with the help of the EU". A project, if the country had to decide and pay for itself, it would not have spent the money on.

In short, the whole point is that policies that are certainly possible for each of the countries separately, are no option for the totality of the EU. It lacks the necessary homogeneity; priorities cannot be set. To transfer authority and hence policy to Brussels has its limits.

6. Priority strategies oriented towards integration and synthesis

Creation of the knowledge-based economy is possible, provided all subjects are rationally specialized. Principles and practices confirm that in efficiently operating systems surplus value is created at a greater extent. This statement works in all cases where ways are present to increase efficiency and compatibility on both particular economic subjects and large national and regional economic systems. The precondition to ensure efficiency and compatibility of any economic system is to achieve that it is properly specialized.

For the sake of rationalisation various means may be implemented. The means should create a solid complex, and have to be long-term and consecutive and developed as a large macro-cluster or hyper-cluster that are multi-profiled and oriented towards creation of different and diverse final products. It is obvious that clusters in countries or regions should meet the

following requirements: clusters should function as open systems, maintaining both internal and external economic and technological relations in international and global markets; inside the clusters various specialized clusters can be created incorporating diverse institutions of science, research and education, enterprises of production and services, business incubators, parks of science and technology, centers for innovation, and industrial, trade, transportation and communication companies.

Development of systems by way of clusterisation may be of great variety. A prospective method to implement are regional (territorial) or sector "oases" possessing advantageous political, legal, economic and other exclusive conditions. "Oases" can be established on behalf of political will of a state or even a group of states. The idea of regional "oases" is also viable in the improvement and implementation of regional policy comprised of regions of different countries. When creating the knowledge based economy the priority should be on clusterization, networks of clusters, economic "oases" and specialization of regional economies. It is necessary to prepare and implement a complex of strategies for clusterization and specialization of regional economies. These should include integration and synthesis. Integration is to ensure high efficiency and compatibility of regional economies and sectors both in the integral EU-economic space and in global markets. Key decisions are:

- national or regional economic systems should shape up one or more priorities oriented towards creation of modern state-of-the-art technologies and products. Based on such priorities one could define or develop rational specialization of each national or regional economy,
- systems according to the regional priorities, should form economic "oases" and clusters; whereas general "oases" and clusters can be transformed into macro-or hyper-clusters on the scale of large regions or the entire country,
- creation of "oases" and clusterization should ensure that the major role in the growth of economy is to be played by intellectual resources and technological advancement. Strategies oriented towards synthesis must achieve that major economic sectors operate as integral undivided systems.

  Sectors should possess a high level of technological development and

be leaders. Orientation towards the challenges of this kind requires that within the strategies oriented towards synthesis the following decisions are made:

- on the scale of the entire EU the networks of regional and sector clusters as well as "oases" should be created and mutually developed: each element in the networks of this kind could become rationally specialized which would make sure that the network as a system is of a state-of-the-art level of productivity and technological advancement,
- the networks as well as "oases" should be specialized: networks of this kind on the scale of economic space of the EU are mutually complementing and do function as partnerships, they also can operate outside the EU: this will ensure the viability of economic structures and their compatibility in the global markets,
- the networks of regional and sector clusters as well as oases in the future should be an organizational basis for the entire EU: the networks of this kind should be understood as a key structural elements, as well as a key organizational structure.

7. Conclusions and recommendations

Creation of the knowledge based society and knowledge-based economy in the EU is a very complex, long-term and ambiguous process. As is emphasized in this study, the more general the government policy the better. The government simply does not have the necessary knowledge to implement special policy: it cannot pick the winners. The market process is necessary for this. However most important is that the government should do the things it can do (Van de Velde, 2005, p. 66). The confidence should be in the individuals, families, businesses who make up society: not in the state. Creativity is a quality which pertains to individuals. A potential that can only be fulfilled within a society. Government, however, is a necessary institution. "Government is not, as some people like to say, a necessary evil; it is not an evil, but a means, the only means available to make peaceful human coexistence possible (Mises, 1988, p. 19). Government only underpins the conditions for a prosperous society. It

does not generate them. The proposal in this paper can best be understood as a framework for freedom. This does not mean a weak government but only less government. The proposal is also does not want to increase the power of central government. Competition mobilizes the knowledge available in society: competition explores knowledge the best.

The basis for creation of the knowledge based economy in the EU is the implementation of the universal principle of "creation of a new quality". The development of the society and the economy of a new type is going under concurrent processes of integration and synthesis. Strategies oriented towards integration and synthesis should be created and implemented. Main emphasis should be on: rational specialization of national and regional economies, ensuring high compatibility both in the EU and in global markets; transformation of national, regional and sector economies into the macro–or hyper–clusters and systems of such clusters; development of clusters and networks of economic "oases"; further development of clusters and networks of economic "oases" as key organizational structures. The clusters in various spheres of industries and services, as well as regional and sector "oases", should be created in various countries and regions and also be based upon strategies oriented towards integration. The goal should be the creation and development of the knowledge based economies in various countries and regions. Coordination and partnership, however, should be ensured on the scale of the entire EU. The organizational pattern should be based on networks of clusters and "oases". The creation of the networks should be based on synthesis. The goal of these strategies should be creation and development of the common and undivided knowledge-based economy in the entire EU.

REFERENCES

Boldrin, M. and Canova, F. (2001), *Inequality and convergence in Europe's regions: reconsidering European regional policies*, Economic Policy, vol.16, issue 32.

Cohendet, P. and Stojak, L. (2005), *The digital divide in Europe. The economic and social issues related to knowledge-based Europe*, Futuribles: Analyse et Prospective, issue 305, pp. 5–28.

David, P.A. and Foray, D. (2002), *An introduction to the economy of the knowledge society*, International Social Science Journal, issue 171, pp. 5-9.

Friedman, Milton and Rose (1981), *Free to Choose*, Harmondsworth: Penguin, [1979].

Goeransson, B. and Soederberg, J. (2005), *Long waves and information technologies–On the transition towards the information society*, Technovation, vol. 25, issue 3, pp. 203–211.

Grace, A. and Butler, T. (2005), *Beyond knowledge management: Introducing learning management systems*, Journal of Cases on Information Technology, vol. 7, issue 1, pp. 53–70.

Hayek, Friedrich A. *The Economic Conditions of Interstate Federalism*, in: Individualism and Economic Order, London: Routledge & Kegan Paul, 1949.

Hayek, Friedrich A. (1982), *Law, Legislation and Liberty*, London: Routledge & Kegan Paul.

Huseman, R.C., Godman J.P.(1999), *Leading with Knowledge: The Nature of Competition in 21st Century –London*, Sage Publications.

Kirzner, Israel M. (1962), *Rational Action and Economic Theory*, Journal of Political Economy, Vol. LXX, August, pp. 380–85.

Kirzner, Israel M. (1985), *Discovery and the Capitalist Process*, Chicago: University of Chicago Press.

Kirzner, Israel M. (1999), *The Driving Force of the Market*, London and New York: Routledge.

Melnikas, B. (1999), *Probleme der Integrattion der baltischen Staaten in westliche Strukturen (Berichte des Bundesinstituts fuer ostwissenschaftliche und internationale Studien)*, N 40, Koeln.

Melnikas, B. (2002), *Transformacijos. – Vilnius*, Vaga.

Melnikas, B. and Reichelt, B. (2004), *Wirtschaft und Mentalitaet: Tendenzen der EU-Osterweiterung – Leipzig, Leifim – Verlag.*

Mises, Ludwig von (1988), *Liberty and Property*, Auburn: The Ludwig von Mises Institute.

Steinmueller, W.E. (2002), *Knowledge–based economies and information and communication technologies*, International Social Science Journal, issue 171, pp. 141–154.

Velde van de, M. (2005), *Kapitalisme buit kennis het beste uit*. In: Politieke visies op innovatie, Den Haag: Innovatieplatvorm, pp. 59–69.

A NEW MILLENNIUM CURRENCY AS INTERNATIONAL YARDSTICK

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Abstract

At least for analytical purposes, one might consider a kind of currency that is composed of USD, Euro, Yen and GBP, such as equivalent to one US Dollar around the start of the new millennium.

Introduction of this "NMC" is here discussed because there is a need for some kind of international yardstick in view of the volatility of the main currencies at present. It will be shown how one might use it to be more precise on the volatility of the before mentioned currencies and how one also can applicate it in different directions.

JEL classification: E40.

Keywords: new millennium currency, exchange rate.

1. Introduction

There is ongoing doubt about the US Dollar as measure of money value in the international arena. The volatility of its exchange rates since the turn of the century seems to make it less suitable to be a yardstick. Around the turn of the millennium in 12 European countries the Euro has been introduced, formally in 1999, and in full practice in 2002. In the year of its formal introduction it had an exchange rate to the US Dollar of around €0,93; today that rate is approximately €0,80. In this paper the introduction will be discussed of a kind of "new millennium currency" (NMC); seen as a basket of USD (40%), EUR (30%), YEN (20%) and GBP (10%), and also supposed to start in the year 1999, at that time equivalent to $1,-. Both the development of its nominal value and that of its real value –in view of de- and inflation of its components– give interesting insights. It

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then demonstrates that this NMC may function as an analytical tool in relation to what happened with various exchange rates since the introduction of the Euro in 1999. Secondly, certain applications of that NMC will be mentioned, such as with regard to the development of the oil price, and the international comparison of stock exchanges (more in particular the NYSE and the one in Amsterdam). Furthermore its general applicability will be highlighted for the arrangement of international financial transactions in the future.

2. Definition of a New Millenium Currency

In the year 1999 the US Dollar had an average exchange rate to the Euro of 0,93(4) respectively the Japanese YEN: 114 and the British Pound: 0,61(6). Suppose we compose a basket of the four currencies with the following content: forty US Dollars, the equivalent of thirty US Dollars in EURO, that of twenty US Dollars in YEN and that of ten US Dollars in Sterling. This basket then contains: USD 40, EUR 28,02, YEN 2280, GBP 6,16, in the year 1999 on average equivalent to $100,--; such as then to be understood as 100 units of a so called new millennium currency (NMC). From this definition of the NMC one can derive the opening exchange rates of the mentioned four currencies in 1999 in units of the NMC, namely for one US Dollar: 1,00; for one EURO: 1,07, for 100 YEN: 0,877 and for one GB Pound: 1,62.

For the present year, 2005, we estimate the average exchange rates for the US Dollar as follows: $1 = € 0,80 = ¥108 = £0,55. The nominal value of a unit of the NMC then becomes: $1,07335 = € 0,85868 = ¥115,9218 = = £0,5903425. This corresponds to the following exchange rates of the four currencies in units of the NMC: for one US Dollar: 0,93; for one EURO: 1,17, for 100 YEN: 0,863 and for one GB Pound: 1,70.

Therefore, the US Dollar in this sense has depreciated with 7 percent, the Euro has appreciated with $9^{1/2}$ percent, the Yen has depreciated with $1^{1/2}$ percent, while the Pound has appreciated with around 5 percent.

3. Volatility of US Dollar and Euro

In the past seven years, of the four currencies, in particular the US Dollar and (even more so) the Euro showed a large volatility of exchange rates. Such can be seen in the following table (i.e. in terms of units of NMC).

Table 1: *Exchange rates to the NMC (period: 1999–2005).*

year	US Dollar	EURO	YEN	GBP
			×100	
1999	1,00	1,07	0,877	1,62
2000	1,04	$0{,}95^{1/2}$	$0{,}962^{1/2}$	1,57
2001	$1{,}07^{1/2}$	0,97	0,889	1,55
2002	1,07	1,00	0,854	1,59
2003	0,98	1,11	0,852	1,60
2004	$0{,}93^{1/2}$	1,16	0,866	1, 68
2005	0,93	1,17	0,863	1,70
[average]	[1,00]	[1,06]	[0,88]	[1,62]

For each of the currencies, we could compute the mean deviation from the average exchange rate, in this period, i.e. as a percentage of the latter.

mean relative deviation	4,8%	7,0%	2,9%	2,7%
mean (rel.) own deviation	8,0%	10,0%	3,6%	3,0%

Taking into account their relative weight in the NMC itself, one might next compute their mean (relative) own deviation, opposite the other currencies. It follows that, on average, the four currencies had a deviation of 6,2%. The NMC, as a composition of these currencies, had a mean deviation of only 5 percent, such as follows from their combined yearly fluctuations:

0,5% ('99), 6,6% ('00), 6,0% ('01), 5,3% ('02)

0,3% ('03), 6,3% ('04), 6,9% ('05) → per year 4,95%

The US Dollar had indeed a rather high volatility such as here measured by its mean own deviation of 8,0%. That of the Euro, with 10,0%, was even higher. However, its primary weakness during the introductionary period

(1999–2002), has afterwards been redressed. In the last three years (1999–2005) the Euro had an average exchange rate of 1,15 to the NMC; and this in fact is equal to the rate of the Euro on the very moment of its formal introduction (January 1st, 1999). According to one explanation for this primary weakness, the investors, after the Euro had been introduced in 12 countries, had to spread their portfolio among a smaller number of alternatives. Instead of 12 countries, with different valuta, there came only one Eurozone, and therefore they shifted their investments partly out of it; with the effect of (temporarily) lower exchange rates for the Euro. This can be illustrated with the next Table 2 for 1999 and 2003–2005.

Table 2: *Exchange rates to the NMC (first and last three years).*

year	US Dollar	EURO	YEN	GBP
			×100	
1999	1,00	[1,15]	0,877	1,62
2003	0,98	1,11	0,852	1,60
2004	0,93 1/2	1,16	0,866	1,68
2005	0,93	1,17	0,863	1,70
[average]	[0,96]	[1,15]	[0,86]	[1,65]
→ mean own deviation	5,0%	2,3%	1,0%	2,7%

The NMC then has a mean deviation not higher than 2,0 percent; though this is higher than the mean own deviation of the YEN of 1,0%, the NMC anyway seems to be a better international yardstick than US $ and Euro.

4. Exchange Rates and Purchasing Power

After the volatility aspect, as a main reason for doubt about the US Dollar as international (money) yardstick, one may look into the relation between exchange rates and purchasing power of the various currencies. We will start from the following estimation of de- and inflation rates, for the whole of the period between 1999 and 2005, for the four currencies:

US Dollar (18 1/2 % inflation), Eurozone (14 1/2 % inflation)
Japanese Yen (3 % deflation), GB Pound (16 1/2 % inflation)

In relation to these de-/inflation rates, and in view of the composition of the NMC, one might compute for the latter an implicit inflation rate of: $0{,}40 \times 18^{1/2} + 0{,}30 \times 14^{1/2} - 0{,}20 \times 3 + 0{,}10 \times 16^{1/2} = 7{,}4 + 4{,}35 - 0{,}6 + + 1{,}65 = 12{,}8$ precent.

For the US Dollar one might therefore expect an exchange rate to the NMC of $1{,}00 \times 112{,}8/118{,}5 = 0{,}952$ (in 2005 it will be 0,93 or 2% lower).

For the Euro one might then expect an exchange rate to the NMC in 2005 of $1{,}07 \times 112{,}8 / 114{,}5 = 1{,}054$ (in fact it will be 1,17, i.e. 11% higher). But, leaving out Euro's introductory period –see Table 2– one gets on expected rate of $1{,}15 \times 112{,}8/114{,}5 = 1{,}133$ (cf 1,17, thus only 3% higher). The same approach results for the (100) Yen in an expected rate of 1,02 (the present rate of 0,863 is 15 percent lower), and for the British Pound in an expected rate of 1,60 (the present rate of 1,70 is 6 percent higher). In relation to purchasing power the ¥ seems the worst bet and the £ the best while the € is really just slightly better, and the $ only somewhat worse, i.e. with regard to the international purchasing power of these currencies after that duely has been taken account of their national purchasing power.

5. The NMC as rod of measurement

In several directions the NMC might be used as a rod of measurement, both concerning the development of certain magnitudes in the course of time, and for the comparison of magnitudes at (in) the same moment (period).

Take for instance the development of oil prices, which at present seem rather high with a price for Brent–oil around fifty US Dollar per barrel[1]. In US Dollar of 2003, the price had a historic high level of $81 in 1980, but from 1986 onwards it was throughout stable between levels of twenty and thirty US Dollar. Then in the end of October 2004 it reached a peak of $52 and since that moment it did not come back to a lower price range.

In 2003 the US Dollar had an exchange rate to the NMC of 0,98; therefore the Brent–price before was stable around 24,50 units of NMC, while $50 is equivalent to 46,50 units of NMC.

With the actual scarcity of oil (for various reasons), the market cannot easily be balanced, because –in the present circumstances– the pricing in dollars meets an inelastic response of demand in the Eurozone because of

lower exchange rates of the Dollar in that area. This drives the price in US Dollars upwards before also the supply side gets motivated to increase.

The working of the oil market, in order words, is rather hindered by this going up and down of the exchange rates for the US Dollar, and the oil price might be better expressed in some other more stable kind of currency.

Another example may be found in a comparison of stock exchanges. The Dow Jones Index on the NYSE in the beginning of March, 2005, came at 10.900 and with that on a level which lately was reached in June, 2001. In between, medio September 2003, this index had a level of around 9.450. Taking for instance the (Amsterdam) AEX Index, that had a level of around 500 in June, 2001, in between 333 in medio September, 2003, and in the beginning of March, 2005, it was around 375. From June (10) to August (5), 2005 the AEX Index went up from 376 to 391, with the Dow Jones moving from 10.513 to 10.558. But how does this kind of information read, if and when we would translate it in terms of NMC? For the answer: see table 3.

Table 2: *Exchange rates to the NMC*

year	US Dollar	EURO	Dow Jones ×NMC/USD	A´dam AEX ×NMC//EUR
June 01	1,070	0,970	11.663 = 100%	485 = 100%
Sept. 03	0,987	1,107	9.327 = 80%	369 = 76%
March 05	0,900	1,190	9.810 = 84%	446 = 92%
June 05	0,942	1,141	9.903 = 85%	429 = 88%
Aug. 05	0,943	1,166	9.960 = 85%	456 = 94%

In terms of NMC, the Dow Jones after fifty months is fifteen percent below its June 2001 level. However, the AEX Index now appears to be only six percent behind its previous level. Incidentally, one notices the (temporary?) effect of the negative referenda in France and Holland about the European Constitutional Treaty, the "Second Treaty of Rome", on financial markets.

6. The NMC and International Financial Transactions

In the previous discussion of the oil market, it has already been suggested that the oil price might be better expressed in some more stable currency,

than the US Dollar, and e.g. the NMC could clearly fulfill that function. In that way the continuous clearing of the oil market would be enhanced, seen from the demand side and the supply side, resulting in a more fluent adaptation of the oil price.

The same might be the case for certain other internationally traded bulk goods such as agrarian commodities, various minerals and non–ferro metals. Even so one might think of the global silver market and the gold market. In the following a specific example will be given for international financial transactions, once e.g. the NMC would be accepted as an international money yardstick instead of the previously globally accepted US Dollar, namely the introduction of internationally (on stock exchanges) traded bonds.

One could think of bonds of goverments or, parallel to some more recent development in the Eurozone, (e.g. multinational) business corporations[2]. Now that the valuta–risk of the 12 different countries has disappeared –with the introduction of the Euro(zone)– the ("institutional") investors in the Eurozone became interested in the credit risk related business bonds.

The same, for that matter, could eventually happen on a global scale too. Instead of taking one particular valuta, either the US Dollar or the Euro or any other, as international money yardstick, the NMC –though not actually functioning in the way of "real" giral or chartal money– would have the advantage of reducing the valuta–risk inherent to one particular valuta.

Next to shares, of international business corporations, more room would be given to globally tradable NMC–bonds, of the same (or other) institutions. The financing of mondial interesting projects could certainly in that way become more efficient and the general welfare in the end also promoted.

7. Conclusion

Various sombering scenario's could be made –and indeed have been made– for eventual negative effects, on global welfare, of an further (smaller or larger) downfall of the US Dollar. On the hypothesis that time has come to contemplate about a different international money yardstick, than that one of most of the twentieth century, this paper has looked into

the possibilty of some combination of four different world currencies to fulfill this role. Both in terms of its nominal and real value, he suggested "new millennium currency" comes forward as a more stable and therefore reliable alternative. It would be a matter of time, before ultimately a world bank could be trusted, to initiate the issue of "world money"in either giral form or also in the form of world bank notes and international mint coins.

8. Post Scriptum: The Case of the Renminbi

Around the 20th of July, 2005, the Chinese authorities announced a change in the exchange rate policy for their currency. After many years holding the rate of the so called "Renminbi" in a fixed proportion of 8,27 YUAN to the US Dollar, they responded to outside pressure for some revaluation. They choose for an immediate rise of 2,3 percent of the YUAN, opposite the US Dollar, and binding their currency to a basket of different valuta: fifty percent for the US Dollar, 15 percent for the Euro, fifteen percent for the YEN and 20 percent for various other currencies (e.g. Sterling).

An approximation for this change of Chinese exchange rates is as follows:

- the rate for 100 "Renminbi" directly went up from $12,06 to $12,34,
- the value of 100 "Renminbi" in future would be related to a basket of $6,17 plus €1,50 plus ¥200 plus e.g. £1,43 (i.e. for "other valuta"),
- eventual daily adjustments were announced of not more than 0,3% opposite the US Dollar and not more than 1,5% opposite the Euro.

It is tempting to interpret this redirecting of Chinese exchange rates to be an application of what we have in mind with this paper. It might be the first flower of a nice kind of which thousand more will shine in future. At least the Chinese, with this change of their currency policy, will have an easier entry to various forthcoming international trade negotiations.

NOTES

1. Cf. inter alia the article of Kingma & Mulder, in: ESB 2004, pages 598 ff.
2. See on the spectacular growth of the Euro business bond market, in recent years, the article of Admiraal & De Bondt, in: ESB 2004, pages 110 ff.

ECONOMIC EFFECTS OF TECHNOLOGICAL PROGRESS IN THE EARLY CLASSICAL PERIOD (1800–1840): A SYNOPTIC REVIEW

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Abstract

The issue of technology played a significant role, not only in the development of Political Economy, but furthermore in explaining a variety of significant developmental processes. The main purpose of this paper is to analyse and evaluate the various ideas and arguments presented by economic thinkers of the early Classical period –e.g. during the time of advanced industrialization in Britain (1800–1840)– concerning the various economic effects of "machinery". These effects are analysed and discussed under the following headings which comprise the relevant sections of the paper: (1) the effects on productivity and the level of prices; (2) the effects on the rate of profits and investments; and 3) the effects on the rate of real wages and the level of employment. These effects, moreover, are examined in the light of various empirical findings and with respect to some modern theoretical conclusions. From this analysis we can deduce that many economic thinkers of the period in question (mainly British) had recognized and analysed the majority of those economic effects caused by the introduction of new technology and had incorporated them into the corpus of Political Economy.

JEL classification: B12, O30.

Keywords: Technological effects, classical economics, unemployment.

1. Introduction

The issue of technology played a significant role in the development of "Political Economy" during the Classical era (Berg, 1980, p. 10). The main purpose of this paper is to analyse and evaluate the various ideas and arguments "on the effects of machinery" that were developed by some representative economic thinkers (mainly British) in the early Classical

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period (1800–1840). During this period "machine production and the factory system became definitely established in England and were on the way to becoming so in western countries of the Continent" (Gourvitch, 1940, p. 39).

The various effects of technology are examined and discussed under the following headings which comprise the relevant sections of this paper: (1) the effects on productivity and the level of prices; (2) the effects on the rate of profits and investment; and (3) the effects on the rate of real wages and the level of employment. These outcomes, moreover, have been examined in light of various empirical findings and with respect to relevant modern ideas, arguments and conclusions. From this analysis we can deduce that, in early 19th century economic thought, a majority of the economic effects caused by the introduction of new technology had been recognized, examined and incorporated into the corpus of "Political Economy". Indeed, there remain but few effects, elaborated on by modern day economic theorists, that were not investigated in some manner by those earlier writers of the Classical period.

I. Effects on productivity and the level of prices

The effects of technological progress, endogenously and exogenously induced[1], on the rise of productivity –the "efficiency of technology" as we term it today (see Brown, 1966, pp. 13–5)– and on the reduction of prices were recognized and investigated by various economists at the end of the 18th and the beginning of the 19th centuries[2]. More specifically, Adam Smith (1776, p. 676) emphasized that the increase of labours' productivity depends, "first, upon the improvement in the ability of the workman; and secondly, upon that of the machinery with which he works". J.B. Say (1803, p. 86) regarded that "machines" increase the productivity of labour, not only by advancing its dexterity and skill, but additionally, by introducing and making use of some additional "natural agents". George Craufurd, in his *The Doctrine of Equivalents* (1803), expressed the view that by labour–saving technology, the cost of production and the price of goods are diminished. And if such goods are "of general use", "produce also the effect of lowering more or less the price of all articles" (quoted in Gordon, 1967, p. 11). Lord Lauderdale (1804, p. 289), similarly, stressed that through

"machines" the cost of production and prices decreased. In a similar tone, James Mill argued (1808, pp. 29–30, 81; 1821, pp. 16, 72, 74, 199) that, by the introduction of new technology, either the volume of production is increased, or the cost of production is reduced. Thus, in case "the productive power" is increased, under the function of Say's law, the rate of effective demand is increased, and so are the shares of distribution (i.e. profits and wages).

As is known, the core of the Ricardian pessimistic attitude toward economic progress was that of the diminishing returns of agriculture and the pressure of population's increase (i.e. Malthus doctrine). Ricardo, however, acknowledged (1815, pp. 11, 19ft; 1817, pp. 77–8, 156,335) that, by the introduction of new technology, the point of the stationary economy could be postponed for further doses of the factors of production. Therefore, productivity and the rate of profits would be increased, while, at the same time, the rate of real wages and rents would not be reduced.

The argument for the positive effect of the introduction of new technology in postponing the emergence of diminishing returns, was adopted and developed by some other economists in Britain[3] and America[4] and recently has been verified[5].

Another positive effect of the introduction of new technology which was also discussed by Ricardo (1815, pp. 19, 25ft; 1817, p. 94), is the reduction of prices. Nevertheless, he did not consider it to have a direct effect upon the profit rate. Instead, he argued (1817, pp. 118–9, 133; see also Berg, 1980, p. 55) that technical change indirectly influences the rate of profit through a reduction of the real wage rate and not through a diminution of the price of non necessary (i.e. non subsistence) goods.

The effect of new technology on the variation of the level of prices, however, was developed more deeply by some other economists. More specifically, Robert Torrens argued that the variation of prices depends upon the capital/labour ratio employed in the relative production process –an explanation with a genuinely modern sound as the neoclassical analysis related the effects of new technology with the rate of labour/capital ratio (see e.g. Brown, 1966, ch. 12). Torrens maintained (1821, pp. 101–2) that the price of goods in a labour-intensive industry, after the introduction of labour-saving technology, would be reduced much more than those of a capital– intensive industry[6]. However, he emphasized (see Karayiannis,

2000) that in the long-run, the introduction of new labour-saving or capital intensive technology, by raising labour's productivity, would reduce the cost of production, thereby decreasing the rate of prices of the produced goods. The same view was developed also by Read (1829, p. 188), Longfield (1833, pp. 219–20, 238), Vethake (1838, p. 94), Tozer (1838, p. 7), and J.S.Mill (1848, pp. 124, 128, 700). In particular, Tozer, by using mathematical analysis, attempted to prove the usefulness of labour-saving "machines" in diminishing the rate of prices and increasing consumers' welfare – a concept that has since been validated through modern approach and analysis (see e.g. Salter, 1960, ch. IV).

The argument of the above Classical authors who maintained that, by the introduction of new technology, the cost or production and the level of prices would be reduced is confirmed by experience. Mokyr has shown (1985, p. 6) that the intersectoral spillover effects of technological improvement in manufacture, agriculture and transportation, at the beginning of 19th century England, were the main factors in diminishing the cost of production.

II. Effects on the rate of profits and investment

It was a widely circulated argument by the time of Steuart (1767, vol. 1, p. 256) and Smith (1776, p. 77), that the innovator gains a short-run extraordinary profit. Such a case was described more fully by some authors of the early 19th century. More specifically, J.B. Say explicitly discussed (1803, pp. 86–7, 89–90), that, in the beginning of the introduction of a new more productive "machine", the benefits are gained by the innovator. However, as the function of the imitators began taking place, the process of intense competition would increase the volume and/or the quality of products, thus resulting in a reduction of price levels, thereby eliminating the source of extraordinary profits. In this manner, Say described quite clearly the mechanism by which diffusion of technological benefits throughout the entire community would be accomplished.

Robert Torrens, was also deeply engaged in analyzing the effects of new technology on the profit rate and investment. The role of profits and technology in Torrens' analysis differs somewhat from the relevant Ricardian one (see Karayiannis, 2000). Torrens turned against Ricardo's and James Mill's thesis of the inverse relationship between wage and profit

rate, basing his main counter-argument upon the effects of technological progress. He held (1815, p. xvii) that if by the "improvements in agriculture" the cost of production is reduced, while the amount of production and employment remains the same, then, "the proportions, or proportional wages remain unchanged, yet profits have risen". Torrens' main assumption was that through the competitive mechanism and the role of the process of profit equalization, technological effects would be extended to the whole economy. Moreover, he developed the thesis that through increased investment, stimulated by the prospect of a higher rate of profit gained by the introduction of new technology, the rate of economic growth would be increased, mainly when there existed unemployed labourers (see Karayiannis, 2000, pp. 71–7). Such a theory has been formally developed and empirically proved in the mid–20th century by Fei, Ranis (1963; see also Hale, 1979).

In regard to the detailed economic analysis of the various results of technological progress, Charles Babbage was the leading figure in the early 19th century (see Schefold, 1996). He advanced the following three main advantages of "machinery":

"The addition which they make to human power. –The economy they produce of human time.– The conversion of substances apparently common and worthless into valuable products" (1832, p.6).

Babbage credited the innovative process to the profit motive and the function of competition– as did Schumpeter (1911, pp. 93–4, 132–6) in a similar manner, less than a century later. Namely, as the function of the innovative entrepreneur. As Babbage wrote:

"The great competition introduced by machinery, and the application of the principle of the subdivision of labour, render it necessary for each producer to be continually on the watch, to discover improved methods by which the cost of the article he manufactures may be reduced; and, with this view, it is of great importance to know the precise expense of every process, as well as of the wear and tear of machinery which is due to it" (1832, p. 203).

Such a competitive process toward reduction of cost, according to Babbage, was the main target of the capitalist-entrepreneur[7]. He maintained (1832, pp. 121–2) that the short-run monopolistic profit gained by the innovator would be eliminated in the long-run by the actions of

imitators. Such a competitive process was also recognized by the majority of writers during the period in question, e.g. Lauderdale (1804, pp. 162–5, 168–9, 228), Read (1829, p. 185), Scrope (1833, pp. 195, 242), Rae (1834, pp. 321–3), Carey (1837, p. 89), and Tucker (1837, p. 54).

Babbage also claimed (1832, p. viii) that the target of the manufacturer is to produce a commodity of better quality at a lower cost. Then, the innovator by diminishing the price of goods would increase their demand and thus his own profit (1832, pp. 119–120)[8]. He fully described (1832, pp. 27–37, 63) the process through which the introduction of new technology (i.e. "new machines") would increase the productivity of labour. Also, he argued that, through the specific qualities of mechanized production, such as uniformity, steadiness, velocity and precision, a better and more uniform-quality product would be produced[9].

Moreover, Babbage maintained that an economy of resources is an additional outcome of large firms and of increasing returns in manufacture. He acknowledged (1832, pp. 217–224; see also Romano, 1982, p. 394, ft 42; Schefold, 1996, p. 34) some important cost advantages accruing to large firms, such as: (a) the production of some by-products useful in the firms' trade activities; (b) the establishment of fame and good-will; and (c) the ability to undertake research activities. Such an argument in behalf of the large firms' effectiveness in producing new technology has also been stressed by many modern economists (see e.g. Schollhammer, 1982; Hammond, 1984). Babbage's argument about the results of the operation of large firms seems to be verified according to recent empirical evidence (see e.g. Huberman, 1991). It is also shown (see Blaug, 1960–1, p.93) that, in the British cotton industry during the early decades of the 19th century, large firms were much more able to introduce and incorporate labour-saving technology than were smaller ones.

Babbage also specified (1832, pp. 212–6) that increasing returns in manufacture are produced by: (i) the reorganization of production, (ii) an increase in the capital/labour ratio, and (iii) the introduction of new technology. In addition, he recognized (1832, p. 228) the gathering of the various manufacturers in a specific place as a source of the emergence of external economies –an argument developed later on by Marshall (1890, pp. 395–9).

As well as the above positive influences of new technology on the rate of

profits shared by the majority (see Tucker, 1960, p. 179) of the classical authors, there exists another negative, mainly emphasized by McCulloch. Such an effect is related with the obsolescence of fixed capital. As McCulloch (1826, p. 12) argued, the increased level of the real wage rate would promote the introduction of labour-saving technology. Such a process would rise the rate of fixed capital obsolescence, a condition that would lead to a reduction in the rate of profits[10]. Nevertheless, he stressed (1825, p. 153) that after all these consequences of the introduction of new technology, society's benefits would be advanced. Such a causation analysis that relates the process of new technology and the rate of capital obsolescence has been developed more extensively in modern-day economic theory by Eisner (1956), Salter (1960, pp. 67–70) and others.

Arriving at the radical economic thinkers of the early industrialization period, we come across some interesting arguments regarding the effects of technological progress. More specifically, Sismondi shared the view (1826, pp. 144, 147; 1834, p. 200; see also Gourvitch, 1940, p. 51) that market competition as an innovative process in the use of new labour-saving "machines" results in short-run monopolistic profits. Also, he stressed the superiority of large firms against small ones in regard to the cost reducing process[11]. However, some other radical theorists, such as the Ricardian socialist Bray, turned against the concept of an innovative process and its supposed positive effects on increasing the rate of profits. He credited (1839, p. 83) the increased poverty of the mass of population to the appropriation of the fruits of "machines" by the capitalist.

III. Effects on the level of employment and the real wage rate

Aside from the previously discussed significant economic effects brought on by the introduction of new technology, there are some other effects that received considerable attention from the economic thinkers of the period in question. These are the various direct and/or indirect outcomes of "machinery" on the short-run and long-run welfare level of the labouring class–results which were also being discussed at that time in the British parliament[12].

From the time of Sir James Steuart, the various consequences of new technology on the level of labourer's welfare had been discussed. Steuart noticed (1767, vol. 1, pp. 124–5, 256) the short-run unemployment caused

by the introduction of "machines". However, he maintained that the long-run effects of "machines" are the advance of production and the rise of demand for labour. Some years later, J.B.Say would argue that a direct effect is the emergence of short-run unemployment (see also, Gourvitch, 1940, p. 47; Heertje, 1973, p. 23), but, by conducting a cost-benefit analysis, he claimed that labourers in the end would be benefited by the technological progress. He noticed (1803, pp. 87–8) four factors compensating those "thrown out of employ":

(1) "New machines are slowly constructed, and still more slowly brought into use; so as to give time for those who are interested, to take their measures, and for the public administration to provide a remedy";

(2) "machines cannot be constructed without considerable labour, which gives occupation to the hands they throw out of employ";

(3) "The condition of the consumers at large, and consequently, amongst them, of the class of labourers affected by the innovation, is improved by the reduced value of the product that class was occupied upon"; and

(4) "The multiplication of a product commonly reduces its price, that reducing extends its consumption; and so its production, though become more rapid, nevertheless gives employment to more hands than before"[13].

The majority of writers during the early decades of industrialization recognized and specified the short-run unemployment that unavoidable took place as a result of the introduction of new labour-saving technology. Some of these writers, such as Johnson (1813, p. 52) and Rooke (see Seligman, 1903, p. 98), however, by passed such a situation, stressing the positive long-run effects on labourers. Other economic theorists, such as Ricardo, argued that there existed some detrimental negative effects on labourers' welfare. He altered his original positive views concerning the consequences of new technology and, by introducing in his 3rd edition (1821) of *On the Principles of Political Economy and Taxation* the new chapter "On Machinery", tried to demonstrate specific negative effects on labourers' welfare[14].

Ricardo's early support for the beneficial effects of "machinery" to all the classes of society was based (1817/1821, pp. 387, 390) upon the following

argument: the introduction of capital-intensive "machines", which increase productivity and reduce the rate of real costs, by leaving the composition of fixed to circulating capital intact, would cause an increase in consumption and in real wage rate –and at least, temporary profits– without reducing employment. The important factor for the favorable outcome for labourers of the introduction of "machines" is produced through the reduction of the prices of consumable goods which would induce an increased saving, capital accumulation and investment, which in its turn, would rise the demand for labour[15]. Also, he recognised (Ibid., p. 396; see also his letter to Malthus, Bonar, 1887, p. 99; and ed. 1951, pp. 234–6), that, if the rate of profit after the introduction of "machines" is increased, then the capital accumulation would be augmented and the demand for labour would also be increased[16].

The negative effect of "machinery" in increasing the rate of unemployment had been stressed in British parliamentary speeches as early as 1819[17]. Ricardo, by changing his mind regarding the positive effects of "machinery" during 1820–1 (see Sraffa, 1951, p. lx), wrote that "I am convinced, that the substitution of machinery for human labour, is often very injurious to the interests of the class of labourers" (1817/1821, p. 388). Thus, he examined (1817/1821, pp. 392, 388, 390,392) the following potential negative consequences of the introduction of "new machines" on labourers' welfare and interest: (i) the level of total production would be reduced and thus the demand for labour would be decreased (see also Hollander, 1979, p. 343)[18]; or (ii) by the same level of total production, the ratio of circulating to fixed capital would be diminished and thus the demand for labour would be reduced[19]. The crucial factor in both these arguments upon the rate of employment is the rate of profits and the way that it is used. In the case where the profits are spent by the capitalist, Ricardo argued (1817/1821, p. 393) that the re-absorption of unemployed labourers would be determined by the kind of goods on which the increased demand of capitalists were imposed. If these profits were spent to increase the demand of "menial servants", then the demand for labour would be augmented more than if they were spent for such luxury goods as costly furniture, carriages, etc.

Ricardo, in addition to the above cases where the introduction of "machines" may be proved detrimental to the labourers' welfare, noticed

another such example: “of the possibility of an increase in the amount of the net revenue of a country, and even of its gross revenue, with a diminution of demand for labour, and that is, when the labour of horses is substituted for that of man” (1817/1821, p. 394; see also ed. 1951, p. 239; Meaccci, 1998)[20]. This detrimental for the labourers consequence of “machines”, according to Ricardo (1817/1821, p. 395), is supposed to happen when “improved machinery is suddenly discovered, and extensively used”. On the other hand, when a gradual introduction and extensive use of “machines” takes place, the increased rate of capital accumulation would re-absorb the unemployed labourers[21]. Ricardo, at the end, evaluating both the positive and negative effects of “machines” on labourers, suggested (1817/1821, p. 396) not to be “discouraged in a State, for if a capital is not allowed to get the greatest revenue that the use of machinery will afford here, it will be carried abroad, and this must be a much more serious discouragement to the demand for labour, than the most extensive employment of machinery”.

The issue of the introduction of new labour-saving technology and its effects on labourers' welfare was central to the economic thought of the early 1800's. More specifically, the American economist, Jacob Cardozo, criticized the Ricardian argument of the unavoidable tradeoff between the rate of profits and wages. He counter-argued (1826, p. 50) that in a progressive economy with new implementations of technology, the rate of profit would be increased. Therefore, capital accumulation would be augmented. Such an increased capital accumulation would advance the rate of investment, the demand of labour, and at the same time, the rate of wages. By such a process, he claimed (1826, p. 57) that the interest of both entrepreneurs and labourers in the labour-saving technology is not contradicted, but harmonized.

One of those who analysed the various outcomes of new technology on labourers’ welfare through a mechanism that takes place mainly in the consumption side of economy was the American economist, Daniel Raymond. Raymond examined (1820, vol. II, pp. 110–1) two main effects of the introduction of “machines”: a shifting of labour from one employment to another, and a stimulus for inventions and innovations. He then claimed (1820, vol. II, pp. 109, 115) that, at the end, the non-saturation consumption demand is the prime cause for the re-absorption of

unemployed labourers created by the introduction of "machines".

However, the leading figure in explaining the effects of new "machines" on labourer's welfare through the consumption side of the economy was Thomas Malthus. He based his relevant explanation of the rate of re-absorption of the unemployed labourers, on the rate of price elasticity[22]. He argued (1820, p. 352) that all technical innovations which are labour-saving would reduce cost and diminish the rate of price. Hence, the quantity demanded would be augmented. In cases where the increased demand is higher than the quantity produced by new technology, the demand for labour would be expanded[23]. As is obvious, the key factor in this positive effect of "machines", for Malthus, is the extension of total production and demand for labour which are generated by the rise of income which springs from new technology. He expressed the view (1820, pp. 356–7, 360) that the extension of the internal and external markets for those goods produced by new technology is the safeguard for the prevention of unemployment[24].

However, Malthus was well aware that the above positive results of technology on employment might not occur because there are the following cases where the rate of profits and the demand of labour would not be increased: (1) when there is an inelastic demand for the products and thus the demand for labour is not increased (1820, p. 352)[25]; (2) when there exist no more profit opportunities for the employment of the additional capital and thus labour demand would not be increased (1820, pp. 353–4, 358–9; see also Gourvitch, 1940, p. 54); and (3) when the rise of the real income derived by new technology might not result in a proportional increase to the work effort of individuals and their demand for commodities (1820, p. 355). Moreover, he criticized Ricardo's argument that any improvement in agriculture would lower the rate of rent and thus the landlord would be against such improvements (Paglin, 1961, pp. 66–7). Malthus counter-argued (1820, pp. 195–6) that through the gradual introduction of technological improvements in agriculture, the rate of production would increase and so would the rate of population and the rate of rent –an argument repeated later on by Jones (1831, pp. 212–3).

Some years later, McCulloch (1825, ch. VII; see also O'Brien, 1975, p. 227) examined the objections toward the beneficial effects of the introduction of "machines" as exposed by those stressing the possibility of

a “glut”, such as Sismondi (see Sowell, 1974, pp. 41–2)[26]. He regarded (1825, pp. 145, 155–6; see also Gourvitch, 1940, p. 64) that a general overproduction, or a “glut”, in economy could not take place, although a short-run unemployment would be created by the introduction of labour-saving “machines”. Thus, he suggested (1825, p. 153) that the state take care of the temporarily unemployed.

On the other hand, he recognized some positive consequences of “machinery” on labourers’ welfare. He claimed (1825, pp. 142–4, 148) that, by the introduction of “machines”, the productivity of labour is increased and thus the cost of production and the price of the goods are reduced. Such an alteration would cause an increase of demand and thus the level of long-run employment would not be reduced –an argument also shared by Carey (1837, pp. 15–6, 29). McCulloch justified this argument for the beneficial effects of technology upon employment on the following grounds: (a) the high level of demand elasticity for necessary goods; (b) the functioning of Say's law; and (c) the increased demand for “machines”. In regard to the first case of increasing employment, he argued (1825, p. 152; see also O’Brien, 1975, p. 228) that the introduction of new technology in the production of a necessary and widely circulated good would increase its rate of demand and, thus, unemployed labourers would be re-absorbed into the same industry[27]. In the case where Say's law prevailed, McCulloch held (1825, pp. 149, 156ft; 1826, p. 93) that the reduction of the price of a necessary good - produced by new technology - having an inelastic demand, would cause consumers to augment their demand for other products. The third instance of new technology increasing the rate of employment, according to McCulloch (1825, p. 153), derives from the increased demand and production of “machines”: “a new field for the employment of additional hands in the construction of machinery, and in the subordinate departments connected with the manufacture[28]”. Based on his extensive analysis of the effects of technological progress, McCulloch concluded (1825, pp. 154, 320; 1826, pp. 92–3) that, in the end, the welfare of labourers would be significantly increased.

The British economist, Nassau Senior, by developing the wage fund theory (1831, pp. iv, 18–9), credited some important beneficial effects of new technology on labourers' welfare. He regarded (1831, pp. 43–4; see also Gourvitch, 1940, p. 67) that if the “machines” are mainly introduced in

the production of capital goods, the total wage fund remains constant and thus the general wage rate would not be reduced. On the contrary, in cases where there exists an introduction of "machines" into "the production of any commodity used by the labouring population, the general rate of wages will rise" (1831, pp. 44–5). He justified (1831, p. 45; 1836, pp. 165–6) such an effect by observing, as McCulloch had done previously, that when the introduction of technology brings about the reduction in price of a product with high price elasticity, the employment in such an industry would not be diminished but, to the contrary, would be increased.

In general, Senior claimed (1831, p. 49), that the introduction of new technology, by increasing the rate of profits without decreasing the level of wages at the same rate, brings an increase in total capital destined for investment[29]. Such an increase of total capital, under the functioning of Say's law, would cause an increase in labour and/or its wage rate. Therefore, in the long-run, as Senior argued, "the use of machinery must either raise the general rate of wages, or leave it unaltered" (1831, p. 43) –an argument also shared by Chalmers (1832, pp. 476–7, 555)[30].

Charles Babbage repeated (1832, pp. 334–5) the argument of compensatory unemployment of "machines", by stressing that the increased demand caused by the reduction of the level of prices, would advance, in the long-run, the demand for labour[31]. However, he noticed that a short-run unemployment and a change of labourers' occupation are unavoidable consequences, since there would always be some labourers not properly qualified to work with new technological prerequisites. He also examined the consequences of the over-supply of products on the rate of unemployment and the real wage rate. He argued (1832, p. 232) that, in general, if there is a "glut" in a market, then, either the wage rate or the demand for labour would be reduced in order for the supply of products to decrease, thus enabling the equality between demand and supply of products to be restored at a profitable price level. However, he recognized (Ibid.) that such a possibility of overproduction could be avoided when the diminution in the level of prices "opens the consumption of the article to a new class" and demand would increase accordingly.

Aside from the above effects of new technology on the rate of employment, Babbage emphasized (1832, p. 335) the increase of real income of consumers produced by the reduction in the level of prices of

necessary goods. Such an increased income would enable consumers to buy more luxury goods and thus their welfare would be advanced. Yet, he was aware of and addressed (1832, p. 250) the argument put forth by some economic theorists that there is a conflict of interest between the labourers and entrepreneurs toward the introduction of new technology. He found such an argument to be erroneous and "unfortunate" (Ibid.,). Instead, he claimed (1832, p. 251)that there existed a harmony of interests as "the prosperity and success of the master manufacturer is essential to the welfare of the workman"[32].

Robert Torrens allotted much space in his works to an analysis of the various consequences of "machines" on the welfare of labourers. Although he accepted (see Karayiannis, 2000) the well-circulated argument for short-run unemployment, he criticized (1821, pp. xi–xii, ft.) the Ricardian thesis regarding the detrimental effects of "machines" on the rate of employment. Then, in his treatise of 1834, he used the second chapter, entitled "On the effect of machinery upon wages" (1834, pp. 33–44), to justify his thesis that, by the introduction of new technology, the welfare of the labourers is increased. In proving this thesis, he used (1834, pp. 33–5) lengthy arithmetical examples to demonstrate that by the introduction of a new labour–saving technology, the cost of production is reduced and the rate of profit is increased. Therefore, the investment or consumption of these extra profits would increase the demand for labour, thus ensuring that the welfare of the labourer would not deteriorate –such an argument had already been stressed in 1826 by W. Ellis (see Blaug, 1958, p. 71).

Torrens, however, not only discussed the above positive effects of technological progress on economic productivity and labourers' welfare, but also mentioned two short-run problems (see Karayiannis, 2000). The first deficiency of technological progress, according to Torrens, is that of structural unemployment and the shifting of labourers from one sector of production to another. He was well aware of the fact that when workers were dismissed by one sector of production (e.g. agriculture), although they would ultimately find employment in other sectors (e.g. manufacture), their productivity would be significantly reduced as they did not possess the necessary skill and dexterity in their new employment[33]. The second short-run negative effect would take place due to the decline, albeit temporarily, of the unemployed labourers' living standard. Torrens proposed, as a

remedy for such a situation, the establishment of a national fund for the unemployed. However, in his later work, where he was especially persuasive in the distinction between the long-run and short-run effects of technological progress on the labourers' welfare, he concluded:

"The ultimate effect of every new application of mechanical power, causing the same quantity of work to be executed by fewer hands, is to increase national wealth, and to enlarge the field of employment. The immediate effect of every such improvement is to diminish the demand for labour in the particular trade to which it is applied" (1834, p. 260)[34].

Samuel Newman in America, followed (1835, pp. 69–73) a reasoning process similar to that of Malthus, McCulloch, and others in examining the effects of new technology on unemployment through the response (i.e. the price and income elasticities) of demand. However, he suggested that, in the case where the increased demand for goods in other branches is not adequate for the re-absorption of unemployed labourers, then, the state must intervene and create some "employment opportunities". He also maintained (1835, p. 74) that the emergence of short-run unemployment could be avoided if the introduction of new labour-saving technology took place gradually. In such a case, the labourers would have adequate time to find employment in other industries or regions (1835, p. 74). Such a spatial distribution of labour after the introduction of a new technology has been adequately explained by Lloyd (1837, pp. 73–4).

George Ramsay in Britain, though he devoted an entire book (1836) of more than 500 pages to analysing the various income's shares and the causes which determine their rate, spared but few pages to the subject of technological effects. He considered (1836, pp. 189–90; 218–9, 226, 455) that labour-saving technology, by increasing the productivity of production and maintaining the same rate of circulating to fixed capital, would augment, in the long–run, the living standard of all the proprietors of the factors of production[35].

From the above analysis, it becomes clear that a majority of the mainstream economists of the early decades of the industrialization process exaggerated, more or less, the beneficial effects of new technology on labourers' welfare. However, there did exist some radical voices of the period who were concerned with the possible deleterious effects of such technological progress on labourers' welfare.

One of the most eminent of those radical economic thinkers to delineate the negative consequences of technology with respect to the labourer was Sismondi. He examined the results of the introduction of "machines" in two different cases: where there is a shortage of labour, and where there is an adequate amount of labour. In the first case, he regarded (1815, p. 65) that the introduction of "machines" would be beneficial to all the classes of society, because it would reduce the cost and the price of products. In the second case, he claimed that the position of the labouring class would deteriorate as the resultant unemployment emerged. He claimed (1826, pp. 117, 121) that the introduction of "machines" in Britain caused a reduction in the rate of employment and a reduction in the labourers' living standard. Thus, he regarded (1826, p. 141; 1834, p. 216), that if the fruits of labour were distributed more equally among the members of a community, a "happier" society would be established. He justified such a thesis with the disturbing observation (1834, pp. 210–1, 216) that an entire class of manufacturers could be ruined through the appearance of a market overproduction or "glut". Such a crisis would be created (1834, pp. 210–1; 1835, pp. 235, 239, 242–3) through the reduction of the wage rate and/or of the labour share which would, in turn, diminish the consumption level of economy, thus resulting in an over-supply which, ultimately, would ruin the capitalists as well[36].

The Ricardian socialist, Thomas Hodgskin, was not, in essence, opposed to the introduction of new technology, but rather to the unequal distribution of the produced surplus. He argued (1825, pp. 22–3) that the increased surplus, produced by an advance in skill, knowledge and technology, is gained not by the labourers, but instead by the capitalists, and thus the welfare of labourers was not improved[37]. As he had emphasized the skill and knowledge of the labourers to be the most decisive factor for increasing productivity (1825, pp. 46, 61) and that "machines" were nothing more than "the produce of previous labour" (1825, p. 54), he claimed that the labourers' proprietorship of such surplus was purely justified (Ibid, pp. 54–5, 92, 99).

Conclusions

As we have shown in the above analysis, the following important effects of new technology had been recognized and adequately explained by the economic theorists of the early Classical period: (1) the increase in productivity and the decrease of prices; (2) the postponement of the emergence of diminishing returns; (3) the rise of the profit rate, of the level of capital accumulation and investment; (4) the emergence of increasing returns in some sectors of economy, such as manufacture and trade; (5) the sectoral and spatial redistribution of labour and capital; (6) the temporary unemployment; (7) the higher rate of the obsolesence of capital and labourer's skill and knowledge; (8) the possible crises of overproduction; (9) an increase in the general living standard; and (10) a redistribution of wealth against the labour class. The relevance of these early Classical period theorists to modern day economic thought is demonstrated by the fact that many of their concepts regarding the effects of the introduction of new technology have been verified by modern empirical investigations; others, through the application of neoclassical assumptions and techniques, have ultimately been incorporated into the corpus of modern mainstream economic theory.

NOTES

1. For an analysis of the supply-push and demand-pull factors influencing and determining technological progress in the early decades of the 19th century, see Karayiannis (1998).
2. For example, Sir James Steuart (1767, vol. 1, p. 255) had anticipated the effect of “machines” in diminishing the price of products.
3. Among the main leading figures who developed such an argument were Torrens (1821, pp. 123–5, 128–36,138, 187,191), McCulloch (1825, pp. 121, 419, 467), Edmonds (1828, pp. 123–5, 165), Samuel Read (1829, pp.

254 ft, 304 ft), Scrope (1833, pp. 265–9), and Longfield (1833, p. 187) who specially emphasized that, by the continuation of technological innovations, the case of diminishing returns would not take place.

4. See e.g. Jacob Cardozo (1826, pp. 15, 17–8, 35, 136), Vethake (1838, p. 94) and the Scot-Canadian John Rae who additionally pointed out (1834, pp. 12–3, 20) that through new technology the rate of profits and capital are increased (see also Drakopoulos, 1998). Rae, as Heertje (1973, p. 82) comments, is "a somewhat neglected figure whose importance is now being recognized, was not only a pioneer of the theory of capital, but also made a significant contribution to the theory of technical change".
5. The so-called "iron law of diminishing returns", as McCloskey (1981) recently has shown, was postponed because of the improvement of the factors of production derived from advanced technology.
6. The improvement in transportation and trading practice, as Torrens has shown (1821, pp. 192, 207), would decrease the transaction costs and thus the price of goods. Ellet's empirical research (1839) proved that in North America, due to technological improvements in transportation, the price of the trade goods was diminished, while the volume of trade had tremendously increased. For an historical analysis of the effects of technological progress on the means of transportation in relation to economic development during 19th century economies, see Parker (1961).
7. The British entrepreneur was much more an innovator than the Continental one. As Hoselitz (1955, pp. 118–9) has shown, entrepreneurs in England, during the early decades of the 19th century, were much more willing to take risks in introducing various technical innovations under the expectation of a higher rate of profit than to undertake other kinds of investment.
8. Babbage advised (1832, pp. 248–9) the product innovator to search for the right time when introducing a new product into the market. Longfield (1833, p. 232), by analyzing the positive outcome of new technology on the level of profits, disregarded any specific entrepreneurial innovative function. However, he clearly distinguished between the capitalist and the entrepreneur who, as he says (Ibid.), is actively engaged in business supplying "his skill and labour in superintending the business in which it is employed." For the various

functions of pure and non-pure entrepreneurship recognised by the members of the Classical School, see Karayiannis (1990).

9. McCulloch had similarly stressed (1825, p. 52) that the increased production of manufactured goods had been made possible by the introduction of new technology. Also, he argued (Ibid.) that, by such a mechanized process, not only had the cost and the price of products been decreased, but that a better quality and "a degree of fineness and of evenness, or equality" had been achieved.
10. The consequence of the various innovations of the production process on the rate of capital obsolescence had also been recognized by Craig (1821, p. 141) and Senior (1836, p. 71). Later on J.S.Mill (1848, p. 80) had stressed that by sudden technological progress the rate of human capital obsolescence would be also increased.
11. Sismondi had called (1834, p. 206) "industrialism" the process of the transformation of small firms into larger ones.
12. The rate of unemployment in some specific branches of production and regions increased in the first decade of the 1800's. The movement of "Luddites", who started to break the frames in a systematic plan of action, took place in such industrial districts as Nottingham, Lancashire, etc (see Trevelyan, 1942, p. 482).
13. The French writer, Tracy, although following (1817, pp. 154–5) Say's analysis on the effects of new technology, primarily examined the case in which "a workman is never so adopted to the business he seeks as to that which he is forced to quit" (1817, p. 148). Thus, he suggested (1817, p. 155) that society take measures to relieve the temporarily unemployed.
14. McCulloch objected Ricardo's changing of mind in regard to "machinery". As Ricardo wrote to Malthus "McCulloch has specifically and strongly objected to my chapter on Machinery; he thinks I have ruined my book by admitting it, and have done a serious injury to the science" (Bonar, 1887, p. 184). But as he claimed "the truth of my propositions on this subject appear to me absolutely demonstrable" (Ibid.,). For an extensive analysis of Ricardo's "old" arguments in favour of "machines", see Hollander (1979, pp. 342, 346–8). For a scholarly analysis of Ricardo's views on the various effects of the

introduction of new technology and the way that these views were developed through Ricardo's correspondence with his contemporaries, see Gourvitch (1940, pp. 58–62); Blaug (1958, pp. 64–71); Heertje (1973, pp. 11–20); Hollander (1971; 1979, pp. 339–375).

15. The role of capital accumulation in the advancement of technological progress and economic growth, which was emphasized by the majority of mainstream writers belonging to the Classical School, has been analytically explained and verified by Johansen (1961).
16. John Hicks (1969, p. 154) extended this Ricardian idea arguing that, "Once the initial fixed capital stock has been accumulated.... it will itself, by farther technical progress, gain in productive power; this later growth imposes no strain upon savings, so that it has a purely favourable effect upon the demand for labour". A similar argument was used by Ranis and Fei (1969) to justify that the main characteristic of the Industrial Revolution was the increased rate of fixed capital something which was empirically verified by Mokyr (1985, p. 34).
17. For a detailed analysis of relevant views and arguments, see Gordon (1976, pp. 64–5, 89).
18. Ricardo make specific to a letter to Malthus that "machinery sometimes actually diminishes the gross produce" (Bonar, 1887, p. 188). Ricardo's argument for the output-reducing technology with the same rate of profit was criticized by Senior who regarded it (1836, p. 163) to be a "vulgar error", and commented (1831, pp. 39–40): "I do not believe that there exists upon record a single instance in which the whole annual produce has been diminished by the use of inanimate machinery". Later on J.S. Mill (1848, p. 98) although accepted the Ricardian possibility of reduction of total product after the introduction of a new technology, he considered it to be a short-run case. In the long run any technological improvement would result in an increase in profits and/or a decrease of prices. In the beginning of the 20th century, Wicksell (1901, p. 137) criticized this Ricardian argument, arguing that such a possibility "is theoretically untenable. A diminution in the gross product, or in its value (assuming, ... that prices of commodities are given and constant), is scarcely conceivable

as a result of technical improvements –under free competition".

19. This Ricardian idea for the effects of "machinery" in reducing the rate of employment had been stressed during the same period by John Barton in his *Observations on the Circumstances Which Influence the Condition of the Labouring Classes of Society* (1817), (see Schumpeter, 1954, p. 681; Sraffa, 1951, p. lviii; Sotiroff, 1952, pp. 90–1, 94; Hollander, 1979, pp. 349–50).
20. Senior also accepted the short-run effects of such a substitution for the rate of unemployment as an "apparently possible" (1831, p. 43) case. However, he noticed that these were "the natural accompaniments of a certain period in the progress of national improvement" (1836, p. 164).
21. Such an argument for the positive outcomes of the gradual introduction of new "machines" was also adopted and used by some other authors, such as James Mill (1821, pp. 14–5, 263), E.S. Cayley (see Gordon, 1967, p. 15), etc. (see also Zamagni, 1996, p. 44).
22. The measure of price elasticity was used by an English merchant during the 1830's (see Clapp, 1962).
23. Malthus (1820, p. 352) takes as an example the innovations in the cotton industry in Great Britain of his time. Mokyr recently (1977) verified the increased demand for labour in the British textile industry during the Industrial Revolution. McCloskey (1981, pp. 59, 63, 65) also has shown that such increased demand was an outcome of the reduction of price credited to technological innovations.
24. Bloomfield (1978) analysed the arguments, ideas and suggestions of 19th century British economic thinkers for the effects of technological improvements on foreign trade and, particularly, on the establishment of relevant comparative advantages.
25. Pigou later on investigated (1920, pp. 676–8) the effects of new labour-saving technology on labourers' welfare by considering the kind of goods (consumption or luxury) to which such technology was applied.
26. McCulloch has also contradicted (1825, pp. 126–7) the "popular prejudice" that the introduction of new technology and the increase of manufacture would be "unfavourable to the health of the people",

claiming that such a progress "has been marked by an extraordinary diminution of the rate of mortality."

27. A similar argument was advanced also by Cardozo (1826, p. 56), Chalmers (1832, pp. 474–5), and, more recently, has been verified by Mokyr (1977, p. 110).
28. According to empirical data (see Musson, 1957–8, pp. 175–6), during the first three decades of the 19th century British economy, a majority of the "machines" were "executed by hand"; thus, the rate of labourers employed in the manufacture of "machinery" had increased.
29. Tozers (1838, p. 516), by using mathematical analysis, showed how extra profits would increase the circulating capital and the demand for labour. Similarly, J.S.Mill's thesis was that innovation in manufacture, e.g. the inventions of Watt and Arkwright, increase the labour productivity and the rate of profits. Such an increase has as a consequence the increased accumulation of capital which is reinvested in the same production process. This would increase the demand for labour and the wage rate, not only in this production, but also in agriculture as the demand for its products would be increased (1848, p. 350). Under the function of Say's law he claimed that a case of not reinvestment of capital is rather rare, as "the entire savings of the community [is]… annually invested in really productive employment within the country itself" (1848, p. 732; brackets added);.
30. According to empirical data (see Trevelyan (1942, p. 470; Court, 1954, p. 5; Deane, Cole, 1962, p. 27; Deane, 1973, p. 221), during the post-Napoleonic period, the population in Britain had increased as the death-rate had declined and an increase in temporary unemployment had taken place; nevertheless, the living standard of labourers' showed a remarkable rise. However, the living standard of the English working class was advanced later on, mainly during the period between 1820–1850 (see Lindert, Williamson, 1983; Tunzelmann, 1985).
31. For an analysis of the various endogenous and exogenous factors of compensating employment, see Heertje (1973, pp. 25–8) who, in addition, (Ibid., pp. 28–34) created a "model of compensation in Classical Economics".

32. Babbage, in order to avoid the extreme maldistribution of increased wealth produced by the use of "machines" (1832, pp. 253–4, 257–9), suggested a new system of firms' organization based on the type of proprietorship and on the structure of decision-making. He recommended (see also 1832, pp. 257–9) a new system of enterprise in which "intrapreneurship", the term now used to describe the entrepreneurial activity of employees in a modern company, would be stimulated. Such a system, he reasoned (1832, p. 254; see also Schefold, 1996, p. 32), would be established in a kind of "partnership" between skilled workers and small capitalists.
33. This is a kind of labour skills obsolescence that has been mostly emphasized during the various technological "revolutions" of the 20th century (see e.g. Salter, 1960, p. 153).
34. Marx, in his *Capital* (1867, pp. 413–5) characterized such arguments in favour of "machines" as the "Theory of Compensation" which states that the labourers will be compensated for initial sufferings, incident to the introduction of new technology. Marx turned against such a theory (1867, p. 415), claiming that "the real facts, which are travestied by the optimism of economists, are as follows: The labourers, when driven out of the workshop by the machinery, are thrown upon the labour-market, and there add to the number of workmen at the disposal of the capitalists." Marx's ideas and arguments for the introduction and causes of technology are splendidly presented by Heertje (1973, ch. 3) and Rosenberg (1982, pp. 34–51).
35. The same argument used by the members of the Manchester School for the repeal of the corn laws in 1843 (see Hirst, 1903, pp. 168–9).
36. Sismondi also proposed another solution to the problem of "glut", or over-supply, produced by the use of labour-saving technology. He stated (1835, pp. 235, 238) that technological progress had to be directed toward an improvement in the quality of the product, without reducing the consumption power of the labourers.
37. Crafts, in his paper (1980), shows that during the Industrial Revolution, the living standard of the labourers and lower income classes in Britain did not share in the fruits of mechanization as did other income groups, such as the entrepreneurs and landowners. Some other modern

economic historians, such as Lindert and Williamson, (1983) and Tunzelmann (1985), have shown that the living standard, measured as material gains, of the English working class during the early phase of the Industrial Revolution (1750–1820) was much lower than that gained during the period from 1820 to 1850.

REFERENCES

Babbage, C. (1832), *On the Economy of Machinery and Manufactures*, 4th ed. 1835, Fairfield NJ: A.M. Kelley, 1986.

Berg, M. (1980), *The machinery question and the making of political economy 1815–1848*, Cambridge: Cambridge University Press.

Blaug, M. (1958), *Ricardian Economics: A Historical Survey*, 2nd ed. Greenwood Press, 1973.

Blaug, M. (1960–1), *The Productivity of Capital in the Lancashire Cotton Industry during the Nineteenth Century*, Economic History Review, vol. XIII, pp. 358–381, repr. in K. Tucker (ed.) Business History: Selected Readings, London: Frank Cass & Co. Ltd, 1977, pp. 91–125.

Bloomfield, A. (1978), *The impact of growth and technology on trade in 19th century British thought*, History of Political Economy, vol. 10, No 4, pp. 608–635.

Bonar, J. (1887), *Letters of David Ricardo to Thomas Robert Malthus 1810–1823*, Oxford: At the Clarendon Press.

Bray, J.F. (1839), *Labour's Wrongs and Labour's Remedy; or, The Age of Might and The Age of Right*, New York: A.M. Kelley, 1968.

Brown, M. (1966), *On The Theory and Measurement of Technological*

Change, Cambridge: Cambridge at the University Press.

Cardozo, J.B. (1826), *Notes on the Political Economy*, Clifton: A.M. Kelley, 1972.

Carey, H. (1837), "Principles of Political Economy", New York: A.M. Kelley, 1965.

Chalmers, T. (1832), *On Political Economy in connection with the Moral State and Moral Prospects*, New York: A.M. Kelley, 1968.

Clapp. W. (1962), *A Manchester Merchant and his Schedules of Supply and Demand*, Economica, vol. 29, No 114, May, pp. 185–7, reprinted in K. Tucker (ed) Business History: Selected Readings, London: Frank Cass & Co. Ltd, 1977, pp. 377–380.

Court, W. (1954), *A Concise Economic History of Britain: From 1750 to recent Times*, Cambridge: Cambridge at the University Press, Cambridge.

Crafts, N.F.R. (1980), *Income Elasticities of Demand and the Release of Labor by Agriculture During the British Industrial Revolution: A Further Appraisal*, in J. Mokyr (ed) The Economics of Industrial Revolution, London: George Allen & Unwin, 1985.

Craig, J. (1821), *Remarks on some fundamental questions in Political Economy*, New York: A.M.Kelley, 1970.

Davis, J.B. (1989), *Distribution in Ricardo's machinery chapter*, History of Political Economy, vol. 21 No 3, pp. 457–480.

Deane, P. (1973), *The Industrial Revolution in Great Britain*, in M.Cipola (ed) The Fontana Economic History of Europe, Part one, Glasgow, Fontana/Collins, pp. 161–227.

Deane, P. and Cole, W. (1962), *British Economic Growth, 1688–1959: Trends and Structure*, 2nd ed. Cambridge: Cambridge at the University Press, 1969.

Drakopoulos, S. (1998), *The concept of order of Instruments and Goods in J. Rae and C. Menger*, in O. Hamouda, C. Lee, D. Mair (eds.) The Economics of John Rae, London: Routledge.

Edmonds, T.R. (1828), *Practical Moral and Political Economy*, 2nd ed. 1833, New York: A.M. Kelley, 1969.

Eisner, R. (1956), *Technological Change, Obsolescence and Aggregare Demand*, American Economic Review, vol. XLVI, No 1, pp. 92–105.

Ellet, C. (1839) *An Essay on the Laws of Trade in reference to the Works of Internal Improvement in the United States*, New York: A.M. Kelley, 1966.

Fai, J. and Ranis, G. (1963) *Innovation, Capital Accumulation, and Economic Development*, American Economic Review, vol LIII, Bo 3, pp. 283–313.

Gordon, B. (1967) *Non-Ricardian Political Economy: Five Neglected Contribution*, Massachusetts: The Kress Library of Business and Economics.

Gordon, B. (1976) *Political Economy in Parliament: 1819–1823*, London: Macmillan.

Gourvitch, A. (1940) *Survey of Economic Theory on Technological Change & Employment*, New York: A.M. Kelley, 1966.

Hale, C. (1979) *Resource transferal in the developing economy: a critique of the classical position*, History of Political Economy, vol. 11, No 3, pp. 363–381.

Hammond, P. (1984) *Must Monopoly Power Accompany Innovation?*, in C.Seidl (ed.) Lectures on Schumpeterian Economics, Berlin: Spring–Verlag.

Heertje, A. (1973), *Economics and Technological Change*, Engl. Trnsl. London: Weidenfeld and Nicolson, 1977.

Hicks, J. (1969), *A Theory of Economic History*, Oxford: Oxford University Press.

Hirst, F. (1903), *Free Trade and other Fundamental Doctrines of the Manchester School*, New York: A.M. Kelley, 1968.

Hodgskin, T. (1825), *Labour Defended Against the Claims of Capital*, New York: A.M. Kelley, 1969.

Hollander, S. (1971), *The Development of Ricardo's Position on Machinery*, History of Political Economy, vol. 3, No 1, Spring, pp. 105–135.

Hollander, S. (1979), *The Economics of David Ricardo*, London: Heinemann Educational Books.

Hoselitz, B. (1955), *Entrepreneurship and Capital Formation in France and Britain since 1700*, repr. in M. Falkus (ed.) Readings in the History of Economic Growth, London: Oxford University Press, 1968, pp. 95–133.

Huberman, M. (1991), *How Did Labor Markets Work in Lancashire? More Evidence on Prices and Quantities in Cotton Spinning, 1822–1852*, Explorations in Economic History, vol. 28, pp. 87–120.

Johansen, L. (1961), *A Method for Separating the Effects of Capital Accumulation and Shifts in Production Functions upon Growth in Labour Productivity*, Economic Journal, vol. LXXI, No 284, December 1961, pp. 775–782.

Johnson, A. (1813), *An Inquiry into the Nature of Value and of Capital and into the Operation of Government Loans, Banking Institutions and Private Credit*, New York: A.M. Kelley, 1968.

Jones, R. (1831), *An Essay on the Distribution of Wealth and on the Sources of Taxation*, New York: A.M. Kelley, 1964.

Karayiannis, A.D. (1990), *The entrepreneurial function in economic literature: A synoptic review*, Rivista Internazionale di Scienze Economiche e Commerciali, vol. 37, No. 2, pp. 245–268.

Karayiannis, A.D. (1998), *Supply-push and Demand-pull factors of technological progress in the early decades of the 19th century (1800–1840)*, History of Economic Ideas, Vol. VI, No 2, pp. 97–120.

Karayiannis, A.D. (2000), *Robert Torrens on Technological Progress*, History of Economic Ideas, Vol. VIII, No 2, 2000, pp. 63–94.

Lauderdale, J.M. (1804), "An Inquiry Into the Nature and Origin of Public Wealth and Into the Means and Causes of its Increase", New York: A.M. Kelley, 1966.

Lindert, P. Williamson, J. (1983), *English Workers' Living Stan-dards During the Industrial Revolution: A New Look*, in J. Mokyr (ed) The Economics of Industrial Revolution, London: George Allen & Unwin, 1985.

Lloyd, W.F. (1837), *Lectures on Population, Value, Poor-Laws and Rent*, delivered in the University of Oxford during the years 1832–36, New York: A.M. Kelley, 1968.

Longfield, M. (1833), *Lectures on Political Economy, Delivered in Trinity and Michaelmas Terms*, in R.D. Collison Black (ed.) The Economic Writings of Mountifort Longfield, New York: A.M. Kelley, 1971.

McCloskey, D. (1981), *The Industrial Revolution 1780–1860: A Survey*, in J. Mokyr (ed) The Economics of Industrial Revolution, London: George Allen & Unwin, 1985.

McCulloch, J.R. (1825), *The Principles of Political Economy*, 5th ed. 1864, New York: A.M. Kelley, 1965.

McCulloch, J.R. (1826), *A Treatise on the circumstances which determine the Rate of Wages and the condition of the Labouring Classes*, 2nd ed. 1854, New York: A.M. Kelley, 1967.

Malthus, R. (1820), *Principles of Political Economy*, 2nd ed. 1836, Fairfield, NJ; A.M. Kelley, 1986.

Marshall, A. (1890), *Principles of Economics*, 8th ed. London: Macmillan & Co, Ltd., 1959.

Marx, K. (1867), *Capital*, Vol. I, London: Lawrence & Wishart, 1954.

Meacci, F. (1998), *Further Reflections on the Machinery Question*, Contributions to Political Economy, vol. 17, pp. 21–37.

Mill, J. (1808), *Commerce Defended*, New York: A.M.Kelley, 1865.

Mill, J. (1821), *Elements of Political Economy*, 3rd ed. 1844, New York: A.M. Kelley, 1965.

Mill, J.S. (1848), *Principles of Political Economy*, Edit. By Sir W. Ashley, 1909, Fairfield: A.M. Kelley, 1976.

Mokyr, J. (1977), *Demand vs. Supply in the Industrial Revolution*, in J. Mokyr (ed) The Economics of Industrial Revolution, London: George Allen & Unwin, 1985.

Mokyr, J. (1985), *The Industrial Revolution and the New Economic History* in J. Mokyr (ed) The Economics of Industrial Revolution, London: Georege Allen & Unwin, 1985.

Musson, A.E. (1957–8), *James Nasmyth and the Early Growth of Mechanical Engineering*, Economic History Review, vol. X, pp. 121–7, reprinted in K. Tucker (ed) Business History: Selected Readings, London: Frank Cass & Co. Ltd, 1977, pp. 174–183.

Newman, S. (1835), *Elements of Political Economy*, Clifton: A.M. Kelley, 1973.

O'Brien, D. (1975), *The Classical Economists*, Oxford: Clarendon Press.

Paglin, M. (1961), *Malthus and Lauderdale: The anti-Ricardian Tradition*, Clifton: A.M. Kelley, 1973.

Parker, W. (1961) *Economic Development in Historical Perspectives*, repr. in N. Rosenberg (ed.) The Economics of Technological Change, Harmondsworth: Penguin Books.

Pigou, A.C. (1920), *The Economics of Welfare*, 4th ed. London: Macmillan & Co Ltd, 1960.

Rae, J. (1834), *Statement of Some New Principles on the Subject of Political Economy*, New York: A.M. Kelley, 1964.

Ramsay, G. (1836), *An Essay on the Distribution of Wealth*, Clifton: A.M. Kelley, 1974.

Ranis, G. and Fei, J.C.H. (1969), *Economic Development in Historical Perspective*, American Economic Review, vol. LIX, No 2, May, pp. 386–800.

Raymond, D. (1820), *The Elements of Political Economy*, 2nd ed. 1823, vol. I,II, New York: A.M. Kelley, 1964.

Read, S. (1829), *Political Economy an Inquiry into the Natural Grounds of Right to Vendible Property or Wealth*, Fairfield NJ: A.M. Kelley, 1976.

Ricardo, D. (1815), *An Essay on the Influence of a Low Price of Corn on the Profits of Stock*, in P. Sraffa (ed) The Works and Correspondence of David Ricardo, vol. IV, Cambridge: Cambridge University Press, 1951.

Ricardo, D. (1817/1821), *On the Principles of Political Economy and Taxation*, 3nd ed. 1821 in P.Sraffa (ed) The Works and Correspondence of David Ricardo, vol. I, Cambridge: Cambridge University Press, 1951.

Ricardo, D. (ed. 1951), *Notes on Malthus' Principles of Political Economy*, in P.Sraffa (ed) The Works and Correspondence of David Ricardo, vol. II, Cambridge: Cambridge University Press.

Romano, R. (1982), *The economic ideas of Charles Babbage*, History of Political Economy, 1982, vol. 14, No 3, pp. 385–405.

Rosenberg, N. (1982), *Inside Black Box: Technology and Economics*, Cambridge: Cambridge University Press.

Salter, W. (1960), *Productivity and Technical Change*, 2nd ed. Cambridge: Cambridge University Press, 1969.

Say, J.B. (1803), *A Treatise on Political Economy, or the Production, Distribution and Consumption of Wealth*, Engl. trns. by C.R. Prinsep, 1821, New York: A.M. Kelley, 1964.

Schefold, B. (1996), *Charles Babbage: Pioneer of the Theory of Industrial Organisation and Development*, in C. Perrota, V. Gioia (eds.) Innovations and Economic Changes, Leece: Congedo Editore, pp. 21–38.

Schumpeter, J. (1911), *The Theory of Economic Development*, engl. trnsl. by R. Opie, London: Oxford University Press, 1961.

Schumpeter, J. (1954), *History of Economic Analysis*, ed. Oxford University Press, New York.

Scrope G. Poulett (1833), "Principles of Political Economy deduced from the natural laws of social welfare and applied to the Present State of Britain", New York: A.M. Kelley, 1969.

Seligman, E. (1903), "On Some Neglected British Economists", The Economic Journal, vol. XIII, 1903, reprinted in E.R. Seligman Essays in Economics, 1st ed. 1925, New York: A.M. Kelley, 1967.

Senior, N. (1831), *Three Lectures on the Rate of Wages*, New York: A.M. Kelley, 1966.

Senior, N. (1836), *An Outline of the Science of Political Economy*, New York: A.M. Kelley, 1965.

Sismonde de Sismondi, J.C.L. (1815), *Political Economy*, ed. in Brewster's Edinburgh Encyclopedia, New York: A.M. Kelley, 1966.

Sismonde de Sismondi, J.C.L. (1826), *Preface to New Principles of Political Economy*, in Sismonde de Sismondi, J.C.L. (1847) Political Economy and the Philosophy of Government, New York: A.M. Kelley, 1966, pp. 113–150.

Sismonde de Sismondi, J.C.L. (1834), *On the Condition of the Work People in Manufactories*, in Sismonde de Sismondi, J.C.L. (1847) Political Economy and the Philosophy of Government, New York: A.M. Kelley, 1966, pp. 196–223.

Sismonde de Sismondi, J.C.L. (1835), *On the National Income, or the Income of the Community*, in Sismonde de Sismondi, J.C.L. (1847) Political Economy and the Philosophy of Government, New York: A.M. Kelley, 1966, pp. 224–244.

Smith, A. (1776), *An Inquiry into the Nature and Causes of the Wealth of Nations*, edited by R.H.Campbell and A. Skinner, Oxford: Clarendon Press, 1976.

Sotiroff, G. (1952), *John Barton (1789–1852)*, the Economic Journal, March, pp. 87–102.

Sowell, T. (1974), *Classical Economics Reconsidered*, Princeton: Princeton University Press.

Sraffa, P. (1951), *Introduction* in p. Sraffa (ed) The Works and Correspondence of David Ricardo, vol. I, Cambridge: Cambridge University Press.

Steuart, J. Sir (1767), *An Inquiry into the Principles of Political Oeconomy*, vol. 1,2, edited by A. Skinner, Edinburgh and London: Oliver & Boyd, 1966.

Torrens, R. (1815), *An Essay on the External Corn Trade*, new ed. 1829, Clifton: A.M. Kelley, 1972.

Torrens, R. (1821), *An Essay on the Production of Wealth*, New York: A.M. Kelley, 1965.

Torrens, R. (1834), *On Wages and Combination*, New York: A.M. Kelley, 1969.

Tozer, J.E. (1838), Mathematical Investigation of the Effect of Machinery on the Wealth of a Community in which it is employed and on the Fund for the Payment of Wages, New York: A.M. Kelley, 1968.

Tracy, D. (1817), *A Treatise on Political Economy*, Engl. trns. Thomas Jefferson, New York: A.M. Kelley, 1970.

Trevelyan, G. (1942), *English Social History: A Survey of Six Centuries, Chaucer to Queen Victoria*, London: Logmans, Green and Co.

Tucker, G. (1837), *The Laws of Wages, Profits, and Rent Investigated*, New York: A.M. Kelley, 1964.

Tucker, G.S.L. (1960), *Progress and Profits in British Economic Thought 1650–1850*, Cambridge: At the University Press.

Tunzelmann, G. von (1985), *The Standard of Living Debate and Optimal Economic Growth*, in J. Mokyr (ed) The Economics of Industrial Revolution, London: George Allen & Unwin, 1985.

Vethake, H. (1838), *The Principles of Political Economy*, 2nd ed. 1844, New York: A.M. Kelley, 1971.

Wicksell, K. (1901), *Lectures on Political Economy*, vol. I, engl. trns. by E. Classen, edited by L. Robbins, London: George Routledge and Sons, Ltd, 1934.

Zamagni, S. (1996), *Technological Change, Time-Use Policies and Employment*, in C. Perrota, V. Gioia (eds.) Innovations and Economic Changes, Leece: Congedo Editore, pp. 41–57.

A GAME THEORY APPROACH TO INSTITUTIONAL CHANGE

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Abstract

The subject of lock–in or path dependence has raised considerable interest in its various aspects. Economists have distinguished three different areas of lock–in: institutional, technological and spatial. In this paper we adapt for the first time a model that combines the new institutionalism approach with the mathematics of game theory in the form of signaling games in order to formulate a specific theory of path dependence and regime change, followed by the historical evidence of one specific case of sudden shock and change of regimes that take the form of what we call 'turn to the sea'. We present the case of Ancient Athens focusing in particular on its finances and solutions concerning public choice.

JEL classification: N00, N01, N13.

Keywords: Signaling games, lock–in, institutional change, Ancient Athens, state finance, public choice.

1. Lock–in and regime change

The subject of lock–in or path dependence has raised considerable interest in its various aspects. A path dependent sequence of economic changes is defined as one in which 'important influences upon the eventual outcome can be exerted by temporarily remote events, including happenings dominated by chance elements rather than systematic forces' (David, 1985). It is characterized by inflexibility or inertia, in that once an outcome begins to emerge, it becomes progressively more locked–in, and 'non ergodicity', in that historical 'small events' are not averaged away and 'forgotten' by the dynamics (Arthur, 1989). If we apply too strictly this to economic history there is a danger of a quasi–deterministic approach.

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Economists have distinguished three different areas of lock–in: **i)** Institutional, examining either why nations can be stuck with inferior and inefficient institutions that inhibit growth (North, 1981; Hodgson 1999, 2001), or delay their transition to capitalism. The second subject is still very actual, and more and more scholars offer their contributions explaining the slowness of transition of former communist countries by attitudes and values inherited by the communist regimes that are very slow to adapt and change (Pejovich, 2002; Zouboulakis, 2002), **ii)** Technological, attempting to explain the possible lock–in in inferior technologies (Arthur, 1989; David, 1994, 1985; Nelson and Winter, 1982) explain for example technological lock–in as 'time consuming and costly for a firm to learn about, and learn to use, technology significantly different from that with which it is familiar', i.e. the transaction cost of introducing new technologies may be perceived by some firms as being too high. They further elaborate this through the introduction of the 'neighborhood' concept, the result of today's searches being both a successful new technology and a natural starting place for the searches of tomorrow.

Technology thus becomes 'cumulative' on a given one adopted at some point in time, a conclusion similar to that of David (1985). Glete (2000) mentions an historical case, the Portuguese inability during the 17th century to modernize their shipping technology as an interesting case of inertia in an established organization. **iii)** Spatial, concerning firm location and its impact to regional development (Krugman, 1991; Fotopoulos and Spence, 1999; Gilpin, 2002) uses the concept of path dependence in order to explain competitive advantages of different countries over time. A country which at a certain point in time may have an initial advantage in some technology, may be able over time to strengthen this advantage through an 'accumulation of experience', while a country which did not have this advantage initially, may fall further back in the course of time. So, if path dependence is an often – encountered phenomenon, what causes great changes, which can be called a change of regime, or a break with the old path? What are the conditions that would cause a bifurcation in the historic path?

The new institutionalism approach has underlined gradual macro historic change that brings about in some cases a transition of regimes. North (1978, 1981, 1984, 1990, 1991, 1994) has been the main exponent of institutional change and the conditions that shape them, analyzing historical examples

of successful transition (for instance, England and the Netherlands in the 17th century) as against unsuccessful ones (for instance, Spain and France in the same century). The new institutionalism approach incorporates the historical complexity of institutional change and recognizes that the historical context in which a specific change takes place is often decisive in determining how that change unfolds (Fogel, 1997). The theory has been developed taking into account for example the effects of warfare on taxation (Hoffman and Rosenthal, 1997), sovereign debt (Weingast, 1997) and the interrelations of economic, social, political and normative factors (Greif, 1997).

But we can also distinguish historical cases where change and the transitions to a new regime have been more dramatic and faster. These cases are related to the impact that an external shock of great magnitude had on these states and societies forcing upon them a change of regime in order to meet successfully the threat and survive.

In the next section we present an outline of the theory of shock and adaptation then a model that combines the new institutionalism approach with the mathematics of game theory in order to formulate a specific theory of path dependence and regime change, followed by the historical evidence of two specific cases of sudden shock and change of regimes that take the form of what we call a 'turn to the sea'.

2. Outline of the model

We start with a general case, where a society evolves among a given path or regime that has been determined by past historic events. This regime has an upper and a lower boundary that illustrate path dependence or lock–in. Small events or small shocks do not break the path dependence of the regime, because they cannot overcome inertia, as illustrated by the boundaries.

Change can come about in three ways: **i)** gradually, by small internal adaptations that combine, strengthen and gain momentum over time, possibly leading to a different regime, **ii)** more rapidly, due to a successful reaction and adaptation to a big external shock. This shock may take the form of an external threat that puts into question the survival itself of the

country / society. The international order has a dominant impact in these cases on the internal political and socioeconomic regime (Downing, 1993) and this distinguishes this situation from that of gradual change which is mainly due to internal dynamics, indigenous social classes and economic development or **iii)** through an internal sudden revolution that overthrows the 'old regime', like in France in 1789 and Russia in 1917, although here too, the forces that overthrow the regime are being gathered over a period of time preceding the actual revolution.

In the second case, the choice is between continued independence and loss of sovereignty for the country whose regime we consider. Military organization plays here an important role. Successful defense against the external danger necessitates military reorganization, and this again demands the adaptation of the institutional framework of the society.

Regime changes that are linked to 'turns to the sea' are characterized by four elements: 1. They lead to more representative and democratic regimes (political change). 2. They lead to economic growth (economic change). 3. Coupled with territorial expansion – empire building (geographic change) to institutional change that is both a result and a driving force of the other three elements, and 4. An alliance of interests.

Some of these elements may be present also in other regimes, but only in cases of 'turns to the sea' are all four to be found at the same time. The adaptation may take two forms: either bring about an authoritarian absolutist state, of which examples are Spain in the 16^{th} – 17^{th} century, Russia in the 18^{th}, Prussia in the 17^{th}–18^{th} and France in the 17^{th}–18^{th}, if the military adaptation takes the form of strong standing land armies under the direct authority of the king, a situation called by Roberts (1958), Downing (1993) and others 'the military revolution', or, if the military adaptation takes the form of, as we call it 'a turn to the sea', then more liberal, and democratic regimes may develop (Gilbert, 1975; Glete, 1993; Rodger, 1997, 2003; Kyriazis and Zouboulakis, 2002).

We characterize cases of grave external threat to the existence of a country and its successful defense and adaptation, 'Survival'. The outcome of a big external shock may thus bring about 'survival' and faster regime change, if it takes the form of a 'turn to the sea', but it may also lead to the destruction of the country, which loses its independence, if it does not succeed in defending itself successfully. We call this outcome 'breakdown'.

We have many examples of breakdowns of more 'traditional' societies in America, Asia and Africa, when they were confronted by European expansionism after the 16th century. Hanson (2002) illustrates for example the breakdown of the Atzec Empire, which could not resist the Spanish invasion in the early 16th century and the breakdown of the Zulu society, when confronted by the British in the second half of the 19th century.

In more recent periods, breakdown situations occurred after World War 2, with the overthrow of dictatorial regimes in Italy, Germany and Japan, and of capitalist regimes in the states of Eastern, Central Europe and the Balkans by the Soviet Army. These economies may be developing now in transition from the old communist regime to a new capitalist one along the line GC–NR_2 in Figure 1 presented in the next section.

We focus in the outcome we called 'turn to the sea', as a specific case of successful change of regime towards more democratic and constitutional societies. When the external threat forces the state to change its defense strategy by a 'turn to the sea', the probability of a break with the old path and the eventual development along a new path / regime becomes greater. Often, the 'turn to the sea' is linked to technological – military innovations, which again lead to tactical innovations in order to take best advantage of the new, in modern terminology, 'weapon system'.

Naval power needs a great degree of consensus within societies, because navies require a much higher amount of resources, than land armies, being, in modern terminology, much more capital intensive. To illustrate this, it suffices to say, that the English fleet, that met the Spanish Armada had a total of more than 830 guns[1] for about 13.000 crew. A land army of similar strength for the same period would never field more than 50 guns and of much smaller callibre than naval guns[2]. The above example of course does not take into account all other resources needed to build a ship. Shipbuilding brings with it, through industrial linkages, and spillovers, the development of new sectors and new skills. If the time horizon is long enough these developments mature and are as if a continuous game was played, where the various players / interest groups undergo a learning process that permits them to estimate better their own cost – benefit result of the situation. If the majority of the interest groups / decision makers feel that the turn to the sea is to their advantage, then a great alliance of interests is cemented and proves itself viable for long periods. This again

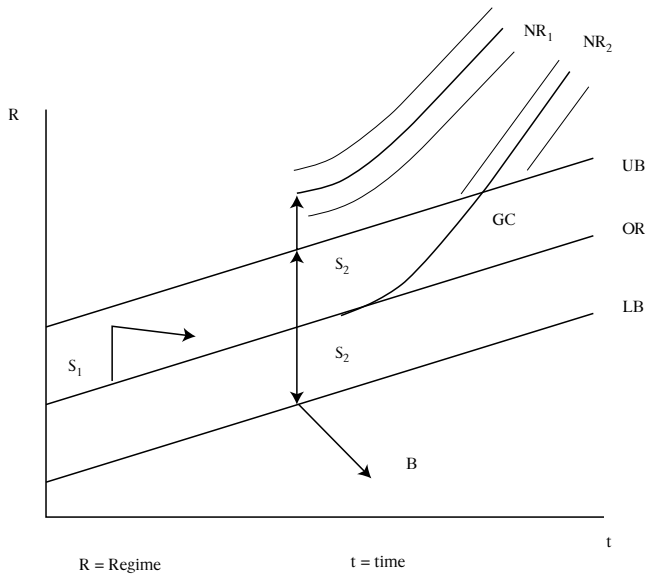
brings about further institutional change that safeguards the interests of the alliance and further promotes these interests, which in most known cases (as we elaborate in the last section) bring about 'expansion' and are beneficial for economic efficiency and growth.

Let us know turn to a more detailed formulation of the model.

3. A Game Theoretical Modeling Using Signaling Games

Let us first start presenting the analysis graphically. Figure 1 illustrates the possible outcomes in regime changes over time for a given country / society. OR is the central path of the 'old regime', with UB and LB the upper and lower boundaries that illustrate the lock–in and inertia of the system. At time t_1 there is a relatively small shock S_1 to the regime, which results in a deviation from the central path. But this shock is not strong enough to overcome the boundaries of lock–in and gradually the system returns to the old path. At time t_2 there is a strong external shock S_2, a vital threat to the country's independence and existence. This shock is strong enough to overcome the boundaries of inertia[3].

Figure 1: *Path Dependence and Change.*



Two outcomes are possible: either the system does not successfully adapt and the country is overcome by its enemies, which we characterize as B, 'breakdown', or it meets the threat successfully and adapts relatively fast, so that the country survives. The successful adaptation brings about a new regime, NR_1, which we characterize as SU, 'Survival'. The 'turns to the sea' and the historical analysis following next, fall within this category. A situation like S_2 could also come through a sudden internal revolution, where the 'old regime' is violently overthrown by a revolution like the French one of 1789 or the Russian Communist of 1917–1920.

Lastly, we have the possibility of gradual adaptations: At point t_3 in time, enough forces have gathered internally within the old regime, so that the regime starts gradually to be transformed in a new one. This is characterized by gradual change GC, and the outcomes are mainly two, NR_2 which corresponds to a transformation towards a more liberal and democratic regime, or NR_3, towards a more absolutist one. In all three cases NR_1–NR_3 of new regimes, these bring again with them gradually new boundaries of inertia and lock–in, so that in future we can have again the various outcomes illustrated so far come again into play, but starting with the central path of whichever new regime has been the outcome of the previous historical situation.

The various possibilities illustrated are characterized by the following functions:

1. $OR = b_0 + b_1 P$ where P demotes the central path
2. $UB = b_0 + c + b_1 P$
3. $LB = b_0 - d + b_1 P$ with b_0, b_1, c and d constants.

The outcome of a small shock is

4. $OR = b_0 + b_1 P + S_1 e^{-g.t}$

so that the term $S_1 e^{-g.t}$ comes asymptotically towards the old path.

The outcome of a big shock is given by

5. $SU = b_0 + b_1 P + S_2 e^{g.t}$

i.e. the 'growth' exponent g of the shock becomes positive, so that we have development along a new path, where the term $S_1 e^{g.t}$ predominates. The requirement for the shock to break the boundaries of lock–in is that its initial magnitude be:

6a. $S_2 > b_1$ for Survival
and
6b. $S_2 < c$ for Breakdown

In the case of breakdown we have

7. $B = b_0 + b_1 P - S_2 e^{g.t}$

and lastly, for gradual changes of the two regimes, we have:

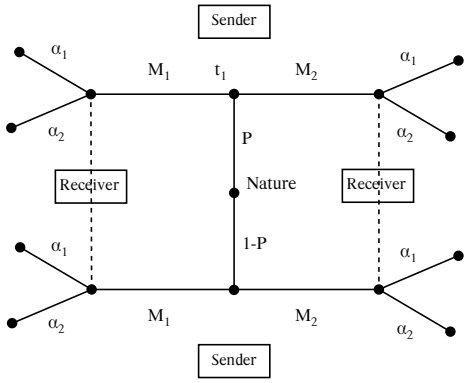
8a. $NR_2 = b_0 + b_1 P + e^{g_1 * t}$
8b. $NR_3 = b_0 + b_1 P - e^{g_1 * t}$

In this paper we formulate the behavior of the two countries as a signaling game. Signaling games are dynamic games of incomplete information between two players. In these games both the issues of updating and perfection arise. Specifically, following Gibbons (1992), a dynamic game of incomplete information between the players, a sender (S) and a receiver (R), is a signaling game, where the dynamic timing of the game consists of the following:

1. External event draws a type t_i for the sender (Persean) from a feasible set of results (strategies) $T = \{t_1, t_2, t_3,\ldots, t_J\}$ according to the probability distribution $P(t_i)$, with $P(t_i) > 0$ $\forall i$ and $P(t_1) + \ldots + P(t_I) = 1$.
2. The sender observes t_i and chooses a message (invasion threat) M_j from a feasible set of messages $M = \{M_1, M_2, M_3, \ldots M_J\}$.
3. The receiver (Athens) observes M_j but not t_i (sea / land) and chooses an action a_k from a feasible set of actions $A = \{\alpha_1, \alpha_2, \alpha_3, \ldots, \alpha_\chi\}$.
4. Payoffs are represented by $U_s (t_i, M_j, \alpha_\chi)$ and $UR (t_i, M_j, \alpha_\chi)$.

The figure below (adopted from Gibbons 1992) presents a graphical extensive form of a single case where $T=\{t_1, t_2\}$, $M=\{M_1, M_2\}$, $A\{\alpha_1, \alpha_2\}$and $Prob\{t_1\} = P$

Figure 2: *A single case of a Sender and a Receiver.*



In a signaling game a pure strategy for the sender is a function $M(t_i)$, which specifies the message to be chosen for each type that nature might drawn (in the form say of a shock) and a pure strategy for the receiver is a function a (M_j), which specifies the action to be chosen for each message that may be sent by the sender. The sender has two pooling strategies (sending the message) and two separating strategies (sending different messages). Specifically, the sender plays M_1 if nature draws t_1 or t_2 and plays M_2 if nature draws t_1 or t_2. In the case of separating strategies the sender plays M_1 if nature draws t_1 and M_2 if nature draws t_1 and M_1 if nature draws t_2.

In this kind of games a number of requirements are expected to be assumed. According to the first signaling requirement, after observing any message M_j from the feasible set M, the receiver must have a belief about which types could have sent M_j. If we define this belief by the probability distribution $\mu(t_i \mid M_j)$ where $\mu(t_i \mid M_j) \geq 0$ for each t_i in T, yields

$$\sum_{t_i \in T} \mu\,(t_i \mid M_j) = 1$$

Then for each M_j in M, the receiver action $\alpha^*(M_j)$ must maximize the receiver's expected utility, given the belief $\mu(t_i \mid M_j)$ about which types could have sent M_j. That is $\alpha^*(M_j)$ solves

$$\max_{\alpha_k \in A} \sum_{t_i \in T} \mu(t_i \mid M_j) U_R(t_i, M_j, \alpha_k)$$

This requirement implies that the sender's strategy is optimal given the receiver's strategy (Gibbons, 1992).

It follows that for each t_i in T, the sender's message $M^*(t_i)$ must maximize the sender's utility given the receiver's strategy $\alpha^*(M_j)$. That is, $M^*(t_i)$ solves

$$\max_{\alpha_{k\in A}} U_S(t_i, M_j, \alpha^*(M_j))$$

If we denote as T_j the set of types that send the message M_j given the sender's strategy $M^*(t_i)$, then for each M_j in M, if there exists t_i in T such that $M^*(t_i) = M_j$, then the receiver's belief at the information set which corresponds to M_j must follow from the Bayes' rule and the sender's strategy:

$$\mu(t_i \mid M_j) = \frac{P(t_i)}{\sum_{t_i \in T_i} P(t_i)}$$

A pure strategy perfect Bayesian Equilibrium in a signaling game is a pair of strategies $M^*(t_i)$ and $\alpha^*(M_i)$ and a belief $\mu(t_i \mid M_j)$ which satisfies all the above requirements (Gibbons, 1992). According to if the sender's strategy is pooling or separating, we call the equilibrium as pooling or separating respectively.

4. Historical evidence

Economists, social scientists and historians usually trace back the origins of the democratic and liberal states to the 17th century, citing as the most well known examples England and the Low Countries. We propose in this section to present a historic case of successful 'turns to the sea' in order to demonstrate that the elements of the theory presented in the previous section existed in older societies and countries as well (the case of Athens). We present the evidence in the form of a table (Table 1) that summarizes the main findings that support the theory outlined in the second section and the model of the third comparing Athenian and English institutions.

Table 1: *Local Government Share in General Government Expenditures (2001).*

Country	Threat	Innovation		Adaptation	Outcome	Time horizon			New regime characteristics
		Technical	Tactical			Preparaton	Transition	Expansion	
Athens	Persian invasion Loss of independence	New ships (Sea-hoplites)	Narrow waters combat	Built fleet, turn to the sea	Successful, invasion repelled, counterattack, empire	482-480 BC	480-462 BC	480-449 BC or 480-413 BC	More democratic, indications of increased welfare and growth
England	Spanish invasion Loss of independence	New galleons (better sailing properties, move efficient gun carriages, and fire ships)	Running gunfights avoid boarding	Built fleet, turn to the sea	Successful, invasion repelled counterattack, empire	1558-1588	1588-1689	mid 16th century up to 19th century	More democratic, increased welfare and growth, emergence of 'modern' economic institutions like stock exchange and jointstock companies to finance privateers and trade, emergence of property rights structure

Athens[4]

Athens faced the threat of the second Persian invasion which if not successfully repelled would lead to the loss of independence and incorporation into the Persian Empire. Athens reacted by a turn to the sea, first building a new fleet of 200 triremes. These triremes presented the technical innovation of having reinforced bows and rams that transformed them into 'sea–hoplites', i.e. ships superior to those of the enemy for frontal and close combat. The technical innovation necessitated suitable tactical moves, i.e. to choose favorable ground for direct confrontation. Thus the choice of narrow sea straits for combat, cape Artemission and Salamis, where the enemy's superior numbers and seamanship were nullified.

The outcome was successful for Athens, which after the Persian defeat at Salamis led the Greek counterattack, liberating gradually all Greek islands and the Greek cities of the Hellespont and the sea–shore of Asia Minor. The time horizon of the regime change, which followed the turn to the sea, comprised a two year preparation period, 482–480 B.C., when the fleet was prepared, a transition period from the old mainly land based regime to the new mainly sea – based one, which brought with it a transformation towards more democratic institutions, that more or less were completed with the reforms of Ephialtes (leader of the so called 'democratic' party before the advent of Pericles) 462–461 B.C.

Parallel to the institutional transition period, there was a period of expansion that combined territorial expansion with indications of economic growth and increased welfare. This phase begun in 479 B.C., with the sea victory of Mycale, encompassed the formation of the 'Athenian League' (the Alliance of Greek cities wishing to continue the war against Persia, under Athenian leadership after Sparta retired from the war) and ended in 449 B.C. with the so called 'peace of Kallias' (named after the Athenian negotiator) with the Persian Empire. Gradually the League was transformed into an Athenian empire, whose decline started with the disastrous Sicilian expedition of 413 B.C. and ended with Athens capitulation at the end of the Peloponnesian war in 404 B.C.

During this period, we have indications of the emergence of an alliance of interests between wide groups of the Athenian population: The poorest classes, which gained full political rights but also substantial economic benefits, first as workers to build the fleet, and then as rowers who were regularly paid out of the public treasury and also some of them as recumerated public servants. Also, a new class of 'entrepreneurs' emerged who were responsible for emerging sectors, linked to the shipbuilding programme and then to the increased trade opportunities offered within the Athenian empire, but also beyond it: Shipbuilding itself, followed by the iron and bronze industry, luxury goods, arms production, construction, jewelry, pottery, private banking etc (Cohen, 1997)[5].

Although growth and welfare are difficult to estimate for old societies, the anecdotic evidence we posses seem to indicate growth and increased welfare, as well as development of economic institutions and property rights that go hand in hand with political ones, as for example joint stock companies for trade and shipping and even a monetary union with one legal tender, the Athenian drachma that replaced all other currencies within the empire. Since the time horizon of the game was long enough, the 'players' – citizens had time to estimate and consolidate their estimates of the welfare gains of the turn to the sea. This, again reinforced first the transition to the new regime, and them created a new path dependence around it, that was so strong that it survived the downfall of 404 B.C. Less than a year later, in 403 B.C. the oligarchic regime imposed by the Spartan victors was over–thrown by a democratic revolution and Athens returned to its former regime and it turned again to the sea. After a big victory against the Peloponnesian fleet at Naxos, in 376 B.C., Athens became again the leading sea power a position it kept till its defeat by the Macedonian Kingdom in 322 B.C.

Next, we focus for the first time as far as we know, on the financial aspects (both the revenue and the expenditure side) of Ancient Athens, which are related to public choice. Ancient Athens is of course well known as the "prototype" political democracy. As we purport to show, it was also the prototype economic democracy, in the sense of active and general participation of it's citizens in decision making concerning economic issues, such as the choice of public goods, mainly but not only, defense. We want to underline here, that decisions taken under the principle of

"economic democracy" are not necessarily better or more correct than those taken under other forms of decision making, although in many cases the solutions adopted do seem to be farsighted, welfare promoting and also more "equalitarian", as we will analyze below. But what is indisputable is that decisions taken under "economic democracy" increase responsibility of the individual citizen. By having the right to vote on every issue, and very often using actively this right, the Athenian citizen did not delegate authority in decision–making, as citizens of modern democracies do by delegating decision–making to parties and governments. He took the personal responsibility of shaping economic policy and public choice upon himself. Correct or wrong decisions were the outcome of his choice and voting. Using modern concepts, this decision–making procedure is the first example of internalizing the benefits and costs of the outcomes of decision–making for every active citizen–voter. The outcome could not be perceived as an externality, i.e. something given and were the citizen had no, or at best minimal influence, as for example in today's decision making concerning defense, but depended on his own choice, expressed through his vote on every issue. In this aspect, we argue that Ancient Athens was more advanced than today's democracies, where decision–making is indirect.

We turn now to the analysis of the first and most famous case of public choice under the principle of "economic democracy" the so–called "Decree of Themistocles" or "Naval Law of Themistocles". In 482 B.C., when Athens faced the renewed threat of Persian invasion by Xerxes, Athens had a stroke of luck, which seemed almost a Godsend. At Maroneia, in the silver mining district of Lavrion near Sounion, the small operators who worked under contact for the city–owned mines struck an unprecended rich vein. The royalties reached the figure of 600.000 ancient drachmas (or 100 talents per year) at a time when one drachma was a middle–class day's income. This amount of money was enough to cover all the regular state expenses, with a large surplus to be allocated at a flat rate of ten drachmas per citizen.

But a speech by Themistocles carried the Assembly. The proposed distribution was called off, and the money was devoted to the building of 100 new ships, being entrusted to the 100 richest men (public entrepreneurs and contractors) each of whom was to take charge of one shipbuilding operation. This new liturgy, called trierarchy, led to additional shipbuilding during 482–1 B.C. and 480 B.C., so the Athenian fleet was comprised of 200

triremes, equivalent to the two thirds of the total Greek strength. This fleet defeated the Persian invaders in the naval battle of Salamis in 480 B.C., a decisive battle for the entire Western history (Burn, 1962; Munro, 1977).

The introduction of the Naval Law and the transformation it brought about is the first known historical example of what we call "economic democracy". This system includes (1) a decision–making process concerning not just political choices involving the exercise of public functions or making of war and peace but also economic choices, such as taxation and the provision of public goods; (2) a process of direct voting that can be characterised as a continuing process of '"permanent referendums"; (3) a market–like mechanism of decision—making, where the Athenian assembly of citizens –Ecclesia –simulated the attributes of modern markets. modern markets. This decision–making system served as a mechanism of (a) information exchange. (b) first defining and then safe–guarding property rights through laws voted by the Ecclesia; (c) expression by the citizens of their preferences of public decisions; (d) determining social prices and, (e) determining the distribution of tax burdens.

Economic democracy, like political direct democracy, is linked with continuous voting, but it also involves economic issues, the most important being the determination of public goods and their financial support. In the case of Athens, the information exchange prior to the vote determined: (1) the kind of public good 'defence' needed in order to face the threat, such as the decision to build a fleet or not; (2) the amount of the public good needed, as well as the time perspective, for example 200 triremes in two years; (3) the definition of property rights and their safeguard, e.g. who would build the ships and what their legal rights and obligations would be; (4) the "social price" of the public good, for example one talent per ship; (5) the distribution of tax burden, for example each citizen offering his ten drachmas of the Lavrion silver receipts. During the fourth century, "economic democracy" was further refined.

While during the fifth century, when Athens had transformed the Dehian League to an empire, and the war contributions of its former allies to a tribute to itself, the tribute amounting to 400 talents per year (Thac. II.13.3, a talent being 6000 drachmas, when a drachma per day was the remuneration of a worker at the Parthenon construction) during the 4th century Athens had lost its empire and had to find other means of finance.

In the second half of the fourth century Athens had the following sources of revenues:

1. Rents from state owned property, either directly or indirectly through sanctuaries and temples of various gods and divinities. These were let to auction to the highest bidder, usually on ten years leases. The auction was held in the Council under the direction of the so–called "poletai" (sellers), in the presence of the king–archon (επώνυμος άρχων, one of the state's high magistrates). Rents were paid annually to the apodektai in the " bouleuterion" building (Andoc. I.92–3, Arist., "Ath.Pol." 47.4). This method anticipated modern state procedures when dealing with similar matters.
2. Minerals and whatever lay beneath the soil belonged to the state. For Athens, the most important minerals were the silver–mines of Lavreion, which we mentioned already in their relation to Themistocles Naval Law. The mines were let out in separate concessions to the highest bidders for either three or even ten years at a time, in a procedure similar to the one under point one, but with the presence of the treasurer of the Military Fund and the Board of the Theoretic Fund. These two magistrates could be vaguely compared in their functions with todays Ministers of Defense and Culture respectively. The rents were payable each year to the "apodektai" (cashiess) in the bouleaterion building (Arist. Ath.Pol. 47.2). It goes again witout saying that this again anticipated modern procedures concerning mineral wealth, as for example oil concessions.
3. Custom duties, of which the most important was the "pentekoste" a two percent one on the value of all imports and exports. Collection was farmed out for a year to the highest bidders. Procedure was similar to that of point 2. What is important to note from a modern standpoint is that the highest bidders were usually a consortium of private individuals, which is an indication of the advanced nature of the legal procedures and property rights in the Athenian State. Without such the organization of consortiums would have been impossible (Andoc, 1.133–6, De. 35.29–30).
4. The "metoikion", a personal tax on metics (for non Athenian citizens living and working in Athens). It was farmed out on a yearly basis in the Council by the poletai (Harp.s.v. metoikion)

5. The "pornikon telos", the license fee paid by all prostitutes to carry out legally their profession (Aesch. 1.199–20)
6. Court fees, fines and confiscations. In private suits both parties paid fees called prytaneia, and in disputes of private citizens against the state a citizen deposited a "parakatabole" a percentage of the value in dispute, which was returned if the plaintiff won but fell to the state if he lost. Fines in public prosecutions went also to the state. They were frequent and could amount to several talents. Confiscated goods were sold at public auctions (Harp.s.v. parakatabole, Dem. 24.50, 43.71, 23.167, Arist. Ath. Pol. 52.1, Hansen 1999). Again, the modernity of these procedures is evident.
7. Finally, the "eisphora", a property tax. Athenians had thought that free citizens should not be liable to pay a property (or income) tax, which for them was a sign of servitude. So, in the beginning, "eisphora" was an extraordinary measure, decided under the principle of "economic democracy" by voting only in times of extreme necessity, i.e. during war, as for example in the last years of the Peloponnesian war. During the fourth century, when the revenues from the empire did not exist any more, and the revenues from other sources were not sufficient to cover expenditure, the Athenians were convinced of the necessity of a permanent imposition of "eisphora", to be imposed on the wealthier citizens and metics. The decision was again taken through the usual voting procedure. The eisphora was a highly progressive form of taxation, falling on the rich. Again, the modern nature of this tax is evident. It is the first known example in history, where a democratic citizens' body decides to impose a permanent property–income tax on some of its members, of a progressive nature and for redistribution purposes, since the proceeds were used to finance "programs" benefiting in part the poorer citizens, as will analyze below (Dem. 50.8).
8. Lastly the "liturgies". Under these, wealthy citizens undertook some "payment cum personal service" (Hansen, 1999) for the benefit of the state. The most important and onerous one was trierarchy under which first one and later on a group (under the system of "symmoriae", introduced by a proposal of Demosthenes) of wealthy citizens undertook the running cost for a year of a trieres warship, at

the same time offering the service of overseeing it and captaining the ship. The cost was high, averaging between 3.000–6.000 drachmas (Gabrielsen, 1994) but could not fall on the same person for consecutive years. Other liturgies were the paying and overseeing the production of theatrical plays and religious festivals. "Liturgies" were also of highly progressive nature, since they fell on the rich, to the benefit of the poor. They were also an ingenious way of solving problems of public choice and their finance. Through this system, Athenians financed public goods such as defense (the warships) and culture–religion (the theatrical plays and religious festivals).

In the 350s, total revenues of the Athenian state was annually 130 talents, which had increased to about 400 ten years later and in the period of peace after 338 B.C., under the able administration of Lykourgos, to 1200 talents (Dem. 10.37, 10.38, Plut. Mor. 8527).

We turn now to the examination of the expenditure side of the Athenian state budget. Athens did not have a centralised budget but separate Funds, the most important ones being the Military Fund and the Theoretic Fund. The second was created by Euboulos in the middle of the fourth century and apart from its primary function, the finance of the theorics (i.e. payment to the poorer Athenian citizens of some renumeration, usually one drachma per day, as a compensation for working time lost, to enable them to see the four days long enactment of theatrical plays) it took over the finance of public buildings and roads, and strategy, the administration of the navy (Arist. Ath. Pol. 43.1, Aesch. 3.25, Harp. S.v. theorikon). Concerning the navy, finance by this board must probably be understood to comprise construction of ships, ship's "houses" ("νεόσοικοι") and administration expenses of the personnel, but not the running expenses of the fleet, covered by trierarchy. What is important here, is to underline that the Theoric Fund covered the expenditure of three kinds of public goods: First, culture and education, i.e. the theatrical plays attendance; second, public infrastructure, such as buildings and roads; and third, defense, this one shared with the Military Fund.

Concerning now the specific amounts of the various expenditures, the ancient sources allows us to quantify the following:

1. The renumeration of the Assembly (which required a quorum of 6.000, at 1 drachma per session) would have cost about 45 talents a year (Arist. Ath. Pol. 62.2; Hansen, 1999, p. 150)[6].

2. The Council of 500 cost about 15 talents (Hansen, 1999, p. 255).
3. The Courts cost between 22 and 37 talents (Hansen, 1999, p. 189)[7].
4. We have not sufficient information to enable us to estimate the expenditure on "theorika", which may have been high.
5. Payments for honorary decrees, which may have amounted to about 10 talents.
6. Military expenditures: As with most states from ancient times to the beginning of the twentieth century, military expenditure was by far the most costly item, necessitating high expenditure, which usually took more than (and often during wartime as much as 90%) 50% of total state expenditure[8]. Here also, we do not have sufficient data to permit us accurate estimates, but we can at least quantify some expenses: After the reform of 336/5 B.C. the training of the ephebes (youths of 18 to twenty years doing their obligatory military service, each year's class being between 500–1.000 strong) cost 25 talents a year (Arist. Ath. Pol. 42.3). The 1.000 strong cavalry force (the ownership of the horse belonging to the cavalryman and so presumably also the cost of acquiring it) cost 40 talents per year for the mounts fodders, which was borne by the state.

To the above must be added the cost of fortifications (the Attica region being perhaps the most heavily fortified of all Greece)[9], the upkeep of the navy (without trierarchy) and the "police force", a mercenary corps of so called "Scythian archers".

What is important here, is the fact that by the 4th century Athens had both a standing navy (the biggest in Greece and the eastern Mediterranean) and a standing army (although a small one, mainly the cavalry force). This was a decision taken again under the principle of "economic democracy" and enabled the state to solve the problem of providing the public good national defense, at specific amounts (number of ships, number of soldiers, both infantry and cavalry) and at a specific cost. It must also be further underlined, that in this aspect again, Athens was again ahead of the times: Other Greek states followed in establishing permanent military forces (such as Macedon, the Hellenistic Kingdoms and then Rome) but Western states did not establish such forces till the second half of the 15 century, when Charles VI of France established the "Companies d' Ordonnances".

How expensive defense was, can be seen from a proposal by Demosthenes in 351B.C. (Dem. 4.28–29) to establish a permanent "mobile intervention force" of 10 triremes, 2.000 hoplites and 200 cavalry. He estimated that this force would require an annual expenditure of 92 talents.

We mentioned above the liturgy of "trierarchy". The rich Athenians paid trierarchy themselves (either individually or as a group) so that this did not form strictly part of the Athenian state budget. Still it was a form of taxation and financed in great part the public good defense. We offer here an estimate of the total likely expenditure for trierarchy. We assume a minimum of ten ships in service during peacetime, and a sustainable–maximum of 100 during wartime for the fourth century.

Further, following Gabrielsen (1994) we assume a yearly average expenditure for a ship of 3000 drachmae for peacetime that could increase to as much as 6.000 during wartime[10]. So, we arrive at a range of estimates from 5 talents (30.000 drachmae) during peacetime to 60 during wartime.

5. Conclusion

We have tried to present above, for the first time as far as we know, the finances of the Athenian state and the solutions adopted under the principle of "economic democracy" in the provision of public goods. The Greek poleis in general were characterized by the abundance of their political institutions and Athens was notoriously in the lead. Never before or since has such an elaborate network of institutions been created and developed in order to run a quite small and fairly simple society. Most adult male Athenian citizens were often and some regularly involved in the working of those institutions (Hansen, 1999, p. 319). We have tried above to analyze the financial basis that permitted the smooth and relatively efficient functioning of the Athenian democracy that reached a high degree of sophistication. We argue that this was a result of the general economic change due to Athens "turn to the sea" and the economic prosperity it brought with it. We further argue, that this enabled Athens to introduce and use in decision–making for the provision of public goods, the very important and relevant also for today's democracies, concept of economic democracy.

Specifically, we have presented a theory of regime and institutional change

that encompasses various sub–cases. We have focused on one particular type of sub–case, which we have called a 'turn to the sea', as being more likely to bring about regime change that includes both change of political institutions towards more representative ones, and economic, towards more market oriented ones. Lastly we have discussed a new historic case of turns to the sea, Athens, which illustrates and supports the theory.

Specifically, the four elements characterizing regime change linked to a turn to the sea were present in the Athenian case. The representative and democratic political regime, the indications of economic growth and prosperity, the empire–building and territorial expansion and the alliance of interests among voters–decision makers were linked to the long–term turn to the sea. Similarly, the seeds of a more representative and democratic regime that culminated in the Civil War and the Glorious Revolution during the Elizabethan period, the economic growth, the territorial expansion, the institutional change and the alliance of interests among mainly the decision–making elites were linked again to the long–term turn to the sea for England.

NOTES

1. Naval guns being usually 12, 24 and 32 pounders, while land guns, (except for siege guns) usually of 6 to 12 pounders.
2. This is estimated as follows: We know the exact number of guns carried by the royal purpose build galleons, 220 for 12 ships. We know further, that 10–armed merchant vessels under Lord Seymour carried a total of 120 guns, or an average of 12 per ship. Taking this as an average for another 41 armed merchantmen for which we lack exact number of guns, we arrive at an estimated total of 220 plus 120 plus 492, or 832 guns in total. This may be on the low side, since some of the armed merchant ships for which we do not have the exact number of guns, like

the 'Galleon Leicester' (400 tones) were much bigger ships than the ones we know their guns, for example the 'George Noble' (120 tones, 14 guns, (Konstam, 2001)).

3. This would have been a likely outcome for Athens if decided to fight only on land. In fact the city of Athens was conquered and destroyed by the Persians in 480 B.C., but due to their fleet, the population had already been brought to safety in various places in the Peloponnese, and the islands of Salamis, Aegina and Euobeia. The Athenian fleet continued the fight with the other Greeks, which led to the decisive sea–battle and Greek victory of Salamis, September 480 B.C.
4. For further details see Ackroyd (1992), Andrewes (1982), Burn (1962), Carmichael (1997), Cohen (1997), Davies (1981, 1992), Delbrück (1990), Gabrielsen (1994), Hanson (2002), Jenkins (1959), Jones (1966), Lyttkens (1997), Pelekides (1971), Ridgway (1984), Tod (1979).
5. As a mater of fact, the Athenian's enthusiasm with the sea can be testified even by philological research, which as far as we know has been overlooked till now. After 480 B.C. we find an abundance of names, which are synthetic with the word ship (ναυς) or trades related to the sea, like Ναυσίνικος (Sea Victor or Ship Victor), Ναυσίμαχος (He who battles with ships), Ναυσικράτης (Mighty in ships), Ναυσίνους (Ship Minded) etc.
6. By the time of Aristotle, when he was writing Athenaion Politeia the pay was one drachma per day for an attendance to the Assembly and one an a lalf for the "main" Assembly (ekklesia kyria), which lasted longer. Under the assumption that only the first 6.000 participants (quorum) were paid and the number of days per year that the Assembly was meeting, Hansen (1999) arrives at the sum of 45 talents. Using similar assumptions, Hansen arrives at the amounts quoted for the Council and the Courts.
7. No amount is mentioned in Demosthenes famous "list of payments" (Dem. 24.97–9). Still, we will endeavour here to offer a very rough estimate: Assuming a daily attendance of an average 3.000 poor citizens, getting one drachma per day for four days per year, gives a sum of 12.000 drachmae, i.e. 2 talents, only for the theatrical attendance. If this was extended also for attendance at religious

festivals etc. (the sources are not clear on this, but it may have been so during the second half of the 4th century) the total expenditure would have been a multiple of this.

8. Very often, this led to bankruptcies and default, Athens was near bankrupt in 355 B.C., but recovered fast in the years of peace up to 338 BC and again between 338–322 B.C. Not so other states, as the Hapsburg empire under Charles V, which went bankrupt, defaulted and brought the ruin of famous banking houses like the Fuggers of Augsburg or the Spanish empire of his son, Phillip II, which went bankrupt four times during his long reign.
9. These fortifications included the Acropolis, the Piraeus, the long Walls linking Piraeus and Athens and the "borderline" fortifications of Porto–Germeno (facing the Gulf of Corinth), Phylae (on Parnes mountain guarding one of the paths to Beotia), Eleutherai (on Parnes, guarding the main road to Boetia), possibly Dekelia (on the foothills of Parnes), possibly Sounion and Lavreion and Ramnous (a small harbour facing the island of Evboia, on the north–eastern shore of Attica).
10. As with today's "weapon systems" the running cost of the trieres increased through more intensive use in wartime, requiring more repairs, change of materials like sails and ropes etc.

REFERENCES

Ancient authors

Andocides, *On the mysteries* (Andoc.)

Aristoteles, *Athenaion Politeia* (Arist. Ath. Pol.)

Aeschines, *Speeches*, in particular *Against Timarchus*, *Against Ktesiphon*, (Aesch.)

Demosthenes, *Speeches*, in particular *Against Lacritus*, *Against Timocrates*, *Against Macartatus*, *Against Aristocrates*, *Against Polykleis, Fourth Phillipic*, *First Phillipic*, (Dem.)

Harpocration, "Lexikon", (Harp.)

Plutarchus, *Moralia*, (Plut. Mor.)

Thucydides, *History of the Peloponnesian War* (Thuc.)

Modern authors

Ackroyd, P. (1992), *Greek lessons for property right arrangements: justice and nature protection*, American Journal of Economics and Sociology 51(1), 19–26.

Andrewes, A. (1982), *The growth of the Athenian State' in The Cambridge Ancient History*, Volume III, Cambridge University Press 2nd revised edition.

Andrews, K.R. (1964), *Elizabethan Privateering*, Cambridge.

Andrews, K.R. (1978), *The Spanish Caribbean: Trade and Plunder 1530–1630*, New Haven.

Andrews, K.R. (1984), *Trade, Plunder and Settlement: Maritime Enterprise and the Genesis of the British Empire 1480–1630*, Cambridge.

Arthur, B.W. (1989), *Competing Technologies, Increasing Returns and Lock–in by Historical Events*, Economic Journal 99, 116–131.

Burn, A.R. (1962), *Persia and the Greeks*, New York: Minerva Press.

Cameron, R. (1989), *A concise economic history of the world*, Oxford University Press.

Carmichael, C. (1997), *Public munificence for private benefit: Liturgies in Classical Athens*, Economic Inquiry 35(2), 261–270.

Cipolla, C. (1980), *Europe before the industrial revolution*, Academic Press.

Cohen, E. (1997), *Athenian Economy and Society*, Princeton University Press.

David, P.A. (1985), *Clio and the Economics of QWERTY*, AEA Papers and Proceedings 75(2), 332–337.

David, P.A. (1994), *Why are Institutions the 'carriers of history?' Path dependence and the evolution of conventions, organizations and institutions*, Structural Change and Economic Dynamics 5(2), 205–220.

Davies, C.S.L. (1963), *Supply Services of the English Armed Forces*, Oxford. Ph. D. Thesis.

Davies, J.K. (1981), *Wealth and the power of wealth in Classical Athens*, New York: Arno Press.

Davies, J.K. (1992), *Greece after the Persian wars. In The Cambridge Ancient History*, Volume V, Cambridge University Press, 2nd revised edition.

Delbrück, H. (1990), *Warfare in Antiquity. In History of the Art of War*, Volume I, Lincoln and London: University of Nebraska Press.

Downing, B. (1993), *The Military Revolution and Political Change*, Princeton UP.

Fogel, R.W. (1997), *Douglas C. North and Economic Theory*, In Drobak, J.N., Nye, J.V.C., (Eds.), The Frontiers of the New Institutional Economics. Academic Press.

Fotopoulos, G. and Spence, N. (1999), *Spatial Variatons in New Manufacturing Plant Openings: Some Empirical Evidence from Greece*, Regional Studies 33, 219–229.

Gabrielsen, V. (1994), *Financing the Athenian Fleet: Public Taxation and Social Relations*, Baltimore: John Hopkins University Press.

Gibbons, R. (1992), *A primer in game Theory*, Hemel Hempstead: Harvester Wheatsheaf

Gilbert, F. (1975), *The Historical Essays of Otto Hintze*, Oxford UP, New York.

Gilpin, R. (2002), *The challenge of global capitalism*, Princeton University Press.

Glete, J. (1993), *Navies and Nations: Warships, Navies and State Building in Europe and America 1500–1860*, 2 volumes, Stockholm, Corronet Books.

Glete, J. (2000), *Warfare at Sea 1500–1650*, Routledge,Warfare and History Series.

Greif, A. (1997), *On the Interrelations and Economic Implications of Economic, Social, Political and Normative Factors: Reflections from Two Late Medieral Societies*, In Drobak J.N., Nye, J.V.C. (Eds), The Frontiers of the New Instituional Economics. Academic Press, pp. 57–94.

Hansen, H.M. (1999), *The Athenian Democracy in the Age of Demosthenes*, Bristol Classical Press– Gerald Duckworth and Co. Ltd.

Hanson, V.D. (2002), *Carnage and Culture*, London, Doubleday.

Hodgson, G. (1999), *Evolution and Institutions*, Cheltenham, U.K., E. Elgar.

Hodgson, G. (2001), *How Economics forgot History. The Problem of historical specificity in social sciences*, London, Routledge.

Hoffman, P.T. and Rosenthal, J.L. (1997), *The Political Economy of Warfare and Taxation in Early Modern Europe: Historical Lessons for Economic Development*, In Drobak, J., Nye, J., The Frontiers of New Institutional Economics, Academic Press, pp. 31–56.

Jenkins, G.K. (1959), *Guide to the Principal Coins of the Greeks*, British Museum, London

Jones, A.H.M. (1966), *Athenian Democracy*, Oxford: Basil Blackwell.

Konstam, A. (2000), *Elizabethan Sea Dogs*, Osprey.

Konstam, A. (2001), *The Armada Campaign 1588*, Osprey Campaign 86.

Krugman, P. (1991), *History and industry location: the case of the manufacturing belt*, American Economic Review 81, 80–83.

Kyriazis, N. and Zouboulakis, M. (2002), *Private Law for Public Benefit: Property Rights Arrangements in Elizabethan England*,

Communication at the 19th Annual Conference of the European Association of Law and Economics', Athens, September 20, published as The economics of seapower, Economic and Social Sciences Tribune 37 (2003) pp. 77–96.

Lewis, M. (1960), *The Spanish Armada*, Pan.

Lyttkens, C.H. (1997), *A rational actor perspective on the origins of liturgies in Ancient Greece*, Journal of Institutional and Theoretical Economics 153 (3), 462–484.

Nelson, R. and Winter, S. (1982), *An evolutionary theory of economic change*, Harvard University Press.

North, D.C. (1978), *Structure and Performance: The Task of Economic History*, Journal of Economic Literature 16(3), 963–978.

North, D.C. (1981), S*tructure and Change in Economic History*, London: W.W. Norton & Co.

North, D.C. (1984), *Transaction costs, institutions and Economic History*, Journal of Theoretical and Institutional Economics 140, 7–17.

North, D.C. (1990), *Institutions, Institutional change and economic performance*, Cambridge: Cambridge University Press.

North, D.C. (1991), *Institutions*, Journal of Economic Perspectives 5(1), 97–112.

North, D.C. (1994), *Economic Performance through Time*, The American Economic Review 84(3), 359–68.

North, D.C., Weingast, B. (1989), *Constitutions and Commitments: The evolution of Institutions governing public choice in 17th century England*, The Journal of Economic History XLIX (4), 803–832

Pejovich, S. (2002), *Understanding the transaction costs of transition: It's the culture stupid*, Communication at the 19th Annual Conference of the European Association of Law and Economis, Athens, September 20.

Pelekidés, H. (1971), *From Marathon to Thermopylae and Platea; In*

History of the Greek Nation, Volume B, Athens (in Greek).

Ridgway, D. (1984), *L' alba della Magna Grecia*, Milano: Longanesi and Co.

Roberts, M. (1958), *Gustavus Adolphus: A History of Sweden*, Cambridge University Press, 2 vols.

Rodger, N.A.M. (1997), *The Safeguard of the Sea*, London, Harper and Collins.

Rodger, N.A.M. (2003), *The Military Revolution at Sea*, Lecture at the University of Volos, Greece, 27 February 2003, forthcoming, Economic and Social Sciences Tribune.

Schubert, H.R. (1957), *History of the British Steel Industry from 450 B.C. to AD 1775*, London.

Tincey, J. (1988), *The Armada Campaign 1588*, Osprey Elite, No 15.

Tod, M. (1979), *The Economic Background of the Fifth Century*, In The Cambridge Ancient History, vol. V, pp. 1–32. Cambridge University Press 2nd revised edition.

Weingast, B.R. (1997), *The political foundations of limited government: Parliament and sovereign debt in 17th and 18th century England*, In Drobak, J., Nye, J., The Frontiers of New Institutional Economics, Academic Press, pp. 213–246.

Zouboulakis, M. (2002), *Path Dependence and the Institutional Determinants of Growth*, Paper presented at a Conference on 'Economies in Transition', University of Thessaly, Volos 3, July.

TRANS–EUROPEAN TRANSPORT NETWORKS: THE DEVELOPMENTAL CONTRIBUTION OF VIA EGNATIA MOTORWAY IN NORTHERN GREECE

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Abstract

Via Egnatia motorway, part of the Trans-european Transport Networks of the European Union, constitutes a project of major significance for Greece (and especially for Northern Greece), connecting (through its vertical intersections) the country with the Pan-european Transport Network that stretches from Central and Eastern Europe to the Balkans. This paper attempts to outline the social and economic strategy of Greece in the current planning period (2000-2006) and to determine the role of Via Egnatia in the implementation of this strategy. More particularly it explores the way in which the operation of Via Egnatia, its vertical axes and supplementary works contribute to the overall strategic planning for the socio-economic development of Greece. Moreover, it examines the growth potential of the country in Europe and the Balkans after the completion of Via Egnatia and the Pan-european Corridors. In general, the completion of Via Egnatia and its vertical intersections, combined with the completion of interventions in ports and airports which service the road and constitute its entrance/exit gates, as well as of other large-scale national transport works (P.A.TH.E., Western Axis, Junctions, etc.) will contribute to the strengthening of cohesion and the balanced development of Greece. On the other hand, it will assist the functional networking of Greece with the wider surrounding geographical areas (South-eastern Mediterranean, Balkans, Eastern Europe, Black Sea Area).

JEL classification: R49, R58, R42, R11.

Keywords: Trans–european Transport Networks, Pan–european Corridors, Via Egnatia, Transportation Policy, Regional Development, Development Planning, Greece, European Union.

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1. Introduction

Public capital investment is a driving force for regional economic development. Especially, investment in infrastructure, leading to a higher infrastructure endowment, increases the productivity of private investment and reduces private cost (Biehl, 1991: 13). Transport infrastructure, in particular, plays a decisive role in the development of the economy, the increase of level of growth, as well as the decrease of inter- and intra-regional disparities on a national level (Button, 1998).

Since the EU was established with the Treaty of Rome, transport policy was recognised as one of the main sectoral policies required at the European level (Vickerman, 1991: 36). In recent years, especially given the increased tendency of globalisation of markets and the continuing effort towards European integration, EU enlargement and economic and social cohesion, transport infrastructure still constitutes a major matter of policy not only at a national, but also at a European level (European Commission, 2000a; Ministry of Transport and Communications, 2000).

In Target 1 regions, such as Greece, which are characterised by a lower level of growth compared to the rest of Europe, investment deficiencies are certainly observed, and transportation infrastructure is one of the areas where such deficiencies are most prominent. For this reason, EU policies are often targeted at redressing this lower level of development. The European Spatial Development Plan (European Commission, 1997) specifically calls for trans-national efforts to act complementary to those at the national level, aiming at the promotion of a more balanced development of EU as a whole (Committee on Spatial Development, 1999). This is particularly significant in the area of transports.

In this framework, the European Transport Policy moves in two directions. The first is to achieve the linking of Southern, Mediterranean and peripheral areas of Europe with more centrally located regions through the materialisation of the Trans-european Transport Networks. This way, stronger ties will be forged between regions and the economic and social cohesion of the Union will be improved. The second direction is the amelioration and restructuring of infrastructure in Central and Eastern European countries. The EU increasingly promotes various initiatives aimed at specific infrastructure problems in all the countries of Central

Europe and the Balkans, and especially in those countries that are expected to accede to the EU in 2004 (Regional Development Institute, 2000). In particular, these initiatives seek to improve the link between those countries' networks and those of EU countries, in preparation for EU enlargement. Within this framework, a significant increase is expected in the circulation of goods, people and capital, as well as of trade activity and transactions between the current EU members and the candidate member-countries (Ministry of Transport and Communications, 2000). The basic mechanism of EU Transport Policy that promotes the linking of the present EU area with the accession countries is the Pan – European Transport Corridors. These Corridors, as defined in a conference that took place in Crete in 1994 and revised later in Helsinki[1] in 1997, are ten (see Table 1).

Table 1: *Pan – European Transport Corridors.*

Corridors	Connected countries	Main connected urban centres	Main intersections towards
I (road and railway)	Finland, Estonia, Latvia, Lithuania, Poland, Russian Federation	Tallin-Riga-Kaunas-Warszawa	Kaliningrad-Gdansk
II (road and railway)	Germany, Poland, Belarus, Russian Federation	Berlin- Warszawa-Minsk-Moskva-Nizhny Novgorod	
III (road and railway)	Germany, Poland, Ukraine	Dresden-Wrocaw-Lviv-Kiev	Berlin
IV (road and railway)	Austria, Bulgaria, Czech Republic, Germany, Greece, Hungary, Romania, Slovakia, Turkey	Dresden-Praha Bratislava/Vienna-Budapest-Arad Thessaloniki Nurnberg	Constanta Istanbul
V (road and railway)	Bosnia Herzegovina, Croatia, Italy, Hungary, Ukraine, Slovakia, Slovenia	Venice-Trieste/Koper-Ljubljana-Budapest-Uzgorod-Lviv Bratislava	Koper Rijeca Ploce

Corridors	Connected countries	Main connected urban centres	Main intersections towards
VI (road and railway)	Czech Republic, Poland, Slovakia Zilina	Gdansk-Grudziadz/ Warszawa-Katowice-	Poznan Breclav/Brno
VII (river–Danube Axis)	Austria, Bulgaria, Croatia, Germany, Hungary, Moldavia, Romania, Slovakia, Ukraine, FR Yugoslavia	44 connected sea and river ports	
VIII (road and railway)	Albania, Bulgaria, FYR Macedonia (links to Italy, Greece and Turkey)	Durres-Tirana-Skopje-Sofia-Varna/Burgas	
IX (road and railway)	Belarus, Bulgaria, Finland, Lithuania, Moldova, Romania, Russia, Ukraine, Greece	Helsinki-St. Petersburg-Pskov/Moscow-Kiev-Ljubasevca-Chisinau-Bucharest-Dimitrovgrad -Komotini-Alexandroupolis	Klaipeda Kaliningrand Odessa
X (road and railway)	Austria, Bulgaria, Croatia, FYR Macedonia, Greece, Hungary, Slovenia, FR Yugoslavia	Salzburg-Ljubljana-Zagreb-Beograd-Nis-Skopje-Veles-Thessaloniki Florina (via Egnatia)	Graz Budapest Sofija-Istanbul

Source: European Commission, 2000a.

According to this plan, the Balkan Peninsula becomes a significant intersection that links Western and Eastern Europe as well as the Southern and Northern areas, since out of the 10 Pan-european Axes of the plan, six run across the wider Balkan area. Corridor IV runs through Romania, Bulgaria and Greece, Corridor V, through Bosnia Herzegovina, and Corridor VII (water Dunabe corridor) through FR Yugoslavia, Romania and Bulgaria. Corridor VIII runs through Albania, FYROM and Bulgaria,

Corridor IX through Romania, Bulgaria and Greece and finally Corridor X through FR Yugoslavia, FYROM, Bulgaria and Greece.

In this framework, Greece as the only EU member state in the area, should improve its strategic links with the other EU member states, as well as with the rest of Europe. This will be mainly accomplished through the improvement of major road axes included in the Trans-european Road Networks, and particularly through the completion of the Via Egnatia, P.A.TH.E. (Patra-Athens-Thessaloniki-Evzoni), and Western Axis motorways as well as their interconnections with Pan-european Corridors (see Figure 1: Map I).

Figure 1: *Map I.*

Via Egnatia, in particular, constitutes undoubtedly the largest development project of Northern Greece. It runs across all four regions (Epirus, Western Macedonia, Central Macedonia, Eastern Macedonia and Thrace) and links the western coast of Northern Greece (Igoumenitsa) with the Northeastern borders of the country (Kipi, in the prefecture of Evros). Via Egnatia is expected to have multiple implications on the growth potential and the geopolitical standing of Greece (European Commission, 2000a). Through its 9 vertical Northbound axes, which are expected to be completed in the framework of the 2000-2006 planning period, Via Egnatia connects Greece, its Northern part in particular, with the Pan-european Transport Axes, primarily those of the Balkans as well as of Eastern and Central Europe.

2. The role of the large–scale transport projects in the implementation of the development strategy of Greece

Since the mid-1990s, the Greek regional development strategy has been characterised by a shift from small-scale projects scattered throughout the country, to the strengthening of outwardness and national and international networking, through strategic infrastructure projects, several of which were related to transportation infrastructures.

As early as the period of the implementation of the 2nd Community Support Framework (CSF 1994–1999), along with the primary target of the previous planning period (1st CSF, 1989–1993) for a balanced allocation of basic infrastructure for the strengthening of less developed areas, special weight has been put on the target of economic development as a whole, as well as the external networking of the country through large-scale transport projects of national and transnational importance. The preparation of the country for entering the Economic and Monetary Union, the exploitation of its geographical position in South-eastern Mediterranean and the Balkans, combined with the general EU directions (expressed by the preparation of the Eastern European countries' accession in the EU and the general shift of the Union's centre of gravity towards the East), as well as the overcoming of barriers emerging from the national geophysical structure justify the selection of the specific large projects. Moreover,

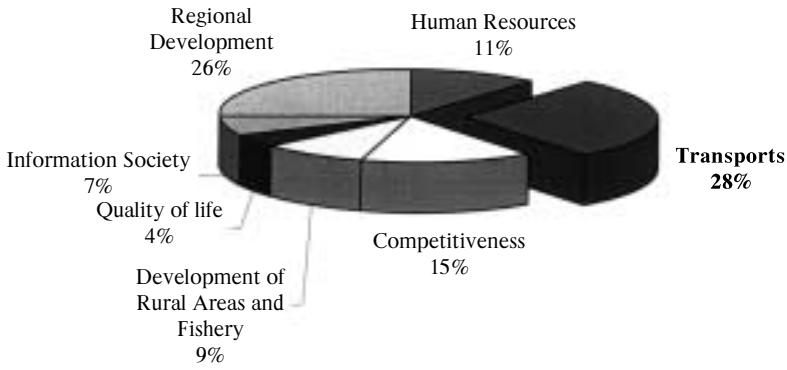
further development of problematic areas is considered as directly attached to the improvement in the competitiveness of the national economy as a whole (Konsolas, Papadaskalopoulos and Plaskovitis, 2001).

During the 1994–1999 planning period, therefore, major transport infrastructure projects were began, such as the P.A.TH.E. and Via Egnatia motorways, the new Athens international airport "Eleftherios Venizelos", the Rio-Antirio bridge and the Aktio-Preveza tunnel, the Athens Metro, etc., whilst an ambitious plan regarding the modernisation of railways was also introduced as part of development planning for the first time. Around 30% of total funds dispensed through the 2nd CSF and the Cohesion Fund for this period went to the major transportation projects, whilst in four separate cases, the system of combing private and public funds for infrastructure projects was implemented for the first time (Papadaskalopoulos and Christofakis, 2002). Most of these major projects were completed within the 2nd CSF implementation period, whilst others are still being pursued during the current planning period of the 3rd CSF, 2000–2006.

More particularly, in the new Development Plan 2000–2006 and the ensuing 3rd CSF, a clear continuity of major pursued objectives is observed. The strengthening of transport infrastructure still remains one of the primary targets of the overall national development strategy. Relevant initiatives include the completion of major infrastructure works, begun in the previous period, as well as the selective construction of a limited number of new large-scale projects such as the Metro at Thessaloniki, the second largest Greek city.

The largest single development priority, within the 3rd CSF[2] , is the one related to transport infrastructure, which accounts for 28% of total funding. The second largest development priority, in terms of funding, is the regional development one (almost 26%) that also extensively promotes transport infrastructure works in particular regions, while also financing particular parts of major projects (see Diagram 1). In addition to these allocations, the Cohesion Fund also finances transportation infrastructures (3,018 million euros of Public Expenditure, representing 57% of the Fund's total Public Expenditure for Greece for the 2000–2006 period). Moreover, the Community Initiative "Interreg" also contributes to the completion of large-scale Greek transport infrastructure projects.

Figure 2: *Percentage distribution of CSF 2000–2006 Funds per basic Priority Axis.*



Source: Ministry of National Economy, 3rd CSF.

The major strategic objectives of the entirety of actions in the area of transport infrastructure are the strengthening of cohesion and the balanced development of the country as well as the networking of the country with the wider surrounding geographical areas (South-eastern Mediterranean, Balkans, Eastern Europe, Black Sea Axis). These objectives are accomplished through (Ministry of Transport and Communications, 2000):

(a) The improvements in the major road axes included in the Trans-european road network (especially the completion of P.A.TH.E. and Via Egnatia motorways) and the improvement in their interconnections with other Greek areas. This way the country achieves greater cohesion, since the projects will have a major impact on areas, whose development prospects were limited by the poor condition of transportation infrastructures.

(b) The connection of the Greek Trans-european road network with Pan-european Corridors.

(c) The development of a system of combined transports in certain hub points as well as in the final destination points of the Greek road network (Athens and Piraeus, Thessaloniki, Patra, Igoumenitsa, Alexandroupoli), through the creation of Trans-european Networks hubs, ensuring therefore a more effective connection of Greece with the rest of the EU and the countries in the Balkans, Eastern Europe and the Black Sea.

Within this context, the three major national road axes, which constitute the backbone of the national road network (P.A.TH.E., Via Egnatia and the Western Axis), are expected to be transformed into major Development Axes. Development Axes connect dynamic urban centres while activities or various land uses are developed alongside these axes, which are due or serve the cooperation of these centres. In essence, they function as a means of growth diffusion towards isolated or downgraded regions and as a means of expansion of the dynamic urban centres' range of influence (Papadaskalopoulos, 1995).

The development strategy served by the major Greek Development Axes is presented in Table 2 (Ministry of National Economy, 1999a).

Table 2: The Development Strategy for the Transport Corridors in Greece

Axis	Main Hub	Connected Urban Centres	Expansion/ Connection Networking	Main strategic goals
P.A.TH.E.	***Athens, Thessaloniki***	Patra, Korinthos, Lamia, Larisa	Balkans, Eastern Europe, European Union Volos,	Putting forth Athens' and Thessaloniki's role in the Balkans. Utilisation of Combined Transports System. Strengthening of large Urban Centres.
Via EGNATIA	***Thessaloniki***	Alexandroupoli Komotini, Xanthi, Kavala, Veria, Kozani, Ioannina, Igoumenitsa	Balkans, Italy, European Union, Middle East, Black Sea Zone	Putting forth Thessaloniki's role in the Balkans, Black Sea area and Europe. Utilisation of Combined Transports System and Trans-european and Pan-european transport axes hubs. Reinforcement of isolated regions (Western Macedonia, Epirus, Eastern Macedonia – Thrace). Raising of isolation– overcoming geophysical barriers (mountain range of Pindos).

Axis	Main Hub	Connected Urban Centres	Expansion/ Connection Networking	Main strategic goals
				Operational interconnection of the western with the central and eastern part of Northern Greece. Exploitation of the vicinity of Epirus (through the Ioannina-Igoumenitsa Combined Transports axis) with W. Europe (Italy).
WESTERN AXIS	***Patra***	Kalamata, Pyrgos, Agrinio, Arta, Ioannina, Igoumenitsa	Albania, Other Balkan countries, Italy	Development of Western Greece. Utilisation of Combined Transports System. Exploitation of the vicinity (via Patra) with W. Europe (via Italy). Strengthening of the cohesion in Greece and more balanced distribution of growth.

Source: Ministry of National Economy, 1999a.

The transformation of those road axes into Development Axes requires the development of a special policy that promotes this target. In the case of Greece, this policy serves three basic objectives (Ministry of National Economy, 1999a):

(a) The balanced development of Greece, through the strengthening of urban centres connected by those Development Axes, the decrease in the isolation of downgraded areas, as well as the development of new opportunities for growth.

(b) The organisation of industrial concentrations and other activities alongside major axes and the facilitation of interventions in entrance and exit points of Metropolitan Centres and major Development Axes. In this framework, the spatial organisation of the existing Development Axes is required (creation of Industrial and

Entrepreneurial Areas, environmental interventions, improvement in infrastructure, etc.).

(c) The strengthening of the interstate role of Metropolitan centres and dynamic urban centres and the expansion of their range of influence in the areas of the Balkans, South-eastern Europe, Black Sea and the Mediterranean.

As regards the materialisation of the national development strategy and the achievement of the primary strategic objectives set in the development plan of the current planning period, the completion of Via Egnatia is considered of significant importance, not only for the northern part of the country but also for Greece as a whole. Via Egnatia and its 9 vertical axes are expected to benefit many thus far isolated regions, changing the lives of many Greek, as well as citizens of other South-eastern European areas.

3. Via Egnatia motorway and developmental planning

3.1. The Project of Via Egnatia Motorway

The history of Egnatia Motorway originates at around the 2nd century BC, when the Romans (under Emperor Traian) constructed the ancient Egnatia of around 800 km total length. That was the extension of Via Appia, ending at Brindisi (Berechman, 2003). Starting from Durres and Avlona (in what is now Albania), it went through Macedonia and Thrace and ended at Kypsela (now part of Turkey)[3]. It was named after the Proconsul "Gneus Egnatius", who had initiated the project, and constituted a significant commercial network, promoting the exchange of goods as well as customs and traditions among the peoples of the Roman Empire. This road was constructed on an older network, from the time of King Philip the Second of Macedonia, which was used for many well-known martial expeditions[4].

During the centuries, what remains unchanged is the name of Egnatia. The Egnatia of the 21st century revives a historical route and connects, once again with one motorway, the Western and Southern Europe with the East. This was the idea behind the establishment of the modern Via Egnatia. This motorway is also expected to provide a high quality longitudinal road axis at the area of Northern Greece for the interregional and intraregional

connection of this geographical entity. The idea of constructing the Egnatia Motorway was first conceived at the aftermath of World War II. At the beginning of the 1970s, some initial parts were constructed, namely the part of Strimonas (Serres Prefecture) - Nea Peramos (Harbor of Kavala Prefecture), with Greek funding, while the project was not part of a wider planning initiative.

The current Egnatia motorway is part of the Trans-european Transport Networks, one of the initial 14 large-scale priority projects of the EU (along with the new Spata airport and the P.A.TH.E. axis). It is 680 km. long and the first road axis[5] of high standards in the country. It runs across Greece "horizontally", spanning Northern Greece from its western to its eastern border. It starts from the port of Igoumenitsa, in the Thesprotia Prefecture and ends at Kipi in the Evros Prefecture, on the borderline with Turkey, with the potential for eastbound expansion outside Greece.

The total estimated expenditure for the project amounts to 3,521.64 million euro. Approximately 1,200 million euro had been secured from the Programmes of the 2nd CSF, the European Regional Development Fund and the Cohesion Fund (1994-1999) and around 2,200 million euro from the Programmes of 3rd CSF[6]. Also, 60 million euro have been allocated to the project from the Community Budget (Trans-european Transport Network Budget Heading) for the design of Via Egnatia's Main and Vertical Axes. Additionally, in current planning, funds of 380 million euro have been allocated to public works carried out in the vertical axes and the service roads linking Via Egnatia with the Trans-european axes, ports and airports. The funding of these works is provided through the Regional Operational Programmes of Epirus, Western and Central Macedonia and Eastern Macedonia and Thrace, the Sectional Operational Programme "Road Axes, Ports and Urban Development", which is under the jurisdiction of the Ministry of Environment, Planning and Public Works, the Community Initiative Interreg III and the national programme "Greece 2004". Other potential funding sources are also being investigated for the funding of the sections that are not included in the main funding scheme (Egnatia Motorway S.A., 2002).

Out of the 680 km, which constitute the total length of Via Egnatia, 394 km were completed, whilst the rest are expected to be completed by the end of the current planning period (up to 2008) (see Table 3).

Table 3: *Progress of the Via Egnatia project (in km).*

Sections constructed before 1994	94
Sections constructed after 1994	300
Completed and opened to traffic until August 2002	269
Completed - to be delivered by the end of 2002	31
Sections under construction	190
Sections that have been tendered	37
Sections in the stage of design	59
TOTAL LENGTH OF VIA EGNATIA	680

Source: Egnatia Motorway S.A., 2002.

Via Egnatia is expected to become not just a high-speed motorway, but also a complete developmental intervention for Northern Greece. In particular, Via Egnatia (Ministry of Environment, Planning and Public Works, 2002):

(a) Serves directly from west to east, four regions, ten prefectures and runs across the major urban centres of Northern Greece (see Table 4).

(b) Runs through a total of 332 Municipalities and Communities, 30 tourist areas, as well as areas of special interest.

(c) Is complemented by nine Vertical Axes towards the northern borders, as well as by other service roads. More specifically, the main axis is surrounded by service roads with a length of 720 km. in total.

(d) Is connected with five ports and six airports, which service the road.

(e) Is connected with ten Industrial Areas in Northern Greece, either directly or via the vertical axes.

Table 4: *Main Characteristics of Via Egnatia's impact zone.*

Countries connected directly	Albania–FYROM–Bulgaria–Turkey
Greek regions connected directly	Epirus, Western Macedonia, Central Macedonia, Eastern Macedonia and Thrace
Prefectures connected directly	Thesprotia, Ioannina, Grevena, Kozani, Imathia, Thessaloniki, Kavala, Xanthi, Rodopi and Evros
Major Urban Centres	Igoumenitsa–Ioannina–Grevena–Kozani–Veria–Thessaloniki–Kavala–Xanthi– Komotini–Alexandroupoli
Ports	Igoumenitsa–Thessaloniki–Volos (which is the closest Aegean Sea port to Egnatia and the connection is via the vertical axis in the south of Egnatia)–Kavala–Alexandroupoli
Airports serving the Motorway	Ioannina– Kastoria (via the second vertical connection towards the north)–Kozani–Thessaloniki–Kavala–Alexandroupoli
Industrial Areas	Ioannina–Florina–Edessa–Thessaloniki–Kilkis– Serres–Drama – Xanthi–Komotini–Alexandroupoli

Source: Egnatia Motorway S.A., 2002.

In this framework, the projects that complement this developmental intervention of Via Egnatia include the construction of nine vertical axes and a supplementary transport network, interventions for improvement and upgrading of ports and airports, environmental works, projects concerning the promotion of cultural heritage, etc. More specifically, parts of the nine vertical interconnections of Via Egnatia have already been completed in the context of the 2nd CSF (1994-1999), to a total budget of 440.21 million, and their completion is secured with funds from the 3rd CSF (2000–2006). Moreover, 293.47 million euro of the total Via Egnatia budget are used for works protecting and restoring the natural environment and promoting cultural heritage[7].

In terms of airport infrastructure, upgrading works of a total budget of 73.37 million euro have been completed or are still in progress in the Thessaloniki, Kavala and Alexandroupoli airports. Especially in the case of the "Macedonia" Airport in Thessaloniki, plans for its transformation into a modern international airport include projects, currently in progress, such as the construction of a parallel runway, the expansion of terminal and cargo areas, the extension of the existing runway towards the sea, as well as the construction

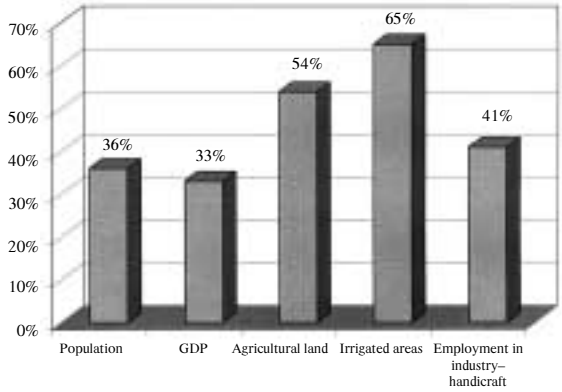
of a new terminal building. For these projects, a total funding of more than 293.47 million euros has been secured from the 3rd CSF. The 3rd CSF also finances the interventions at the other airports connected with Via Egnatia.

As far as the 5 ports related to Via Egnatia, interventions with a total budget of 176.08 million euro have been completed (funded through the 2nd CSF), while additional resources that amount to 88.041 million euros have been secured from the 3rd CSF. Especially in the case of the port of Thessaloniki, that is the closest EU port to the countries of the Balkans and Eastern Europe (it is located in the middle of Via Egnatia and functions as the terminal point of Pan-european Corridors X and IV), the total budget for expansion, development and completion of infrastructure amounts to approximately 73.368 million euro.

3.2. Basic development implications at the national level

The completion and operation of Via Egnatia, and its complementary projects, is expected to have far-reaching and long-lasting implications not only for the areas directly affected by the project, but also for the whole of Northern Greece and, more widely, Greece in general, reinforcing its strategic role in the area of the Balkans, as a political and economic locomotive for the greater geographical area. A significant part of Greece's population will benefit directly by the operation of Via Egnatia, whilst the four Regions of Northern Greece where Via Egnatia is located account for a major part of Greece's economic and social activity (see Figure 3).

Figure 3: Percentage participation of regions crossed by Via Egnatia in major national economic and social figures.



Source: Ministry of Environment, Planning and Public Works, 2002.

A direct and most significant implication of the completion of Via Egnatia is the major decrease in travel time not only between the areas crossed by the axis, but also among various areas of Northern Greece. Travel time from the western towards the eastern end of Northern Greece (from Igoumenitsa to Alexandroupoli) is decreased by approximately 50%. More specifically, the completion of Via Egnatia will contribute to (Ministry of Environment, Planning and Public Works, 2000; 2001):

(a) A 5-hour decrease of total travel time from Igoumenitsa to Kipi of Evros (in the borders of Greece with Turkey). Specifically, the operation of Via Egnatia decreases the travel time from 11 hours and 30 min. to 6 hours and 30 min.

(b) The strengthening of the role of the Thessaloniki Metropolitan Centre as a hub, which is located in the middle of the route. Travel time from Igoumenitsa to Thessaloniki decreases from 6 hours and 30 min. to 3 hours and 30 min. Travel time from Thessaloniki to Alexandroupoli decreases from 5 hours to 3 hours (see Map I).

(c) An estimated 53% increase in road safety.

(d) An increase in traffic capacity by approximately 270%.

The development of a high quality road corridor, which traverses the huge geographical entity of Northern Greece, has significant importance for the interregional and intraregional transfers, as well as for the interconnection of the main urban centers of Northern Greece. Based on this rationale, the longitudinal road axis of the geographical district of Northern Greece coincide with Egnatia, which traverses the whole of the North Greece (Ministry of National Economy, 1993). More specifically, the project contributes to the operational linking of Western Macedonia and Epirus with Central and Eastern Macedonia and Thrace, as well as with the rest of country, while the continuous communication between Epirus and Macedonia, especially during winter period, is also secured. This parameter is very important given the lower level of GDP per capita of the Regions of Epirus and Eastern Macedonia and Thrace compared to the Greek average. Indeed, it is these two Regions that are expected to experience the biggest gains in terms of travel times to other Regions as can also be shown by accessibility models, i.e. models that also take into account the 'population mass' of destinations (Panebianco and Schurmann, 2002). However, the

application of the 'Socio-economic and Spatial Impacts of Transport Infrastructure Investments and Transport System Improvements' (SASI) Model shows that the overall GDP increase specifically attributed to the transport infrastructure investments is rather low (Panebianco and Schurman, 2002; for a discussion of the SASI Model in the context of the Trans-european Transport Networks see Schurmann, Spiekermann and Wegener, 2002). Nevertheless, the multitude of increased opportunities for the Greek Regions crossed by Via Egnatia, which is described below, will surely have a positive impact on all development indicators.

Specifically, the Regions of Western, Central and Eastern Macedonia and Thrace secure a safer and less costly Exit Gate for the transportation of goods towards European markets, whilst Epirus gains access to new markets in Northern Greece.

Vertical axes, in combination with Pan-european Networks currently under development, strengthen the operational linking of the country with its neighbouring Balkan countries and upgrade the development role of urban centres in Northern Greece regarding the Balkans and the Black Sea region. The Metropolitan role of Thessaloniki is particularly promoted, and its range of influence is expanded to a great degree.

The connection of the new Igoumenitsa port with Via Egnatia creates a new sea and road link to the Near East that is of significant importance for Europe, offering also direct benefits to other EU and non-EU countries that are in a position to take advantage of the new prospects. This new link promotes improvements in the access to Igoumenitsa port and the attraction and promotion of merchandise flow on the Eastern-Western axis through the ports of Thessaloniki, Kavala and Alexandroupoli. Moreover, Turkey's European prospect further reinforces the potential for transit trans-national transport activity through Via Egnatia. Finally, a major re-routing of exports and international transports from Eastern Thrace (Turkey), Bulgaria, FYROM and South Albanian is expected towards Via Egnatia and the Igoumenitsa port, at least for those exports directed to Southern EU regions and Western Mediterranean countries.

The anticipated implications of these developments contribute to a strong increase of the competitiveness of Northern Greece, to the diversification of the production base and eventually to higher levels of prosperity. Some of the most obvious repercussions are the following:

(a) The development of new activities, such as combined transports and

transit services, alternative – mountainous tourism, trade of local goods of high quality, shift of agricultural production towards export goods, etc.

(b) For the larger urban centres of the axis (Thessaloniki, Ioannina, Kavala, etc.) the most important repercussions concern the spatial reorganisation of industrial units and storage and logistics facilities away from the peri-urban zone towards more distant areas, since shorter travel times for employees and clients renders their relocation an economically viable alternative. This will also lead to a rationalisation of land prices in urban centres that have increased dramatically in recent years.

(c) The creation of development potential of satellite town/cities lifting the pressure from existing overpopulated suburbs.

(d) The increase in population and the decrease of unemployment in problematic areas.

(e) The technological and organisational restructuring of manufacturing caused by the opening up of new markets, as well as by the co-operation prospects among previously spatially isolated businesses.

(f) The development of cross-border economic co-operation, as well as co-operation in other areas such as the protection of the environment, cultural exchanges, border controls, etc.

(g) A direct increase in employment. According to the ex ante evaluation of the Operational Programme "Road Axes, Ports and Urban Development" (2001) during the construction of an infrastructure project financed by the 2nd CSF (1994 – 99), the temporary job creation cost per year was estimated at about 18 million drachmas (52,825 euro). Thus, between 1994 and 1999, the total temporary man-years of employment for the construction of Via Egnatia were estimated at approximately 22,716 (1,200,000,000/52,825). This number is equivalent to 3,786 temporary job positions per year[8]. Given the figures above, it was estimated that, during the 2000-2006 planning period, the temporary job creation cost for infrastructure project would reach the amount of 54,000 euro (for labour-intensive projects) and 67,500 euro (for capital-intensive projects). Due to the project's mixed character, the average cost for the creation of one man-year of employment is estimated at around 64,500 euro per year. Consequently, during the 2000-2006 period, the total temporary man-years of employment for the construction of Egnatia's projects are

estimated to be around 34,108 (2,200,000,000/64,500). This estimate is equivalent to 4,872 temporary jobs per year. According to the Evaluation of Egnatia Motorway, (by the Christophersen Team and Trademco), as far as the permanent and direct impact to employment, it is estimated that there is a need for 1.3 employees for the maintenance and operation of 1 Km of motorway, while the equivalent standards for French motorways is 2 employees per km of motorway[9]. Therefore, the demand for permanent employees due to the maintenance and operation of Egnatia Motorway after the completion of the project, will be 680 X 1.3 = 884, or according to the French standards 680 X 2 =1360 permanent employees. Obviously new permanent employment positions will be created through the modernisation of industrial and service activities, the differentiation of production and the sectoral restructuring, the increase of investments and local enterprise creation, the multiplier income results, etc.

(h) The substantial decrease in atmospheric pollution in urban centres bypassed by the motorway. More specifically, it is anticipated that the detour of Asprovalta and Nea Karvali will result, by 2006, to a 790 tn/year decrease of the concentration of carbon monoxide, 100 tn/year decrease of nitrogen oxides, 101 of hydrocarbons, 12 of sulphur dioxide and 9 tn/year decrease of the concentration of airborne dust particles.

(i) Finally, the completion of Via Egnatia complements the planned Western Development Axis (Via Ionia or Western Axis, accompanied by the Rio-Antirio bridge and the Aktio-Preveza tunnel, that has already been constructed) and the development role of Patra that constitutes the South-Western gate of Greece.

Apart from the above-mentioned implications, the completion of the envisaged total transport system in Eastern Europe and the Balkans (Via Egnatia – Vertical Axes – Pan-european Corridors) is expected to boost the prospects of Greece in Europe and its wider geographical area.

4. Development prospects of nothern Greece after the completion of Via Egnatia and pan–European corridors

At a European level, Via Egnatia connects the markets of the West with

those of the East. It is obvious that the larger a political and economic formation, such as the EU, becomes, the greater the need for radial links from the centre towards the periphery. For this reason, Via Egnatia receives substantial financing from the Union.

The completion of the Corridors programme is also considered important for Greece, "mainly as regards to the merchandise links with Central Europe" (Ministry of National Economy, 1999b), as well as the new markets of the EU candidate countries, a fact that justifies the tremendous importance Greece attaches to these road axes. Via Egnatia and its vertical axes offer Greece the opportunity to actively participate in the formation and operational incorporation of this new peripheral market in the EU, to function effectively in entrepreneurial community initiatives and to develop trade activities in the Balkans and other areas.

In this context of strategic planning, the nine vertical axes of Via Egnatia (the terminal points of Via Ionia and P.A.TH.E. axis included) secure the linking of Greece with the countries of the Balkans and through them with the rest of Europe, whilst prospects for expanding eastwards (through neighbouring Turkey) are also feasible (see Table 5).

Table 5: Vertical interconnections and extensions of Via Egnatia

Crossing Countries	**Via Egnatia Vertical interconnections**
Through Albania	1. Ioannina–Kakavia–Durres. 2. Siatista–Krystallopigi–Durres (and Krystallopigi–Tirana junction).
Through FYROM	3. Kozani–Florina–Niki–Prilep. 4. Thessaloniki–Evzoni–Skopje.
Through Bulgaria	5. Thessaloniki–Serres–Promahonas–Sofia. 6. Drama–Nevrokopi–Exochi – Samocov–Sofia. 7. Xanthi–Echinos–Smolian–Plovdiv. 8. Komotini–Nymfeo–Kurdzhali–Haskovo. 9. Alexandroupoli–Ardanio–Ormenio–Svilegrand–Dimitrograv.
Potential extension towards the East	
Through Turkey	(a) Alexandroupoli–Kipi–Istanbul. (b) Ardanio–Kastania–Edirne.

Source: Egnatia Motorway S.A., 2002.

Since Via Egnatia functions as a collector road axis of transports from Central and Eastern Europe, the Pan-european axes of major significance for Greece are: the forth (IV connecting Berlin with Thessaloniki and Istanbul), the eighth (VIII, also known as "Para-Egnatia" [Pseudo-Alternative Egnatia]) – passing through Durres, Tirana, Skopje, Sofia, Burgas and Varna), the ninth (IX – from Helsinki to Alexandroupoli), the tenth (X – connecting Salzburg and Budapest with Florina and Thessaloniki), the north-south Yugoslav corridor, the Adriatic coastal corridor and the Adriatic corridor of combined transports (see Map I).

In light of the above Via Egnatia is of a geo-strategic significance not only for Greece, but also for the EU. Three major transport route zones in the area are the Black Sea, the Aegean Sea and Eastern Mediterranean, and the Ionian Sea and the Adriatic Sea. The effective connection of these zones is initially achieved through a road quadrangle that includes: Via Egnatia, its two vertical axes (Ardanio – Ormenio – Burgas and Siatista – Krystallopigi – Pogradec – Tirana – Durres) and the Pan-european Axis VIII, Durres – Skopje – Sofia – Burgas, the so-called "Para-Egnatia".

This quadrangle is intersected by the Pan-european Axis X that ends, through links, at the port of Thessaloniki, strengthening the prospects of functional integration and interconnection of transport zones.

The immediate construction of the three sides of this quadrangle, along with the X axis (since it is estimated that the VIII axis will be delayed due to lack of funding, as well as due to the fact that this axis passes through different countries and territories that are characterised by political instability), will allow substantial development of transports in the area. This prospect will lead to an integrated core, a zone of commercial and economic co-operation with continuous transport flows, and a significantly wider influence zone regarding commercial and spatial interdependence (see Figure 4: Map II).

Figure 4: *Map II.*

For the achievement of this objective, the co-operation and development of combined transports in the major ports of the aforementioned zones is essential (European Commission, 2000b). These ports are: Costanja, Varna, Burgas in the Black Sea, Duress, Igoumenitsa, Patra in the Ionian Sea and the Adriatic Sea (in combination with the major Italian Adriatic

ports), Alexandroupoli, Kavala, Thessaloniki, Volos, Piraeus in the Aegean Sea.

In this way, the potential of the western coast and the Aegean Sea for the development of commercial and economic co-operation with the countries of the Black Sea, Central Asia, the Middle East and Northern Africa is strengthened. In light of the above, it is perfectly clear that the implementation of this development strategy requires, besides the completion of Via Egnatia and its vertical axes, the completion of modernisation and expansion projects at the five ports that serve the motorway and function as commercial and economic co-operation gateways.

5. Conclusion and recommendations

The analysis demonstrates the importance of the development of transports in the Balkans and the necessity, on the part of Greece, of constructing Via Egnatia and its vertical intersections, combined with the completion of interventions in ports and airports which service the road and constitute its entrance/exit gates, as well as of other large-scale national transport works (P.A.TH.E., Western Axis, Junctions, etc.). In this way the dual strategy objective regarding the interventions in transport infrastructure is served: the strengthening of cohesion and balanced development of the country and the functional networking of Greece with the wider surrounding geographical areas (South-eastern Mediterranean, Balkans, Eastern Europe, Black Sea).

This networking is realised mainly through cities-hubs where the economies of networking are functioning. These cities-hubs have the opportunity to develop into combined transport hubs, provided that this proves to be technically and economically feasible. In the case of Greece, the ports related to Via Egnatia and the other dynamic urban centres of Northern Greece will play this role.

In this context and in light of the previous analysis, it could be inferred that one of the major and immediate priorities in the area of Southern Balkans is the interconnection of Thessaloniki with the other major Metropolitan Centres of the Balkan core (Sofia, Bucarest, Belgrade) and

primarily with Sofia, which is situated in the centre of the Balkans and is part of three Pan-european Corridors (VIII, IV and X). This interconnection is particularly urgent and benefits both sides, since (Regional Development Institute, 2000):

(a) it connects the two most significant and central transport hubs,

(b) it provides Thessaloniki with an important exit to the geometric centre of the Balkan axis, as well as an alternative route to the X axis,

(c) it offers Sofia an exit to the port of Thessaloniki, which is closer to Sofia than other Bulgarian ports and also closer to most important international markets.

The success of this networking clearly depends on two factors. The first one is the drastic improvements in the Thessaloniki port (and secondarily in the port system of Kavala – Nea Karvali) and the second is the interconnection of Sofia with the X axis.

Thessaloniki is situated in the terminal points of corridors IV and X, P.A.TH.E. and Via Egnatia. It should be noted that P.A.TH.E. acquires its full international importance only if the vertical axes towards Central Europe are completed and Via Egnatia (to the degree that the Igoumenitsa port functions as a real and modernised gate of the country) is completed and connected with Istanbul and Ormenio-Svilegrand as well as if the port of Alexandroupoli is developed into a combined transport hub.

In this direction, the possibility of expansion of Via Egnatia towards Istanbul should be put under consideration. This prospect could be supported by the following arguments: the construction of the expansion is faster in terms of time, since the construction of Via Egnatia is already under way, whilst the construction of Corridor VIII in combination with the X Axis is a difficult venture. In order for Istanbul to be connected with Central Europe, there is the option of the X Corridor which meets the VIII Corridor at Plovdiv, both following a common path up to Sofia. Further, either it continues along with X up to Central Europe, or it runs, along with VIII, further up to the Adriatic coast in Durres and then by ship (combined transport) to Italy. In this prospect, a commercial axis is created, having Via Egnatia as the main body, that stretches eastwards (Turkey – Near East) through the gate of Alexandroupoli and westwards (Italy) through the Igoumenitsa gate (see Maps I, II).

With the completion of Egnatia, the construction of the connection with Istanbul will demand a short period of time (since the Eastern Thrace territory consists mainly of plains) bringing about benefits to both parties. Therefore, an alternative connection with Central Europe will take shape and cargo transport from Greece towards the East (not only Istanbul and Turkey) will be served – at least to some degree. Also, tourist flows will be intensified for both sides.

Following this line of argument, the realisation of the south part of corridor IX should become a major priority with the works from Stara Zagora to Ormenio – Alexandroupoli and Edirne. This triple border area, if considered as a whole, is of great spatial importance, since it is becoming the hub of two (almost three) European Corridors with important interconnections not only with Central, but also with Eastern Europe, particularly regarding the future route of the Black Sea ring (Regional Development Institute, 2000).

Moreover, the creation of an additional corridor in the Western Balkans should also be seriously examined, after the recent changes in New Yugoslavia, and in the light of a serious prospect for political stability, since these territories (Southern Albania, Montenegro, Bosnia Herzegovina and West Croatia) are expected to enter a new phase of growth, mainly based on tourism – therefore their future connection with Pan-european corridors will be necessary. The economic viability of the creation of an additional corridor, Corridor XI which will constitute the continuity of Via Ionia and could be named Adriatic Corridor should thus be examined (European Investment Bank 1999; 2000). This would aim at the direct connection of these areas with Greece as well as with Italy and Central Europe. The creation of this corridor, as far as its section within Albania (north – south) is concerned, is also suggested by the Stability Pact. It is generally argued that this corridor should start from Kakavia and running through Albania, New Yugoslavia (Montenegro), Bosnia Herzegovina, Croatia and Slovenia, ending up in Triest and following a route that includes important ports: Durres-Tirana, Shkodër, Bar, Ploce-Mostar, Dubrovnic, Split, Zadar, Rijeka, Triest (Regional Development Institute, 2000). In this context, another development axis is created which passes through Western Greece, starting from Patra and crossing Egnatia, via Igoumenitsa, continues to Durres (with serious spatial and development

implications for the bipolar Durres-Tirana), and could also expand up to Triest to further develop and reinforce the Adriatic transport zone.

In conclusion, the major implications of the operation of Via Egnatia for Greece are the following:

(a) The creation of a new Development Axis in Northern Greece and the Southern Balkan area.

(b) The development of Thessaloniki into a Metropolitan Centre of the Southern Balkan area (in combination with the Pan-european Axes and the development infrastructure of the city – port, airport, Industrial and Business Centre, etc.).

(c) The strengthening of the role of Igoumenitsa and Alexandroupoli as Entrance/Exit Gates of the EU.

(d) The strengthening of the rest of the "Egnatia ports", mainly that of Kavala and secondarily the port of Volos.

(e) The development of New Centres of Development and Inter-regional and, occasionally, Inter-state Co-operation. In hierarchical order these centres are: Ioannina, Kavala, Kozani, Xanthi, Komotini, Drama.

(f) The major re-routing of exports and international transports of Eastern Thrace (Turkey), Bulgaria, FYROM and Albanian South towards Egnatia and the Igoumenitsa port (at least of exports directed towards the southern areas of the EU and Western Mediterranean).

(g) The creation of a new Transportation and commercial flow Axis: Italy- Southern Balkan area–Istanbul–Anatolia–Caspian Sea.

Finally, it should be noted that transport policies per se are not sufficient for spatial development no matter how much they constitute its key elements. More regional policies are needed on a national as well as transnational level.

NOTES

1. During the 2nd Pan-european Transport Conference that took place in Crete (1994) 9 Corridors were adopted (Crete Corridors), as regards the territories of Central and Eastern European countries. In the 3rd Pan-european Transport Conference in Helsinki (1997) a 10th axis was added (X axis). X axis runs through the Balkans and is of significant interest for Greece. It is considered as an essential supplement to the plan outlined in Crete, which appeared incomplete as far as the Balkans area is concerned, due to the crisis prevailing at that time.
2. According to CSF 2000-2006 figures, the inflow of euros 22,707 million in current prices is provided for in the Structural Funds programme for the 2000-2006 period. In these funds national public expenditure of about euros 11,206 million (current prices) should be added, along with the funding by the Cohesion Fund that this period corresponds to euros 3,320 million. Given the environmental principle "the polluter pays" and the existence of additional revenues from future receipts, the total public expenditure is raised to approximately euros 5,300 million. In addition to community funding through the Structural Funds and the Cohesion Fund for the 2000-2006 period, a further support of around euros 3,800 million is anticipated by the European Investment Bank. Therefore, the total amount of public expenditure mobilised for the materialisation of interventionary actions in Greece in the period 2000-2006 (through the 3rd CSF and the Cohesion Fund) amounts to euros 39,200 million in current prices. On top of these, private funding should be added, especially through the framework of growth incentives and concessions for the construction and exploitation of infrastructure. Total amount is estimated to approximately euros 11,500 million. Therefore, without taking into account the funding in the framework of Community Initiatives, an overall amount exceeding euros 50,000 million will be mobilised for the implementation of 3rd CSF development strategy (Ministry of National Economy, 2000).

3. The width of the road oscillated from 6 to 8,5 m. and was constructed in squares of 4X6 m. Throughout its length, small stone columns ("miliaria") were erected, with information on distances, stations etc.
4. The armies of King Xerxis of the Persians and Alexander the Great used this route.
5. Via Egnatia is a closed dual carriageway motorway with a paved width of 24.5 metres, a central reserve, two traffic lanes plus an emergency lane per direction. It has bridges and tunnels with a length of 40 and 42 km. respectively, 50 interchanges with the rest of the road network, around 400 overpasses and underpasses and 11 railway crossings (Ministry of Environment, Planning and Public Works, 2002).
6. It should be noted that EIB has granted loans of 1,550 million euros in total to the Greek State (to cover part of the national costs) for the works carried out in Via Egnatia within the framework of the 2nd and 3rd CSF.
7. Via Egnatia's crossings through natural habitats (e.g., brown bear area in Pindos, 70 wildlife protection areas, Nestos river and 17 other protected areas) are constructed with respect to the environment, preserving the ecosystems. Alongside the route eco-Museums will be established for the promotion of natural and cultural heritage. Also, the routing is done in such a way so as to protect archaeological findings and monuments that exist in the greater area of Via Egnatia. A characteristic example is the Dodoni tunnel which keeps the archaeological site intact. Also, archaeological excavations are financed in the areas of Kozani, Polimilo, Xerolimni, etc. (Ministry of Environment, Planning and Public Works, 2002).
8. The calculation methodology of the above figures was based not only on records derived from organisation's databases, but also on data derived from contractors and surveyors.
9. It must be noted that this ratio accounts for all three forms of permanent employment: new positions, positions that are maintained and seasonal positions.

REFERENCES

Berechman, J. (2003), *Transportation – economic aspects of Roman highway development: the case of Via Appia*, Transportation Research Part A: Policy and Practice, Volume 37, Issue 5, 453–478.

Biehl, D. (1991), *The Role of Infrastructure in Regional Development*, Infrastructure and Regional Development, European research in regional science, ed. R. W. Vickerman, vol. 1, pp. 9–35. Pion Limited, London.

Button, K. (1998), *Infrastructure investment, endogenous growth and economic convergence*, The Annals of Regional Science, 32, 145–162.

Committee on Spatial Development (1999), *European Spatial Development Perspective. Towards Balanced and Sustainable Development of the Territory of the European Union.* Potsdam.

Egnatia Motorway S.A. (2002), in: http://www.egnatia.gr/text/index.html

European Commission, Directorate General for Transport – TINA Office Vienna (2000a), *Status of the Pan-European Transport Corridors and Transport Areas.* Vienna.

European Commission (2000b), Estia - Interreg IIC, *European Space and Territorial Integration Alternatives, Spatial development strategies and policy integration in Southeast Europe.*

European Commission (1997) *European Spatial Development Plan.*

European Investment Bank, Balkan Task Force (2000), *Basic Infrastructure Investments in Southeastern Europe.* Regional Funding Conference for South-Eastern Europe, Brussels, 29–30 March.

European Investment Bank, Balkan Task Force (1999), *Basic Infrastructure Investments in Southeastern Europe*. Regional Project Review.

Konsolas, N., Papadaskalopoulos, A. and Plaskovitis I. (2001), *Regional Development in Greece*, Springer Publications.

Ministry of Environment, Planning and Public Works (2000), Operational Programme *Road Axes, Ports and Urban Development*, 3rd Community Support Framework III 2000-2006, Athens.

Ministry of Environment, Planning and Public Works (2001), Operational Programme *Road Axes, Ports and Urban Development*, 3rd Community Support Framework 2000-2006 – Programming Complement. Athens.

Ministry of Environment, Planning and Public Works (2002), *Major Works - Via Egnatia*, in: http://www.minenv.gr/4/45/4502/g450201.html

Ministry of National Economy (1993), *Strategic Plan for the Development of Transport Infrastructures - Greece 2010*. "DROMOS - Urban Company of Studies, A. ROGAN AND COLLABORATORS LTD", Athens

Ministry of National Economy (1999a), *Development Plan 2000-2006, Regional Part, Metropolitan Centre Development Plan*, Athens.

Ministry of National Economy, General Secretariat for International Economic Relations (1999b), *Hellenic Plan for the Economic Reconstruction of the Balkans.* Mimeo.

Ministry of National Economy (2000), 3rd Community Support Framework 2000–2006, Athens.

Ministry of Transport and Communications (2000), Operational Programme Railways, Ports and Urban Transports, 3rd Community Support Framework 2000-2006, Athens.

Panebianco, S. and Schurmann, C. (2002), *The Egnatia Motorway – a chance for Northern Greece to catch up?*, Paper presented at the 42nd Congress of the European Regional Science Association, Dortmund, 27–31 August.

Papadaskalopoulos, D.A. (1995), *Patterns and Policies of Regional Development*, Papazisis Publications, Athens.

Papadaskalopoulos, D.A. and Christofakis, S.M. (2002), *Regional Programming*, Papazisis Publications, Athens.

Regional Development Institute (2000), *Spatial Aspects of Transports Policy in the Balkans.* Ministry of Environment, Planning and Public Works, Athens.

Schurmann, C., Spiekermann, K. and Wegener, M. (2002), Trans-european Transport Networks and Regional Economic Development. Paper presented at the 42nd Congress of the European Regional Science Association, Dortmund, 27 – 31 August.

Vickerman, R.W. (1991), *Transport Infrastructure in the European Community: New Developments, Regional Implications and Evaluation. Infrastructure and Regional Development*, European research in regional science, ed. R. W. Vickerman, vol. 1, pp. 36 – 60, Pion Limited, London.

THE DETERMINANTS OF INTERGOVERNMENTAL GRANTS

V. PATSOURATIS*

Abstract

The allocation of grants across local municipalities has attracted the interest of both economic researchers and politicians. This is so because every system of grants raises very interesting questions concerning the equity, economic efficiency and the control of central government upon local government.

This paper examines a question which has proved to be among the most difficult and contentious in grant Policy. It examines how grants are provided to localities in the case of Greece, under two rival governments putting emphasis on the political dimension of the subject.

The regression results obtained are similar for the two governments which mean that both political parties followed the same policy regarding the allocation of grants among local governments. It was found that the size of population of the municipality and the political power of its mayor are the main factors which determine the allocation of grants.

JEL classification: H70.

Keywords: Grants, Local Government.

1. Introduction

Local governments have become increasingly dependent on intergovernmental aid for revenue in recent years. Thus, intergovernmental grants have the larger share in local government revenues. This fact shows the significance and the role which is played by grants in a federal and unitary system of administration. At the same time this fact shows the lack of economic autonomy of the local government which implies local dependence on central

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government. There is no doubt that grants constitute a complex issue in the economics of local government. This is so because every system of grants raises very interesting questions concerning the equity, economic efficiency and the control of central government upon local government. In other words, the central government through grants tries to correct externalities that arise from the structure of subnational governments, to redistribute resources among localities, and to secure a certain level of specific services.

Therefore it is important, to understand the process by which grants are determined by the central government. Public choice theory hypothesizes that grants are related to the economic and social needs of voters. However, alternative rationales for grants include the fiscal needs of cities and political factors based on the incentives of local bureaucrats (Giroux and Wiggins, 1987). Due to these comparing objectives it makes it difficult to detect policy decisions (Alperovich, 1984, Giroux and Wiggins, 1987). Empirically, a small number of studies have tried to study the factors which determine the size and the form of grants under two different approaches. According to the first approach the central government aims to maximize the welfare of the citizen and the size of the grant is determined on the basis of a number of objective criteria such as the size of the population, the income of the citizen etc. According to the second approach the central government aims to maximize its own utility function which includes as the main variable the prospect of reelection and determines the size of grants on the basis of political considerations. The empirical findings of Holcombe and Zardkoohi suggest that political considerations dominate the process i.e. grants levels are significantly related to political variables rather than economic or social variables.

In this paper we examine a question which has proved to be among the most difficult and contentious in grant policy. We examine how grants are provided to localities in the case of Greece, under two rival governments putting emphasis on the political dimension of the subject.

A major conclusion derived from this analysis is that while objective criteria, such as the size of the population and per capita income of locality are important factors explaining the process of grants' allocation to local authorities the political dimension of the affected population is also an important factor affecting per-capita grants. Furthermore, our findings show that the political variable is positive both for New Democracy and Pasok governments which indicates that these governments choose to

reward their supporters rather than "buy-off" their opponents.

The paper is organized as follows. Section 2 contains the rationale for intergovernmental grants. Section 3 provides the Salient features of the intergovernmental transfer system in Greece. In section 4 the model is presented. The data sources, the estimation of the model and the results are discussed in section 5. Section 6 contains a summary and the concluding remarks.

2. The rationale for intergovernmental grants

Grants constitute a transfer of funds from a higher level of government to a lower one and this may affect the level and the composition of local expenditures and revenues. Grants are provided under various forms and are aimed to achieve certain goals such as to face the problem of externalities in the case of supply of local public goods, to transfer resources to local authorities and the control of local governments by the central government. Reasons, therefore, of economic efficiency, social policy and political control support the existence of intergovernmental grants.

In particular, the benefits from the supply of certain local public goods may be diffused beyond the geographic borders of a locality. For example, a good entertainment place or a good street may also provide services to citizens from other localities. This fact may lead to undersupply of these goods and services by a locality since the latter confines the supply of goods and services to such quantities which satisfy the needs of its own citizens. The solution of the problem of externalities through the use of grants is in line with the Pigou's prescription. Coase, however, has suggested that the problem of externalities may be solved in a satisfactory way with the use of voluntary collective bargaining between the affected parties. When the number of affected parties is large it is difficult to come in an agreement and the parties are usually tempted to under-state the benefits they receive in order to become free-riders (King, 1984). In this case the only solution to the problem is the provision of grants to localities which offer these goods and services. In other words, the central government in order to secure that certain goods and services are provided at a specific level finances a part or all the supply of these goods and services through the system of grants. Thus,

it provides the local authorities with an incentive to supply larger quantities than they would supply if they had to bear all the cost of its provision. The proper form of a grant in this case is a matching grant equal to the size of the spillover effect. Buchanan, however, has suggested that the solution to the problem of externalities may be achieved through lower tax rates in poorer localities to compensate tax-payers for the higher local rates that will be required to the low tax base rather than through a system of grants.

Oates, on the other hand, has argued that grants are retained in practice because they exist constitutional or political obstacles to geographically discriminatory tax rates (Oates 1972, p. 84).

Buchanan raised the problem of horizontal equity in a federal system (Buchanan, 1950, Oates, 1972). Each local jurisdiction has its own pattern of provision of local goods and services and it levies its own tax rates to finance them. There are three reasons why these packages might vary from one locality to another (Le Grand, 1975, King, 1984). Firstly, some localities might have higher per capita tax bases therefore they are able to raise a certain amount of revenues at lower tax rates. Secondly, some localities might need more units of public services per head than others to provide similar standards of services. Thirdly, the costs of units of services might be higher in some localities than others. Thus, a system of grants aims to reduce or eliminate such differences among localities trying to secure a certain level of goods and services and at the same time it encourages the undertaking of various projects.

Finally, it has been argued, that the central government uses grants as a means to influence the level and composition of local expenditures. This may be due to the fact that grants may lead to an increase of dependence of local authorities on central government which implies a weakening of their autonomy. Thus, functions which belong by constitution in the competence of local authorities are controlled by the central government.

Empirical studies have reached the conclusion that grants are significantly related to political factors rather than economic and social needs (Holcombe and Zardkoohi, 1981). Nonuniform grant distribution is likely to be associated with political goals by the central government (Torgovnick, 1978, Strouse and Jones, 1974). In other words, the political beliefs of the mayor may affect the central government's decision regarding the size of the grant provided to his locality. Localities whose mayors have more political power may therefore receive larger grants.

Contrary to the above position, other studies have shown that political influence is not so important in the determination of the allocation of grants among local jurisdictions. Such studies have shown that political factors appear to be important only in explaining the allocation of employment opportunity grants across local governments (Luksetich, 1983). Luksetich has argued that the political factor affects the aggregate distribution of grants whereas the distribution of individual grant is less important. Therefore, he concluded that the effect of political factor has yet to be ascertained.

3. Salient features of the intergovernmental transfer system in Greece

Greece has a unitary system of administration with the first degree of self-government at the level of municipalities and communities. The second was recently enacted. Table 1 provides information about the relative decentralization of public finance in 19 selected countries indicating that Greece is at the end of the ranking among those, with decentralization ratio of 5.0 percent in 2001.

Table 1: *Local Government Share in General Government Expenditures (2001).*

	%	Ranking		%	Ranking
Denmark	57,8	1	Austria	28,5	14
Canada	56,5	2	G. Britain	25,9	15
Sweden	43,4	3	France	18,6	16
Japan	40,7	4	Luxemburg	12,8	17
United States	40,0	5	Portugal	12,8	17
Norway	38,8	6	Greece	5	19
Germany	36,1	7	**Mean Average**	**32,2**	**–**
Finland	35,5	8			
Netherlands	34,2	9			
Belgium	34,0	10			
Spain	32,2	11			
Italy	29,7	12			
Ireland	29,5	13			

Source: OECD, Revenne Statistics.

The functions of local authorities are not determined by the constitution but by laws. So, the central government has the power to intervene in the function of local authorities. The articles 22–27 of the law 1065/1980 refer to the functions of municipalities and communes, while article 144 of the same law classifies their revenues in the categories, the ordinary and extraordinary. Table 2 shows the composition of revenues of local authorities in Greece from current exchanges for selected years in the period 1982–1998. It is shown that during the whole period under consideration the transfers from central government had the greater share (ranged from 37,80 to 49,70 per cent). Tax revenues follow but their share decreased during the period under consideration (ranged from 35, 0 to 27,70 percent). The income form property remained constant whereas the revenues from loans decreased.

Table 2: *Composition of Revenues of Local Authorities in Greece.*

	1982	**1986**	**1990**	**1992**	**1994**	**1998**
Tax Revenues	35,00	33,30	27,90	26,57	29,32	27,70
Income from Property	4,90	1,90	5,60	4,12	7,25	4,54
Transfers from central Government	37,80	40,50	49,70	43,51	48,52	42,81
Loans	10,00	10,20	6,60	3,90	3,17	2,74
Other	12,30	11,10	10,20	21,90	11,54	22,21
Total	100	100	100	100	100	100

Source: National Statistic Service of Greece

The ordinary grants are distinguished in two categories (table 3). The first category, the regular grants, is provided by the Ministry of Internal Affairs and is aimed to certain specific goals (Law 4260/1962, Law Decree 703/1970 and President Decree 304/1977). The second category of ordinary grants is provided by a number of organizations such as the Ministry of Health and Social Welfare, and aims to finance specific functions of local authorities. The President Decree 304/1977 determines the way in which grants are provided. According to this Decree the main criterion determining the size of regular grants is the size of the population of local authority.

In Greece the extraordinary grants are provided by various public organizations such as the Organization of Employment of Labor Force, Communal Funds etc. The criteria according to which these grants are provided by these organizations are not widely known and they are provided

only in the case where the local authority has applied for receiving a grant. The provision of these grants depends, along with other things, on the availability of funds, the priorities which have been set by the organization which provides them, the capability of local authority to support its application and the political power of local authority. From the above it is clear that extraordinary grants are not provided on the basis of predetermined criteria, such as the needs of a local authority, and therefore local authorities are not benefited on the basis of their needs.

Ordinary revenues enjoy a higher share than that of extraordinary. Among the regular revenues those from local fees have the larger share (24,60% in 1998) while second in ranking are the grants with 23,90% share. The tax revenue rank third with a share of 3,10% among the extraordinary revenues the ones from grants are first in the ranking with a share of 18,91% while revenues from debt have a share of 2,74%. The significance of role of grants is clear. The total share (ordinary and extraordinary grants) in total revenue of local authorities was 42,81% in 1998.

The whole system of grants in Greece is characterized by serious weaknesses due to the lack of clear criteria and the variations realized in the size of grants which do not allow a rational planning by the local authorities (Tatsos, 1988). The unique clear criterion for the basis on which the grants are provided is the size of population, which by itself does not constitute the perfect index of local needs. The capacity of local authority to finance its expenditures and tax effort are not taken into consideration. In other words, the provision of grants in Greece does not have a clear–cut distributional goal. Therefore, it seems realistic, to support the view that the political factor may play a significant role in the determination of grants.

Table 3: *Regular and Extraordinary Local Government Revenues (%).*

	1982	**1986**	**1990**	**1992**	**1994**	**1998**
A. Regular	69,60	58,70	64,20	63,73	66,70	70,24
1. Income from property	3,90	4,00	4,90	3,61	6,66	4,00
2. Local Fees	27,20	23,50	23,00	22,96	26,16	24,60
3. Taxation	7,80	9,80	4,90	3,61	3,36	3,10
4. Transfers from central government	23,90	16,00	26,30	20,49	23,69	23,90
5. Other revenue	6,80	5,40	5,10	13,06	6,43	14,64

	1982	1986	1990	1992	1994	1998
B. Extraordinary	30,40	41,30	35,80	36,27	33,70	29,76
1. Disposition of property	1,00	0,90	0,70	0,51	0,59	0,54
2. Loans	10,00	10,20	6,60	3,89	3,17	2,74
3. Grants	13,90	24,50	23,40	23,02	24,83	18,91
4. Donations–Inheritances	0,60	0,50	0,40	0,37	0,37	0,24
5. –Fees etc.	–	0,80	0,90	096	1,16	0,94
6. Other revenue	4,90	4,40	3,80	7,52	3,58	6,39
A+B	100,00	100,00	100,00	100,00	100,00	100,00

4. The model

Grants–in–aid in Greece do not clearly conform to those prescribed on the basis of our economic reasoning. Presumably one main role of the grant–in–aid is to transfer purchasing power from the central government to local government to overcome fiscal imbalances and to pursue the goal of fiscal equity. In other words, the two main goals of grant–in–aid in Greece are the equalization of fiscal effort across jurisdictions, and the achievement of a minimum level of public services throughout the nation. The former goal is presumably motivated by a desire to achieve fiscal equity, while the latter is a goal that is based upon political motive.

Based on the above considerations, the empirical model employed in this study describing government behavior in allocating grants to local governments has the following form:

$$G = a_o + a_1 Y_1 + a_2 P_1 + a_3 M_1 + a_4 D_1$$

Where, the dependent variable, G, refers to per capita grant distinguished by regular, extraordinary and total. Y_1 refers to per capita revenue, P_1 the population of each municipality, M_1 the political variable and D_1 the density of population.

The above model is structured so as to address the main features which characterize the process of grant allocation to local governments in Greece. The model postulates that governmental allocation of grants among local governments is motivated by factors falling into three broad categories:

The allocation of grants among jurisdictions may be related to some characteristics of the recipient government such as fiscal capacity, needs and political beliefs of the majority of the citizens expressed to the mayor. To achieve the goal of establishment a fiscal environment in which each local government can provide a satisfactory level of basic public services, the central government bases the allocation of grants on the need element and fiscal capacity of the local government.

Fiscal capacity is a measure of the ability of a jurisdiction to finance government services. The fiscal capacities of local government units are likely to vary with the amount of money it can collect from own resources. Such differences in the fiscal capacities of local governments suggest that some central government intervention is necessary to assure that all local governments supply a "minimum" acceptable level for public services. Among the commonly used measures of fiscal capacity are per capita income and per capita magnitude of various tax bases. However, per capita income is only an accurate measure of fiscal capacity for raising income tax revenues. A more accurate reflection of fiscal capacity might require taking into consideration the ability to raise revenue from a variety of sources (Boadway and Wildasin, 1984). This paper employs two different measures of fiscal capacity. Per capita revenue from every source and per capita revenue from regular sources.

The index which expresses the needs of a local authority reflects the difference between its capacity and that required to provide an accepted level of goods and services. The differences in local authorities' abilities to finance a certain level of goods and services may be due to various reasons such as the different per unit cost of provision, the different number of people who benefits from these services etc. The ability of a local authority, for example, to finance its education system, for a given amount of funds, depends on the per pupil expenditure required and the number of pupils.

The needs of the local government, therefore, are determined from a number of factors such as demographic, geographic, social, and economic. Since these factors might differ from one locality to another it is plausible to expect the needs of these localities to be different. Thus, the quality of goods and services provided by a local authority, the number of users and the per unit cost of these goods and services determine the needs of the local authority.

Population is the most common measure of needs for many grant formulas. A number of studies use population as the measure of need as a second–best solution for certain services, because this index is not a good criterion. In this paper we use population as a proxy for need on the ground that, the larger the population, the larger are the needs of the jurisdiction. The composition of population and the stage of economic development of local jurisdiction may also determine its needs. The per capita income of a jurisdiction is usually used as an index of the stage of development. Therefore, the inclusion of a per capita income variable to our model has a twofold aim. In the case of Greece, as noted previously, the main criterion to distribute grants among municipalities and communes is the size of population. Accordingly we expect that the coefficient of population variable to be positive. Others include the population variable in their models in order to take into account the possible economies of scale in the provision of services provided by local authorities. It is suggested in the literature that the average costs of providing such services decreases with city size. Thus, the inclusion of population in their models intends to capture government grant policy concerning such economies (Alperovich, 1984). Accordingly, it is expected that the coefficient of population will be negative.

Since the population variable does not constitute, by itself, a unique index of a jurisdiction's needs, for the reasons above mentioned, it must be supplemented by one or more other indeces which also determine the needs of a jurisdiction. Such indeces may be the density of population, the geographic area of the jurisdiction etc. In our model we use, alternately, these indexes due to the large correlation existing among them. We expect a positive sign between them and the per capita grant variable.

Finally, political factors may affect the allocation of grants among the local governments. In the literature there is a debate as far as the role of this factor is concerned. One side supports the view that local governments whom the mayors have political power may receive a larger amount of grants while the other side supports the view that the political factor does not play any significant role in the allocation of grants.

If the coefficient of political variable (a_3) equals to zero, this indicates that the process of grant allocation in Greece is free of political considerations. On the contrary, if $a_3 > 0$ or $a_3 < 0$ this indicates the relevancy of political considerations in the above process. In the case

where $a_3 > 0$ the government in its effort to be reelected rewards its supporters while for $a_3 < 0$ means that the government rewards its opponents.

Empirical studies have shown that the data strongly suggest that political influences overwhelmingly determine the allocation of central governments, despite the fact, that each of these studies used different political variable (Holcombe and Zardkooni, 1981, Giroux and Wiggins, 1987). Thus, there is a nonuniform aid distribution among local jurisdictions associated with political goals towards a central authority (Torgovnik, 1978).

On the other hand, it has been argued that the above results are questionable due to some serious flaws in their models (for example, the functional form of the model, see Luksetish, 1983). It is argued, therefore, that the statistical estimates don't show that political influence overwhelmingly determines the allocation of grants among local jurisdictions. Therefore, despite the fact, that the above studies suggested an interesting field of research, the economic and political variables affecting the distribution of grants across local jurisdictions have yet to be ascertained.

We expect that the second category of grants, the extraordinary, reflects the political dimension of grant allocation since their allocation takes place on the government's discretion and it is not based on clear and predetermined criteria. The choice of that as dependent variable may be explained that this category of grants is not free of political consideration.

The study of these factors will be accomplished by incorporating a dummy variable in the model which expresses the political belief of the mayor, which reflects the majority of the citizens. This model will be run for two years, for each different government. In that way we can first examine if the political variable affects the central government's decision to allocate grants among local governments and secondly under which political party in power the political variable is higher.

5. Data sources–estimation–results

The data which we used to estimate our model are cross–sectional and refer to a sample of municipalities. The sample includes the municipalities with odd

numbers which appear in the Ministry of Internal Affairs, population with all the municipalities of the country. From the same source we took the data which refer to grants and other revenues of the municipalities.

The population of each municipality was collected from the same Ministry. The population for both years 1992 and 1998 is taken from the 2000 census.

The data for the geographic area of each municipality were collected from the National Statistic Service of Greece.

Two of our variables, grant and income, are expressed in per capita units. This is done for two reasons. Firstly, the fact that the decisions for the allocation of grants are taken on the basis of that size and second, to avoid heteroscedasticity which may arise from the proportionality of the error term with the size of population (Alperovich, 1984).

The model was estimated for two years. For 1992 when the party of New Democracy was in power and for 1998 when the party of Pasok was in power. The choice of these years was made, with the criterion that both of these years were not municipal election years. We ran the equations i.e. dependent variable was successively per capita regular grant, per capita extraordinary grant and per capita total grant. We observed that the sample without the municipality of Athens provides better results than the sample with the municipality of Athens. A general observation is that the R^2 all the estimated equations are satisfactory and they range between 0.60 and 0.89 which means that a large part of the variations of the dependent variable is explained by the independent variables of the model.

In particular, we observe that the most significant factor which influences the level of per capita regular grant across the Greek municipalities, for both years, is the population of municipality. We expected such a finding since as we have already mentioned, previously, this category of grant is allocated on the basis of population. It is worth mentioning that the coefficient for per capital regular grant is the same for both years (6.5 and 6.1) which means that both political parties took into consideration the population factor at the same degree in the allocation of regular grants. This finding is against the widely held opinion that production of public service, by local authorities is done under economies of scale; i.e., the city size is negatively associated with per capita grant. The other variables, per capita income, political belief of the mayor and the geographic area of the

municipality seem not to affect the allocation of ordinary grants.

As far as the allocation of extraordinary per capita grant is concerned, we observe the political variable has a significant influence. The coefficients in both cases are positive, which means that both political parties in their effort to be reelected reward their supporters. The per capita revenue of the municipality also affects the allocation of the grant, even to a less degree while the other independent variables don't.

Finally, the variations of per capita total grant are mainly influenced by the population of each municipality and to a less extent by the per capita revenue of the municipality.

Table 4: *Regression Results For Determinants of Grants Allocation.*

	Constant	**Income Y**	**Population P**	**Political Power M**	**Density of Population D**	**R^2**	**DW**
RG_{1992}	0,45 (4,8)	0,06 (4,8)	6,1 (2,1)	0,05 (1,8)	0,0007 (0,99)	0,60	1,99
RG_{1998}	0,47 (2,1)	0,06 (3,3)	6,5 (2,0)	0,05 (2,4)	 (0,8)	0,89	1,94
EG_{1992}	0,54 (4,17)	0,35 (16,5)	1,3 (0,9)	2,2 (2,4)	0,006 (0,5)	0,72	1,5
EG_{1998}	0,44 (1,2)	0,22 (9,3)	1,06 (0,6)	3,5 (1,9)	0,001 (0,6)	0,61	2,0
tG_{1992}	0,13 (0,9)	0,41 (16,8)	2,2 (1,9)	0,20 (1,7)	0,001 (0,9)	0,72	1,6
TG_{1998}	0,40 (1,0)	0,39 (15,4)	1,2 (1,8)	3,0 (0,8)	0,01 (0,5)	0,65	2,0
RG_{1992}, RG_{1998}: ordinary per capita grant for the years 1992 and 1998 correspondingly							
EG_{1992}, EG_{1998}: extraordinary per capita grant for the years 1992 and 1998 correspondingly							
TG_{1992}, TG_{1998}: total per capita grant for the years 1992 and 1998 correspondingly							

6. Summary and conclusions

This paper examined the factors which influence the allocation of grants across local municipalities in Greece under two rival governments. It is worth emphasizing that the regression results obtained are similar for the two governments which mean that both political parties followed the same policy regarding the allocation of grants among the local governments. We found that the size of population of the municipality and the political power of its mayor are the main factors which determine the allocation of grants. Other factors such as per capita revenue and geographic area of the municipality have a small or zero effect upon the distribution of grants.

The population factor as we noticed does not express by itself the needs of a municipality. The central government therefore should adopt another objective criterion which expresses the needs of a locality such as the density of population, the per unit cost of goods and services provided etc.

REFERENCES

Alperovich, G. (1984), *The economics of choice in the allocation of intergovernmental grants to local authorities*, Public Choice, 44, pp. 285–296.

Aronson, J. and Schwartz, E. (ed), (1987), *Management Policies in Local Government Finance.*

Bahl, R. and Pillac, V. (1976), *The allocative effects of intergovernmental flows in less developed countries: a case study of India*, Public Finance, Vol. XXXI, pp. 73–89.

Boadway, R. and Wildasin, (1984), *Public Sector Economics*, Little, Brown and Company, Boston, Toronto.

Buchanan, J.M. (1950), *Federalism and fiscal equity*, American Economic Review, Vol. 40, N^{o} 4, pp. 583–99.

Coase, R. (1960), *The problem of social cost*, Journal of Law and Economics, Vol. 3, pp. 1–44.

Conn, E. and Costa, J. (1986), *Equity and efficiency effects of Intergovernmental aid: The case of Portugal*, Public Finance, Vol. XXXXI, pp. 42–62.

HoLcombe, R. and Zardkoohi, A. (1981), *The determinants of federal grants*, Southern Economic Journal, pp. 393–399.

Giroux, G. and Wiggins C. (1987), *Intergovernmental grants and local needs*, Journal of Accounting and Public Policy.6, pp.169–183.

Gist, J. and Hill, R. (1981), *The economics of choice in the allocation of federal grants: An empirical test*, Public Choice, Vol. 36, pp. 63–73.

King, D. (1984), *Fiscal Tiers, The Economics of Multilevel Government*, George Allen and Unwin Ltd, U.K.

Le Grand, Julian (1975), *Fiscal Equity and Central Government grants to local authorities*, The Economic Journal, Vol. 85, PP. 531–547.

Luksetich, W. (1983), *The determinants of federal grants: Comment*, Southern Economic Journal, Vol., pp. 270–274.

Oates, W. (1972), *Fiscal Federalism*, Harcourt Brace Jovanovich, inc. N. York.

Strouse, J.C. and Jones, P. (1974), *Federal aid: the forgotten variable*, Journal of Politics, 36, PP. 200–207.

Torgovnik, E. (1978), *Central aid*, Public Finance Quarterly, Vol. 6, No 2, pp. 211–239.

Thurow, L. (1982), *Aid to state and local governments*, National Tax Journal, Vol. 23, pp. 23–25.

Tatsos, N. (1988), *Grants to local governments* (in Greek), Greek Company of Local Development and Self–Government.

THE EX–DIVIDEND PRICE BEHAVIOR OF DUALLY LISTED INTERNATIONAL STOCKS

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Abstract

This paper analyzes the ex–dividend day price behavior of multinational shares, determines the their tax clientele, the marginal tax rates of United Kingdom, Japan, South Africa and United States, and the marginal tax ADR shareholders.

JEL classification: F21, G32.

Keywords: Ex–dividend price behavior, tax clientele, marginal tax.

1. Introduction

The objective of this paper is the analysis of the ex–dividend day price behavior of multinational shares. The ex–dividend price behavior of foreign shares' trading in the U.S. may be very important for several reasons. First, no one yet, to the best of my knowledge has systematically examined this behavior. An attempt will be made to determine the existence of a tax clientele on the dually listed international shares; to determine the marginal tax rates of United Kingdom, Japan, South Africa, United States; and finally, to determine if the marginal tax ADR shareholders are subject to the tax legislation of the ADR's country of origin or the country in which the ADR is sold. Second, the study of U.S. traded international shares avoids problems caused by foreign currency translation which affect all previous studies dealing with foreign stocks. Similarities or differences of the ex–dividend price behavior of the same foreign stock traded both internationally and in the U.S. can lead to inferences about the degree of international capital market integration or segmentation.

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The rest of this paper is organized as follows. Section II is a brief review of the literature. Section III describes the major taxation rules in foreign countries such as the United Kingdom, South Africa, Japan and the United States. The hypotheses tested are explained in Section IV. The methodology and data are explained in Sections V and VI. Finally, Section VII presents the major empirical findings, while Section VIII is a summary and conclusion.

2. Review of Literature

The ex–dividend price behavior has stimulated a large body of theoretical and empirical. Miller and Modigliani (1961) were the first to suggest the possibility of the existence of the clientele effect. The tax clientele effect refers to a class of investors that prefer some particular dividend payout ratio, basing their decision on the effect of the tax rates applied to their taxable income i.e. investors that have different tax rates may hold some stocks in preference to others. Hence, stockholders who pay higher (lower) income tax rates on dividends compared with capital gains will prefer low (high) dividend payout stocks. The tax clientele hypothesis suggests that due to lower personal taxes on capital gains than on dividends, the returns on the ex–dividend day should include a tax premium to compensate the typical investors that held the stock through the dividend for their higher tax liability.

Elton and Gruber (1970) made the first attempt to systematically analyze the tax clientele effect; their evidence suggested that investors who hold stocks with low dividend yields are in high tax brackets compared with stockholders who hold stocks with high dividend yields. As a result, firms seem to attract a rational clientele effect. They found, in particular, that the correlation between the ex–dividend price drop – defined as the ratio of price drop (price before minus price after) over the dividend amount – and the dividend yield was positive and statistically significant. It was also found that the tax bracket in general increases as the dividend yield decreases. They finally found that stock prices fell by an amount smaller than the dividend per share and identified the average marginal tax brackets of the stockholders at the margin to be 36.4%.

Kalay (1982) found that even after an adjustment for potential biases, the

correlation between the dividend yield and the ex–dividend relative price drop still exists and is positive which is consistent with a tax effect. He argued, however, that the positive correlation is not a sufficient condition to conclude that the marginal tax rates can be inferred in the absence of additional information. Kalay concluded that the documented ex–dividend price behavior is not only consistent with a clientele effect or tax effect but also can be consistent with the short–term trading hypothesis. According to Kalay, in the United States short–capital gains (those gains realized in a period of less than a year) are taxed as ordinary income. Therefore, a substantial difference between the dividend per share and the expected price drop would offer profit for traders who do not own the stock initially. This argument, in essence, was that if the price drop on the ex–dividend day is different from the dividend amount, short–term traders facing differential taxes on capital gains versus dividends could make arbitrage profits. This arbitrage profits process may be inhibited by the transactions costs involved and he argued that the transactions costs are sufficiently small for broker–dealers. The presence of transaction costs led him to conclude that the documented relationship between the ex–dividend price drop and the dividend yield is consistent not only with the clientele hypothesis, but also with the short–term trading hypothesis.

Elton, Gruber and Rentzler (1984) discussing Kalay's findings argue that he had seriously underestimated transaction costs – by omitting clearance costs, bid–ask spreads, transfer taxes and registration fees – and his closing prices' adjustment method was not better than theirs and suggested that even for broker–dealers the transactions costs may be prohibitely large. In particular, they suggested that if there were no tax effects the short–term traders in the presence of transaction costs would cause the decline on the ex–dividend price to have a random distribution around the amount of dividend, but this pattern was not found by any researcher in the field. Recognizing another possibility that if the tax rates are important but that short–term trade limits the amount that prices fall that would occur due to pure tax effects, they asserted that this evidence would cause a downward biased estimate of tax rates in particular for very high dividend stocks.

Kalay (1984) responding to Elton, Gruber and Rentzler recognized that the effective transaction costs in the period he studied were larger than the minimum costs, such as broker dealer costs, costs associated with the bid

and ask spreads, transfer taxes and registration fees, but argued that the transaction costs were not enough to prevent short–term profit elimination around the ex–dividend day. He also argued that, in the absence of perfect clientele effects, there will be infra–marginal investors who are not indifferent between selling (or buying) before or after the ex–dividend day. If this investor population is sufficiently large, it will have an unpredictable impact on stock prices. Given the limitations on the short–term traders and on the trading population in setting equilibrium prices, his results were consistent with the tax clientele effect and also with the short–term trade hypothesis.

Miller and Scholes (1978) stated that even with prevailing tax laws (before the Tax Reform Act of 1986) where the capital gains tax is less than the personal ordinary income tax, many investors need not pay more than the capital gains on dividends and thus will be indifferent between payments in the form of capital gains or dividends. They pointed out that the tax laws allow plenty of opportunity for the investor to postpone the tax on dividends or to transform dividends into capital gains, such as by buying a straight life insurance policy or by increasing his contribution to a pension scheme. Because pension funds and life insurance companies are not taxed on their investment income, it pays wealthy investors to save through these institutions. If they borrow to pay their pension contribution or insurance premium, they could use the loan interest to offset the dividend income on their common stock. It is plausible that the government's favorable tax treatment of pension funds and life insurance provides a chance for investors to postpone taxes on investment income. Therefore, there will be no clientele effect. Pettit (1977) examined 914 individual portfolio accounts between 1964 and 1970 handled by a large retail brokerage firm. He concluded that there is a clientele effect. The evidence by Lewellen, Stanley, Lease and Schlarbaub (1978), using the same data base as Pettit, supported only a very weak clientele effect.

Miller and Scholes (1982) reexamined some tests of whether shareholders with higher dividend yields receive higher risk–adjusted rates of return to compensate for the heavier taxes on dividend payments than on the long–term gains. Their particular concern was with tests using short–term measures of dividend yield, i.e. measures that seek to deduce the differential tax burden on dividend over long–term capital gains from differences in

return rates on shares that do and shares that do not pay cash dividends during the return interval. They show that such measures are not appropriate for this purpose. Then they concluded that any yield related effects associated with such measures must arise from sources other than the long–term tax differential, such as short–term trading and transaction costs. They also found that the differences in estimated yield effects appear to reflect differences in the degree to which the expected dividend yield introduces unwanted information effects, and after correcting these measures for information effects, they found no significant relationship between returns and expected dividend yields. Their conclusion was that evidence provides no clear–cut support for tax effects. Lakonishok and Vermaelen (1983), analyzing the effect of a major Canadian tax reform effect on the ex–dividend day behavior of Toronto Stock Exchange companies, concluded that price changes on ex dividend days do not reflect the relative taxation of dividends for the representative investor and that ex–dividend price behavior reflects short–term trader activities. Recognizing the dependence of stock prices and personal taxes on dividend policy, they argued that the ex–dividend price behavior should not be used to access the existence of clientele effects. They suggested that their results should not be interpreted as evidence of independence between dividend policy and personal taxes. Their main argument was that ex–dividend price behavior should not be used to assess the relative valuation of taxable dividends versus taxable capital gains by the average investor or the existence of the tax clientele effects.

Eades, Hess and Kim (1984) found that the ex–dividend days' excess returns cannot be fully explained by the tax hypothesis, and that the differential tax rates between capital gains and dividends cannot be inferred from the average relative price drop on the ex–dividend day. The ex day results for the taxable common stock distributions were found to be consistent with the tax interpretation. Their conclusion was that the returns on the ex–dividend period remain an anomaly.

Lakonishok and Vermaelen (1986) investigated the trading volume around the ex–dividend days. Their results were consistent with the hypothesis that the short–term traders have a significant impact on the price behavior of ex–dividend days and this short–term trade activity makes it difficult to conclude the existence of clientele effects or to infer the

investor's marginal tax brackets from the ex–dividend behavior. In the examination of taxable and non–taxable distributions, it was found that the trading volume increased for the former and declined for the latter around the ex–dividend day.

Booth and Johnston (1984) attempted to determine whether the ex–dividend day price ratio can be used to estimate marginal tax rates in Canada. Their findings supported a market preference for capital gains over dividend income and a response of the ex–dividend price to tax changes that is consistent with a marginal tax investor who is an individual with a very low effective tax rate on capital gains. Their data rejected the realized capital gains tax version of the tax clientele hypothesis and the institutional short–term hypothesis under reasonable transaction costs. They noticed that the latter hypothesis failed to explain the ex dividend price behavior around major tax reforms unless some restrictive assumption would be made. Their evidence did not provide strong support for the existence of dividend tax clienteles. They found that interlisted stock prices were determined by the American investors' community while the Toronto Stock Exchange listed stock prices were determined by Canadians. These findings were consistent with the nationality hypothesis.

The work of Poterba and Summers (1984) attempted to examine the dividend tax effects on investors' relative valuation of dividends and capital gains. Drawing their conclusions from British securities' data they conclude that changes in dividend taxation has a significant impact on the premium that investors require to induce them to receive returns as dividends, and those changes provide good evidence that taxes can partly be the cause of the positive relationship between yields and stock market returns. They suggested that weighted averages of investor tax rates may provide a reasonable approximation to the tax preferences prevailing in the market.

3. Taxation in Foreign Countries and in the United States

United Kingdom: The introduction of an integrated corporate income tax law in April 1973 has substantially reduced the dividend tax rate on individuals and corporate investors and has actually provided a dividend subsidy to untaxed payers. Investors were permitted to take a partial tax

credit for corporate tax payments in evaluating their dividend tax liability. In the U.K., corporate tax is the withholding mechanism for collecting dividend tax. In order to affect the "dividend stripping" by trading around the ex–days, Inland Revenue has been empowered to levy penalties on investors engaging in securities' transactions which are principally motivated by tax considerations.

Trading, also, by institutions around ex–days could be declared void if they bought and then sold the same share within a month of its ex–dividend day. If its transactions are disallowed, the institution could be required to pay taxes, regardless of its tax–exempt status. A dealer, also, who trades in a security around its ex–day and holds his shares for less than a month, will not be able to deduct his full capital loss from taxable income, that is, only a fraction of his capital loss is disallowed for tax purposes.

The U.K. taxes its residents on their worldwide income and capital gains. Non–residents are taxed on their U.K. income but generally not on capital gains. Investment income and capital gains arising from sources outside Britain earned by a non–resident is taxed only if they are received in the United Kingdom.

U.K. residents are entitled to a credit for foreign taxes paid against U.K. income or capital gains tax payable on the same income or gain.

The income tax rates prevailing in the United Kingdom during the period of the analysis are as follows (Table 1):

Table 1: *Income Tax Rates in the United Kingdom.*

Taxable Income ($)	Tax Rates (%)
12,320	30
14,560	40
18,480	45
24,480	50
30,480	55
Over 30,480	60

Source: Britain's Inland Revenue–Department of Statistics.

South Africa: Capital gains are not taxable. Investment income derived from sources outside South Africa is also tax exempt in certain circumstances. Generally, no foreign tax credits are granted that may be offset against South

African tax payable.

The South African tax law does not distinguish between a resident and a nonresident individual. Both are subject to tax for income arising from sources within or deemed to be within South Africa. The same tax rates are applicable to both.

The income tax rates prevailing in South Africa during the period under investigation are as follows (Table 2):

Table 2: *Income Tax Rates in the South Africa.*

Taxable Income ($)	Tax Rates (%)
10,000	6
15,000	10
20,000	13
25,000	17
30,000	21
35,000	24
40, 000	26
45, 000	29
50, 000	31
60, 000	34
70, 000	36
80, 000	37
90, 000	38
100, 000	40
120, 000	41

Source: South Africa's Inland Revenue–Department of Finance.

Japan: For individuals, dividend income is classified as ordinary income and is subject to the personal income tax rate schedule. In principle, taxes are not imposed on capital gains for both corporations and individuals. Nevertheless, under certain circumstances capital gains are subject to special tax treatment. Items of non–taxable income are provided for in the Income Tax Law or other related laws. Some of the principal items regarding the taxation of income from the sale of securities are described below. Taxable income is:

a) Income from the sale of shares accumulated for the purpose of increasing the price of such shares by obstructing normal trading.

b) Income from continuous trading in securities (more than 50 transactions involving more than 200,000 shares per year).

c) Income from the sale of securities of identical issue, amounting to not less than 200,000 shares per year.

d) Income from the sale of securities involving the disposition of ownership control over the business assets of a corporation (sale of substantial participation).

e) Income from the sale of "special information issues" as designated by the Stock Exchange amounting to not less than 200,000 shares.

f) Income from the sale of so called zero–coupon securities. Resident taxpayers can credit foreign income taxes against their Japanese tax liabilities if non Japan source income is taxed in Japan. Withholding tax on Japan source interest and/or dividends is generally creditable against a resident's annual tax liability. A special deemed tax credit is available in addition to the tax withheld on dividends received from domestic companies for tax purposes.

A non–resident taxpayer is taxed only on his Japan source income. A non–permanent resident taxpayer is taxed on Japan source income plus that part of non–Japan source income that is paid in and/or remitted to Japan. A permanent resident taxpayer is taxed on his worldwide income.

The income tax rates prevailing in Japan during the period under consideration are as follows (Table 3):

Table 3: *Income Tax Rates in Japan.*

Taxable Income ($)	Tax Rates (%)
4,100	0,3
6,000	3,3
8,000	4,2
12,000	5,5
20,000	7,8
28,000	10,7
40,000	14,7

Source: Consulate General of Japan.

United States: In U.S.,the Tax Reform Act of 1984 a) abolishes various shortselling benefits; b) extends the holding period from 16 to 45 days for incorporated traders–buyers to be eligible for the 85% dividend received deduction and c) disallows certain hedging strategies during the holding period.

Individuals were taxed at rates varying from 11% to 50% and generally were allowed to use tax credits and losses to shelter income tax liabilities attributable their other business activities.

The corporate income was taxed at rates varying from 15% to 46%. A corporation in the lowest tax bracket had a dividend tax rate of 2.15 percent (0.15 x 0.15) while a firm in the highest tax bracket had a dividend tax rate of 6.9 percent (0.46 x 0.15).

Non–resident aliens' U.S. source dividends are generally subject to a flat 30% tax rate, usually withheld at source. Non–resident aliens are taxed on U.S. source capital gain if they are in the United States 183 days or more during the taxable year in which the gain occurs. Foreign taxes may be deducted from taxable income of resident aliens. Non–resident aliens are generally not entitled to a deduction or credit for foreign taxes.

The income tax rates prevailing in the United States during the period of the analysis are as follows (Table 4):

Table 4: *Income Tax Rates in the United States.*

Taxable Income ($)	Tax Rates (%)
2,390	11
4,580	12
6,760	14
9,050	17
12,280	18
15,610	20
18,940	24
24,460	28
29,970	32
35,490	35
46,520	42
63,070	45
85,130	48
112,720	50

Source: Standard Federal Tax Reporter.

4. Hypotheses Tested

In this paper, the aim is to analyze the ex–dividend day price behavior of American Depository Receipts, shares that are internationally listed. An attempt will be made to: Investigate the marginal tax rates of the countries under investigation such as England, Japan, South Africa and the U.S. Examine whether the marginal tax investors holding dually listed shares are subject to the tax legislation of the country of origin or the country where the ADR's are dually listed, and Examine if the investors' preference for some particular dividend payout ratio is based on the tax rate applied to their taxable income, in other words, if a tax clientele effect exists.

The tax brackets of the marginal stockholder play an important role in the firm's cost of capital and optimal investment policy as well as the corporate dividend policy. In a world in which dividends are taxed to a greater extent than capital gains, as in the U.S., investors may have a demand for higher before–tax returns in order to hold securities with high dividend yield. In contrast, if dividends are taxed at a lower rate, as in the case of the U.K., then the capital gains investors may prefer to demand lower before–tax returns to hold securities with high dividend yield. In South Africa and Japan, capital gains are not taxed.

For a foreign corporation trading A.D.R.s in the United States, in order to establish dividend policy, it is important to know the specific dividend clientele as well as the country in which the investors are located (i.e. if the body of investors belongs to the corporation's nation of origin or to the country in which the A.D.R.s are sold).

The ex–dividend price Behavior is developed in a world where the following assumptions are made about the investors:

Assumptions:

A1: The investors are risk neutral, i.e., the utility of their expected wealth is equivalent to their expected utility of their wealth.

A2: No restrictions exist on short sales i.e. no market imperfections.

A3: Individual buyers and sellers value the dividends relative to capital gains in a similar manner, i.e. all buyers and sellers decide on the basis of an identical opportunity set, there is the same information structure at the same time for every individual investor.

A4: In equilibrium, individuals are indifferent between buying (selling)

after the share go ex–dividend or before, hence there exist no opportunities for arbitrage profits.

A5: Investors own the stock initially, i.e., no arbitrage opportunities.

If the assumptions above hold, the market prices are determined for selling and buying respectively by:

$$P_t - t_g(P_{t-1} - P_0) = P_t - t_g(P_t - P_0) + D(1 - t_d) \quad (1)$$

$$-P_t + D(1 - t_d) = -P_t - t_g(P_t - 1 - P_t) \quad (2)$$

where

P_{t-1}: *The price of the share the instant before it went ex–dividend (cum dividend)*

P_t: *The price of the share in the ex–dividend day.*

P_0: *The original price of the share.*

t_g: *The marginal tax rate on capital gains.*

t_d: *The marginal tax rate on dividends.*

D: *The dividend per share.*

Expressions (1) and (2) can be rearranged as:

$$(P_{t-1} - P_t)/D=(1 - t_d)/(1 - t_g) \quad (3)$$

The rationale of derivation of the above model is as follows: if an investor sells cum, he receives the dividend cum price and pays the capital gains rate on the difference between the cum dividend price and the price at which the share was originally purchased. If he sells ex, he receives the ex–dividend price and pays the capital gains rate on the difference between the ex–dividend price and the price at which the stock was purchased and receives the dividend paying the dividend tax rate. If an investor buys cum, he pays the cum dividend price for the stock, he receives the dividend and pays the dividend tax rate on it. If he buys ex, he pays the ex–dividend price and, also, pays the capital gains tax rate on the difference between the cum dividend and ex–dividend price.

In equilibrium, investors are indifferent between selling (buying) at the cum dividend and ex–dividend price.

In the United States and the United Kingdom tax rates are applicable on both dividend and capital gains (i.e. equation 3 is applicable) but are different in magnitude. It is an empirical question as to which country's tax

codes reflect the marginal investor's after tax pricing.

In South Africa and Japan the capital gains are not taxed.

The equation above was utilized by Elton and Gruber (1970), Lakonishok and Vermaelen (1983), Booth and Johnston (1984), and was the basis of comparison for the Kalay work (1982).

From the model above we can get the following conclusions:

i) If there is a negative relationship between the price drop over the dividends and the dividend amount, this implies that the stock price fell by more than the amount of dividend, then this relationship is consistent with tax– induced clienteles if the marginal purchasers are taxable corporations. Corporations are able to exclude 85% of any dividends received as taxable income, whereas capital gains are taxable at rates as high as 46% if they are short–term capital gains.

ii) If dividends are taxed more heavily than capital gains, a price drop less than the amount of dividends is an evidence of a tax or a tax clientele effect. A relative price drop equal to the dividend amount is an evidence of short–term trade arbitrage since the professional traders are equally taxed on both dividends and capital gains.

A price drop on high yield stocks greater than the amount of dividends is an evidence of tax–induced dividend clientele.

iii) A price drop over the dividend amount less than one is attributed to a preference for capital gains and this ratio should start being less than one and progressively increasing to more than one whenever the low tax bracket investors become marginal for the high dividend yield stocks.

5. Methodology

In order to test the hypothesis of the existence of a clientele effect, the Spearman Rank Correlation Coefficient r(s) was used to determine the degree of relationship between the price drop over the dividend and dividend yield. A positive coefficient is consistent with the existence of a clientele effect.

A negative difference of dividend amount from the price drop implies that the trading was performed by taxable corporations.

The transaction costs might shed some bias on the clientele effect results,

since profit elimination involves short–term trading around the ex–dividend day. If the short–term trader hypothesis prevails, then the ex–dividend price drop will be randomly distributed around the dividend amount.

In order to calculate the implied marginal tax rates, the statistical sample was divided into five deciles and the mean of each decile was estimated. To test the hypothesis that the average mean of each decile was equal to one (or equal to zero), the Z test was performed with significance level a = 0.01. To test the hypothesis that the means of the deciles were the same, two tests were performed, the non–parametric Kruscal–Wallis and the parametric One–Way tests.

6. Data

Daily observations (2,974) of 106 American Depository Receipts and dually listed American shares were obtained from the daily version of the tape furnished by the Center for Research in Security Prices (CRSP) of the University of Chicago and from Standard and Poor's Over the Counter Daily Price Records. Dividend data were obtained from Moody's Dividend Record. In the analysis a representative sample of companies was selected from countries where an active trading (relatively larger volume) takes place. The observations, covering the period January 1976 to December 1985, were divided into five n–tiles based on the average dividend yield in order to identify the existence of the clientele effect. The analysis was attempted on stocks, trading on organized capital markets (N.Y.S.E and A.M.E.X.) and non–organized markets (O.T.C.). The capital markets of the original stocks under consideration were those of England, Japan, South Africa, and the U.S.A.

7. Empirical Findings

United States

It is clear that the difference of the dividend amount from the relative price drop is negative for every A.D.R. traded in NYSE–AMEX in the United States as is indicated in Table 9. A negative difference is meant to

be an evidence consistent with tax–induced clienteles if the marginal purchasers are taxable corporations.

The degree of relationship between the price drop over the dividend and the dividend yield was measured by the Spearman's rank correlation coefficient (Table 10). The rank correlation on the ex–dividend day was not statistically significant for United States' dually listed international shares trading in the NYSE–AMEX. United States' international shares did not exhibit a tax clientele effect in the NYSE–AMEX market.

Table 5 shows that the ex–dividend price drop is randomly distributed around the dividend amount and this is consistent with the short–term trader hypothesis. Also, the price drop over the dividend amount is less than one which is consistent with a preference for capital gains.

Table 5: *United States.*

NYSE – AMEX						
N–tiles	**Meana***	**S.D.**	**N**	**Z_0***	**Z_0****	**ITR*****
1	0.8769	0.9501	434	19.2276	–2.6995	0.2192
2	0.8521	0.8731	253	14.9403	–2.7007	0.2578
3	0.8816	0.8193	503	24.1331	–3.2438	0.2117
4	0.8738	0.7856	349	20.7789	–3.0047	0.2241
5	0.9618	0.6759	385	27.9211	–1.1104	0.0735
Total	0.8913	0.8262	1,924	47.3196	–5.7819	0.1961

a: *The mean of the price drop over the dividend amount.*

**:* *The Z_0 statistic to test the hypothesis whether the ratio mean is equal to or different than zero.*

***:* *The Z_1 statistic to test the hypothesis whether the ratio mean is equal to or different than one.*

****:* Implied tax rates.

The ex–dividend price ratio of U.S. common stocks traded in N.Y.S.E, as estimated by Elton and Gruber (1970), was 0.7767. The dually listed international stocks are listed in A.M.E.X and N.Y.S.E or traded over the O.T.C. and also traded around the major stock exchanges of the world. They would, therefore be considered more speculative than the stocks analyzed by Elton and Gruber. Consequently we would expect a lower

ex–dividend price ratio than their estimates, to reflect a higher tax bracket and more speculative clientele (see Booth and Johnston [1984]). Our estimate for the American dually listed stocks is 0.8913, which is a reasonable estimate and is inconsistent with the hypothesis that these stocks have their prices determined by American investors.

Kruscal–Wallis and One–Way tests were used to test for differences between the means of all five deciles. Performing an F test (Table 11) we cannot reject the hypothesis that the mean price changes across dividend yield deciles are identical for the U.S. dually listed international shares traded in the NYSE–AMEX. An alternative test, the Kruscal–Wallis (Table 12A) was used in order to depart from the restrictive assumptions of normality of distributions under consideration. The evidence in this table points out that the deciles were different for the United States (NYSE–AMEX) dually listed international shares.

The American dually listed international shares exhibited an average dividend yield of 0.014. This result was statistically significant at 1% level.

Our results are consistent with the findings of Kalay (1982), Miller and Scholes (1978, 1982), Lakonishok and Vermaelen (1983, 1986) and Booth and Johnston (1984).

United Kingdom

From Table 9 it is clear that the difference of the average dividend amount from the average relative price drop is negative for every A.D.R. traded in organized and non–organized markets for the Great Britain. A negative difference is meant to be an evidence consistent with tax–induced clienteles if the marginal purchasers are taxable corporations. T h e Spearman's rank correlation coefficient (Table 10) was used to evaluate the degree of relationship between the price drop over the dividend and the dividend yield. The rank correlation on the ex–dividend day was not statistically significant for the Britain's ADRs trading in OTC and NYSE–AMEX correspondingly, as well as in its overall capital markets. Therefore, no inference can be made on the existence of a tax clientele effect for the British ADRs traded in the NYSE–AMEX as well as in the Over The Counter Market.

It is evident (Table 6) that the ex dividend price drop is randomly distributed around the dividend amount and this is consistent with the short–term trader hypothesis. Also, the price drop over the dividend amount

is less than one which is consistent with a preference for capital gains.

Table 6: *United Kingdom.*

NYSE–AMEX–OTC

	Mean[a]	**S.D.**	**N**	**Z_0^***	**Z_1^{**}**	**ITR[***]**	**ITR[****]**
1	0.5051	0.6991	41	4.6856	–4.5	0.6622	0.4951
2	0.9581	0.8346	25	5.7398	–0.	0.0419	0.0419
3	0.6799	0.6746	43	6.6089	–3.	0.3201	0.3201
3	0.6891	0.7617	34	5.2772	–2.	0.3109	0.3109
5	0.5297	0.5287	35	5.9272	–5.	0.4703	0.4703
Total	0.6509	0.7026	178	2.3599	–5.	0.3491	0.3491

NYSE–AMEX

	Mean[a]	**S.D.**	**N**	**Z_0^***	**Z_1^{**}**	**ITR[***]**	**ITR[****]**
1	1.4377	0.8231	14	6.5355	1.9904	n.d.	n.d.
2	0.9355	0.7437	19	5.4831	–0.3781	0.1212	0.8788
3	1.2427	0.8692	18	6.0665	1.1851	n.d.	n.d.
3	1.0361	0.7487	16	5.5349	0.1924	n.d.	n.d.
5	0.6573	0.5237	17	5.1749	–2.5566	0.5105	0.4895
Total	1.0478	0.7765	84	12.3763	0.5643	n.d.	n.d.

OTC

	Mean[a]	**S.D.**	**N**	**Z_0^***	**Z_1^{**}**	**ITR[***]**	**ITR[****]**
1	0.2678	0.6236	19	1.8719	–5.1972	0.6908	0.3012
2	0.1925	0.6141	20	1.4018	–5.6193	0.8935	0.1865
3	0.4981	0.6993	18	3.0481	–3.0716	0.6684	0.3316
3	0.3065	0.4923	20	2.7842	–6.3045	0.8191	0.1811
5	0.3331	0.3856	19	3.7642	–7.5452	0.8002	0.1988
Total	0.3163	0.5773	96	5.3682	–11.8082	0.8122	0.1878

A: *The mean of the price drop over the dividend amount.*

**:* *The Z_0 statistic to test the hypothesis whether the ratio mean is equal to or different than zero.*

**: *The Z_1 statistic statistic to test the hypothesis whether the ratio mean is equal to or different than one.*

***: *Implied tax rates.*

***: *Implied tax rates from the viewpoint of an American investor.*

****: *Implied tax rates from the viewpoint of a British investor.*

n.d.: Not determined

The British ADRs, as any other foreign firm stocks, pertain higher risk to the American investor due to his unfamiliarity with conditions by which the foreign firms operate. Consequently, foreign origin ADRs would attract a more speculative American clientele than those investing in American common stocks and dually listed shares of U.S. origin. Therefore, we would again expect an ex–dividend drop price ratio much lower than the estimated one by Elton and Gruber. This is in fact the case with British ADRs (Table 6) trading in O.T.C and O.T.C–N.Y.S.E–A.M.E.X. with corresponding ex–dividend price drop ratios of 0.6509 and 0.3163. In the case of U.K. ADR trading in N.Y.S.E. the ratio was 1.0478. In the former case American investors determine the prices of British dually listed international shares but it cannot be determined for the latter case.

To test for differences between the means of all five dividend deciles the Kruscal–Wallis and One–Way tests were used. Performing an F test (Table 11) we cannot reject the hypothesis that the mean price changes across dividend yield deciles are identical for the Over the Counter ADRs of stocks of the United Kingdom. The above hypothesis was also rejected for the ADRs of U.K. (NYSE–AMEX,Overall) but not rejected for U.K. (NYSE–AMEX). An alternative test, the Kruscal–Wallis (Table 12), was used in order to depart from the restrictive assumptions of normality of distributions under consideration. The evidence in this table points out that the deciles were different for the U.K. (NYSE–AMEX) American Depository Receipts.

In listed markets the average marginal tax bracket for holders of British ADRs was not determined. For the over–the–counter stocks, the average marginal tax bracket for British ADRs was 81.22% . Whenever the Implied Tax Brackets were not determined (n.d.), in those ntiles the market evidenced a preference for dividends over capital gains. The hypothesis that the ex–dividend day price ratio was either zero or one was rejected at the

1% significance level, and in consequence, the hypotheses of costless round trip trading could not be rejected.

Given a level of risk, a higher dividend yield implies a higher return. This is, in fact an equilibrium condition described by Brennan (1970). He asserted that Rj–t = H Cov (Rj Rm) + T (δj–r), i.e. the required risk premium is a function of the security's risk characteristics and of its expected dividend yield.

For the United Kingdom ADRs (Table 13) trading in the N.Y.S.E and A.M.E.X., the dividend yield was 2.14 percent higher – and consequently implying 2.14 percent higher return, given a level of risk – than in the O.T.C. market. The average of dividend yield was statistically significant at the 1 percent level.

Our findings are in congruence with the previous studies conducted by Kalay (1982), Miller and Scholes (1978,1882),Lakonishok and Vermaelen (1983, 1986). However, our results are in agreement with the study of Booth and Johnston (1984) only in the case of price determination of ADRs by foreigners for stocks trading in O.T.C. and O.T.C. – N.Y.S.E – A.M.E.X.

South Africa

Referring to Table 9, it is evident that the difference of the dividend amount from the relative price drop is negative for every A.D.R. traded in the Over the Counter market for South Africa. A negative difference is meant to be an evidence consistent with tax–induced clienteles if the marginal purchasers are taxable corporations.

In Table 10, the Spearman's rank correlation coefficient measured the relative relationship between the price drop over the dividend and the dividend yield. The rank correlation on the ex–dividend day was statistically significant for the South African ADRs trading in Over the Counter Market. This is consistent South African American Depository Receipts exhibiting a tax clientele effect (at 5% significance level).

In Table 7, it is clearly shown that the ex–dividend drop is randomly distributed around the dividend amount and this is consistent with the short–term trader hypothesis. Also, the price drop over the dividend amount is less than one which is consistent with a preference for capital gains.

Table 7: *South Africa.*

NYSE – AMEX							
N–tiles	**Meana^{*}**	**S.D.**	**N**	**Z_0^{*}**	**Z_0^{**}**	**ITR*****	**ITR******
1	0,6641	0,5549	52	8,6269	–4,6887	0,5031	0,3561
2	0,8532	0,4361	50	13,8341	–2,3851	0,2561	0,1468
3	0,9234	0,4591	52	14,5071	–1,2044	0,1422	0,0766
4	0,9178	0,3462	52	19,1171	–1,7125	0,1519	0,0822
5	0,9627	0,3316	51	20,8191	–0,7176	0,0064	0,0333
Total	0,8611	0,4427	257	31,1824	–5,0326	0,2438	0,1369

a: *The mean of the price drop over the dividend amount.*

**:* *The Z_0 statistic to test the hypothesis whether the ratio mean is equal to or different than zero.*

***:* *The Z_1 statistic statistic to test the hypothesis whether the ratio mean is equal to or different than one.*

****:* *Implied tax rates.*

****:* *Implied tax rates from the viewpoint of an American investor.*

*****:* *Implied tax rates from the viewpoint of a South African investor.*

The estimated ex–dividend price drop ratio of 0.8611 shows clearly that the South Africa's ADRs have their prices determined by South African investors.

Kruscal–Wallis and One–Way tests were again used to test for differences between the means of all five deciles. Performing an F test (Table 11) we can reject the hypothesis that the mean price changes across dividend yield deciles are identical for the Over the Counter market of South Africa's stocks. An alternative test, the Kruscal–Wallis (Table 12) was used in order to depart from the restrictive assumptions of normality of distributions under consideration. The evidence in this table points out that the deciles were different for the South African (OTC) American Depository Receipts.

South Africa exhibited the highest average dividend yield among all dually listed international shares, 0.055, and this result was statistically significant at 1% significance level.

As in the previous cases the above results are in agreement with the

works of Kalay (1982), Lakonishok and Vermaelen (1983, 1986) and Miller and Scholes (1978,1982).

Japan

For every ADR in Japan, the difference of the dividend amount from the relative price drop is negative for those traded in organized and non–organized markets (Table 9). A negative difference is meant to be consistent with tax–induced clienteles if the marginal purchasers are taxable corporati/ns.

According to Table 10, the Spearman's rank correlation coefficients was used to evaluate the degree of relationship between the price drop over the dividend and the dividend yield. The rank correlation on the ex–dividend day was not statistically significant for Japan's ADRs trading in Over the Counter Market as well as in its overall capital market. Hence, no inference can be made on the existence of a tax clientele effect.

As is indicated in Table 8, the ex–dividend drop is randomly distributed around the dividend amount and this is consistent with the short–term trader hypothesis. Very few values of the price drop over the dividend amount exceed one and are apparently scattered randomly throughout the dividend deciles. This result is consistent with a preference of capital gains over dividends.

Table 8: *Japan.*

NYSE–AMEX–OTC

N–tiles	Mean[a]	S.D.	N	Z_0^*	Z_1^{**}	ITR***	ITR****
1	1.5642	3.5659	70	3.6701	1.3237	n.d.	n.d.
2	0.6473	2.4009	32	1.5251	–0.8311	0.5145	0.3527
3	1.1069	2.8695	62	3.0373	0.2933	n.d.	n.d.
3	0.8226	2.6884	55	2.2692	–0.4893	0.3831	0.1774
5	0.2701	1.5451	48	1.2106	–3.2735	0.8651	0.7301
Total	0.9627	2.8195	287	5.5792	–0.2162	0.2781	0.0373

NYSE–AMEX

N–tiles	Mean[a]	S.D.	N	Z_0^*	Z_1^{**}	ITR***	ITR****
1	0.9559	2.9418	17	1.3397	–0.0618	0.22381	0.0441
2	1.6731	1.8401	9	2.7279	1.0387	n.d.	n.d.
3	0.6451	2.8464	16	0.9065	–0.4987	0.5162	0.3549
3	0.8383	2.5379	23	1.5803	–0.3055	0.3713	0.1617
5	0.0261	1.5681	15	0.0642	–2.4055	0.9805	0.9741
Total	0.7662	2.4644	80	2.7808	–0.8485	0.4254	0.2338

OTC

N–tiles	Mean[a]	S.D.	N	Z_0^*	Z_1^{**}	ITR***	ITR****
1	1.6223	3.2729	47	3.2524	1.3055	n.d.	n.d.
2	0.7351	3.3176	25	1.1077	–0.3993	0.4488	0.2651
3	1.6156	3.5799	49	3.4697	1.2037	n.d.	n.d.
3	0,2809	2.1771	37	0.7848	–2.0091	0.7191	0.8366
5	0.2802	1.7934	30	0.8557	–2.1985	0.7899	0.7198
Total	1.0244	3.0231	188	4.6461	1.1071	n.d.	n.d.

a: *The mean of the price drop over the dividend amount.*

**:* *The Z_0 statistic to test the hypothesis whether the ratio mean is equal to or different than zero.*

***:* The Z_1 statistic statistic to test the hypothesis whether the ratio mean is equal to or *different than one.*

***: *Implied tax rates from the viewpoint of an American investor.*

****: *Implied tax rates from the viewpoint of an Japanese investor.*

n.d.: Not determined

Table 9: *A Comparison of the Price Drop and the Dividend Amount.*

Country	No. of Stocks	Average Drop	Average Dividend	Difference = Drop – Dividend
U.K. (NYSE, AMEX, OTC)	19	0.174	0.257	–0.083 < 0
U.K. (NYSE, AMEX)	9	0.326	0.372	–0.046 < 0
U.K. ()TC)	10	0.041	0.149	–0.108 < 0
S.A. (OTC)	19	0.767	1.791	–0.023 < 0
Japan (NYSE, AMEX,OTC)	29	0.245	0.295	–0.051 < 0
Japan (NYSE, AMEX)	10	0.114	0.206	–0.092 < 0
Japan (OTC)	19	0.272	0.336	–0.064 < 0
U.S.A. (NYSE, AMEX)	39	0.458	0.947	–0.039 < 0

Table 10: *Spearman Rank Correlation Coefficients between Price Drop over the Dividend Amount and the Dividend Yield.*

Country	No. of Stocks	Average Drop	Average Dividend	Difference = Drop – Dividend
U.K. (NYSE, AMEX, OTC)	19	0.0302	178	0.689
U.K. (NYSE, AMEX)	9	–0.2511	84	0.021
U.K. ()TC)	10	0.0429	96	0.678
S.A. (OTC)	19	0.1788	257	0.004
Japan (NYSE, AMEX,OTC)	29	–0.0837	267	0.173
Japan (NYSE, AMEX)	10	–0.0249	80	0.827
Japan (OTC)	19	–0.1216	188	0.096
U.S.A. (NYSE, AMEX)	39	0.0496	1,540	0.029

Table 11: *One–Way Test for the Difference between the Means of All Deciles.*

Country	No. of Stocks	F–Ratio	F–Probability
U.K. (NYSE, AMEX, OTC)	19	1.9842	0.0991
U.K. (NYSE, AMEX)	9	0.5113	0.0483
U.K. ()TC)	10	0.7348	0.5722
S.A. (OTC)	19	4.5041	0.0016
Japan (NYSE, AMEX,OTC)	29	1.7136	0.1473
Japan (NYSE, AMEX)	10	0.6714	0.6139
Japan (OTC)	19	2.0439	0.0901
U.S.A. (NYSE, AMEX)	39	0.9332	0.4436

Table 12: *Kruskal–Wallis Test for Differences between the Means of All Deciles.*

Country	No. of Stocks	Chi Square	Corrected for Tiles Significance
U.K.	19	5.7906	0.2153
U.K.	9	8.6052	0.0718
U.K.	10	2.3414	0.6732
S.A.	19	10.7041	0.0197
Japan	29	2.4985	0.6449
Japan	10	3.2059	0.5421
Japan	19	4.5063	0.3418
U.S.A.	39	7.3277	0.0111

The ex–dividend price drop ratio for Japanese ADRs trading in N.Y.S.E–A.M.E.X and N.Y.S.E.–A.M.E.X–O.T.C was 0.7662 and 0.9627 respectively. Hence, this evidence is inconsistent with the hypothesis that the Japanese ADRs have their prices determined by American investors. For Japan's ADRs trading in O.T.C. it is undetermined who sets its prices.

In Table 11, Kruscal–Wallis and One–Way tests were used to test for differences between the means of all five deciles. Performing an F test we

cannot reject the hypothesis that the mean price changes across dividend yield deciles are identical for the Japanese ADR's traded in the NYSE–AMEX. An alternative test, the Kruscal–Wallis (Table 12), was used in order to depart from the restrictive assumptions of normality of the distributions under consideration. The evidence in this table points out that the deciles were not different for the Japanese (OTC–NYSE–AMEX–Overall) American Depository Receipts.

For the Japanese ADRs (Table 13) trading in the N.Y.S.E and A.M.E.X., The dividend yield was 12.5 percent lower – and consequently implying 12.5 percent lower return, given a level of risk – than in the O.T.C. market. The average of dividend yield was statistically significant at the 1 percent level.

In the organized markets, the greater dividend yield was held by the British stocks, accounting for a difference of 20 percent from the American issues and 26 percent from the Japanese. The second best were the American shares that were exceeding the Japanese by 6 percent. South African ADRs were not trading in the N.Y.S.E and A.M.E.X. .

In the O.T.C. market, the South African stocks held the higher dividend yield, which was two times higher than the British and six times higher than the Japanese.

A relative comparison (Table13) of a combination of organized and non–organized markets, consisting of the national capital markets for ADRs, South Africa ranks as most profitable, followed by Britain, the United States, then Japan.

Table 13: *Dividend Yield.*

Country	No. of Stocks	Mean	S.D.	N
U.K.	19	0.031	0.041	178
U.K.	9	0.034	0.038	84
U.K.	10	0.028	0.041	96
S.A.	19	0.055	0.027	257
Japan	29	0.009	0.013	267
Japan	10	0.008	0.003	80
Japan	19	0.009	0.015	188
U.S.A.	39	0.014	0.006	1.540

8. Summary and Conclusions

In this study we have investigated the possibility of the existence of a tax clientele effect on the American Depository Receipts issued by British, Japanese, South African and American ownership firms. The statistical significance of the Spearman Rank Correlation coefficient between the dividend yield and the price drop over the dividend amount was used as a criterion for the existence of a clientele effect. It was found that South Africa were the only country that exhibited its existence, while in Britain, Japan the United States the traders were taxable corporations.

We have also inferred the implied average marginal tax rates from the means of the price drop over the dividend amount. To investigate the implied tax rates, we partitioned the whole set of observations according to the dividend yield. The average marginal tax brackets for U.K., Japan, South Africa and U.S. were found to be at the level of 3.5%, 13.8%, 3.7%, and 19.6% correspondingly.

It was also found that the price of ADRs is determined by the issuing country as in South Africa (O.T.C) and Japan (N.Y.S.E. – A.M.E.X., O.T.C. – N.Y.S.E. – A.M.E.X.).; by the country in which sold as in the United States (N.Y.S.E), Britain (O.T.C., O.T.C. – N.Y.S.E. – A.M.E.X. These prices are not determined for Britain (N.Y.S.E – A.M.E.X.) and Japan (O.T.C.).

The implication of these results are that there exist differences of the price behavior of the same foreign stock traded both internationally and in the U.S., i.e. there exist capital markets segmentation between United States and U.K, South Africa, and Japan. Also, the marginal tax investors holding dually listed shares are not subject to the tax legislation of the country where the ADRs are sold i.e.the United States.

The validity of the results above can be mitigated by the presence of short–term trade arbitrage profits. It seems that the trading population of American Depository Receipts are arbitragers and/or speculators taking advantage of market imperfections existing in segmented markets.

The results above can be in agreement with the actions of traders that diversify internationally, as well as mutual and pension funds investments.

REFERENCES

Black, F. and Scholes, M. (1974), *The Effect of Dividend Yield and Dividend Policy on Common Stock Prices and Returns*, Journal of Financial Economics, 1, 1–22.

Booth, L. and Johnston, D. (1984), *The Ex–Dividend Day Behavior of Canadian Stock Prices: Tax Changes and Clientele Effects*, Journal of Finance, 39, 457–476.

Brennan, M.J., (1970) *Taxes, Market Valuation and Financial Policy*, National tax Journal, 22, 417–27.

Eades, K., Hess, P. and Kim, H. (1984), *On Interpreting Security Returns during the Ex–Dividend Period*, Journal of Financial Economics, 13, 3–35.

Elton, E.J. and Gruber, M.J. (1970), *Marginal Stockholder Tax Rates and the Clientele Effect*, Review of Economics and Statistics, 52, 68–74.

Elton, E.J., Gruber, M.J., and Rentzler, J. (1984), *The Ex–Dividend Day Behavior of Stock Prices: A Re–Examination of the Clientele Effect: A Comment*, Journal of Finance, 39, 551–56.

Hess, P.J., (1982), *The Ex–Dividend Day Behavior of Stock Returns: Further Evidence on Tax Effects*, The Journal of Finance, 37, 445–56.

Japan, *Income Tax Rates*, Consulate General of Japan, Personal Communications.

Kalay, A. (1982), *The Ex–Dividend Day Behavior of Stock Prices: A Re–Examination of the Clientele Effect*, Journal of Finance, 37, 1059–70.

Kalay, A. (1984), *The Ex–Day Dividend Behavior of Stock Prices: ARe–Examination of the Clientele Effect: A Reply*, Journal of Finance, 39, 557–61.

Lakonishok, J. and Vermaelen, T. (1983), *Tax Reform and Ex–Dividend Day Behavior*, The Journal of Finance, 38, 1157–79.

Lakonishok, J. and Vermaelen, T. (1986), *Tax–Induced Trading Around Ex–Dividend Days*, Journal of Financial Economics, 16, 287–319.

Lewellen, W.G., Stanley, K.L., Lease, R.C., and Schlarbaum, G. (1978), *Some Direct Evidence on the Dividend Clientele Phenomenon*, Journal of Finance, 33, 1385–99.

Litzenberger, R. and Ramaswamy, K. (1979), *The Effect of Personal Tax and Dividends on Capital Asset Prices: Theory and Empirical Evidence*, Journal of Financial Economics, 7, 163–95.

Litzenberger, R. and Ramaswamy, K. (1980), *Dividends, Short Selling Restrictions, Tax–Induced Investor Clienteles and Market Equilibrium*, Journal of Finance, 35, 469–82.

Miller, M.H. and Modigliani, F. (1961), *Dividend Policy, Growth, and the Valuation of Shares*, The Journal of Business, 34, 411–33.

Miller, M.H. and Scholes, M. (1978), *Dividends and Taxes*, Journal of Financial Economics, 6, 333–64.

Miller, M.H. and Scholes, M. (1982), *Dividend and Taxes: Empirical Evidence*, Journal of Political Economy, 90, 1118–41.

Papasyriopoulos, N., (1990), *Multinational Listings: Essays on the Behavior of Dually Listed International Shares*, Unpublished Ph.D. Dissertation, University of Wisconsin–Madison.

Poterba, J.M. and Summers, L.H. (1984), *New Evidence that Taxes affect the Valuation of Dividends*, Journal of Finance, 39, 1397–1415.

South Africa, *Income Tax Rates*, Inland Revenue–Department of Finance, Personal Communications.

Standard Federal Tax Reporter, Commerce Clearing Housing, Inc, various issues.

United Kingdom, *Income Tax Rates*, Inland Revenue–Department of Statistics, Personal Communications.