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Testing taxpayers' cognitive abilities - Survey-based evidence

Nima Massarrat-Mashhadi¹ and Christian Sielaff²

Abstract

Our paper assesses the accuracy of individuals' tax perceptions. Based on personal interviews, we aim to find out how tax complexity affects the capability of respondents to calculate income tax liability. Tax complexity is measured by interacting multiple tax rates, applied to one or more tax bases. Empirical results question the traditional view of taxpayers having a comprehensive understanding of taxation rules. Our findings support the view that increasing complexity affects the capability of taxpayers to accurately calculate income tax liability. For tax policy, there is also a need to determine how taxpayers erroneously deviate in terms of extent and direction, when facing increasing tax complexity. Our research design allows us to analyze extent and possible direction of the calculation bias. Approximating an empirical distribution of erroneous calculated effective tax rates could be helpful to design a more effective income tax system.

Keywords: Tax Complexity, Survey Data, Estimated Tax Rates

JEL classification: C83, H 21, H24

1. Introduction

The standard economic approach of how individuals respond to taxes is based on Ramsey's (1927) analysis of optimal commodity taxation. He assumes that tax changes are perceived in the same way as price changes. His pioneer work has triggered a rich body of subsequent literature. The basic assumption is that agents are fully aware of the tax system. Based on comprehensive knowledge of the tax system, economic models are helpful to develop optimal decision strategies with respect to taxes. For example, seminal contributions by Harberger (1964), Mirrlees (1971), Atkinson and Stiglitz (1976) rely on the idea that taxpayers have a comprehensive knowledge of the tax system. They have been successful in identifying principles of efficient taxation. Over the last decades, several

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studies on behavioral economics have often proved this standard economic assumption about omniscient agents wrong. As Congdon et al. (2009) point out: "...standards assumptions are so consistently violated as to be neither literally true nor useful as modeling assumption."¹ In the literature, the opinion prevails that taxpayers have all necessary information regarding the underlying tax system and the cognitive ability to calculate the personal tax burden. If the view of behavioral agents finds its way into the literature, it is undoubted that many rules governing how to design an efficient tax system need to be tested for validity and are likely to be reconsidered.

The purpose of our study is to gain new insights into how multiple combinations of tax rates affect the ability of taxpayers to calculate personal income tax liability for a given tax base. In reality, there are several cases where different tax rates interact with each other. In the US tax code, local and federal taxes coexist. The German income tax code contains several special rules and tax rates (solidarity surcharge, church tax rate) that additionally apply to income tax base. In international terms, there are even more interacting tax rates which determine effective tax burden. Therefore, this study is of high practical and scientific relevance from an international perspective.

Our contribution to the existing literature addresses the question how severe taxpayers' miscalculations are, when facing increasing tax complexity. We do not only provide an approach to determine the extent and direction of the gap between taxpayers' empirical, i.e. real, behavior and its theoretical counterpart. We also account for socio-demographic heterogeneity and its influence on taxpayers' decision-making, i.e. the individual capability to calculate effective tax rates.

Our concept is straightforward and simple to understand. It tests the validity of the canonical model of taxation. We carried out a survey with 289 participants to determine equivalent tax-free payments for a given payment liable to income taxation. Participants were randomly assigned to one of four tax rate complexity groups. By calculating equivalent tax free payment, we basically test the ability of taxpayers to determine the amount of taxes they pay, which is considered a desirable attribute of any tax system (Madeo et al., 1995). Our contribution to the existing literature on tax complexity provides an easily applicable framework to test the ability of the taxpayer to calculate the personal tax burden while controlling for possible systematic errors in decision-making, e.g. determining equivalent tax-free payments. Our findings suggest that a higher degree of complexity reduces significantly the ability of taxpayers to calculate tax liability, contradicting economic theory of omniscient individuals with regard to taxes. We are able to determine if and how multiple interacting tax rates conceal tax liability, even if the tax base is known. This simple framework is appealing since it accurately outlines whether interdependent multiple tax rates - holding effective tax burden for each combination constant - might prevent participants from calculating their tax burden properly. The remainder of the paper is divided into five sections. The first section of which contains relevant literature. The following section provides a description of the research method and states the hypothesis.

¹ We recommend the study of Congdon et al. (2009) for a detailed discussion.

The results of hypothesis testing are presented in the fourth section. We have also carried out a more elaborate analysis of tax complexity by applying logit regression to our data. The fifth section is devoted to a discussion of the major findings and their implications for tax policy.

2. Previous Research on Tax Complexity

In the last decades, theoretical as well as empirical contributions on behavioral economics have been established to question the traditional view of perfectly informed and rational agents. Tax complexity is considered as a possible reason for why individuals do not behave as economic models imply. However, there is still no consensus regarding what constitutes tax complexity (Slemrod, 2005). For example, complexity can arise in measuring income tax base(s), the extent of deduction possibilities, and the constant change in tax law. In general, tax complexity is costly since taxpayers seek to understand the tax law and its application to their activities. Edmiston et al. (2003) argue that tax complexity can be also associated with the number of tax rates. The coexistence of multiple tax rates and their proper application to the same tax base distorts economic behavior by reducing the return of any given investment. The vast majority of recent studies on behavioral economics question taxpayers' capability to correctly infer and incorporate marginal tax rates.

Literature on behavioral taxation aims to gain insights into how tax rules, e.g. tax rates, are perceived and used by taxpayers when making economic decisions. Rational calculus in economic decision making frequently relies on marginal considerations. While traditional economic theory assumes that individuals use 'true' marginal tax rates, a rich body of empirical literature emerged that analyzed how average and marginal tax rates are perceived and applied in economic decisions.

Steuerle (1992) argues that the marginal tax rate is the most important variable affecting individual behavior. From a theoretical perspective, the impact of marginal tax rates is straightforward. However, empirical evidence is not consistent in providing support for these theoretical considerations. Rupert and Fischer (1995) investigate how accurately individuals can estimate the true marginal tax rate. They find that perceived and 'true' marginal tax rates differ significantly. His results confirm previous findings by Gensemer et al. (1965), Morgan et al. (1977) and Fujii and Hawley (1988) whose studies indicate that awareness of marginal tax rates among individuals is low. An experiment by de Bartolome (1995) tests if individuals use the average tax rate as reference point for the marginal tax rate. He finds that individuals have difficulties in calculating marginal tax rates if they are not explicitly shown but rely on average tax rates. His results provide strong support for the view that average tax rates are (more) important variables for individuals (than marginal tax rates). Rupert and Wright (1998) address the question as to how individual decision performance is affected by tax rate visibility. Their findings indicate that increased tax rate visibility is associated with better decision performance. In an experimental setting, Rupert et al. (2003) assign each participant to one of three tax systems and ask them to

maximize after-tax income via two different investment decisions. The results identify increasing complexity as a main driver of inaccurate decision making. Participants facing low complexity perform significantly better than those in more complex systems.

Blaufus and Ortlieb (2009) provide empirical evidence on tax complexity affecting preferences for pension plans. In their experimental framework, tax complexity is modeled by the time needed for understanding taxation rules, applied to pension plans. Their results show that tax system simplifications would significantly ease decision making for taxpayers, figuring out pension plans with the highest after-tax return.

Chetty et al. (2009) analyze tax complexity in terms of different degrees of tax liability salience. Their approach aims to test economic theory by determining the effect of taxes on consumption bundles. Comparing consumption choices in supermarkets, they distinguish between non-salient taxes and fully salient taxes to derive tax-demand and price-demand curves which are used to calculate welfare effects of (lacking) tax salience. Their findings contradict the canonical theory of taxation which is traditionally used for policy analysis. They suggest reconsidering optimal taxation rules when agents optimize imperfectly².

We have added another dimension to empirical analysis of tax complexity by interacting multiple tax rates and their application to one or more tax bases. To our knowledge, this approach has not been yet used to model different degrees of tax system complexity which is intuitive and of practical relevance.

Our survey-based approach tests the taxpayers' ability to determine the amount of taxes they pay. This ability is considered a desirable attribute of any tax system (Madedo et al., 1995). We propose an easily applicable framework to test the taxpayers' ability to recognize tax consequences. This approach provides new evidence on how and to what extent economic theory of taxation and real individual behavior diverge. Our survey identifies tax complexity as one important reason why tax policy relying on canonical model assumptions most likely needs to be reconsidered.

3. Research Method and Hypotheses

3.1 Research Method

As Schoenberger (1991) highlights “the [...] interview method is particularly appropriate in periods of economic and social change that challenge traditional analytical categories and theoretical principles”. Our goal is to test the validity of the canonical model of taxation and how tax complexity prevents individuals from identifying their personal tax burden. We conducted personal interviews with 289 employees who are assumed to have at least basic knowledge of income taxation. Subjects participated on a voluntary basis. Table 1 provides information on the demographic composition of our sample.

² Slemrod (1990) provides a detailed discussion of the Optimal Taxation Theory.

Table 1: Demographic sample composition

Category	Value	Frequency	%
Gender	Male	154	53.3
	Female	135	46.7
Age	Younger than 30	96	33.2
	30 - 39 years	63	21.8
	40 -49 years	52	18.0
	50 - 59 years	65	22.5
	Older than 59	13	4.5
Education	Primary School	2	0.7
	Secondary School	14	4.8
	Intermediate School	100	34.6
	A level	62	21.5
	University degree	111	38.4
Income Class	Less than 1,000 €	43	14.9
	1,000 – 2,000 €	81	28.0
	2,000 – 3,000 €	78	27
	More than 3,000 €	87	30.1

We created four tax systems (A, B, C, D) with different levels of difficulty in terms of interacting tax rates. The effective tax rate of each system is equal, amounting to 40%. Tax systems only differ in the number of tax rates (one, two or three) and in how the tax rules of each system are formulated. We model tax complexity through necessary calculation requirements to determine effective tax rates. Tax system A contains ne tax rate, which applies to one tax base. B contains three additive tax rates, which all apply to the same tax base. Its effective tax rate can be calculated by a simple addition of the three tax rates. Respondents face higher complexity in tax systems C and D. C consists of two different tax rates, which are applied to different tax bases. D however is assumed to be most complex because it has two different tax rates applied to two tax bases with self-deductibility. Table 2 presents the characteristics of each system³.

³ Phrases are based on German Income Tax Code wording. Tax system B is equivalent to the combination of income tax rate and solidarity surcharge in Germany. Tax system C corresponds to the interaction of income tax rate and church tax rate. Tax system D decomposes effective taxation into three additive tax rates.

Table 2: Tax Systems

Tax System	Tax Rule	Effective Tax Rate
A	Income tax payment on tax base is 40%.	40%
B	Overall tax burden on tax base consists of income tax, the additional tax and a wage based tax. Income tax payment on tax base is 15%. The additional tax applies to tax base and amounts to 10%. The wage based tax applies to tax base and is 15%.	40%
C	Income tax payment on tax base is 32%. There is an additional tax of 25%, which applies to the income tax payment.	40%
D	Income tax payment on tax base is 36%. There is an additional tax of 18.5%, which applies to the income tax payment. This additional tax is deductible from tax base ⁴ .	40%

Each participant was randomly assigned to one tax system, a description of which was also handed out to the participants. On the basis of this tax system and a given payment of 20,000 € which is subject to income taxation, each individual was asked to calculate the equivalent tax-free payment. The correct answer for each system is 12,000 €. The difficulty of determining the equivalent tax-free payment derives from understanding the taxation rules and properly applying the tax rates to the tax base. Instead of a single tax payment calculation, we consciously asked participants to determine equivalence between a tax-free and a taxable payment. This task is more realistic when determining taxpayers' ability to deal with tax planning issues. The purpose of our survey is to determine systematic over- or underestimation of tax burden and its causes, depending on different degrees of tax complexity⁵.

⁴ Total tax rate calculation for tax base deduction (tax system C):

$$(I): T_{AT} = \tau_{AT} \cdot T_{IT}; \quad (II): T_{IT} = \tau_{IT} \cdot (TB - T_{AT}); \quad (I \text{ in } II): T_{IT} = \frac{\tau_{IT}}{1 + \tau_{IT} \cdot \tau_{AT}} \cdot TB$$

$$(in I): T_{AT} = \frac{\tau_{AT} \cdot \tau_{IT}}{1 + \tau_{IT} \cdot \tau_{AT}}; \quad T_{total} = T_{IT} + T_{AT} = \frac{\tau_{IT} + \tau_{AT} \cdot \tau_{IT}}{1 + \tau_{IT} \cdot \tau_{AT}} \cdot TB; \quad \tau_{total} = \frac{\tau_{IT} \cdot (1 + \tau_{AT})}{1 + \tau_{IT} \cdot \tau_{AT}}$$

⁵ To ensure a high response rate, participants were told that in case they were not able to calculate the equivalent tax-free payment, it is still important how their decision making was done.

3.2 Hypotheses

We pose four hypotheses to examine potential effects of tax complexity on taxpayers' behavior. First, it is straightforward to assume that the share of correct calculations of income tax liability depends negatively on the underlying tax system.

H₁: *Increased complexity in the tax system will lead to greater difficulty in accurately calculating income tax liability.*

Our implicit assumption is that increasing tax complexity affects the calculation of the income tax liability but does not itself affect individual calculation effort. Since our interview does not contain real effort decision-making, we can rule out possible pure tax complexity aversion. We do not only expect that errors resulting from increased tax complexity will become more likely, we also test the direction and extent of misperceptions by the two following hypotheses.

H₂: *The ratio of over- and underestimations is on average not equal across all tax systems.*

To control for further heterogeneity, we are interested in identifying the influence of education on dealing with tax complexity. Knowledge and experience of German tax law is assumed to reduce the difference between the correct and the self-calculated tax-free payment. The hypotheses are:

H₃: *The higher their level of education, the more likely the respondent will accurately determine tax liability.*

H₄: *Better knowledge of German tax law reduces deviations between correct and estimated tax-free payment.*

4. Empirical Findings

4.1 Group-specific complexity analysis

Our empirical strategy is based on three steps. First, we test whether the ratio of correct and incorrect answers depends on the tax system. Our second step is a more detailed analysis of how the distribution of answers (mean and standard deviation) is affected by the underlying tax system. The last step compares the absolute values of the tax system-specific estimation biases to find possible differences of erroneous calculations, i.e. underestimations and overestimations. Our goal is to gather detailed evidence about both the extent and the direction of the estimation bias. Our analysis is based on the calculated

effective tax rates, which are directly derived from the calculation of the tax free payment⁶.

Table 3 presents the number of correct and incorrect calculations of the effective tax rate⁷. Increasing tax complexity (A to D) indicates that the number of correct estimations decreases. Despite being subject to the most straightforward tax system (A), only 79% of the respondents calculated the tax rate accurately. For tax systems C and D, the percentage of correct answers equals 59% and 23%. Tax system B consists of merely adding-up different tax rates. This additive tax system was recognized and applied correctly by 73% of the participants.

Table 3: Errors in decision making

Tax system	Partici-pants	No. of under-estimations	No. of over-estimations	No. of correct estimations	Mean	Median	Std. dev.
A	78	8	8	62	0.4048	0.4	0.06071
B	62	10	7	45	0.3973	0.4	0.06947
C	69	14	14	41	0.4055	0.4	0.07495
D	60	19	27	14	0.3893	0.4	0.07107
Total	269	51	56	162	0.3998	0.4	0.06882

Testing statistical significance, we perform different two-sample proportion tests. A two-sample proportion -test is helpful to determine whether differences between two proportions of independent samples are significant. We conduct pairwise comparisons of each tax system. The +null hypothesis of our test is equal to:

$$H_0: \text{Comparing two tax systems, the percentage of correct answers do not differ significantly from each other.}$$

On a 5% level of significance, p-values (0.014, 0.001, 0.007) indicate that the percentage of correct estimations between the tax systems (A and C, A and D, C and D) are statistically significantly different⁸. The two-sample p-test provides support for H_1 . Tax complexity affects taxpayers' capability to accurately calculate the tax burden. Taxpayers are less capable of determining personal tax burden if more than one tax rate applies. Decomposing effective tax rate of 40% (A) into three additive components (B) increases the amount of erroneous calculations (from 21% to 27%). However, this increase is not significant from a statistical point of view.

⁶ Underestimating tax free payment is equal to overestimating effective tax rate and vice versa.

⁷ Outliers are excluded from our sample.

⁸ Comparing the percentages of correct answers between A and B, p-value amounts to 0.39, indicating no statistically significant difference.

When analyzing tax system-specific sample means, Table 3 shows that differences between the means are negligible. This implies that increasing tax rate complexity and mean calculation are not likely to be interdependent. Using Kruskal-Wallis-test, we find no statistically significant differences between tax system-specific means⁹. Taking the standard deviation into account (see last column of Table 3), we find that the sample dispersion of answers and increased tax rate complexity are likely related. Comparing A to B (to C, to D), the sample specific deviation of estimated tax rates increases by 14.43% (by 23.46%, by 17.06%). Levene's test is useful to assess the equivalence of variances in different tax systems. The null hypothesis assumes the variances of the populations from which the different samples are drawn to be equal. Pairwise tests indicate statistically significant differences between tax systems A and C (p-value: 0.085) as well as between A and D (p-value: 0.016) for a 10% level of confidence, leading to a rejection of the null hypothesis. Our empirical findings show that the estimated tax rates are balanced in means but differ significantly in variance. In most cases taxpayers estimate their tax burden correctly but make more mistakes when complexity increases. Our results indicate that the extent of taxpayers' erroneous decisions (e.g. work-leisure-decision) can be reasonably approximated by deviations from the mean. These deviations are directly influenced by the complexity of the income tax system. For tax policy purposes, these distortions are needed to be taken into account when deciding about new (more complex or simplified) tax rules.

Finally, we analyze the absolute value of tax rate calculation errors. Table 4 presents separate descriptive statistics for over- and underestimations, indicating differences between average under- and overestimations. Comparing tax system specific dispersions, we have observed that standard deviation is always higher for taxpayers who underestimate the effective tax rate than for those who overestimate it.

Table 4: Degree of over- and underestimation in percentage points

Tax system	Mean of underestimations	Standard deviation	Mean of overestimations	Standard deviation
A	0.0969	0.0633	0.1437	0.0495
B	0.0980	0.0840	0.1157	0.0830
C	0.0884	0.0637	0.1157	0.0514
D	0.0891	0.0631	0.0388	0.0400
Sum	0.0919	0.0658	0.0827	0.0659

For statistical significance, we perform Mann-Whitney-U-Test to assess whether one tax system group tends to have larger absolute values for underestimation than for overestimation. The null hypothesis is that the distribution of underestimations is stochastically not different from the distribution of overestimations.

⁹ The p-value amounts to 0.808.

Within tax systems A, B and C, p-values indicate no statistically significant difference between underestimations and overestimations, implying a rejection of H_2 . However, the difference between underestimation and overestimation is significant on a 1% level of confidence (p-value is 0.004), providing empirical support for H_2 . Regarding the validity of H_2 , no clear picture can be drawn from the empirical analysis. Except for D, the most complex tax system, absolute values of incorrect estimations do not depend on the estimation direction. A possible explanation could be a risk premium. If participants are not able to calculate income tax liability correctly, they add a risk premium¹⁰.

4.2 Results from Logit Regression

Logit regression is a nonlinear probability model. In general, it is used to estimate the effect of particular variables of interest on a binary response when potentially confounding variables are controlled for. We estimate a logit model to predict the probability of accurately calculating equivalent tax free payment, depending on different socio-demographic characteristics. Logit regression is a more elaborate approach to identify individual factors which determine the capability to provide an accurate calculation. In particular, we are interested in how the level of education and knowledge of German tax law affect taxpayers' capability to determine the tax burden (testing H3 and H4). On the individual level, our estimation equation is specified as

$$\text{logit } Y_i = \beta_0 + \beta X_i + \varepsilon_i \text{ with } X_i = \left\{ \begin{array}{l} \textit{education} \\ \textit{knowledge} \\ \textit{complexity} \\ \textit{income} \\ \textit{risk attitude} \\ \textit{age} \\ \textit{gender} \\ \textit{calculator} \end{array} \right\}.$$

¹⁰ The personal interview contains questions on personal risk attitudes. On a scale from 1 (risk averse) to 10 (risk seeking), participants are asked to assess their risk-taking propensity. Furthermore, we have conducted a test using the personal risk attitude to explain the amount of the tax free payment. This, however, produced no result. A possible explanation is that our respondents participated on a voluntary basis. In a risk free framework (in terms of lacking monetary incentives), identifying true risk preferences might be challenging. Providing monetary incentives and different identification strategies of measuring risk preferences could provide promising insights and will be addressed in upcoming work. An indirect query of personal risk preferences via Arrow Pratt measure could be a valuable alternative. See, Huang and Litzenberger (1988) for further information.

Our outcome variable Y_i is dichotomous. There are only two possible outcomes: $Y=1$, if the respondent accurately calculates equivalent tax free payment and 0 otherwise. β_0 is the unknown intercept, β is a row vector of unknown parameters. X_i denotes a column vector of predictors for the i -th observation, containing individual socio-demographic characteristics. The variable age – measured in years – is metric; gender is binary and equals 1 for male respondents and 0 for female respondents. The latter is our base category. Further explanatory variables are information on level of education and income. The basic categories are “no certificate or secondary school certificate” and “income less than 1,000 €”. Self-estimated personal risk attitude is also included as a regressor. Respondents with values between 1 and 3 are considered risk averse, whereas values between 4 and 7 (8-10) are labeled as risk neutral (risk seeking). To account for heterogeneity caused by different degrees of tax complexity, we include a categorical variable “complexity” as a control with values between 1 and 4, corresponding to tax systems A (base category) to D. Finally, we include self-estimated knowledge of German tax law with “above-average knowledge” as base category. Our binary variable “calculator” indicates the use of calculator which is 1 when calculator was used and 0 otherwise. It is assumed that using a calculator and having better knowledge of German tax law will positively affect the probability of accurately estimating tax free payment.

Our estimation results are presented in Table 5, containing point estimates and standard error of each covariate. For the sake of intuitive interpretation, the last column reports odds-ratios. Odds-ratios are defined as the ratio of the probability of success, i.e. accurate calculation of tax free payment, over the probability of failure, wrong calculation of tax free payment. In general, most logit coefficients are significant and have the expected sign. Our findings indicate that the level of education and the individual probability of accurate calculation are clearly related, providing strong support for H_3 . All coefficients for level of education are significant and positive. Respective odds ratios show that the higher the level of education, the higher the probability of correct calculation. Regarding the knowledge of German tax law, findings are rather ambiguous. Although both the coefficient for “no tax law knowledge” and “average tax law knowledge” are statistically insignificant, there is a significant difference between “above-average tax law knowledge” and “low tax law knowledge”. The point estimate amounts to -1.083 and odds-ratio is 0.339, indicating that respondents with low self-estimated tax law knowledge are less likely to provide an accurate calculation. This finding provides relatively weak empirical support for H_4 . Being confronted with increasing tax complexity lowers the probability of correct calculation. Estimated parameters are negative.

Table 5: Estimation Results¹¹

Covariate	Coefficient	Standard error	Exp(B)
Intermediate school certificate	1.283**	0.621	3.608
„A“ level	1.485**	0.691	4.415
University degree	1.722***	0.639	5.594
No tax law knowledge	-0.782	0.651	0.457
Low tax law knowledge	-1.083*	0.575	0.339
Average tax law knowledge	-0.605	0.580	0.546
Tax system B	-0.458	0.386	0.633
Tax system C	-1.017***	0.379	0.362
Tax system D	-3.074***	0.464	0.046
Income between 1,000 – 2,000	-1.090**	0.499	0.336
Income between 2,000 – 3,000	-0.410	0.517	0.664
Income > 3,000	-0.958*	0.541	0.384
Risk neutral	-0.393	0.311	0.675
Risk seeking	-0.400	0.472	0.670
Age	-0.008	0.014	0.992
Gender	0.616**	0.290	1.851
Calculator	0.846***	0.308	2.329
Constant	1.120	1.151	3.064

For tax systems C and D, this effect is statistically significant on 1% level of confidence. This finding is in line with our results from two-sample t-test, where tax complexity negatively affects taxpayers' capability to determine the correct income tax burden. There is no statistically significant difference between tax systems A (base category) and B. The latter is only the sum of four additive tax rates.

The relation between income and our binary dependent variable is estimated to be rather negative. Two of three coefficients are negative and at least statistically significant on a 10% level of confidence. Controlling for level of education, we have found that taxpayers with medium and highest incomes (income between 1,000 – 2,000 and income

¹¹ Note: Asterisks denote the respective significant level at 95% (*), 99% (**) and 99.9% (***).

> 3,000) are less likely to provide an accurate calculation of tax free payment. Assuming that respondents with more income have higher opportunity cost, we suppose that this surprising result is possibly driven by less motivation. Nevertheless, the chosen income classification might hamper identifying the expected relation between a high probability of accurate calculation and disposable income. Our survey only queries disposable household income of each taxpayer, possibly concealing a significant effect. Estimates for age and gender indicate that accurate calculation is not affected by taxpayers' age but their gender. Male respondents are more likely to determine the correct tax free payment. They might benefit from more experience in declaring income taxes. We have found that taxpayers using a calculator have a statistically significantly higher probability of estimating the correct tax free payment. Respective odds-ratios amount to 2.329.

Summing up, logit analysis allows us to estimate the impact of socio-demographic factors on the probability of determining the correct tax free payment. Finally, our results provide strong empirical evidence supporting H3. A higher level of education positively affects the capability of taxpayers to determine the effective tax rate. Coexistence of multiple tax rates and their proper application is negatively influenced by increased tax complexity as well as low knowledge of German tax law.

Overall, our findings provide empirical evidence of the hypothesis that taxpayers' miscalculations of effective tax rates are more pronounced, when faced with increasing tax complexity. The extent and direction of erroneous is determined by the degree of complexity. Taxpayers will benefit from a transparent tax system, i.e. reduced complexity, in two ways: (1) Taxpayers will have less difficulty to estimate individual tax liability. (2) Taxpayers' planning costs will be lowered. Although this theoretical lucidity appeals to howl with the wolves, several practical stumbling stones need to be accounted for.

The vices and virtues of implementing a tax simplification are discussed in detail by James und Edwards (2008). They show that changing one part of a tax system will likely affect the operation of other parts. Mere simplification of a tax system might not improve matters overall. When requesting for a simple(r) tax system, we need to consider that tax simplification is often accompanied by a loss of fairness. Taxing all people in the same way is simple and practicable but not fair. Modern tax systems are complex to increase fairness by developing special norms for individual tax cases. As the literature points out, fairness is an important factor for tax morale (e.g. Schmolders, 2006) and tax compliance (e.g. Adams, 1965; Andreoni, Erard and Feldstein, 1998; Wenzel, 2003). Perceived fairness may increase tax compliance (Kirchler, 2007). This effect may work in the opposite direction of a pure simplification and has to be taken account when interpreting our results. Nevertheless, fairness as well as complexity are individual perceived values. Our results show that a complex tax system leads to distortions and analyses their extent and direction. Further research should not only address the issue of tax simplification on taxpayers' behaviour but also the interaction between reduced tax complexity and fairness and tax morale. The avoidance of miscalculations might be likely under- or overcompensated by an accompanied loss of fairness.

5. Conclusion

Examining self-collected data on determinants of understanding tax complexity, we carried out a survey with 289 participants. Our approach is to use an easily applicable framework to test the taxpayers' ability to calculate the personal tax burden. Participants were randomly assigned to one of four tax complexity groups. Complexity is measured by varying amounts of interacting tax rates across the four groups. Our results have shown that increasing complexity significantly affects taxpayers' capability to accurately calculate income tax liability. Furthermore, we analyzed the extent and direction of the incorrectly estimated tax rates. While the sample means are almost identical, sample standard deviations are significantly different across the tax systems. Regarding the total absolute value of the errors, there is no statistically significant difference between underestimations and overestimations (except for tax system D).

Deploying logit analysis, we are able to identify level of education, knowledge of German tax law and gender as driving factors with regard to probability of correct estimations. We contribute to the existing literature on measuring tax complexity and its impact on taxpayer behavior. Our findings provide strong support for proponents of tax simplification, which would ease tax planning problems considerably. Moreover, our survey questions theoretical results regarding efficient taxation of individuals. The main assumption in taxation literature is that taxpayers have all necessary information or can use cognitive abilities to carry out simple calculations to determine effective taxation. Our results suggest to think outside the box and follow more recent literature (Congdon et al., 2009), where this prominent mindset appears to be not generally valid and needs to be reconsidered.

For tax policy purposes, income tax revenue estimation could be improved. Instead of using a 'real' effective tax rate, a distribution of perceived (erroneously calculated) tax rates would account for likely calculation limitations caused by tax complexity. Furthermore, we discussed possible contra arguments against a pure simplification of the tax system. Opposite effects in form of simplification costs and the loss of fairness have to be taken into account. To address the question if implementing a simple tax system is overall preferable needs further research about possible trade-off effects. To our knowledge, our contribution pioneers in the development of an approach to approximating distorted tax rate perceptions. Further research is needed to develop more elaborate tax models, which account for taxpayers' cognitive limitations. These models may help derive strategies to tax people more effectively.

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Infrastructure, Knowledge and Economic Growth in China: 1953–2004

Sangaralingam Ramesh¹

Abstract

This paper evaluates the economic development of China using the New Economic Geography (NEG) as a framework of analysis. The NEG addresses the formation of agglomeration economies accruing to physical linkages in one location leading to the formation of a core-periphery pattern between the regions of a country. However, the NEG cannot account for the role of knowledge creation linkages which are location independent in the formation of the core-periphery pattern. The main findings of this paper are that the formation of the core-periphery pattern predicted by the NEG depends upon government economic and development policy at a point in time. Furthermore, while the NEG does not allow for knowledge creation to be involved in the formation of the core-periphery pattern, this paper shows that once the core-periphery pattern is formed, the knowledge creation process sustains it. This paper also supports the hypothesis that investment in infrastructure and fixed assets, which has been concentrated in China due to the nature of the Special Economic Zones in the Coastal regions, and the interdependence between different types of infrastructure leads to the formation of the core-periphery pattern.

Keywords: Income disparity, Infrastructure, Knowledge Creation, China

JEL classification: O18, O53, P21

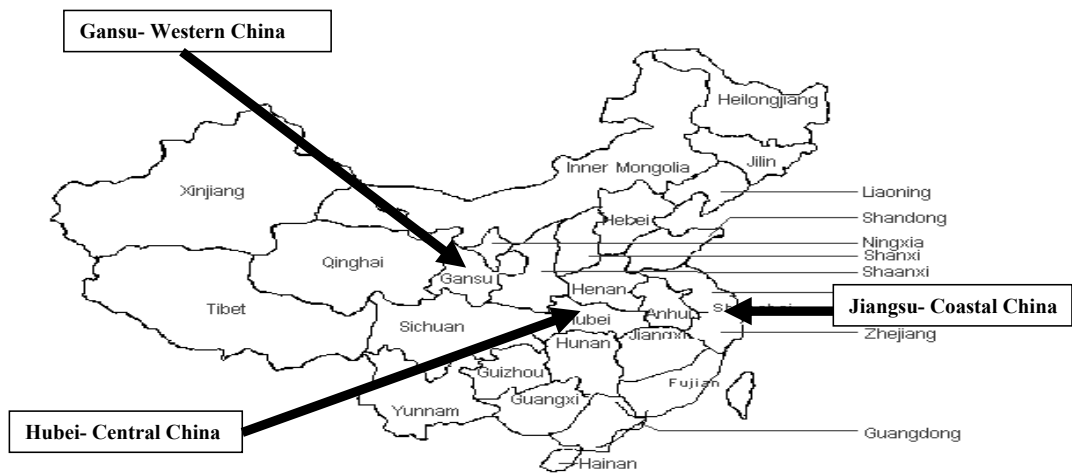
1. Introduction

This paper establishes that the New Economic Geography does not account for the role of time and knowledge in the formation of the core-periphery pattern by examining the economic development of China. This is done on the basis of comparing the infrastructure and knowledge creation attributes in three provinces. These three provinces include a Coastal province (Jiangsu), a Central Province (Hubei) and a Western province (Gansu). The location of the provinces in China can be seen from Figure 1, below. The reason for choosing a Coastal province, a Central province and a Western province is to illustrate core-periphery pattern formation in China following the post 1978 economic reforms.

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The core-periphery pattern in China has not been the same over the last 62 years and has evolved and metamorphosed over time depending on government policy. Currently, the Coastal region of China is generally regarded as the most developed region or core region of the country while the Central region is regarded as the next best developed region. The Western region is the least developed region of the country. In a wider context, the Central and Western regions of China can be considered to be the periphery. The period 1953-2004 has been specifically chosen to avoid the period in the run up to the Global Credit Crunch of 2008.

Figure 1: Map of China



Source: <http://www.maps-of-china.net/chinamaps/enmap.html>

Investment in different types of infrastructure is only one way in which rising rural-urban income disparities can be reduced. The rising rural-urban income disparities have been a feature which has characterised China's post-1978 reform years. However, there are a number of other ways of reducing the rural-urban income disparities. Firstly, increased investment in agriculture, agriculture is the key externality-generating sector of the

Chinese rural economy (Ravallion, 2002). Secondly, the development of non-farm enterprises and investment in town and village enterprises and local village co-operatives. Thirdly, the out migration from rural areas. The National Population Development Strategy Research Report released in January 2007 by the government stated that there were 150 million surplus rural labourers (Kwan, 2007). This represents a fall of 25 million workers from 1997 when the number of surplus rural workers represented an unemployment rate of 34.8% (Beijing Review, 1997). An uncontrolled move from rural to urban areas will cause serious political instability as continuing regional income disparities will also inevitably do so. In any event, it is likely that the urban industrial sector has already absorbed much surplus rural labour. Finally, an increased investment in the so-called knowledge

infrastructure (telephones, computers, networks, schools, universities, research institutes and libraries) in rural areas will increase knowledge linkages in the Chinese economy and aid in the formation of a national innovation System. This paper will only consider the impact of investment in infrastructure on China's economic growth from 1953 to 2004.

In contrast with other studies in the literature regarding the economic role of infrastructure this paper departs from using an econometric methodology. The purpose of this paper is not to quantify the impacts of infrastructure and spatial spillovers but to highlight the main features of development in specific regions of China. The case study methodology is often able to highlight features of economic growth which cannot be fully accounted for by multiple regression analysis. Multiple regression analysis usually involves running regressions of GDP against variables such as length of roads, telephone density and length of paved roads. However, in the case of China such an analysis would produce meaningless results because China's economic growth has been based on Special Economic Zones (SEZ's) and High Technology Development Zones (HTDZ's) in the coastal regions of the country. The first SEZ's were established in Shenzhen, Zhuhai, Shantou and Xiamen in 1980. Due to the continued state funding of the SEZ's and the failure of the SEZ's to attract substantial foreign investment further action was needed (Tracy, 1997). The action which resulted was the opening of 14 coastal cities to foreign investment. SEZ's were also established on Hainan Island and Shanghai Pudong SEZ in 1988 and 1990 respectively. Fifty percent of the SEZ's are located in Guangdong province which is on the coast and very close to established centres of commerce such as Hong Kong, Macao and Taiwan. The planning slogan for the SEZ's was 'seven linkages and one levelling', Kwok (1986). The seven linkages included the state provisioning of drainage, communications, sewage, storm drainage, land, electricity, water and gas while the formation of land was the one levelling, Kwok (1986). Furthermore, in order to connect the SEZ's to international markets the state also had to heavily invest in reservoirs, local transport networks, airports and ports. The post 1978 economic development strategy was based on a concentration in different types of infrastructure investment while the pre-1978 economic development strategy had been based on investment in extensive railway networks in the interior of the country to support the needs of heavy industry.

Regression analysis would produce misleading results with regards to the determinants of economic growth in China because infrastructure development in the SEZ's, the main centres of China's post 1978 economic growth, had been based on the seven linkages and the one levelling. This is contrast to networks of railways and railroads which are normally studied by econometricians in order to establish a link between infrastructure and economic growth using different proxies for infrastructure (Straub, 2008). Multiple regression analysis also has a tendency to oversimplify economic growth due to the constraints on the number of variables which can be modelled due to problems associated with multicollinearity, heteroskedasticity and autocorrelation. Economic growth is not only based on factors such as the length of roads or railways but on a more complex interplay between a diverse range of infrastructure not all of which can be quantified on a uniform basis for the purposes of multiple regression analysis. This is because different types of infrastructure have different

functions, all of which are needed to happen at the same time in order to facilitate economic activity.

2. The New Economic Geography

Krugman (1991) suggests how countries become differentiated into an agricultural periphery region and a manufacturing core region by mechanisms which are internal to the country. In this case Krugman (1991) suggests that in order to maximise scale economies and minimise transportation costs, manufacturing will tend to concentrate in regions of countries where demand will be higher.

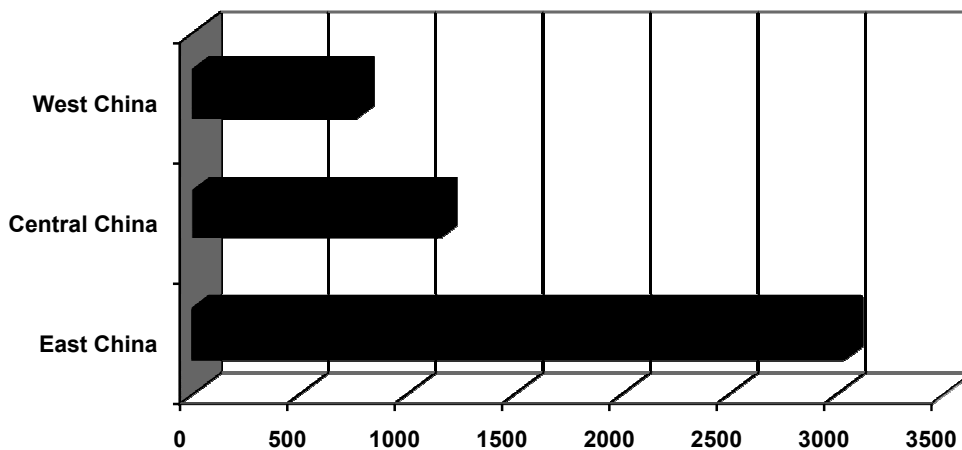
China embarked on economic reforms in 1978. The effect of these reforms is as predicted by the NEG with manufacturing activities concentrating in the Coastal region. The interior (Central and Western regions) of the country in contrast, remained agricultural on the whole. Over time China's Coastal region became its core, while the interior became the periphery in the post-reform period. Krugman (1991) also suggests that the development of a core-periphery pattern will depend on the levels of transportation costs, the level of the contribution of manufacturing to national income and the level of scale economies which can be achieved. However, Krugman (1991) does not provide a comprehensive analytical framework which can be used to evaluate economic development in a country. This is due to the fact that *time, knowledge* and *non-transport infrastructures* have no role in economic development within the context of the New Economic Geography. But, according to Krugman (1991) manufacturing tends to concentrate in regions of countries where demand is high, transportation costs are low and economies of scale are high. Nevertheless, he does not identify that it is the various types of infrastructure which actually give rise to increasing economies of scale. It is clearly evident that different types of infrastructure facilitate different levels of economic activity and differing speeds of knowledge diffusion. Moreover, a combination of different types of infrastructure in one place may lead to location specific economies of scale. On the other hand infrastructure may also give rise to location unspecific economies of scale depending on the type of infrastructure. For example, location specific infrastructure, such as roads and bridges will give rise to location specific economies of scale and increase productivity at that location. However, infrastructure which is location unspecific such as the telephone and the Internet will give rise to economies of scale and spillover effects over great distances. This will lead to a greater division of labour, substantially increased productivity and lower costs. Location unspecific infrastructure would tend to reduce the differentiation of regions based on the agricultural periphery and the manufacturing core. It is the stratification of regions of countries into the agricultural periphery and manufacturing core which gives rise to disparities in income. In this case the endogenous convergence of technologies should play a much more significant role in the reduction of income disparities between the regions of a country. In this case it is necessary to distinguish between the creation of knowledge and the application of knowledge. The common factor to the creation of knowledge and the application of knowledge is government policy.

3. Poverty and Development Policy

The period under evaluation is 1953-2004 but political crises such as the Great Leap Forward and the Cultural Revolution, three programs will not be considered. However, the ‘Third Front’, the Post-1978 economic reforms and the Western Development Program (WDP) are more relevant in the formation of the core-periphery pattern.

The size of China has made the formulation of a national development policy, which would bring prosperity to the whole country, very difficult. Therefore, it was decided that the Coastal regions of China would spearhead economic growth by focusing on export-oriented industries and foreign trade (Fan, 1995). It was hoped by government planners that the resulting economic prosperity of these Coastal regions would ‘diffuse’ to the whole country. This idea was suggested by Deng Xiaoping when he stated ‘Let some prosper, so that others may follow’ (Veeck, 1991). However, this belief was mistaken because the prosperity of the Coastal regions would diffuse to China’s interior hinterland only if government policy facilitated it. In this case without government action the prosperity of the Coastal regions generated through the designation of SEZ’s, creation of open Coastal cities and the creation of the open delta regions has not effectively diffused to the Central and Western regions of China as anticipated by the architects of China’s reforms. Therefore, the stated policy of the post 2003 leadership of China is to reduce rural poverty by the urbanisation of developed regions of the country.

Figure 2: Domestic Patents (Invention) Granted By Region 2005



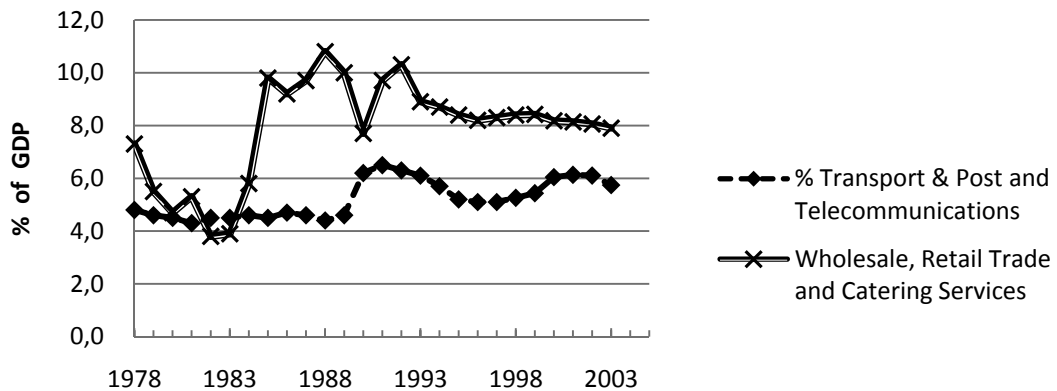
Source: China Statistical Yearbook 2005

The concept of urbanisation was an implicit component of the 2001-2005 Tenth Five Year Plan which encouraged the formation of small towns and cities (Li and Piachaud, 2004). Urbanisation was the strategy embraced by China’s central planners to reduce disparities in income between regions. Increased urbanisation in formerly rural areas would

facilitate economic growth due to increased economic activity and give local people a motive for investing in the local economy (Ravallion and Jalan, 1999).

The central theme of this paper is that the market reforms of the post 1978 period have created the income disparities between the interior and the Coastal regions of China. However, it is the creation, transfer and the commercialisation of this knowledge which is sustaining these income disparities. This can be clearly seen from Figure 2 which shows that in the Coastal and the developed regions such as Guangdong, Zhejiang, Shanghai, Shenzhen, Jiangsu, Beijing and Shandong the knowledge creation process (as measured by the number of patents issued) is more pronounced than in Central provinces such as Hunan, Hubei and Henan. Similarly, the knowledge creation process in the Central provinces is more pronounced than the knowledge creation process in the Western provinces of China such as Tibet, Yunnan and Sichuan. While it is difficult to evaluate the overall contribution of the knowledge creation process to GDP, especially because of the difficulties associated with measuring spillover effects, Figure 3 shows that the contribution of infrastructure (Transport & Post and telecommunications) and trade and catering (including Wholesale and Retail Trade) to GDP for the period 1978 – 2004 is consistently below 6%. This would suggest that even in the reform years infrastructure contributed little to overall economic growth.

Figure 3: Infrastructure Contribution to GDP as a Proportion of GDP (1978 – 2004)



Source: China Statistical Yearbook 2004, Table 3.2

Note: GDP calculated in current prices

The experience of economic growth in Southern China, the Pearl River Delta area, illustrates the impact of focused infrastructure investment in the SEZ's and HTDZ's on China's economic growth. However, the precise nature of the linkage between road infrastructure development and economic growth is unclear. Nevertheless, studies indicate that the building of roads is a necessary but not sufficient condition for economic growth (Lin, 1999). The expansion of port facilities and improvements in the road network has reduced travel time in the region and this has enabled the efficient 'flow of human and capital resources in all directions' (Chan, 1996). In this case, Panyu in the Pearl River

Delta is an example of a region where heavy investment in transport infrastructure has led directly to substantial and prolonged economic growth (Lin, 1999). Two transport infrastructure projects which contributed to the opening up of Panyu, to the metropolitan area of Guangzhou, included the building of the Ruoxi Bridge, the Humen Ferry and Humen Bridge. It can be intuitively suggested that without transport infrastructure investment there would be very little inflow of foreign investment.

The 'Third Front' program, which was implemented from the mid 1960's to the mid 1970's, can be interpreted not only as ensuring China's productive capacity remained independent of the Coastal regions during a time of war but also has an extension of Mao's philosophy that there should be even economic development across all of China. This can be broadly interpreted as suggesting that 'to each according to their need' (Veeck, 1991). During the 'Third Front' program the dispersion of Coastal industries into the interior consolidated and stimulated the process of urbanisation of Sichuan. This was due to the fact that much industrial activity was located along railway routes. Consequently, a growing population and an abundant supply of labour led to 'the emergence of new towns and industrial centres' (Chan, 1996). Naughton (1988) points out that the 'Third Front' program was ineffective and led to the inefficient use of physical and human capital prior to the pre-reform periods. As a result of the 'Third Front' program productive capacity was located at a distance from centres of urbanisation as well as markets for the produced goods. The inland drier climate often meant that productive capital assets literally rusted away. A lack of infrastructure meant that qualified maintenance personnel could not be easily moved to where they were needed. In contrast, a Coastal locality such as the Pearl River Delta (PRD) enjoys superior factor mobility because it has better infrastructure than a Western region such as Yunnan Province. Furthermore, private and State Owned Enterprises in the PRD have greater access to trade because the PRD's Coastal location gets them closer to international markets. Transport costs from the Coastal region to overseas markets are low. Efficiently functioning and connected factor markets, which offer employment opportunities, will allow individuals to improve their initial factor endowments by working and acquiring skills. Indeed, connecting markets in different regions will reduce the urban-rural income gap and can be achieved by investing in infrastructure and linking the Coastal regions to the interior regions of China.

Recent research suggests that the urban-rural income differential is the main cause of wide spread income disparity amongst China's regions (Chang, 2002). If the economic prosperity of the Coastal region is excluded then the rural-urban income divide can be explained by the fact that those working for state owned enterprises and / or living in urban centres receive benefits like subsidised housing, heating and education for their children. However, those living in the rural sector are dependent on the size of the annual harvest for their income. The annual harvest varies from year to year depending on weather conditions. The urban-rural income gap caused by fluctuations in the size of the annual harvest can be eliminated by 'absorbing all rural surplus labour to the modern sector', Chang (2002). Nevertheless, according to Brandt (1999) if one region has different endowments from another and assuming fixed prices this will explain the income inequality that arises

'between and within localities'. Furthermore, market imperfection in factor markets may increase income inequality, as the least endowed will have the lowest shadow prices.

In response to the rising disparities in income between China's Coastal region and the interior hinterland the WDP was initiated in 1999. At the heart of this program is investment in infrastructure in ten Western provinces and two other provinces. A significant amount of the infrastructure investment was associated with irrigation, communication, transportation and energy, Lai (2002). The WDP may go a long way to address the imbalance in investment in infrastructure between the interior and Coastal provinces of China since 1978. This is because the WDP may facilitate the movement of natural resources, goods and people from the interior to the coast. It may also act as a force which acts to integrate the fragmented national Chinese economy. However, the WDP is not seen as a program specifically designed to integrate the Coastal, Western and Central regions of China.

4. Case Study: Propositions, Data and Criteria

The foundation of case study research methodology is based on propositions, data and criteria, Yin (2003). For the purposes of the case study five propositions were put forward with each proposition having associated data and criteria. The variables to be analysed are aggregated within the following major headings of infrastructure, manufacturing, Science & Technology (S&T) Research Parks, education and the indicators of knowledge creation. When the results of the case study are interpreted there are two guidelines which need to be considered. Firstly, the accuracy of the data needs to be considered. Secondly, the availability of consistent and comparable data for each province over different time periods needs to be considered. This case study is based on five propositions:

- a) **Proposition 1:** states that knowledge creation has sustained income disparities between the Coastal regions of China and the interior hinterland since the post 1978 economic reforms. The framework of the NEG relies on transport infrastructure, as opposed to the seven linkages and one levelling, due to the importance of transport costs for the formation of a core-periphery pattern. However, this proposition suggests that the knowledge creation process sustains disparities in income between regions once the core-periphery pattern has formed. This is not acknowledged by the NEG framework.

Data: education and patent registration

Criteria: university graduates, R&D expenditure and patents registered.

- b) **Proposition 2:** states that infrastructure simulates the effects of urbanisation by increasing the geographical and population densities of space by facilitating the mobility of people and resources. This proposition suggests that transport infrastructure such as roads and railways are responsible for the formation of the NEG's core-periphery pattern.

Data: transport infrastructure

Criteria: freight traffic, passenger traffic, highway and railroad length.

- c) **Proposition 3:** states that investment in fixed assets leads to the specialisation of labour leading to the integration of fragmented local markets and market integration. This

proposition suggests a mechanism by which the NEG's core-periphery pattern forms due to the concentration of manufacturing activities within the core region.

Data: manufacturing output

Criteria: Imports, exports and gross input output value (GIOV).

- d) **Proposition 4:** states that the NEG is inadequate in accounting for the role of knowledge creation in the core-periphery pattern formation because it does not account for the role of the micro-foundations of knowledge creation in the economy.

Data: Knowledge factors.

Criteria: Scientific Personnel, University enrolments, R&D expenditure, Internet domain names and websites.

- e) **Proposition 5:** states that the speed with which knowledge is exchanged varies with the type of infrastructure. This proposition suggests that knowledge can be exchanged at different rates depending on the type of infrastructure. For example, the exchange of knowledge by telephone is almost instantaneous and can occur over great distances. On the other hand the exchange of knowledge via transport infrastructure takes a longer time and occurs over smaller distances. The differing speeds of knowledge exchange according to type of infrastructure are not accounted for by the NEG. The type of knowledge transmitted may be tacit or explicit. However, the purpose of this proposition is not to distinguish between the types of knowledge which are exchanged but to assert that regions of China with more advanced communications infrastructure like the Internet will be more knowledge intensive than regions where there may only be the possibility of face to face knowledge exchange via transport infrastructure.

Data: Infrastructure

Criteria: Road transport to face to face transport and telecommunications and the internet.

In order to evaluate the effects of the post 1978 reforms from the perspective of the pre-reform years this case study will focus on the provinces of Jiangsu (Coastal), Hubei (Central) and Gansu (Western) as well as three political periods. The first period will cover the Maoist period from 1952-1977. The second period will cover Deng Xiaoping's 'Four Modernizations' (Agriculture, Industry, Science/Technology, and Defence) from 1978 – 1995. The third period will cover the projection of China's economic future period from 1996-2010. The latter period includes the WDP which began in 1999.

5. Results

A general profile of the main economic features for each province is shown in Table 1. Each economic feature is quantified by being represented as a percentage above the national one. This is assumed to be 100%. From Table 1 it can be clearly be seen that Jiangsu has more of each spatial feature compared to Hubei and Gansu except land area. Similarly, Hubei has more of each economic feature than Gansu except land area.

Table 1: Percentage Comparative Statistics 2005

Economic Feature	Jiangsu*	Hubei*	Gansu*
Area	1.10	1.90	4.73
Population	5.70	4.60	2
FDI	6.90	1.35	0.02
S&T Personnel	9.50	4.97	2.20
GDP	10.60	4.60	1.14
Exports	14.80	0.56	0.02
Imports	16.30	0.60	0.01
Domain Names Registered (excluding .edu)	6.20	2.10	0.30
WWW. Websites	7.70	2.20	0.40
GDP Per Capita	184	99	56
Population Density	536	239	42

Source: National Bureau of Statistics, China Statistical Yearbook 2005 & CNNIC, 16th Statistical Survey Report on the Internet Development in China

Note: *differences in percentage points above the national values

The percentage figures for Domain Names registered, WWW. Websites and Population Density are particularly revealing and relevant to the knowledge economy. Table 1 shows that Jiangsu has 4.1% more Domain names than Hubei and 5.9% more than Gansu. With regards to the number of WWW websites, Jiangsu 5.5% more than Hubei and 7.3% more than Gansu. In terms of Population Density, Jiangsu is 297% more densely populated than Hubei; and 494% more densely populated than Gansu. With regards to the indicators of manufacturing such as exports and imports, the figures suggest even more disparity between Jiangsu, Hubei and Gansu. Clearly, the post 1978 economic reforms have had a self-sustaining effect on the economic growth and prosperity of the Coastal provinces. The spatial characteristics of the three provinces can be divided into four categories which includes infrastructure, administrative, economic and geographical. Table 2 details these features and such categorisation helps to establish which province has more or less of one spatial feature than another.

Table 2: Provincial Spatial Features 2004

Infrastructure	Administrative	Economic	Geographical
<i>Railway Length</i>	Regions	Highway Freight	Length of Coastline
<i>Highway Length</i>	Districts	Waterway Freight	Cultivated Land
<i>Navigable Inland Waterway Length</i>		Urban Population	
		Rural Population	
		Post & Telecommunications Business Volume	
		Vehicles Owned	
		Highway Passenger Traffic	
		<i>Waterway Passenger Traffic</i>	
		<i>Railway Freight Traffic</i>	

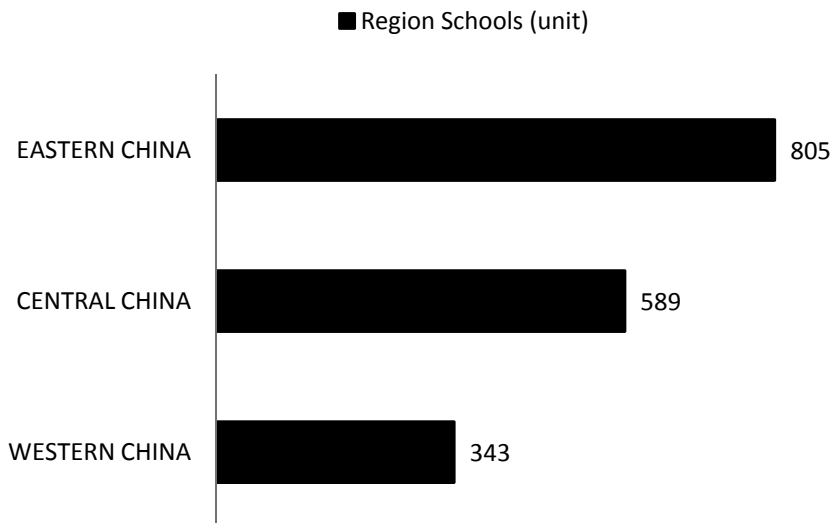
Source: National Bureau of Statistics, China Compendium of Statistics 1949-2004

Note: Compiled by Author from Table 1, 4, 5 and 6

The features in Table 2 which are in bold italic font are those for which Hubei province has greater capacity than either Jiangsu or Gansu. The features in non-bold italic font are those for which Jiangsu has greater capacity than either Hubei or Gansu. It can be clearly determined from Table 2 that Hubei province has greater transport infrastructure capacity with regards to railways, highways and navigable inland waterways. However, the only economic features which Hubei has greater capacity than Jiangsu are waterway passenger traffic and railway freight traffic. The fact that Jiangsu has greater highway passenger traffic may be explained by the fact that Jiangsu has a greater preponderance for car ownership. With regards to Gansu, the only feature it has which is larger than any of Hubei's features is administrative in nature and relates to the number of regions at county level. However, Gansu is superseded by Jiangsu which has a larger number of regions at county level. It can now be established that Hubei acts as the province through which resources are transported from the interior of China to its coastal provinces where manufacturing predominantly takes place. The polarisation effect of the concentration of manufacturing in a region on

knowledge can be established using Figure 4. The latter shows that the number of regular institutions of higher education is highest in Eastern (or Coastal) China and is followed by Central China and Western China. Some other key spatial distinctions can also be discerned from the data. Firstly, the number of S&T personnel, Internet usage and population density decreases moving from Coastal to Western China. Secondly, government grants and bank loans as sources of funding for innovation increases moving from West to East (NBSC, 2006). Thirdly, Hubei has the largest capacity compared to other provinces with regards to length of railway, highway and navigable inland waterway. Finally, in contrast to Jiangsu, Hubei has the largest number of waterway passengers and railway freight traffic carried.

Figure 4: Regular Institutions of Higher Education by Region 2004

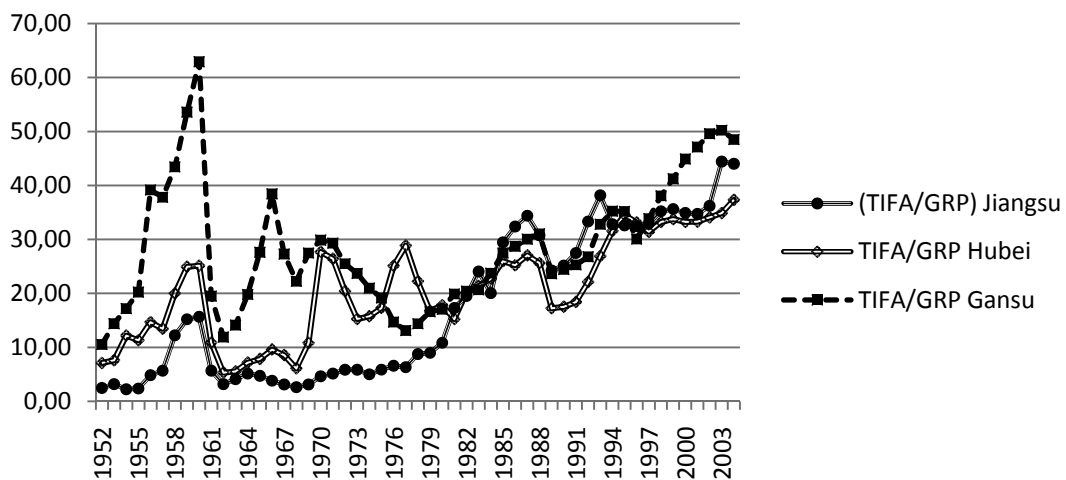


Source: China Statistical Yearbook 2004, Chapter 21, Table 21.25, National Bureau of Statistics

The implications of Proposition 1 are twofold. Firstly, there has been a ‘brain drain’ from China’s interior region to its Coastal regions. Secondly, the increased prosperity of the Coastal regions, typified by Jiangsu, has given these regions increased resources to invest in the education system. In this case, due to the decentralisation of funding for education the Coastal provinces have been better able fund provincial education than the interior provinces have been able to. Proposition 4 suggests that the framework of the NEG cannot account for the individual factors needed for knowledge creation in China. Moreover, Proposition 5 suggests that the NEG also cannot explain the fact that different types of infrastructure allow for knowledge to be exchanged at different rates. Propositions 2 and 3 are justifiable on the

grounds that the economic growth of the Coastal region has made a bigger contribution to China's economic growth in the reform years. Furthermore, exports from Jiangsu province have been greater than the exports from either Hubei or Gansu provinces in the post-reform years. The prominent increases in exports from China's Coastal regions in the post-reform years are matched by the increases in TIFA. Figure 5 shows that after 1980 adjusted TIFA in Jiangsu overtook that in Hubei or Gansu. However, after 1995 this trend reversed. The trend in adjusted TIFA after 1980 maybe due to investment in SEZ's and high technology development zones. These were located in the Coastal regions. The reversal in the trend of adjusted TIFA after 1995 may be due to the impact of the Western Development Program. However, the adjusted GIOV of Jiangsu began to diverge from Hubei and Gansu in 1972, the divergence becoming greater after 1980. This may be accounted for by the emergence of primordial TVE's in the early 1970's; and the start of economic reforms after 1978. With regards to Proposition 4, it is apparent that knowledge creation seems to be more significant in the Coastal regions due to the regions larger number of Science & Technology personnel as well as the larger number of patents registered in that region.

Figure 5: Adjusted Total Investments in Fixed Assets (TIFA) 1952-2004



Source: National Bureau of Statistics .China Compendium of Statistics 1949-2004

Note: Total Investment in Fixed Assets (TIFA) adjusted for inflation by dividing by the respective provincial Gross Regional Products (GRP)

Table 3: 1953-2004: Average Percentage Annual Growth of Knowledge Factors

Time Period	Province	Teachers Secondary Schools (%)	University Enrolments (%)	Telephone Subscribers (%)
1953-1976	Jiangsu	11.91	77.92	7.27
	Hubei	17.37	24.28	8
	Gansu	15.36	21.38	0
Time Period	Province	Teachers Secondary Schools (%)	University Enrolments (%)	Telephone Subscribers (%)
1979-1995	Jiangsu	1.98	6.83	25.59
	Hubei	0.21	6.92	25.47
	Gansu	2.422	6.69	17.89
Time Period	Province	Teachers Secondary Schools (%)	University Enrolments (%)	Telephone Subscribers (%)
1997-2004	Jiangsu	0.44	20.28	24.44
	Hubei	2.71	21.31	19.52
	Gansu	4.98	18.61	30.61

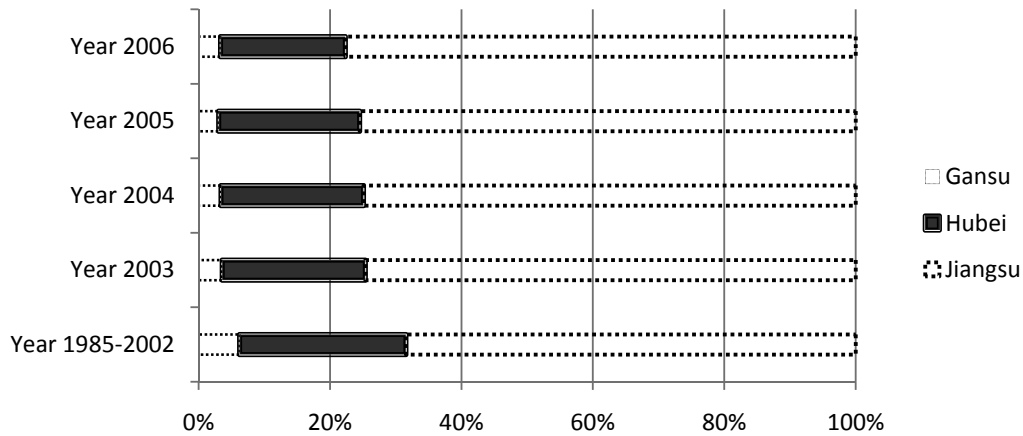
Source: National Bureau of Statistics, China Compendium of Statistics 1949-2004

Another noticeable feature in the Chinese economic landscape moving from east to west is the reliance on heavy industry and increase in natural resources.

6.1 Proposition 1

Other observable features moving from east to west are the increasing population diversity, differing geographical terrain and reduced population density. The overall impact must be a reduction in the effectiveness of education. In terms of the creation of knowledge it would seem that annual average increases in Teachers employed at Secondary Schools, University Enrolments and Telephone subscribers would play a significant role. Telephone subscribers have been included in the knowledge creation category because the use of the telephone facilitates the diffusion of knowledge and knowledge creation amongst the general population. Table 3 shows the average percentage change in Telephone Subscribers, University Enrolments and Teachers in Secondary Schools for the period 1953 to 2004. This period encompasses the pre-reform period 1953-1976 and the early reform period 1979-1995 and the late reform period of 1997-2004.

Figure 6: Distribution of Domestic Applications for Patents Received from 1985 to 2006



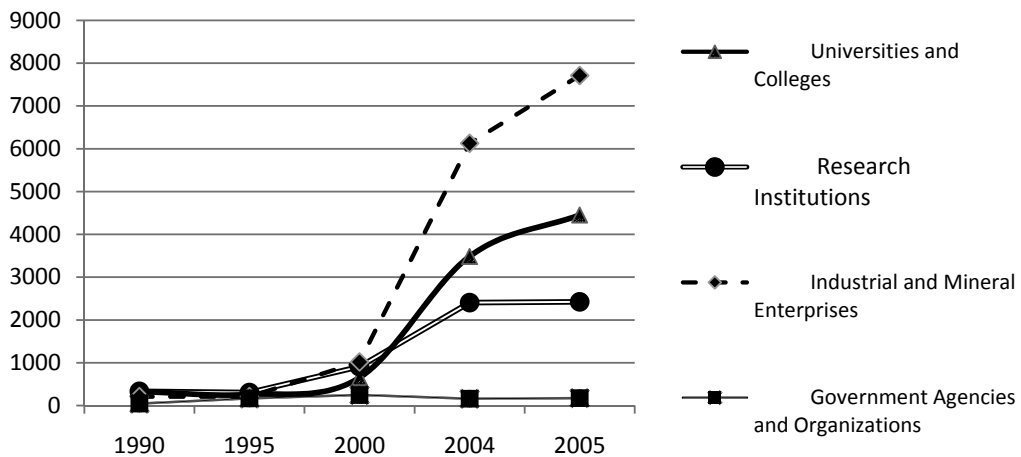
Source: Intellectual Property Office of PRC

Note: Patents are in units of numbers received

It can be seen that in the 1997-2004 period the percentage change in secondary school teachers and telephone subscribers was greater for Gansu province than for the other two provinces. This may reflect the impact of the Western Development program. However, the economic prosperity of the Coastal regions and the decentralisation of education funding have resulted in the development of Coastal innovation systems at the expense of a national one. The comparison of the growth of telephone subscribers, university enrolments and teachers in secondary schools between the three periods does indicate that Gansu has been engaged in a ‘catch-up’ with other provinces with regards to the capacity to enhance knowledge. However, it is clear from Figure 6 that the Coastal provinces such as Jiangsu are doing better than inland provinces such as Hubei and Gansu with regards to knowledge creation. It is possible to say this if knowledge creation can be measured in term of patents filed and granted. In each of the years 1985 to 2004, Jiangsu is ahead of both Hubei and Gansu with regards to the number of patents filed with the Chinese Intellectual Property Office. Similarly, Hubei is ahead of Gansu in each of the years 1985 to 2004 in terms of patents filed. It has already been established in Figure 2 that the Coastal Region (Jiangsu) is ahead of both the Central (Hubei) and Western Regions (Gansu) of China with regards to granted patents. However, the data has not been differentiated to distinguish between the patents of multi-national corporations (MNC’s) and the patents of Chinese companies. In this context, research in China by MNC’s is carried out by indigenously educated researchers. These researchers are perhaps being managed by foreigners because it is cheaper than hiring foreign educated researchers. Therefore, the domination of the Coastal region by MNC’s and manufacturing operations as well as the embedding of the knowledge creation process in China’s Coastal region as resulted in sustaining disparities in income between the Coastal regions of China and its interior hinterland. However, the propensity of MNC’s

and manufacturing operations to condense in the Coastal region has been reduced in recent years (Ramesh, 2010). Nevertheless, entrepreneurial activity in China's Coastal region has been greater due to the open Coastal cities, SEZs, NHTIDZs (National High Technology Development Zones), Science and Technology Research Parks as well as the associated influx of FDI. Moreover, it would seem that the government reforms which facilitated horizontal linkages between Research Institutes and Universities research and development (R&D) with entrepreneurial activity ensured that the greatest knowledge creation activity occurred in the Coastal regions of China. Research is promoted by potential economic gain.

Figure 7: Trend of Invention by Type of Institution



Source: Chinese Statistical Survey 2006, Table 21.45, National Bureau of Statistics

Figure 7 illustrates the point that the trend of invention by type of institution has favoured industrial and mineral enterprises. Enterprises tend to be more innovative as well as being favourable to risk-taking activities. This kind of behaviour is evidenced by the borrowing of funds at commercial rates of return to finance innovative activities. It may also involve having access to Enterprise Funds. Enterprises were located mainly in the Coastal region.

The post-reform trend in the annual average percentage increases, shown in Table 3, in university enrolments, telephone subscribers and teachers employed in secondary schools in inland provinces, such as Hubei and Gansu compared to Jiangsu, suggests two things. Firstly, it can be inferred that educated individuals migrated to the Coastal provinces from inland provinces because of the increased work opportunities. Migration was much easier in the reform years because educational reform facilitated individual choice as students were not educated to plan; and were free to choose courses which offered better employment prospects. The inland provinces, therefore, experienced a 'brain drain' to the Coastal provinces. Secondly, the educational reforms resulted in the decentralisation of educational funding. This allowed the Coastal provinces to better fund education compared

to China's interior provinces (Kai-Ming, 1998). These two features in conjunction with the localisation of MNC's and manufacturing activity in the Coastal region of China ensured the diffusion of knowledge creation activities and its agglomeration in the Coastal region of China. This sustained the income disparities between China's Coastal regions and its interior.

6.2 Proposition 2

In this section the relevance of Proposition 2 is assessed using annual average yearly growth rates in waterway passengers, highway passengers, railway passengers, length of railways, length of highways, rail freight, waterway freight and highway freight. Table 4 shows the average percentage growth of provincial freight traffic in the period 1953 to 2004 for Jiangsu, Hubei and Gansu. In the period 1953 to 1976 the annual average percentage increase in railway freight is biggest in Gansu province. This may have been due to the requirements of a centrally planned economy which promoted a heavy industrialisation strategy in the interior provinces.

Table 4: 1953-2004: Average Percentage Growth of Provincial Freight Traffic

Time Period	Province	Highway Freight*	Waterway Freight*	Railway Freight*
1953-1976	Jiangsu	17.68	11.75	0
	Hubei	20.82	27.92	0
	Gansu	15.32	0	30.44
	Province	Highway Freight*	Waterway Freight*	Railway Freight*
1979-1995	Jiangsu	33.16	13.82	5
	Hubei	1.08	6.1	6.13
	Gansu	20.46	0	4.63
	Province	Highway Freight*	Waterway Freight*	Railway Freight*
1997-2004	Jiangsu	3.72	11.33	1.82
	Hubei	622.51	19.71	7.59
	Gansu	4.31	0	7.77

Source: China Compendium of Statistics 1949-2004, National Bureau of Statistics

Note: * denotes a percentage value

This development strategy was based on the mistaken notion that railways lead to prosperity. In the same period Gansu showed the largest annual average percentage increase in the length of highways, length of railways and railway passengers. Similarly,

Hubei showed the largest annual average percentage increases with respect to waterway passengers and highway passengers. The dominance of the interior compared to the Coastal region may be accounted for the fact that it was in this period that the ‘Third Front’ program was being actively implemented by the Chinese government. The ‘Third Front’ program called for the balanced economic development of all of China’s provinces as well as the industrialisation of China’s interior regions due to military necessity. In this period Hubei shows the biggest increase in the annual average increase in highway passengers. Knowledge creation activities were associated with process design and military need. Most of China’s knowledge creation activity was military related. Nevertheless, there was a lack of facilitation of knowledge creation in the educational sector as well as a lack of knowledge spillovers from institutional research into entrepreneurial activity due to the vertical structure linking research with the end user. Table 4 also shows the average percentage growth of provincial freight traffic during the period 1997 to 2004. As can be seen, the data is dominated by Hubei which shows a 600% annual average increase in highway freight for the period. This can be accounted for by the fact that the highway freight in Ton per KM jumps from 500 in 2002 to 22400 in 2003. If this outlier is removed it can be seen that Hubei and then Jiangsu register the biggest increases in Waterway Freight. Similarly, Gansu and Hubei register comparatively similar increases in Railway Freight.

Table 5: 1953-2004: Average Percentage Growth of Length of Highways and Railways

Time period	Province	Length of Highways (%)	Length of Railways (%)
1953-1976	Jiangsu	6.3	-0.2
	Hubei	0	0
	Gansu	10.03	39.56
Time period	Province	Length of Highways (%)	Length of Railways (%)
1979-1995	Jiangsu	2.21	0.13
	Hubei	0.5	2.21
	Gansu	0.13	0.09
Time period	Province	Length of Highways (%)	Length of Railways (%)
1997-2004	Jiangsu	18.12	0.59
	Hubei	9.44	1.03
	Gansu	1.82	0.18

Source: China Compendium of Statistics 1949-2004, National Bureau of Statistics

Table 5 shows the average percentage growth of the length of highways and railways. On the other hand Table 6 shows the average percentage growth of highways and railway

passenger traffic for the three periods 1953-1976, 1979-1995 and 1997-2004. From Table 5 it can be seen that for the period 1953-1976, Gansu showed the biggest average percentage increases in the length of highways and the length of railways. On the other hand in the periods 1979-1995 and 1997-2004, Jiangsu showed the largest average percentage increase in the length of railways and Hubei with regards to the length of railways. These findings suggest that in the pre-reform period of 1953-1976 interior provinces such as Gansu played a greater role in the government's economic growth strategy. The implication of this is that Gansu assumed the role of the core region while the Coastal region played a periphery role in the pattern of development of China. However, in the post-reform periods of 1979-1995 and 1997-2004, Jiangsu shows the largest average percentage increases in the length of highways while Hubei shows the largest average percentage increases in the length of railways. These findings suggest that Hubei was the 'hub' province, in the post-reform period. In this case, natural resources were transported from the west of the country to the Coastal regions. The railways were important in this process. These findings also suggest that in the post-reform period manufactured goods had to be transported from the site of manufacture to ports. Due to the fact that a significant amount of manufacturing was done in Jiangsu, it is easy to see why the largest increase in the length of highways took place in this province. These changes in the length of highways and the length of railways, in the post reform period, suggest that the Coastal region had become the core and the interior the periphery.

Table 6: 1953-2004: Average Percentage Growth of Highways and Railways Passenger Traffic

Time Period	Province	Highway Passengers (%)	Waterway Passengers (%)
1953-1976	Jiangsu	15.66	7.7
	Hubei	21.09	15.53
	Gansu	14.98	0
Time Period	Province	Highway Passengers (%)	Waterway Passengers (%)
1979-1995	Jiangsu	15.06	-4.41
	Hubei	9.8	4.14
	Gansu	10.08	0
Time period	Province	Highway Passengers (%)	Waterway Passengers (%)
1997-2004	Jiangsu	7.12	-21.65
	Hubei	20.93	9.53
	Gansu	7.4	0

Source: China Compendium of Statistics 1949-2004, National Bureau of Statistics

From Table 6, it can be seen that in the pre-reform period of 1953-1976 Hubei registered the largest average percentage increase in the number of highway and waterway passengers. On the other hand in the first post-reform period of 1979-1995 Jiangsu registered the largest increase in the average percentage increase in the number of highway passengers. But in this period Jiangsu also shows the largest decline in the average percentage of waterway passengers. This would imply that people in Jiangsu switched from using waterways to highways. However, in the second post-reform period, 1997-2004, Hubei shows that largest average percentage increase in the number of highway passengers while Gansu and Jiangsu show a similar level of increase. These changes maybe associated with the WDP which would have entailed the transportation of personnel and capital goods from the Coastal regions to the Western Regions .The changes in the length of highways and the length of railways in the post reform period suggest that the Coastal region had become the core and the interior the periphery. These results would tend to support Proposition 2. Moreover, this finding is supported by the pre-eminence of SEZ's in the Coastal regions in the reform period. The importance of the SEZ's can be associated with a shift towards the significance of highways as opposed to railways in moving from the interior of China to the Coastal regions over the years.

6.3 Proposition 3

Investment in fixed assets leads to the specialisation of labour, leading to the integration of fragmented local markets and market integration. In the post reform period a large amount of investment in fixed assets took place in the SEZ's and the NHTIDZ's. This is due to the fact that a variety of physical and non-physical infrastructures were required to be concentrated in these specially designated areas. Thus, it can be expected that the effects of increased infrastructure investment can be evidenced by the percentage changes in Imports, Exports, Gross Regional Product (GRP), GRP per Capita and Total Investments in Fixed Assets over time. Table 7 shows the average percentage growth of Total Investments in Fixed Assets and GRP per capital. Table 8 shows the average percentage growth of GRP, Exports and Imports.

Table 7: 1953-2004: Average Percentage Growth of Inflation Adjusted Total Investments in Fixed Assets and GRP Per Capita

Time Period	Province	*Total Investments in Fixed Assets (%)	GRP Per Capita (%)
1953-1976	Jiangsu	18.85	2.86
	Hubei	23.21	5.64
	Gansu	16.32	4.73
Time Period	Province	*Total Investments in Fixed Assets (%)	GRP Per Capita (%)
1979-1995	Jiangsu	31.45	11.62
	Hubei	22.81	16.28
	Gansu	20.25	11.9
Time Period	Province	*Total Investments in Fixed Assets (%)	GRP Per Capita (%)
1997-2004	Jiangsu	17.43	11.1
	Hubei	11.66	9.46
	Gansu	17.11	9.51

Source: National Bureau of Statistics .China Compendium of Statistics 1949-2004

Note: *Total Investment in Fixed Assets (TIFA) adjusted for inflation by dividing by the respective provincial Gross Regional Products (GRP)

Table 8: 1953-2004: Average Percentage Growth of GRP, Exports and Imports

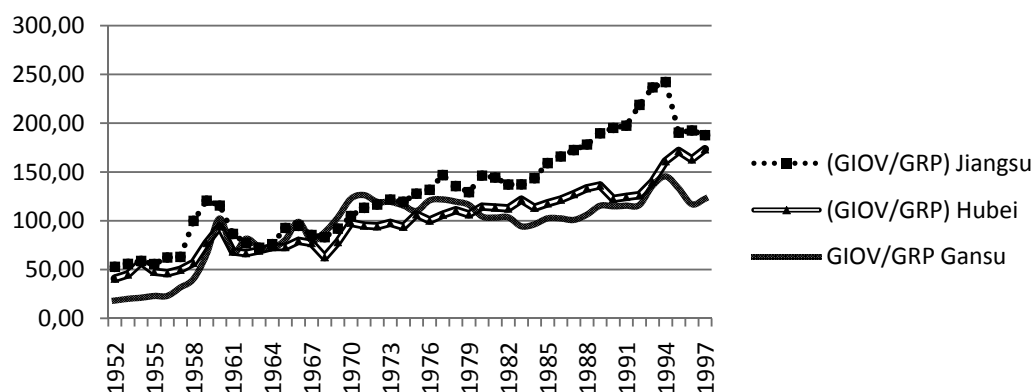
Time Period	Province	GRP (%)	Exports (%)	Imports (%)
1953-1976	Jiangsu	6.2	0	0
	Hubei	7.8	0	0
	Gansu	0.07	0	0
Time Period	Province	GRP (%)	Exports (%)	Imports (%)
1979-1995	Jiangsu	11.89	21.11	69.55
	Hubei	17.9	17.96	39.68
	Gansu	0.14	37.49	40.42
Time period	Province	GRP (%)	Exports (%)	Imports (%)
1997-2004	Jiangsu	12.72	29.67	33.58
	Hubei	9.96	12.35	16.36
	Gansu	0.1	19.82	26.78

Source: China Compendium of Statistics 1949-2004, National Bureau of Statistics

As can be seen from Tables 7 and 8, in the period 1953 to 1976 Hubei shows the biggest average annual increases in Total Investments in Fixed Assets, Gross Regional Product (GRP) and Gross Regional Product Per Capita. These effects may be due to the 'Third Front' program and changes in the agricultural sector which was the predominant sector in this period. This was in contrast to manufacturing. During this period, Jiangsu which also had a buoyant agriculture sector showed the biggest annual average increase in GRP than Gansu.

In the period 1979 to 1995 Gansu shows the biggest average annual increase in Exports than either Jiangsu or Hubei. Gansu produces oil and other natural resources which would have been in demand. Nevertheless, Hubei shows bigger average annual increases than Gansu with regards to GRP, GRP Per Capita and Total Investments in Fixed Assets (TIFA). However, in the same period Jiangsu shows the largest average annual increase with regards to Imports and TIFA than either Hubei or Gansu. The increase in imports maybe due to the fact that it was cheaper for Coastal provinces to import resources than to have it transported from other inland provinces. This can be explained by the poor transportation infrastructure, in terms of quantity and quality, which resulted in bottlenecks in the transport system (Riskin, 1987). It must also be remembered that the period 1979-1995 was a period in which the economic growth rates of China's Coastal provinces converged with those of its interior provinces which relied heavily on the agricultural sector. The high prices of agricultural produce meant that the interior provinces were more prosperous than the Coastal provinces. However, this changed when the prices of agricultural produce fell towards the late 1980s, early '90s. After this time the growth rates of the Coastal provinces began to diverge from the growth rates of the interior provinces following a period of convergence.

Figure 8: Adjusted Gross Input Output Value (GIOV) 1952-1996



Source: Compendium of Statistics 1949-2004, National Bureau of Statistics China

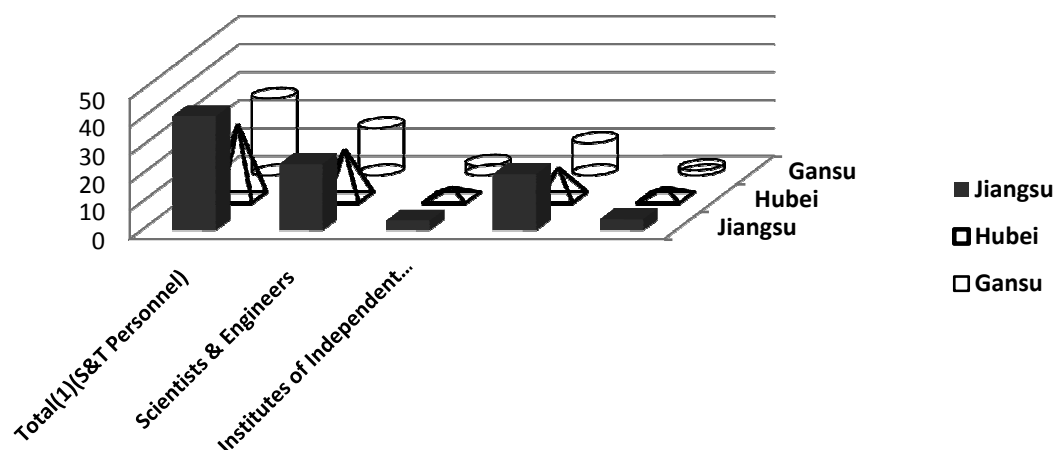
Note: Gross Input output Value (GIOV) adjusted for inflation by dividing by regional GRP

Thus, due to the reforms initiated by the government and the fall in agricultural prices a shift occurred in the core-periphery pattern in China from interior-Coastal to

Coastal-interior. However, during the period 1997 to 2004 there is a perceptible change in the annual average percentage changes of economic factors. It can also be seen that Gansu shows the largest average annual percentage increases with regards to Imports, Exports and Total Investment in Fixed Assets compared to Hubei. Nevertheless, with regards to average annual increases in GRP per Capita, Gansu is approximately on par with Hubei. These effects may be associated with the WDP which was instituted in 1999. It is interesting to note that in the period 1979-1995, the increase in Total Investment in Fixed Assets (TIFA) was greatest in Jiangsu compared to either Hubei or Gansu. This can be accounted for by the fact that SEZs were being constructed in the Coastal provinces during this time period. However, in the period 1997-2004, the increase in TIFA was approximately at the same level in Gansu and Jiangsu. This may be accounted for by the effects of the WDP in China's interior provinces; and the emergence of NHTIDZs in the Coastal provinces. It can also be seen that in the period 1997-2004 that the growth rates of GRP per Capita, Imports, Exports and GRP was greatest in Jiangsu province. This demonstrates the contribution to the economic dominance of the Coastal regions of the SEZs and NHTIDZs.

Figure 8 shows that the inflation adjusted GIOV between Jiangsu and Gansu begins to diverge after 1972. In this case, Jiangsu's GIOV is on an upward trajectory compared to the GIOV of Gansu. This may have resulted from the fact that TVEs began to start emerging in Jiangsu around this time, well before the start of the 1978 economic reforms (Riskin, 1987). Furthermore, TVEs were also predominant in other Coastal provinces such as Fujian where the government was reluctant to invest in State Owned Enterprises for fear of military attack. The inflation adjusted GIOV of Hubei and Gansu begins to diverge after the early 1960's.

Figure 9: Science & Technology Personnel by Region and Weighted by Provincial Population

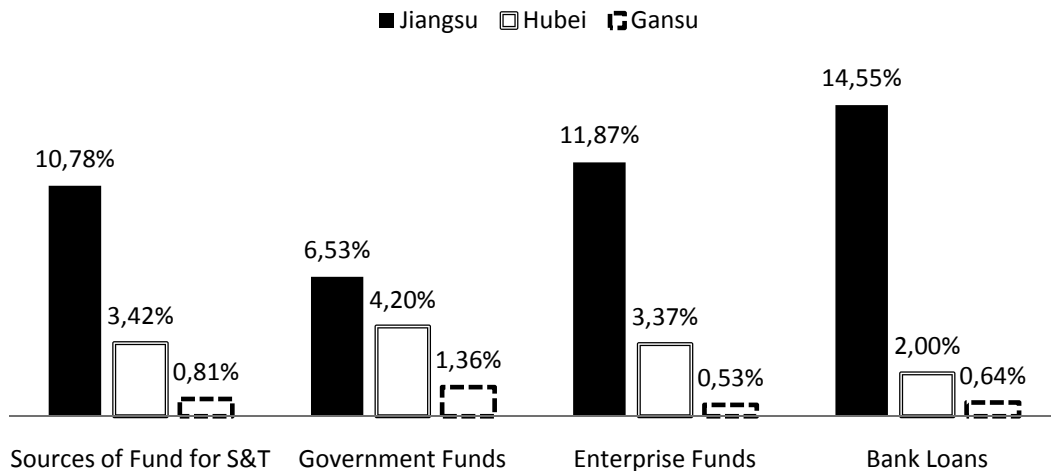


Source: China S&T Statistical Yearbook 2003: Table 1.18: S&T Personnel by Region (2001), National Bureau of Statistics

6.4 Proposition 4

States that the NEG is inadequate in accounting for the role of knowledge creation in the core-periphery pattern formation because it cannot account for the role of the interplay of individual factors of knowledge creation in the economy. According to Krugman (1991) there is no role for the creation of knowledge in the framework of the New Economic Geography (NEG) because only the manufacturing and agricultural sectors are relevant to the formation of the core-periphery pattern. However, traditional economic theory suggests that innovation and knowledge creation in an economy are essential for long term economic growth (Rosenberg, 2004). Figure 9, above, shows the numbers of Science and Technology personnel by region in various categories. In Figure 9, Gansu is represented by the cylinder, Hubei by the pyramid and Jiangsu by the solid object. One obvious feature is that in Jiangsu, in the Coastal region, Large and Medium Sized Enterprises (LME's) employ more Science and Technology personnel than they do in either Gansu or Hubei in 2003. This will facilitate more knowledge creation in the Coastal region.

Figure 10: Source of Funds for Innovation* by Region – 2003



Source: China S&T Statistical Yearbook 2004: Table 1.15: Science & Technology Source of Funds by Region (2003), National Bureau of Statistics

Note: *Percentage of national total

Another surprising feature, which can be observed in Figure 9, is that in Gansu LME's employ more Science and Technology personnel than does Hubei. LME's are important for economic growth because they are both entrepreneurial and innovative. However, Gansu remains one of the poorest provinces in China (Qian et al., 2009).

According to Figure 10 Jiangsu receives more funds for innovation from the government than does either Gansu or Hubei. Figure 2 has already established that the Coastal region has the largest number of domestic patents (invention) granted by region in 2005. These facts would suggest that the knowledge creation process has been embedded in the Coastal region in the post-reform period. Further evidence for this assertion is that, as can be seen from Table 1, the Coastal region as represented by Jiangsu had the largest number of registered domain names and www.websites in contrast to the other two regions. The Internet is seen as a symbol of the knowledge economy. However, the micro-foundations of the knowledge creation process are not accounted for by the NEG.

6.5 Proposition 5

With regards to Proposition 5, it is easy to see that picking up the phone and speaking to someone at the other end, who may be thousands of miles away, is a quicker method of transmitting knowledge than by driving a car or taking a train to speak to them. Moreover, in contrast to network theory, tacit knowledge and explicit knowledge are assumed to be indistinguishable because the purpose of this proposition is to assert that the speed at which knowledge is exchanged will vary with different types of infrastructure. The more knowledge oriented regions such as Jiangsu will have more advanced communications infrastructure such as the Internet, characterised by features such as websites and domain names.

7. Conclusion

This paper has evaluated the economic development of China, using a comparative case study methodology, based on a Coastal, Central and Western province using the NEG has a framework of analysis. The time period of the study is from 1953 to 2004. This time period was purposefully selected in order to avoid a conflict with the events leading to the global credit crunch of 2008. If this had not been done then the results of this paper would not be reliable as the global credit crunch directly led to an inland momentum in economic activity, from the Coastal region to the interior of China (Ramesh, 2010). In the long run this may lead to a shift in the gravitas of the core-periphery balance in China. Furthermore, while the NEG allows for the formation of a core-periphery pattern between the regions of a country based on the concentration of manufacturing industry, taking advantage of low transportation costs, it cannot account for the role of time and knowledge in that agglomeration process. Furthermore, the NEG only considers transportation infrastructure and so excludes the interplay between this type of infrastructure and other types of infrastructure which is essential for economic growth.

This study has shown, by evaluating five propositions based on associated data and criteria that the core-periphery pattern formation envisaged by the NEG is dependent on government economic and development policy. This tends to vary across different time

periods. Moreover, once the core-periphery pattern has formed due to the concentration of light manufacturing activity in one region of a country, knowledge creation sustains the income disparities which result from such a concentration. In the case of China there are three political periods of importance, 1953-1976, 1979-1995 and 1997-2004. Government policy has had a role in shaping the formation of the core-periphery pattern in each three periods. However, the post 1978 economic reforms ensured that the Coastal region of the country became the core and the interior the periphery. Furthermore, even though the WDP in the late 1990's changed the forces of development from the core Coastal region to the West of the country, the gravitas of the Coastal region in conjunction with the effects of the educational reforms and entrepreneurship in these regions ensured that the Coastal region remained the core. However, in the period 1953-1976 it is evident that due to programs such as the 'The Third Front' the forces of economic growth were skewed against the Coastal region and focused very much towards the country's interior. In this case, the interior was in effect the core and the Coastal region the periphery. Nevertheless, in the post-reform period after 1978 the momentum of economic activity, as a result of government policy, shifted towards the Coastal region. Moreover, after the fall in the prices of agricultural goods in the late 1980's and early 1990's the process of divergence in economic growth rates between China's interior and its Coastal region began to increase and the Coastal region became the core and the interior the periphery.

Propositions 1, 4 and 5 support the hypotheses that:

- a) Knowledge creation sustains the core-periphery pattern,
- b) The NEG does not acknowledge the interaction between the individual factors of knowledge creation and,
- c) The speed of knowledge exchange varies with the type of infrastructure.

On the other hand, Proposition 2 and 3 support the notion that investment in different types of infrastructure and fixed assets leads to the concentration of manufacturing industry. In the case of Proposition 1 it is clear that the post 1978 educational reforms in China have, in conjunction with the presence of entrepreneurship and MNC's, led to the consolidation and enhancement of knowledge creation in the Coastal region. This has helped in sustaining the core-periphery pattern formed by the concentration of manufacturing activity in the Coastal region. With regards to Proposition 4, it is clear that the NEG does not account for the role of scientific personnel, universities, R&D expenditure, telephones and the Internet in the knowledge creation process as measured by the number of patents issued by region. Therefore, the NEG cannot account for how knowledge linkages form in the economy. Furthermore, according to Proposition 5, even though the speed of knowledge exchange varies by type of infrastructure (telephone network, roads, railways and the Internet) this is unaccounted for by the NEG. Propositions 2 and 3 tend to support the notion that the post-reform core-periphery, Coastal-interior, pattern formed in China due to increased investment in infrastructure and fixed investment in the Coastal region as compared to the interior.

The evaluation of the five propositions based on associated data and criteria does tend to support the idea that core-periphery pattern formation is not a static one but depends on government policy at a point in time. Furthermore, while economic reforms of the post 1978 period began the process of the divergence in the economic growth rates of the interior and Coastal regions of China, due to the localisation of manufacturing industries in the Coastal region, the fall in agricultural product prices in the late 1980's exacerbated it. In this case, the Coastal region became the core and the interior the periphery of the country. However, once the core-periphery pattern had formed knowledge creation sustained it.

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Employment Status and Job-Studies Relevance of Social Science Graduates: The Experience from a Greek Public University

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Abstract

Research on social science graduates' employment prospects reaches contradictor conclusions intensifying the scepticism on the value of these disciplines in the labour market. The paper examines two important labour market outcomes of these graduates, employment status and job-studies relevance taking into account gender and time of graduation. This is put into the Greek context, then examined further in a case study on graduates of a public University that exclusively serves social sciences. Results indicate deterioration of the graduates' employment opportunities, lower employment status of female graduates, and persistence of a high degree of 'job-studies no relevance' over time.

Keywords: social sciences graduates, employment, job-studies relevance, Greece

JEL classification: I23, J20

1. Introduction

The large expansion in the supply of graduates, mainly observed in developed countries over the last 50 years, has led to concerns about graduates' employment prospects that now appear less certain than in the past. In this context the field of studies became one of the key determinants of graduates' performance in the labour market (e.g. Ballarino and Bratti, 2009; Núñez and Livanos, 2009; Reimer et al., 2008). Research reveals significant variations in employment outcomes; in the main, it shows that graduates from more applied or technical fields do better in the labour market as opposed to those of more general academic fields, like social sciences. The underlying assumption is that social science studies are less vocational oriented and develop less occupation-specific skills; this creates a continued and widespread scepticism on their value in the labour market, which in turn gives rise to perceptions that question the value of social sciences *per se* (Drewes, 2002; Walters, 2004). What is of interest in this paper is the performance of social science

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graduates in the Greek labour market with respect to *employment status* and *job-studies relevance*, an aspect of the incident of job mismatches.

A noticeable feature in the case of Greece is that there exists a higher demand for higher level studies compared to the other European Union countries. This is portrayed at the proportion of tertiary level students over the total population enrolled in the Greek education system, which is the highest in Europe (Eurostat, 2009). However, the gap between this strong supply of highly qualified persons and the limited demand of the domestic economy for such labour (Liagouras et al., 2003) along with the bad economic state of the country, results in high unemployment rates, especially for young and female graduates (Eurostat, 2009). Moreover, the changing conditions of the job market as far as skills and professions are concerned, creates problems to graduates as to holding a job related to their studies (Kalamatianou and McClean, 2003). It would be interesting thus, to examine how social science graduates –whose skills and competencies (e.g. communicative, critical skills) are considered of special importance in the new emerged ‘knowledge society’– perform in the labour market under the above socio-economic conditions. Research so far indicates difficulties for these graduates. Explanations suggested here, include issues concerning supply-side factors, the recruitment policies of the public sector –main employer of social science graduates– and the evolution of social sciences and research in Greece.

The purpose of this paper is twofold. First, we review and discuss about the employment situation of graduates and of social science graduates, in Greece and elsewhere, arguing for the need of a more systematic examination of social science graduates prospects in the Greek labour market. Secondly, using data from the Panteion University of Social and Political Sciences, we analyse graduates’ employment prospects. In particular, we focus on two important labour market outcomes: a) *employment status*, a quantitative indicator of labour market performance, and b) *job-studies relevance* (that is, whether the job of an employed graduate is related to his/her field of study –job mismatch), a measure of the quality of the job performed. Focusing on two different measures of job success we get a more comprehensive picture of graduates’ labor market situation. The paper will moreover analyze the possible changes in the above two outcomes, taking into account gender, and time of graduation. Using a large number of data that cover a period of more than a decade (1988-2000) it is revealed how different generations of graduates (earlier and recent ones) experience labour market returns to their studies. To the best of our knowledge, this is a first attempt for a systematic comparison on social science graduates’ employment prospects in Greece. Most of the research so far examines the employment outcomes by field of study but not focusing on social sciences. Our empirical analysis concentrates specifically on social science graduates, enabling estimations of the employment returns to this field of study and of changes over time. In this respect the paper makes a contribution to the relevant literature.

Information concerning labour market outcomes may be of particular interest to students, social sciences university departments, and educational policy makers. First, it could be useful for the students to know the employment potentials after graduation from a specific field and whether there are any particular positive or negative employment returns

to studying social sciences. The corresponding departments could also be interested in developing or altering the curriculum to enhance e.g. graduates' employability. Finally, educational policy makers may take initiatives to facilitate the transition from university to work, such as financing social research within universities as it can play a key role for the development of the country.

Our inquiry is organized as follows: In Section 2 we describe the issues of unemployment and job mismatch of the Greek graduates in relation to higher education expansion and the local socio-economic conditions, making comparisons with other countries. The information provided serves to contextualize the analysis of these two issues for the specific case of social science graduates where we focus in Section 3. More specifically, Section 3 discusses the scepticism as to the labour market value of social sciences compared to other disciplines, and presents research findings on employment outcomes of the corresponding graduates in Greece and elsewhere. Section 4 is devoted to the empirical analysis; in particular, it describes the research questions, the data, the variables, the statistical procedures, and presents the results of the analysis of the issues under study along with an extended discussion on them. The final Section 5 concludes.

2. Unemployment and Job Mismatch of Graduates, in Greece and elsewhere

From the 1960s onwards there has been a growing social demand for higher education which resulted in the expansion of this level of education in most developed countries. In Greece this demand has appeared somewhat later, in the mid 1970s, when the end of the authoritarian regime opened the way for the final re-introduction of a modern democratic system. In the following years the expansion of this educational level has been remarkable as to the number of the departments established and students enrolled. Of special importance is the 1997 reform that aimed at the widening of participation promising equality of opportunities (Sianou, 2008). It is worth noting that over the period 1998 to 2006 Greece has been among the European countries recording a very significant rise (at least 50%) in the number of their tertiary students (the European average is 25%). Furthermore, tertiary level students constitute more than a quarter of the total population enrolled in the Greek education system; the corresponding proportion comes up to 29.9% –the highest in Europe (EU-27) where the respective average proportion is 17.4% (Eurostat, 2009).

The above figures indicate the strength of tertiary education in the national education system, making Greece a distinctive case in this respect. Indeed, the value Greeks place on higher education has been traditionally very high and goes back to the period of the establishment of the nation in the early 19th century (Tsoukalas, 1977). Even the *numerous clausus* policy adapted by the Ministry of Education does not prevent Greeks from pursuing higher level studies; the most typical aspect is that Greece has one of the largest university student populations abroad (Kalamatianou, 1990). Women's participation is also outstanding as they constitute 62% of the university students and 51.1% of all tertiary level students (Greek National Statistical Service (GNSS), 2005). This is a remarkable evolution considering that, for almost a century since the establishment of the Greek nation, women

had no access to higher education (Belogiannis et al., 2007). Yet, this high demand for university degrees, which increases the supply of graduates, many times happens to any family expense and against the demands of the labour market in specialities and numbers (Kalamatianou, 1992). Given this, a natural question is how well this large number of highly educated people performs in the job market. In the following, the focus is on two labour market performance indicators, unemployment and job mismatch.

2.1 Unemployment

The unemployment rate is an important indicator of graduates' labour market performance, that in many developed countries and despite the variations is rising fast affecting particularly young (recent) and female graduates who are among the most vulnerable groups to unemployment (Eurostat, 2009). Theories developed in economic literature explaining the difficulties young graduates encounter are based on labour market function (e.g. human capital theory, segmented labour market theory), whereas those developed in sociology emphasize the effect of social origins to educational choices and attainments (Karamesini et al., 2008). As regards gender, Lyon (1996) argues that even if women gained equal access to higher education, there are still significant imbalances depending on the field of study as well as inequalities in the labour market outcomes. The main argument is that women have been socialized so as '*...to prepare themselves for careers within spheres of work traditionally seen as «female» and follow career paths premised on assumptions about women's domestic roles*' (Lyon, 1996, p.320).

In Greece, the university graduates (25-64 years old) face comparatively bigger employment difficulties as the unemployment rate (4.9%) is higher than the European average (EU19: 3.2%) while the unemployment rate for the total of tertiary education graduates is 5.7% (EU19: 3.2%) (OECD, 2010). Female and young graduates also, face significant employment difficulties. More specifically, the unemployment rate of Greek female graduates is more than twice (6.2%) that of male's (3.7%) –the corresponding European (EU19) average rates are 3.6% and 2.9% (OECD, 2010). Furthermore, the unemployment rate of Greek graduates aged 25-34 is roughly four times higher than that of graduates aged 35-44; in Europe (EU25) the respective rate is on average around two times higher (Eurostat, 2005). The above figures indicate that (young and female) graduate unemployment remains a serious problem of the Greek society compared to other European societies.

The high rates of graduate unemployment in Greece are mainly attributed to the weak link between higher education and labour market: On the one hand it is argued that higher education is not providing the skills and competencies needed by the economy and is not taking into account the needs of the labour market (Livanos, 2009) –rather it is oriented towards the needs of the public sector. On the other hand, high unemployment has been attributed to the limited demand of the domestic economy for high skilled workers, which is the result of the weaknesses of the business sector and the poor economic performance of the country in the last decades (Liagouras et al., 2003). The broader public sector that expanded greatly especially during 1980s, became graduates' main employer, who prefer it

mainly because of the advantages it offers (e.g. job security, parenthood benefits especially favourable to women). However, as a result of the economic squeeze and the recent tremendous economic recession of the Greek economy the employment chances in this sector have been and will be further significantly lessened, causing additional problems to new generations of graduates.

2.2 Job Mismatch

Graduates, finding themselves in an overcrowded labour market, are driven to accept jobs that do not match their level of education, their skills and knowledge. This incident of job mismatch (either at the education level and/or field of studies) is another significant indicator of graduates' performance in the labour market. We note that most of the relevant research focuses on the level of education mismatches, referred as overeducation (the acquired educational level of a worker exceeds the level of education required to perform a job) (Wolbers, 2003). Special attention has also been paid to the measurement of this incident (see, for example, Barone and Ortiz, 2010; Dolton and Vignoles, 1997), as different methodologies (e.g. subjective and objective measurements) lead to different estimates, and it is not clear what the 'correct' method should be. In particular, according to Dolton and Vignoles (1997) most research has relied on subjective measurements, that is on self-assessment techniques, whereby graduates are asked directly about the educational requirements of their work; alternatively, objective methods are sometimes applied which generally use employment analysis data such as dictionaries of job titles. All these methods have limitations which should be taken under consideration at the interpretation of the findings.

Many empirical analyses have been conducted to measure educational mismatch among graduates. Reviewing the relevant research during 1980s and 1990s in Europe, Dolton and Vignoles (1997) conclude that this incidence varies considerably among countries, and, determining the average European graduate overeducation is impossible from the available data; however, the work that has been done indicates that about 20-30% of European graduates feel overeducated or underutilized. Teichler (2002) reports the results of a survey that compares the situation of graduates of 12 European countries (Greece excluded) four years after graduation, where one sixth of the graduates do not see a reasonable link between their field of study and the work tasks, and 12% believe that a lower level of higher or other tertiary education had sufficed; asked to consider all dimensions in their judgement, one seventh of the graduates believe that their level of employment and work is hardly or not at all appropriate to their level of educational attainment. Findings from the *EU LFS 2000 ad hoc module* (Eurostat, 2003) focusing on persons attained a vocational program, reveal that 30% of tertiary education graduates has a job-field of education mismatch; the respective rate in Greece (35%) is among the highest ones. Furthermore, it was found that in most of the selected European countries and in Greece as well, women are more likely to be employed in a non-matching job than men; however, the gender differences are quite modest. A Greek survey on recent graduates

(1998-2000) (Karamesini et al., 2008) reports that the average rate of those holding jobs with little or no relevance to their field of study is 27.9%, and that more women (28.8%) than men (25.4%) hold such jobs. Similar results come out from another survey on Greek graduates (Basiakos, 2010) where 29.5% of the respondents reported being on jobs not relevant to their studies while also, more women (32%) than men (26%) are in such jobs. As indicated elsewhere (Kikilias, 2008) the percentage of overeducated employed graduates in Greece rose to 21% in 2007, up from 16% in 1993.

In an attempt to explain the above described situation in Greece it has been argued that the private sector was not dynamic enough to provide the types of jobs that would satisfy the growing number of high skilled workers (Patrinos, 1997). Moreover, that the jobs requiring higher educational qualifications were increasing in a slower pace compared to the population holding such qualifications (Karamessini et al., 2008). In addition, according to Glytsos (1990), public sector –that expanded mainly as a response to the pressure put by the large number of graduates– has never been very particular in the recruitment of graduates with special qualifications. As a result, many graduates are in public service jobs that do not match their studies. Under these conditions and given the high level of unemployment, Greek graduates find themselves accepting jobs not corresponding to their level and/or type of education.

Overall, in the specific Greek economic and social environment, the high demand for higher education trains an oversupply of labour of graduates who face more difficulties, compared with those of other countries, in finding a job that is also relevant to their studies. Moreover, those who confront even more difficulties are the young (recent) graduates and the female ones –a situation similar to other countries, yet, more intensive in Greece.

3. Social Science Graduates in the Labour Market, in Greece and elsewhere

In the context of higher education expansion, the issue of labor market differences across fields of study has become of central interest among scholars (e.g. Ballarino and Bratti, 2009; Drewes, 2002, Nunez and Livanos, 2009; Reimer et al., 2008). Research reveals different employment outcomes in terms of employment status, job mismatches, wages, occupational prestige etc., as well as variations among countries making it difficult to identify a simple international trend. In each case, the state of the economy, the structure of the labour market, the employment opportunities, the structure of higher education including entrance requirements, along with demographic and other factors, could determine whether graduates from specific fields face severe problems or seem to be in demand.

3.1 Social Science Graduates in the Labour Market: the International Context

It is useful to notice here that the research results concerning the employment prospects of social science graduates are not consistent. There are studies showing that these graduates (as well as graduates in other general academic programs i.e. humanities) face more difficulties in the work market than those from more applied or ‘hard’ fields,

such as engineering or computer science, while other studies reveal moderate or even good labour market outcomes. In the following, we discuss first about the studies revealing somehow low employment prospects for social science graduates and then, those showing favourable work outcomes.

Teichler (1989) reviewing studies on university graduates from various western European countries during 1980s, points to the differences among countries and summarizes as follows: graduates in most economic and engineering fields as well as those in medical and legal fields do not face serious problems; the fields whose graduates deal with major employment problems vary substantially from one country to another; in most countries, graduates in the social sciences and the humanities face greater than average employment difficulties. Ballarino and Bratti (2009) study the evolution of graduates' employability by degree subject over time in Italy, and find that the degrees ensuring the best employment outcomes are those in technical, hard sciences, and hard social sciences (economics, statistics) fields. Examining the differences in early labour market outcomes across college majors in Italy, three years after graduation, Buonammo and Pozzoli (2009) reveal that 'quantitative' fields (sciences, engineering, and economics) ease the transition into the first job, increase employment probability and early earnings, conditional on employment, whereas graduates in humanities and social sciences are the most disadvantaged in terms of early labour market outcomes. Finally, two European comparative studies (Nunez and Livanos, 2009, Reimer et al., 2008) using data from the *EU LFS*, show that the most effective disciplines on reducing the chances of unemployment are health and welfare, education as well as engineering. Arts and humanities graduates have the most serious employment problems, while the field of social sciences, business and law provides average employment prospects.

Specifically on the issue of job mismatch, Teichler (1989) reports results of two studies where for social science graduates the share of those working on suitable jobs was below the country's average (about 60% of 1984 Swedish social science graduates reported their education was (completely) suitable to their jobs as opposed to the average 70%, and 50% of 1979 German social science graduates reported they did use at work the knowledge acquired during their studies as opposed to the average 57%). Analyzing the early careers of 1980 UK graduates six years after graduation, Dolton and Vignoles (1996) find that social science (along with arts and language) graduates were more likely to be overeducated. Similar findings come out from a study (Barone and Ortiz, 2010) on overeducation in eight European countries, showing that within every country overeducation is unevenly distributed among graduates, being more widespread among those of humanistic fields (humanities, arts, and social sciences).

All the above findings indicate differences in the employment returns to field of study and employment difficulties for the social science graduates. Various explanations have been proposed as to these findings (see Barone and Ortiz, 2010; Reimer et al., 2008). Human capital theory emphasises the acquired skills and competences: certain fields may develop more productive or more occupation-specific skills than others, and may be more vocational oriented; graduates from these fields are more preferred by employers as they

require less training. From the signalling perspective, education is regarded as a signal of individual traits (e.g. ability and motivations): certain fields carry a higher signal value in the labour market as they are presumed to be chosen by students with higher abilities. In both theories the fields considered in a more favourable position are the 'hard' ones (scientific and technical disciplines) where men are over-represented despite a slight but continuous increase of women's proportion. On the contrary graduates from 'soft fields' like social sciences and humanities, which are female dominated, are expected to face problems as a consequence of the more general training they receive and the perception they are less able students relative to their counterparts from the 'hard fields. Sociological approaches pay more attention to the degree of stratification and selectivity of educational institutions as well as to the structure of the labor market and other demand-side factors (social closure perspective): highly stratified systems of education and a high selectivity at entry into higher education may keep the number of tertiary degrees low, thereby enhancing their economic value. A somehow similar to the above line of explanation is followed by Ballarino and Bratti (2009) who argue that the occupational returns to fields of study are mainly affected by the interplay between the demand and supply of graduates in different fields in the labour market. They suggest that the improvement in the relative performance of 'quantitative' degrees over time in Italy is explained mainly by the reduction of students and graduates and less by the technological progress that raises the employment opportunities of high qualified workers. For the upward trend in the relative performance of 'soft' disciplines the authors put forward labour market's flexibility that enhances graduates' employability, and also, graduates' lower expectations about job outcomes –the communicative and relational skills, considered as important to the emerging 'knowledge society', are less influential.

As mentioned earlier in this subsection, contrary to the above mentioned findings there are also studies revealing favourable employment outcomes for social science graduates. Allen (1998) using Census data from Canada on unemployment, occupation, and income shows that university graduates in education, the humanities, and the social sciences are highly employable, find good jobs, and earn high incomes. As he points out: "... the view that most graduates in these areas have trouble finding work or are waiting on tables or driving taxis is contradicted by Census data" (p.30). Ama (2008) also finds that a great majority (72.5%) of social sciences graduates (from the University of Botswana) hold jobs matching their level and field of education. Purcell and Elias (2006) find that the social science PhDs in UK, are satisfied with the type of job they are doing and the job's relevance to their training. Drewes (2002) compares the labour market experiences between humanities and social science graduates and those who graduated from more applied programs in Canada. He finds that the former may initially be disadvantaged by the lack of vocational content in their studies (resulting in longer job search period or more labour market experimentation), but once established in the market, they do as well as graduates from applied fields of study. Drewes argues that transition difficulties and scepticism about the value of these sciences (despite the statistical evidence that their graduates face comfortable futures in the labour market), are due to the inability to draw a one-to-one correspondence between these programs of study and identifiable occupations.

The underlying perception of the above studies is that the evolving economy requires various types of highly educated workers, whose skills are less specific and more transferable, who can think critically and are capable of understanding, transmitting and communicating knowledge. People with these types of skills are more likely to be found in fields of studies more academically oriented, like social sciences and humanities, rather than in technically oriented fields (Drewes, 2002; Walters, 2004).

From what has been stated so far, it is clear that there are cross-national differences affecting social science graduates' employment outcomes; therefore, it is not wise to make any generalizations on their employment prospects. It is important to note, nevertheless, that there seems to be scepticism on the value of these disciplines in the labour market deriving mainly from the disconnection between curriculum content and identifiable occupations.

3.2 Social Science Graduates in the Labour Market: the Greek Context

In Greece, there exist a rather limited number of studies examining graduates' labour market outcomes across the various fields of study, where it is found that social science graduates are among those encountering employment difficulties. Kikilias (2008) indicates that unemployment rates of social/economic science graduates (who were 15-64 years old in 2007) are higher compared to those of graduates of most of the other disciplines and of the total of university graduates; moreover, that female unemployment rate is higher than the corresponding of males' and that these graduates have high chances to be overeducated. The last finding is similar to that of Patrinos (1997) who finds, using a different methodology, that the incident of overeducation is particularly high for graduates in social sciences. Results from a survey on recent graduates (1998-2000) (Karamesini et al., 2008), reveal that more than half of the total of the unemployed graduates come from the fields of Social sciences, business, and law, and of Humanities and arts. Also, that a large part of graduates from almost all social science disciplines, hold jobs that have no or little relevance to their studies. Livanos (2009), using data from the LFS of the years 2000-2004 to explore the labour market of young graduates (15-35 years old), shows that graduates of disciplines traditionally related to the needs of the public sector such as sociology and humanities, have high chances of unemployment and longer period in unemployment, whereas graduates of disciplines with high levels of private sector employment (e.g. computer science) are in general better off in the Greek labour market. Basiakos (2010) finds that the group of social science graduates is the second (33.2%) most vulnerable group in holding jobs not relevant to their studies compared to graduates from other fields. Based on a small group of 1991-1995 sociology graduates from the University of Crete, Samatas (2010) finds that 13% are unemployed and 54% of the employed graduates are in jobs not relevant to their studies.

In an attempt to explain the employment difficulties social science graduates encounter in Greece, one could first argue that these graduates are more sensitive to the structural and economic weaknesses of the labour market as they comprise (along with graduates of business and law) the majority of graduates (33.5%) and are mostly women (63%) (OECD, 2010). Hadjiyanni and Kallas (2006) argue that the easy access to these

studies (as they require less qualifications compared to other studies and especially to those related to ‘hard’ sciences, which in turns diminishes their value in the labour market) and the fact they lead to public sector jobs are the main reasons for this large number of people studying social sciences. However, the supply factor can only be part of this explanation as these graduates comprise the majority in many countries as well (OECD, 2010). Thus, further factors need to be considered. Of particular importance is the way public sector recruits its personnel. Although it has never been very specific in the recruitment of graduates with special qualifications, it had some preference for those with general academic knowledge like social science graduates (Glytsos, 1990); consequently, a large number of them ended up in public service jobs that did not match their studies. Another aspect is related to the evolution of social sciences and research in Greece, which has been delayed compared with other western European countries. More specifically (National Centre for Social Research, 2005), the institutionalization of these disciplines begun in 1959 with the establishment of the first research institution exclusively dedicated to social sciences, the *National Centre for Social Research*, whereas it took more than two decades for the establishment of university departments. Nevertheless, the priority that initially seemed to be given in social research did not last. As a result, the *reproduction* of knowledge –through the expansion of educational institutions– has been favored over its *production*. This inconsistency limits, from another perspective, the chances for this large number of social science graduates to find jobs appropriate to their studies. Additionally, according to Petmezidou (1998), pressures for systematic applied social research as well as a market for social science experts have been limited in Greek society due to the low degree of development of a welfare state.

In summary, results indicate low employment prospects for the social science graduates compared to other graduates in Greece. These results although useful, do not specifically focus on this particular group and are not completely comparable due to differences in the field classifications used and in the populations and time periods examined. The following analysis is a first step towards a systematic examination of social science graduates’ prospects in the Greek labour market, which spans a sufficiently long period of time and allows investigating changes over time.

4. The Case Study: Employment Status and Job-studies Relevance of Graduates of Panteion University

4.1 The Research Questions, the Variables and the Data

The data employed in this study come from a survey on graduates from the Panteion University of Social and Political Sciences, Athens, and also from the corresponding official student records. Panteion School founded in 1927, courses began officially in 1930, and up to 1983 a single degree had been provided. In the same year it was divided into two departments (Political Science and International Studies, and Public Administration) and introduced the department of Sociology, whereas in 1989 it was upgraded to a University

Institution. Today, there are ten departments offering four-year bachelor degrees as well as postgraduate studies in a wide range of social science disciplines –the departments of: Public Administration, Sociology, Political Science and History, International and European Studies, Economic and Regional Development, Communication, Media and Culture, Psychology, Social Anthropology, Social Policy, and, the General Department of Law. The last one belongs to a special category as it provides teaching to other departments but it does not have a program of study leading to a single degree. These departments that came in operation gradually (either as new departments or as the result of the division of previous existed ones) are all classified (ISCED 1997) under the broad education field of *Social sciences, Business and Law* which includes four subfields: ‘Social and behavioral science’, ‘Journalism and information’, ‘Business and administration’ and ‘Law’¹.

As to the total number of students admitted, Panteion is the 9th largest university out of the twenty Greek University Institutions and the 4th largest in the capital area of Athens.

The fact that Panteion University offers degrees exclusively in social sciences along with its size makes it of special importance for the study of social science graduates’ labour market prospects. This, together with the authors’ work relations with the Institution directed the choice of the population under study.

The survey carried out during 2006-07 by telephone interviews. The questionnaire used included closed and open-ended questions concerning graduates’ employment prospects and demographic characteristics.

Based on the analysis of the previous sections, the following questions are emerged and explored here empirically:

Goal A

- A1.** What is the current *employment status* of our social science graduates?
- A2.** Is this status differentiated taking into account factors that correspond to *gender, year of graduation, and graduation class*, (earlier and recent graduates)?

Goal B

- B1.** To what extent the incident of ‘*job-studies no relevance*’ occur to our employed graduates?
- B2.** How is this incident implemented taking into account *gender, year of graduation, and graduation class*?

To address the above goals, the following information (variables) was necessary to be collected and recorded for each case (graduate):

Dependent variables:

- 1.** *Employment status*
considered as taking the three values: (a) *employed*, (b) *unemployed* and (c) *economically inactive*.

¹ In Greece the classification of the education fields (Ministry of Education, 2002) is similar to the ISCED97. In particular, the four fields corresponding to the above four subfields, are: *Social Sciences, Communication and Documentation Sciences, Economics, Business and Administration, and Law*.

2. *Job-studies relevance*

considered as taking the two values: (a) *relevance* and (b) *no relevance*.

It should be noted that graduates were asked directly to declare their *employment status* as well as their *job-studies relevance*. In the case of the latter variable, a subjective measurement has been used. As mentioned earlier (see, Section 2) the various types of measurements for the incident of job mismatch have certain limitations, however the subjective ones have been praised because they enable to capture many specific job situations that only job holders are able to report (Barone and Ortiz, 2010).

Independent variables:

1. *Graduates' gender*

2. *Year of graduation or cohort of graduates*

takes seven values corresponding to the graduation years: 1988, 1991, 1994, 1997, 1998, 1999 and 2000.

3. *Graduation class*

takes two values: (a) *earlier graduates* (of the years 1988, 1991, and 1994) and (b) *recent graduates* (of the years 1997-2000).

The variable *year of graduation* covers a period of thirteen years; year 1988 matches to the earliest cohort of graduates we could have since the introduction of Sociology and the division of Panteion into three departments, while 2000 relates to the latest cohort considering enough time the graduates start working and male graduates complete military service –a compulsory duty for Greek male population. The remaining years were selected randomly. This variable is used to estimate any changes in the respondents' employment status and job-studies relevance over time. The idea is that different cohorts of graduates enter the labour market in different time; so, considering the above two issues for different cohorts controls for changes over time. Most importantly, *years of graduation* serves to measure the variable *graduation class* which is used to estimate differences between earlier and recent graduates, a significant question of our study.

The size of the total population corresponding to the above seven years is 6040 graduates. From them, $N = 4623$ graduates, which constitute the 76.5% of the total population, were found and surveyed. This means that our data set is sufficiently large for estimations.

4.2 Statistical Procedures

To investigate the above mentioned *Goals*, the data was analysed in three steps. First a descriptive analysis was carried out in order to obtain the estimates of the values of the dependent variables as well as to illustrate their distributions across levels of factors (independent variables). Secondly, a significant association between any dependent and independent variable was examined. Also, where it was useful, a series of test of hypotheses was conducted to see if the observed differences of the estimated values of the dependent

variables across levels of factors were statistically significant. Thirdly, logistic regression model analyses were applied to find out the particular effect of the factors to our dependent variables.

4.3 Empirical Results

The main descriptive statistics concerning characteristics of the population examined show that: The majority consists of Greek citizens (99.5%), women (67.1%), and relatively young people (65.1% is between 25 and 34 years old, 90% of whom are *recent* graduates); while also, the vast majority (94%) of the male graduates have performed military service.

4.3.1 Employment Status (Goal A)

Evidence from descriptive analysis and testing hypotheses. Table 1 reports the *employment status* of our graduates estimated for the total sample as well as its distributions according to *gender*, *cohorts of graduates*, and *graduation class*. It is clear that the majority (89.3%) of the examined graduates are employed. However, there is a rather high proportion (7.2%) of unemployed graduates; the remaining (3.5%), are economically inactive. Excluding from the analysis the latter group that includes only 163 respondents, the proportion of the employed comes up to 92.5% and that of the unemployed, to 7.5%. Comparing these two rates with the corresponding rates of the Greek total population of graduates (93.8% and 6.2% in 2007 (GNSS, 2007)) it is obvious that the employment level of our graduates is lower.

Taking into account *gender* it is apparent (Table 1) that men's employment rate, estimated to 93.5% ($= p_{EM}$), is about six units higher than that of women, ($87.2\% = p_{EW}$). At the same time the unemployment rate of women ($8.5\% = p_{UEW}$) is rather high and is almost double the corresponding rate of men ($4.5\% = p_{UEM}$). The proportion of economically inactive women is 4.3%, also higher than that of men (2.0%), mentioning the corresponding small numbers to these groups. Excluding from the analysis the economically inactive men and women, the employment and unemployment rates for men come up to 94.3% and 5.7% correspondingly, while the respective rates for women, to 90.8% and 9.2%. These results indicate that male social science graduates are doing much better in the labour market in terms of employment, compared to their female counterparts. Moreover, comparing the above rates to the respective ones of the total of male and female graduate populations (for men employment and unemployment rates are 95.8% and 4.2% respectively, and for women 91.7% and 8.3% (GNSS, 2007)) we conclude the following: both male and female social science graduates have a lower employment level compared to the total populations of male and female graduates correspondingly. The Chi-square test for independence showed a significant association ($\chi^2 = 43.42$, $df = 2$, $\alpha = 0.001$) between *employment status* and *gender*. Further statistical analysis based on usual procedures for testing hypotheses (Fleiss, 1981) verifies that the differences of the employment and those of the unemployment rates between male and female graduates, noticed above, are statistically significant

($H_0: p_{EM} = p_{EW}$ vs. $H_1: p_{EM} \neq p_{EW}$, $\alpha = 0.001$, $\chi^2 = 42.37$, $df = 1$), ($H_0: p_{UEM} = p_{UEW}$ vs. $H_1: p_{UEM} \neq p_{UEW}$, $\alpha = 0.001$, $\chi^2 = 24.43$, $df = 1$).

It is also clear that the *employment status* of our graduates differs, taking into consideration *years of graduation* (Table 1). In particular, it comes out that the employment rates vary from a minimum estimated to 87.2% up to a maximum of 92.2%. The corresponding unemployment rates vary from a low 4.4%, which is estimated for the cohort of 1994, to a quite high 9.2% related to the most recent examined cohort of 2000. The Chi-square test showed a significant association ($\chi^2 = 20.11$, $df = 12$, $p\text{-value} = 0.064$) between *employment status* and *year of graduation*. Testing the appropriate statistical hypotheses (Fleiss, 1981) we find that employment rates themselves differ significantly among cohorts of graduates ($H_0: p_1 = p_2 = p_3 = p_4 = p_5 = p_6 = p_7$ vs. H_1 : at least two of the p_i are different, where p_i , $i = 1, 2, \dots, 7$ denote the employment rates of the seven cohort of graduates; see Table 1; $\alpha = 0.05$, $\chi^2 = 13.06$, $df = 6$). The same is true considering unemployment rates ($\alpha = 0.01$, $\chi^2 = 18.13$, $df = 6$).

To identify the groups of cohorts that contributed to the statistical significance of the above hypotheses and in view of an observable (Table 1) increasing process of the employment rates of earlier graduates followed by a decreasing tendency of the corresponding rates of recent graduates (the opposite pattern holds regarding unemployment rates), that brings in to our interest to find out any differences of the *employment status* between earlier and recent graduates, we proceed as follows. Let $p_{E, \text{earlier}}$ and $p_{UE, \text{earlier}}$ denote correspondingly the employment and unemployment rates of earlier graduates while $p_{E, \text{recent}}$ and $p_{UE, \text{recent}}$ those of recent ones. It is easy to find estimates of these rates equal to $p_{E, \text{earlier}} = 90.6\%$, $p_{E, \text{recent}} = 88.6\%$ and $p_{UE, \text{earlier}} = 5.7\%$, $p_{UE, \text{recent}} = 7.8\%$. Evidently unemployment rate is much higher among recent graduates. Testing the hypothesis $H_0: p_{E, \text{earlier}} = p_{E, \text{recent}}$ we found it significant ($\alpha = 0.05$, $\chi^2 = 4.75$, $df = 1$). This means, that there exists a significant difference of the employment rates between earlier and recent graduates where the earlier ones have better employment level. Further analysis for any significant differences of the employment rates among cohorts within the group of earlier as well as within the group of recent graduates concludes that in both cases there are not such as differences on an acceptable level. Testing similar to the above hypotheses regarding unemployment rates we find that they differ significantly between earlier and recent graduates ($\alpha = 0.01$, $\chi^2 = 7.23$, $df = 1$). Thus we conclude that the employment and the unemployment rates differ significantly between earlier and recent graduates even as unemployment is higher among recent graduates.

Closing this first set of the results it is useful to highlight some additional points that came out from the analysis (Table 1). Men's employment rates, for almost all cohorts of graduates, are higher than those of women's while also, for both sexes employment rates tend to decrease for the recent graduates, although this is more apparent in the case of men. We also observe a slight increase in the employment rate (85.8%) of the latest female cohort (2000) compared with the corresponding (83.7%) of the earliest cohort (1988). The opposite holds regarding the respective unemployment rates. As the proportion of inactive female graduates remains roughly the same for these two last mentioned cohorts, the

Table 1: Employment status of social sciences graduates with respect to gender, graduation year, and graduation class

Graduation class	Year of graduation	Employment Status									
		Employed			Unemployed			Economically inactive			
		Men	Women	Total	Men	Women	Total	Men	Women	Total	
Earlier graduates	1998	150 (96.8%)	195 (86.7%)	345 (88.9%)	3 (1.9%)	28 (12.0%)	31 (8.0%)	2 (1.3%)	10 (4.3%)	12 (3.1%)	388
	1991	141 (94.6%)	229 (87.1%)	370 (89.8%)	7 (4.7%)	20 (7.6%)	27 (6.6%)	1 (0.7%)	14 (5.3%)	15 (3.6%)	412
	1994	227 (97.8%)	427 (89.5%)	654 (92.2%)	3 (1.3%)	28 (5.9%)	31 (4.4%)	2 (0.9%)	22 (4.6%)	24 (3.4%)	709
	Total	518 (96.7%)	851 (87.5%)	1369 (90.7%)	13 (2.4%)	76 (7.8%)	89 (5.9%)	5 (0.9%)	46 (4.7%)	51 (3.4%)	1509
Recent graduates	1997	252 (94.7%)	482 (88.0%)	734 (90.2%)	10 (3.8%)	42 (7.7%)	52 (6.4%)	4 (1.5%)	24 (4.4%)	28 (3.4%)	814
	1998	185 (89.4%)	405 (89.4%)	590 (89.4%)	14 (6.8%)	29 (6.4%)	43 (6.5%)	8 (3.9%)	19 (4.2%)	27 (4.1%)	660
	1999	250 (92.3%)	484 (85.5%)	734 (87.7%)	14 (5.2%)	61 (10.8%)	75 (9.0%)	7 (2.6%)	21 (3.7%)	28 (3.3%)	837
	2000	216 (90.4%)	484 (85.8%)	700 (87.2%)	17 (7.1%)	57 (10.1%)	74 (9.2%)	6 (2.5%)	23 (4.1%)	29 (3.6%)	803
Total	903 (91.9%)	1855 (87.0%)	2758 (88.6%)	55 (5.6%)	189 (8.9%)	244 (7.8%)	25 (2.5%)	87 (4.1%)	112 (3.6%)	3114	
Total	1421 (93.5%)	2706 (87.2%)	4127 (89.3%)	68 (4.5%)	265 (8.5%)	333 (7.2%)	30 (2.0%)	133 (4.3%)	163 (3.5%)	4623 (100%)	

above stated change signifies a small but not significant improvement of women’s status. The exact opposite pattern appears in the case of men indicating that the deterioration of our graduates’ employment status is mainly attributed to a worsening of men’s status; nevertheless, men continue to experience a better employment situation.

The results so far show a lower employment level of our population compared with other Greek graduates, as well as significant differences in both employment and unemployment rates between men and women, and between earlier and recent graduates. Thus it is reasonable to estimate how much *gender* and *graduation class* (considered as explanatory variables/factors) contribute to the probability a social science graduate has to be employed.

Evidence from Logistic regression approach. The objective here is to investigate the model of the relationship between the *employment status* of our graduates, considered as a binary output variable (Y), and two explanatory variables that correspond to *gender* and *graduation class*. It is well known that binary logistic regression method (see for example, Agresti and Finlay, 2009; Kleinbaun and Klein, 2010) serves for this purpose. The outcome variable is coded with a value of zero to indicate a graduate is unemployed, or 1 to indicate he/she is employed. The group of economically inactive graduates is excluded from this analysis due to small numbers. *Gender* coding is made so that zero indicates female and 1, male while the coding for *graduation class* defines zero to indicate earlier graduates and 1, recent graduates. Apparently in all cases zeros indicate reference categories. The results from the logistic regression analysis are presented, in the form of a model, by the equation

$$\log\left(\frac{P(Y=1)}{1-P(Y=1)}\right) = 2.524 + 0.705gender_{(1)} - 0.282graduation_{(1)} \quad (1)$$

which gives the log odds of a randomly selected graduate to be employed as a function of *gender* and *graduation class*. Further information concerning the above model is given in Table 2.

Table 2: Statistical information of model (1)

Variables	<i>b</i>	s.e	Wald	sign	<i>Exp(b)</i>
<i>Gender</i>	0.705	0.140	25.383	0.000	2.024
<i>Graduation class</i>	-0.282	0.129	4.810	0.028	0.754
constant	2.524	0.114	486.202	0.000	12.478

$N = 4459$; Hosmer and Lemeshow test suggests that the data fit the model adequately $\chi^2 = 4.944$, $df = 2$, $p - value = 0.84 > 0.5$; A test of model (1) versus a model with intercept only was significant $\chi^2 = 34.433$, $df = 2$, $p - value < 0.001$; overall prediction success rate 92.5%.

Several interesting results emerge from this analysis. It is clear that a statistically significant relationship between the *employment status* of our social science graduates and

the two explanatory variables, *gender* and *graduation class*, is verified. It is also clear that the chances of employment are higher for men (compared with women) and for earlier (compared with recent) graduates. In particular, it comes out that for any level of *graduation class* the ratio of the probabilities that a man is employed/unemployed is about 2 times (or the 202%) the corresponding ratio of women ($Exp(b) = 2.024$). Also, adjusting for *gender*, the ratio of the probabilities that a recent graduate is employed/unemployed is 0.754 times (or the 75.4%) the corresponding ratio of earlier graduates. Finally, the model predicts that among recent graduates the 93% of men and the 90% of women will be employed. These predictions are closed to estimates (94.3% and 90.7% respectively) we can get using our data (Table 1).

4.3.2 Job-Studies Relevance (Goal B)

Following the steps of the analysis of the previous subsection, we examine here the second major issue studied in this paper, concerning the relevance between job and studies. The analysis is applied to the group of 4093 employed graduates who gave a clear answer to the corresponding question (self-assessment or subjective measurement). As mentioned earlier, the incident of job mismatch (either level or type of education mismatch) has been traditionally measured by means of objective or subjective indicators both of which have certain strengths and limitations (see, Barone and Ortiz, 2010; Chevalier, 2000). Thus, it is important the methodology used to estimate this incident, to be taken into account when one tries to make comparisons.

Evidence from descriptive analysis and testing hypotheses. Table 3 gives estimates on the issue for the total group of employed graduates as well as considering *gender*, *year of graduation*, and *graduation class*. The results show that the incident of ‘job-studies no relevance’ is quite extended in our examined population as more than half (54.9%) of the respondents declare holding not relevant jobs –the remainder (45.1%) state being in relevant jobs. This finding is in agreement with those reported in the literature, where a large part of the examined social science graduates (either in Greece or elsewhere) are in jobs with no or little relevance to their studies. Thus, it gives further support to the fact that in general, social science graduates face difficulties as regards this particular important qualitative aspect of their job. Additionally, taking into consideration the type of measurement used, it is clear that the incident of ‘job-studies no relevance’ is more extensive (54.9%) in our social science graduates comparatively to other Greek graduates (27.9%) (Karamesini et al., 2008) as well as to social science graduates from other countries e.g. Swedish (40%), German (50%), Africans (27.5%) (Ama, 2008; Teichler, 1989).

With regards to *gender*, it is apparent (Table 3) that the incident of ‘job-studies no relevance’ is also quite extended to male and female subpopulations. In both cases, more than half of the graduates declare holding not relevant jobs. Moreover, it is clear that there are small differences between percentages of men and women in relevant (43.8% vs. 45.8%) and in not relevant jobs (56.3% vs. 54.2%), where more women than men, are in relevant jobs. However, these differences are not proved significant. In particular, the

proportions of male and female graduates are not significantly different either performing jobs relevant ($\chi^2 = 1.49$, $df = 1$) or not relevant ($\chi^2 = 1.64$, $df = 1$) to their studies. Testing for independence we also found ($\chi^2 = 1.64$, $df = 1$) a not significant association between *job-studies relevance* and *gender*. Thus, we conclude that our male and female social science graduates have almost equal (high) chances of performing a job not relevant to their studies. This last finding on the similarity between sexes has also been revealed in Dolton and Vignoles's (1996) study where it is found that male and female UK graduates were equally as likely to be overeducated. However, as results on graduates' job mismatch are mixed regarding gender and there is no clear trend to this issue, further comparisons are hard to be made. We note that in some surveys women are more likely to be overeducated or in jobs not related to their field of studies (e.g. Barone and Ortiz, 2010; Betti et al., 2010; Quintano et al., 2008), while in others, the findings are unclear (e.g. Chevalier, 2000).

Table 3: Job-studies relevance of social sciences graduates with respect to gender, graduation year, and graduation class

		Job-Studies Relevance						Total
		Relevance			No relevance			
Graduation class	Year of graduation	Men	Women	Total	Men	Women	Total	
Earlier graduates	1998	76 (50.7%)	89 (45.6%)	165 (47.8%)	74 (49.3%)	106 (54.4%)	180 (52.2%)	345
	1991	52 (37.4%)	102 (45.7%)	154 (42.5%)	87 (62.6%)	121 (54.3%)	208 (57.5%)	362
	1994	99 (43.8%)	194 (45.9%)	293 (45.1%)	127 (56.2%)	229 (54.1%)	356 (54.9%)	649
	Total	227 (44.1%)	385 (45.8%)	612 (45.1%)	288 (55.9%)	456 (54.2%)	744 (54.9%)	1356
Recent graduates	1997	101 (41.2%)	221 (46.7%)	322 (44.8%)	144 (58.8%)	252 (53.3%)	396 (55.2%)	718
	1998	89 (48.1%)	193 (47.9%)	282 (48.0%)	96 (51.9%)	210 (52.1%)	306 (52.0%)	588
	1999	96 (38.7%)	212 (43.8%)	308 (42.1%)	152 (61.3%)	272 (56.2%)	424 (57.9%)	732
	2000	103 (47.9%)	220 (45.5%)	323 (46.2%)	112 (52.1%)	264 (54.5%)	376 (53.8%)	699
	Total	389 (43.6%)	846 (45.9%)	1235 (45.1%)	504 (56.4%)	998 (54.1%)	1502 (54.9%)	2737
Total		616 (43.8%)	1231 (45.8%)	1847 (45.1%)	792 (56.3%)	1454 (54.2%)	2246 (54.9%)	4093 (100%)

Analogues to the above are the results taking into account *years of graduation* and *graduation class*. We note (Table 3) that more than half of the subpopulations corresponding to *years of graduation* and to earlier and recent graduates perform jobs not relevant to their studies. The observed differences of the percentages of the graduates who perform jobs relevant or not relevant to their studies do not differ significantly among cohorts of graduates ($\chi^2 = 7.03$, $df = 6$ for both cases). Additionally, the test for independence verifies no association between *job-studies relevance* and *years of graduation* ($\chi^2 = 7.12$, $df = 6$). The same is true considering *graduation class* ($\chi^2 = 0.00$, $df = 1$). These results indicate the permanence of the incident under study to our graduates, a fact thoroughly discussed in the next subsection.

Evidence from Logistic regression approach. The relation between *job-studies relevance* and the factors related to *gender* and *graduation class* was further analysed using binary logistic regression methods. The results, illustrated in Table 4, support the ones described above.

Table 4: The incident of job-studies relevance, Logit regression results

Variables	<i>b</i>	s.e	Wald	sign
<i>Gender</i>	-0.085	0.066	1.646	0.200
<i>Graduation class</i>	-0.005	0.067	0.006	0.941
constant	-0.163	0.060	7.373	0.007
<i>N</i> = 4093				

4.4 Discussion on the Results

According to the results of the analysis, one could first argue that our social science graduates perform relatively well in the labour market (92.5%, among active graduates, are employed). However, we call attention to the unemployment rate (7.5%) which is not of any kind of unimportance and it clearly shows that these graduates face more difficulties in finding a job compared to other Greek graduates. Additionally, the fact that more than half of our employed graduates stated they performed jobs not relevant to their studies indicates a high degree of job mismatches. Taken together these findings suggest, that ***the employment situation of our graduates is not particularly good regarding two important labour market outcomes, employment status and job-studies relevance.***

The above results support the notion that the skills and knowledge acquired through social science studies are not particularly used and/or valued in the Greek labour market. Various aspects could be taken into account to interpret the situation our graduates encounter. The ones that seem to be more in line with the empirical evidence involve: a) Issues particularly related to the field of social sciences, namely, the high proportion of social science graduates compared to those of other fields; the large absorption in the public sector where there is a tendency towards the recruitment of social science graduates, however, as

holders of a university degree and not as specialists; and finally, the delayed evolution of social sciences in Greece and the low value placed on social research, affecting the creation of suitable places in the labour market. b) The specific conditions of the Greek society and economy i.e. the high demand for university degrees valued mostly in terms of personal prestige and independently of any link with professional qualification or employment, the expansion of higher education against the needs of the society and the economy, the lack of dynamic forces in the Greek labour market and the economic recessions.

The results on *employment status* in view of two important factors (*gender* and *time of graduation*) are indicative of the general existing trends as they show employment difficulties for female and young (recent) graduates. More specifically: i) women are found to have a lower employment level compared to men, showing that ***female social science graduates remain on average more likely to be unemployed than male***. Our female graduates are also found to have a lower employment level compared to other Greek female graduates, indicating that they cope with a particularly hard situation in the labour market. The above findings could be attributed to the fact that female graduates constitute the majority of social science graduates and therefore, they are confronted with all the problems (mentioned earlier) this group faces in general. The underlying reasons though, should be looked for in a different context involving: the choices women make about their studies and their potential careers; the ways they have been socialized so as to make choices driving them to go for less demanding and prestigious studies (such as social sciences) and therefore, less remunerative in terms of employment opportunities; and, the problems women generally encounter in today's segregated labour markets (e.g. they hold lesser positions with lower incomes, mainly in the public sector which leaves them vulnerable to political and economic shifts in this sector). ii) Additionally, we found a substantial rise of the unemployment rates of the recent graduates comparatively to the earlier ones, proving that ***recent graduates have less probabilities of being employed***. Along with the explanations concerning the total group of social science graduates, provided earlier, the supply of the recent graduates could also be used here to explain the lowering of their employment chances as the total number of these graduates is almost twice that of the earlier ones. A further reason could be the significant hiring reductions across the public sector that has been traditionally the main employer of social science graduates. Overall, the results show ***a worsening employment status of the social science graduates (for both sexes)***, which is a particularly crucial finding to be considered by all parts involved and related to this field of studies (potential students, university departments, and educational policy makers).

Finally, a further crucial finding is ***the high degree of 'job-studies no relevance' that characterizes almost equally male and female as well as earlier and recent social science graduates***. Regarding gender this finding suggests that although men have higher employment rate compared with women, this does not also imply better employment outcomes concerning the job-studies relevance. In other words, a better employment status does not also imply higher performance in terms of 'quality of job' obtained after the university degree. Additionally, the fact that graduates who earned their degrees more

than 10 or 15 years prior to the time of research, are still in jobs not relevant to their studies indicates that this incident is not only extensive to our population but also, a rather permanent feature of their working lives. Therefore, in our case, job mismatch does not seem to be a temporary phenomenon disappearing once these graduates were established in the labour market, as some surveys in other countries reveal (see, Section 3). In this respect, this finding is challenging the view of human capital theory on overeducation as a negligible, transient phenomenon. According to Chevalier (2000) the persistence of overeducation seems to be in accordance with the large heterogeneity in the skills of graduates as some have developed qualities that make them suitable for a graduate job whereas others appear to lack these skills; moreover, some graduates may choose to be overeducated to suit their long term plans while others may be forced into jobs for which they are overeducated. Barone and Ortiz (2010) emphasize the supply-demand approach and the degree of stratification and selectivity of both educational and labour market institutions, arguing that when mass participation in higher education is not accompanied by a high rate of skilled employment creation, overeducation is a concrete risk. This line of explanation seems to fit to our case, as in Greece there exist a large number of social science graduates and at the same time, a scarcity of suitable working places. A further explanation could be that matching job with studies may not be a priority to our population caused by the need to avoid unemployment that, as we have shown, is not negligible. It appears thus, that both these reasons (unemployment and scarcity of suitable jobs) prevail over the effect of the gender and time factors, on the incident of 'job-studies no relevance'. All the above results signify that job-studies mismatch is one major concern for social science graduates, which has to be taken into consideration by all parts involved.

5. Conclusions

The expansion of higher education, in step with the changing needs of the economy, has entailed considerable changes in graduates' employment prospects which have become more uncertain. In this complex emerged reality the choice of a field of study became an important issue. The focus in this paper was on the field of social sciences, examining labour market prospects of graduates. In Section 3 we show that there are contradictory views and findings as to these prospects, and that the relevant studies in Greece –although not exclusively focused on social science graduates– reveal employment difficulties. With the purpose to study in a systematic way Greek social science graduates' labour market prospects, in Section 4, we proceeded with an analysis of two important labour market outcomes, employment status and job-studies relevance examined with respect to gender and time of graduation. The data used come from a survey on graduates from a public university, the Panteion University of Social and Political Sciences that offers degrees exclusively in these disciplines.

Results show a lower employment level of our social science graduates compared to other Greek graduates, a worsening of the recent graduates' employment situation, and women's lower chances to be employed compared to men. Moreover, results show a high

degree of 'job-studies no relevance' that exists overtime and regardless of graduates' sex. We attribute these findings partly to the increase in social science graduates' supply and to the large proportion of women, taking into consideration the general socio-economic condition of the country. However, we strongly believe that factors specifically related to the status of social sciences in the Greek society (e.g. delayed evolution, low value placed in social research) and to the labour market's 'attitude' towards the corresponding graduates (employed mainly as public servants and not as specialists), are significant as well.

Our empirical results add to the relevant literature as they show that social science graduates encounter and will probably continue to, difficulties as regards two important labour market outcomes. Overall, the analysis suggests that in the case of Greece, these graduates' skills and competencies are not sufficiently appreciated, used, or being in demand. All these findings underline the need for new educational and labour market policies to be developed targeting this specific group of graduates, and they are of obvious relevance to the academic institution concerned. However there are several other issues which have not been addressed yet, such as graduates' perceptions about their studies and future prospects, other job characteristics (e.g. job satisfaction, income). These issues would add to the overall picture of social science graduates' situation in the Greek labour market, they belong to our research interests, and we hope to report on them in future work.

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The Effect of Market Orientation, Learning Orientation and Innovativeness on Firm Performance: A Research from Turkish Logistics Sector

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Abstract

As it is emphasized in marketing, management, and strategic management literature, “market orientation”, “learning orientation”, and “innovativeness” are regarded together as having a significant impact on a firm’s performance. The objective of this study is to find out the interrelationships of these variables and their impact on performance in the Turkish logistics sector by using Structural Equation Modeling. The research findings revealed that the firms in the logistics sector in Turkey are market oriented, learning oriented, and innovative and that all variables are effective on performance enhancement.

Keywords: Market Orientation, Learning Orientation, Innovativeness, Performance, Logistics

JEL classification: L25, M10, M31

1. Introduction

A variety of strategies aimed at gaining a competitive advantage are discussed in the management and marketing literature. One of the most important variables examined at a theoretical and practical dimension within such competitive strategies has been performance. Interactions of variations were analyzed in various discussions and studies concerning increase in performance, which is discussed as an important conclusive variable in the literature. This approach depends on the Resource Based Theory in common and dealt with in strategy paradigm as a way of being strategic oriented.

The strategy, dealt initially in the marketing literature since the 1990s, but later discussed in management literature as well, was to increase overall firm performance by using market orientation, learning orientation and innovation together. For this purpose, when the literature was examined, first the impact of three variables on performance was independently evaluated; later explanations were put forward concerning the impacts of these variables in conjunction with performance.

Market orientation in the marketing literature is analyzed in terms of different aspects,

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such as a source (Hunt and Morgan, 1995), a decision-making instrument (Shapiro, 1988), a behavior and actions (Kohli and Jaworski, 1990), an organization culture variable (Day, 1994a; Deshpande et al., 1993; Narver and Slater, 1990; Slater and Narver, 1995a; 1995b). The concept, as discussed by Kohli and Jaworski (1990), becomes prominent on the basis of behavior (creating market information and the spreading of this information within the organization) and processes (formation of the marketing plan to satisfy customer wishes), and in terms of cultural orientations (competitor orientation and customer orientation as well as interfunctional coordination) as discussed again by Narver and Slater (1990). Empirical studies are generally carried out on the basis of these two approaches. Research studies conducted in recent years also discuss different dimensions in the measurement of market orientation. For instance, Narver and Slater, two of the researchers conducting primary studies concerning the concept in the early 1990s, together with MacLachlan, assessed these two dimensions in market orientation through different assessment tools aimed at customers' existing requirements (responsive) and customers' requirements which they are not yet aware of (proactive) (Narver et al., 2004).

Sinkula (1994), Slater and Narver (1995b), by also mentioning the impact of learning orientation among marketing operations, put forward the conclusion that market orientation will be substantially more effective with the help of learning orientation. Han et al. (1998) stressed that innovation must also be analyzed to identify the relationship between market orientation and performance, while Calantone et al. (2002) stressed the importance of innovative capacity between learning orientation and performance. These two approaches laid the foundations of the relationship pattern between market orientation - learning orientation and innovativeness and performance. Other researches regarding this relation pattern have been carried out by Hurley and Hult (1998), Baker and Sinkula (1999b) and Hult et al. (2005).

In 1990s, while logistics came to the agenda as a strategically important matter for companies, the fact that research studies have to be guided for theorization and strategic positioning in logistics (Olavarrieta and Ellinger, 1997) was pointed out; subsequently, in the following period, there was an increase in the number of studies carried out in the fields of supply chain management and logistics, and some empirical studies were also conducted (Steinman et al., 2000; Baker et al., 1998; Panayides, 2004b; 2007a). However, while it is expressed that the number of studies conducted was insufficient and that theoretical discrepancies existed, studies were grounded on resource based theory and analyzed in terms of strategic aspects.

We find that the study's approach was discussed in production firms during the 1990s when such an approach was conceptualized, while it was dealt with by the service sector in the 2000s. The approach was basically adopted in the United States of America, followed by Germany, Australia, Belgium, the United Kingdom, Bulgaria, China, Ghana, Finland, France, the Netherlands, Hong Kong, Scandinavia, Spain, Japan, Canada, Hungary, Malta, Poland, Russia, Slovenia, Saudi Arabia, Taiwan, Ukraine, New Zealand, and Greece, where it was analyzed on the basis of different variable components and under various impacts of mediation and regulations.

As explicitly mentioned by researchers (Deshpande and Farley, 1998,a,b); Kaynak and Kara, 2004; Zhou et al., 2005) working on the market orientation concept, market orientation and other related variables generally discussed in western countries must be discussed in developing economies, too. With market orientation being the basic variable in Turkey, some theoretical and empirical studies have been carried out examining the learning orientation and innovativeness and relationship between each of these variables, as well as relationship between the variables and firm performance (e.g. Keskin, 2006). However, the model in this study is still new in Turkey and, therefore, no comprehensive analysis has been conducted. The model has not yet been tested for the logistics sector, which is the main research field of the study.

As is examined in previous studies, there is a causal relationship between variables. The findings of the research studies leads to the conclusion that the organizations in the logistics sector in Turkey are market oriented, learning oriented and innovative, and in addition to the variables indicated, they are all contributing to performance enhancement.

2. Market Orientation Behaviour

While the first theses on market orientation were first put forward by Drucker, the conceptual framework was established in the 1990s (Narver et al., 1998); it was also ethnographically discussed (Arnould and Wallendorf, 1994) and then examined through different variable components in 2000s.

Three different approaches are observed in the market orientation literature. In the first approach, Kohli and Jaworski (1990) structured the market orientation theory and placed it in the marketing concept. Having examined the 35 year old marketing literature as well as other related literature in their studies, Kohli and Jaworski (1990) expressed that along with the fact that there is no explicit and clear definition regarding the concept, no interest was shown in the assessment of the concept and there is no theory based on an empirical basis. In the second approach, Narver and Slater (1990) conducted the first functional computation regarding the concept and argued that there was a positive correlation between market orientation and operational profitability. Both papers have pioneered those studies conducted in 1990, which exhibit the impact of market orientation on the outputs of enterprises (Narver et al., 2004). In the third approach, Becker and Homburg (1999) studied the concept in terms of its managerial aspects through a system-based approach.

In the literature, researchers put a variety of variables on market orientation forward. Kohli and Jaworski (1990), pioneers of the concept, referred to three basic dimensions: i) intelligence generation, ii) intelligence dissemination and iii) responsiveness. Other pioneers Narver and Slater (1990), on the other hand, identified sub-dimensions of market orientation as customer orientation, competitor orientation and inter functional coordination. In the studies which have been conducted to date, researchers carried out their investigations on these two basic paths, while restructuring studies concerning the concept are still under way (pls. refer to Lings, 2004; Narver et al., 2004).

Empirical studies on the relationship between market orientation and performance,

conducted in 1990s, were found insufficient (Greenley, 1995). While in most studies, there were findings indicating that market orientation increases firm performance positively and significantly (Peterson, 1989; Narver and Slater, 1990; Kohli and Jaworski, 1990; Meziou, 1991; Ruekert, 1992; Jaworski and Kohli, 1993; Deng and Dart, 1994; Slater and Narver, 1994; Fritz, 1996; Lambin, 1996; Pelham and Wilson, 1996; Pitt et al., 1996; Horng and Chen, 1998; Oczkowski and Farrell, 1998; Pulendran et al., 2000; Slater and Narver, 2000; Calantone et al., 2002; Maydeu-Olivers and Lado 2003; Pulendran et al., 2003; Hult et al., 2004; Tse et al., 2004; Panayides, 2004a; Aldas-Manzano et al., 2005); other studies argued that there was no significant or direct relationship of that kind (Greenley, 1995; Bhuian, 1997; Han et al., 1998; Caruana et al., 1999; Sargeant and Mohammad, 1999; Noble et al., 2002; Perry and Shao, 2002; Olavarrieta and Friedmann, 2008). Even though it was asserted that there was no significant relationship (Hart and Diamantopoulos, 1993) or that there was a composite relationship (Jaworski and Kohli, 1993; Greenley, 1995), some studies again mentioned that market orientation, by means of, for instance, some exterior factors and the regulatory impact, enhance performance (Hart and Diamantopoulos, 1993; Slater and Narver, 1994a; Greenley, 1995; Appiah-Adu, 1997; Appiah-Adu, 1998; Chang and Chen, 1998; Kumar et al., 1998; Harris, 2001). One of the other conclusions reached was that the relationship between market orientation and performance appeared to be positive in studies carried out in the United States of America, while studies conducted in other countries found a diminished relationship and even that it became ineffective (Kumar et al., 1998). Similar results have been obtained in studies carried out in different countries and cultures in recent years.

3. Learning Orientation Behaviour

Authors discussing the concept express market orientation, as a system of values aimed at an entire organization, the creation of information and sharing it across the organization (Kohli and Jaworski, 1990; Day, 1994a; 1994b; Sinkula, 1994; Slater and Narver, 1995b). The focus on the creation of customer value and market orientation (Shapiro, 1988; Kohli and Jaworski, 1990; Narver and Slater, 1990; Deshpande et al., 1993; Day, 1994a; Slater and Narver, 1995a; 1995b) requires proper analysis of customers and competitors as well as the ultimate creation and sharing of proper information by collecting correct data. Firms, by properly determining any type of learning source (suppliers, customers, competitors, other sectors, etc.) must ensure dataflow. Deshpande and Webster (1989) argued that because each organization is a cognitive entity, they represent an appropriate means to obtain information from the market by focusing on the organizational memory. Similarly, in their research studies, Hult and Ferrell (1997) questioned the relationship between the market data processing process and organizational learning. The learning orientation concept is related to an organization's learning capability, as well as its culture and system structure. At this point, it is argued that firms are required to possess an organizational learning capability in order to be learning-oriented.

While it is well known that learning oriented firms create a culture which conducive to a learning environment, it is possible to argue from explanations of Narver and Slater (1990)

and Slater and Narver (1995b) that market and learning orientations have institutionalized similar approaches in terms of creating customer value. On the other hand, as the point that can also be expressed as an inadequacy, market orientation generally supports conformist learning; however, in order to be learning oriented, creative learning is required (Farrell and Oczkowski, 2002). Here, the goal is not only to learn something new or to adapt an innovation, but also to create new information and innovations in line with data obtained from the market, as well as to establish a system to share it across the organization.

Learning orientation is discussed as a concept relevant to organizations' knowledge reation and usage capabilities (Sinkula et al., 1997). Learning orientation is also the initial indicator forming organization learning capability (Hult and Ketchen, 2001) and expresses an organizational framework of values defining information creating, sharing and usage capability (Sinkula et al., 1997). The examination of individual learning in terms of organizational processes is also in question (Cohen, 1991); first of all, individual learning must be allowed in firms if they are to be learning oriented. For this, either the learning level of the employees within the organization must be raised, or members from outside, who are equipped with new information, must join the organization (Simon, 1991). When analyzed in terms of market orientation, Celuch et al. (2000) discussed individual learning and market orientation as a subject which is required for organizations to be market oriented. Again, Celuch et al. (2002) probed learning orientation together with market orientation and in terms of organizational capabilities. However, since only learning orientation at a macro organizational level is considered in line with the purpose of the study, the subject of individual learning is off-topic.

In literature, three fundamental organizational values (commitment to learning, shared vision, open-mindedness) (Sinkula et al., 1997) aimed at organizations' learning tendency and a basic variable (intra organizational knowledge sharing) (Calantone et al., 2002, p. 516), which is necessary for the organizational learning structure, are discussed.

While learning orientation is mostly directly linked to the performance of the firms, some researchers reached such conclusions that there is no such direct relation. Santos-Vijade et al. (2005) express on one hand that learning orientation has no direct or significant impact on the performance of the firm; they also reached the conclusion that learning orientation supports market orientation and thus, impacts the performance of the firm. Yılmaz et al., (2005) held face-to-face talks with the managers of 143 production firms in Turkey and thus, reached at the conclusion that there was a meaningful and positive correlation between learning orientation and objective performance.

4. Innovativeness

Organizations' tendency towards markets and innovations is discussed within the approach of strategic orientation and is questioned in terms of its relationship with various performance outputs of firms, such as their productivity, effectiveness and efficiency (Zhou et al., 2005). The foundations of this approach are based on the discussion of the innovativeness concept in literature, usually as a part of firm strategies from past to present (Capon et al., 1992).

When studies in literature are examined (Han et al., 1998; Berthon vd, 1999; Berthon et al., 2004), it is found that it is difficult to express clear definitions for and to set definite boundaries between concepts such as innovation, innovativeness, innovation orientation and innovation capacity. Although there is no clear classification for these concepts in literature, there are definitions which are generally accepted by researchers and authors. While authors were generally using concepts such as innovation and innovativeness in their studies in 1990s, some others (e.g. Berthon et al., 1999; Nambisan, 2002; Narver et al., 2004; Olson et al., 2005; Siguaw et al., 2006; Simpson et al., 2006) subsequently begun using the concept known as innovation orientation, but lack a clear distinction between innovativeness and innovation orientation in their studies.

Innovation is a concept with an important bearing on economic performance. However, it is discussed through three basic approaches at the organizational level. In the first approach, innovation is the determinant of economic performance, whereas in the second approach economic performance is deemed to be a determinant for innovation activities. The third approach, on the other hand, discussed a bidirectional dynamic relation between innovation and economic performance (Cainelli et al., 2006).

5. Relationships between Market Orientation, Learning Orientation, Innovativeness and Performance

Within the framework of Resource Based Theory, market orientation, innovation and organizational learning altogether bear a unique source for firms (Hult and Ketchen, 2001). In 1990 in particular, following the studies carried out by Narver and Slater and Kohli and Jaworski, the market orientation concept was linked to various variables and today, the impacts of concepts such as market orientation, learning orientation and innovativeness on each other and on the performance of enterprises, first discussed by Hurley and Hult (1998) are still examined.

5.1 Market Orientation – Learning Orientation – Performance

In the organizational learning literature, it is questioned how organizations learn and how they turn what they learn through their own market/marketing capabilities into a competitive advantage (Bell et al., 2002). As it is stated there are similarities between organizational learning and market orientation. However, researchers have yet to reach any consensus on which variable is the reason or result of another variable (Santos-Vijande et al., 2005). The most dominant approach linked to the subject is based on the idea that, as mentioned by Narver and Slater (1995), the market orientation approach must be a basis for the improvement of the learning environment. On the other hand, it is expressed that market orientation and learning orientation essentially take joint norms and values as a basis and thus, need to be analyzed together and on a common ground, without taking the direction of influence into account (Bell, 2002).

In market oriented firms where a market data processing process is required, it is

obvious that there is lack of interpretation and memory functions. In this context, the need for learning orientation arises (Baker and Sinkula, 1999a; 1999b). In literature, along with market orientation, learning, particularly learning from customers is essential (Ottesen and Gronhaug, 2004).

The answer to the question of how market oriented firms learns has to be considered as individual learning and discussed as the creation, interpretation and memorization of information. As for individuals, such organizations have to find what they need to learn, and how they need to learn it, from the market at the same time (Day, 1994b). Learning from the market is common for market orientation and learning orientation, both processes being effective in raising the performance of the firm. Some of the research studies examining the relationship between these three variables and findings are shown in Table 1.

Table 1: Summaries of Some Studies Concerning Market Orientation – Learning Orientation and Firm Performance

Researchers	Countries	Type of Enterprises	Findings
Baker Sinkula 1999a	USA	411 Small and Big Sized Enterprises	<ul style="list-style-type: none"> - Market orientation has impact on performance. - Learning orientation has impact on performance. - Market orientation has more impact on performance with the mediation of learning orientation. - Market orientation has impact in the increase of market share with the mediation of learning orientation. - Market orientation and new products' performance decrease with the mediation of learning orientation.
Farrel Oczkowski 2002	Australia	340 Manufacturing Enterprises	<ul style="list-style-type: none"> - Market orientation and learning orientation have impact on performance. - Learning orientation is more dominant on performance than market orientation is.
Liu Luo Shi 2003	China	304 State Enterprises	<ul style="list-style-type: none"> - Market orientation enhances performance. - High market orientation supports higher learning orientation.
Santos-Vijande Sanzo-Perez Alvarez-Gonzalez Vazquez- Casielles 2005	Spain	272 Middle and Big Sized Enterprises	<ul style="list-style-type: none"> - Learning orientation supports market orientation. - Market orientation has impact on performance. - Learning orientation has no significant impact on performance.

Source: Generated by authors.

5.2 Market Orientation – Innovativeness – Performance

Drucker, one of the leading pioneers to discuss the philosophy related to the marketing concept in the field of business administration, envisaged that firms have two basic functions: marketing and innovation. In this context, while there was such an early tendency towards discussing market orientation and innovativeness together (Olavarrieta and Friedmann, 2008), studies in the literature concerning market orientation and innovativeness only began to be analyzed empirically towards the end of the 1990s (Han et al., 1998; Berthon et al., 1999; Berthon et al., 2004).

Market orientation and innovation orientation are shown as two basic concepts related to strategic orientation, particularly by Berthon et al., (1999). It is stressed that these two concepts must definitely exist within an organization for the innovation outputs of such organization (Zhou et al., 2005; Laforet, 2008).

Market orientation essentially requires innovative action in accordance with the market's conditions and expectations. Therefore, it is deemed as an innovative act, and these two concepts are approached together. The item of importance in terms of marketing is the satisfaction of customers' needs, which will be eased through innovative practices and new goods and services.

Marketing and innovativeness are discussed in the marketing literature, particularly in terms of product innovativeness. While a study conducted by Lawton and Parasuraman in the 1980s found no significant relationship between the marketing approach and product innovativeness, researchers such as Atuahene-Gima (1996), Gatignon and Xuereb (1997), and Lukas and Ferrell (2000) have, in the following periods, reached the conclusion that there was a positive and significant correlation between market orientation and product innovativeness.

The impact of market orientation and innovativeness, which assume an important place in marketing literature, on firm performance is clearly accepted (Theoharakis and Hooley, 2008). Related studies are summarized in Table 2.

Table 2: Summaries of Some Studies Concerning Market Orientation – Innovativeness and Firm Performance

Researchers	Countries	Type of Enterprises	Findings
Deshpande Farley Webster 1993	Japan	50 Manufacturing Enterprises	- Customer orientation has impact on performance. - Innovativeness has impact on performance.
Han Kim Srivastava 1998	USA	134 Bank	- Innovativeness acts as a mediator between market orientation and performance. - Particularly customer orientation has impact on innovation. - Innovation has direct impact on performance.
Matear Osborne Garrett Gray 2002	New Zealand	231 Service Enterprises	- Market orientation has positive and meaningful impact on performance. - When market orientation, innovativeness and performance are approached together, it is observed that innovativeness acts as a mediator between market orientation and financial performance.
Salavou 2002	Greece	61 Small and Middle Sized Enterprises	- Market orientation enhances performance. - Product innovation is a mediator between market orientation and performance.
Maydeu-Olivers Lado 2003	European Union	122 Insurance Enterprises	- Market orientation has impact on operational performance. - Innovativeness is a mediator variable between market orientation and operational performance. Innovation performance and the level of being innovative act as separate mediators in such relation.
Erdil Erdil Keskin 2005	Turkey	55 Manufacturing Enterprises	- Market oriented strategies are directly related to the enterprise's innovativeness. - Innovativeness affects performance positively.
Olavarrietta Friedmann 2008	Chile	116 Commercial Enterprises	- Innovativeness has impact on the general performance of the enterprise. - Innovativeness is a mediator variable between market orientation and general performance of the enterprise.

Source: Generated by authors.

5.3 Learning Orientation – Innovativeness – Performance

Innovation is the name given to the transformation of knowledge into economic actions. Innovation, which is dealt as a process based on learning from different sources and adaptation, is a basic prerequisite for economic growth (Tang, 2006). While importance is attached to the impact of organizational factors on innovation, it is assumed that organizational learning, in particular, plays a key role in defining innovation (Aragon-Correa, 2007). Knowledge management within learning, on the other hand, plays a crucial role for innovation (Prajogo and Ahmed, 2006).

One of the definitions given for organizational learning in literature is that organizational learning raises quality, strengthens customer - supplier relations, eases implementation of business strategies and provides sustainable profitability (Mills and Freisen, 1992). Sustainable profitability is an indication of top-level performance and learning from the past and learning with experience, in particular, is required to provide it. Learning is realized with the procurement of information from the right place as well as its proper usage. Innovative results are obtained through the proper use of knowledge (Padmore et al., 1998). In this context, firms develop strategies related to learning and thereby form a basis for processes regarding innovativeness as well.

A significant issue that Greenhalgh et al., (2004) mentioned in their studies concerning the acceptance of innovation in service sector enterprises has been use of information for innovation within the organization. A fundamental purpose of innovativeness in firms is to create new information and instruments, which will ensure organizational development, and many researchers argue that organizational performance - the indicator of such development - is closely related to organizational learning (Aragon-Correa, 2007).

One of the other issues discussed in the literature is the need for developing different types of learning methods for different types of innovation (McKee, 1992). Learning and innovation can be discussed together but within different structures. As mentioned by Stata (1989), the basic problem in firms is not the incapability of creating innovation or unsuccessful innovative attempts, but incapability of teaching the management of innovation. Innovation is a term used for creation, acquirement and adaptation of new ideas, processes, goods or services. Due to the nature of dataflow within a cycle, learning orientation and innovation are seen to be closely related. Among values required for organizational innovativeness, use of information and continuous learning approach are included, a situation which shows that there is a high level of correlation between the two concepts (Wong and Chin, 2007).

An important point in the relationship between learning and innovation is that learning lays a foundation for innovation, because an organization's dependence on learning increases its innovation capacity, while at the same time influencing its overall firm performance. Some of the studies concerning relationships between learning orientation, innovativeness and performance and findings obtained through these studies are summarized in Table 3.

Table 3: Summaries of Some Studies Concerning Learning Orientation – Innovativeness and Firm Performance

Researchers	Countries	Type of Enterprises	Findings
Calantone Cavusgil Zhao 2002	USA	187 Research & Development Enterprises	- Learning orientation has impact on innovativeness. - Learning orientation has impact on performance. - Innovativeness has impact on firm performance. - Age of the organization is regulatory between learning orientation and innovativeness.
Flint Larsson Gammelgaard Mentzer 2005	USA Scandinavia Europe	7 Logistics Enterprises	- Organization learning has impact on innovativeness.
Panayides So 2005	Hong Kong	251 Logistics Enterprises	- Organizational learning and innovativeness are positively correlated. - Innovativeness enhances performance.
Aragon-Correra Garcia-Morales Cordon-Pozo 2007	Spain	408 Big Enterprises	- Innovativeness has direct impact on performance. - Organizational learning has direct impact on innovativeness. - Organizational learning and performance are directly related. - Organizational learning and innovativeness together have bigger impact on firm performance.

Source: Generated by authors.

5.4 Market Orientation – Learning Orientation – Innovativeness – Performance

In initial research studies questioning the relationship between market and learning orientations and firm performance, innovativeness has been a neglected variable. On the other hand, Deshpande et al. (1993) and also Menon and Varadarajan (1992) associated market orientation with the innovativeness culture. In another study, Jaworski and Kohli (1996) also argued that innovativeness was missing in the model. A study regarding the model was also conducted in Turkey by Keskin (2006) and the impact of three variables on performance was tested in small and middle-sized enterprises in Turkey. In the literature, market orientation, learning orientation and innovativeness are discussed as a fundamental strategic approach and research studies are made on the basis of various variable components concerning the subject. Some of the studies conducted in this context are summarized in Table 4.

Table 4: Summaries of Some Studies Concerning Market Orientation – Learning Orientation – Innovativeness and Firm Performance

Researchers	Country	Type of Enterprises	Findings
Hurley Hult 1998	USA	R&D Enterprises	<ul style="list-style-type: none"> - Market orientation and learning orientation are antecedents for innovativeness. - Innovativeness raises innovation capacity. - Firms with high innovation capacity show higher performance.
Baker Sinkula 1999b	USA	Small and Big Sized Enterprises	<ul style="list-style-type: none"> - Product innovativeness is a function of market orientation and learning orientation. - Market orientation has no direct impact on performance. - Market orientation has impact on performance through the mediation of product innovativeness. - Learning orientation has direct impact on performance, but also indirect impact through product innovativeness.
Noble Sinha Kumar 2002	USA	Retail Chain Stores	<ul style="list-style-type: none"> - Competitor orientation is related to performance in any occasion. - Customer orientation is not related to performance. - Impact of a mediator between market orientation and performance must be searched for. - There is a positive relation between learning orientation and performance; and learning orientation acts as a mediator between market orientation and performance.
Hult Hurley Knight 2004	USA	181 Middle and Big Sized Enterprises	<ul style="list-style-type: none"> - Innovativeness is positively related to operational performance. - Market orientation is positively related to innovation. - Learning orientation is positively related to innovativeness.
Keskin 2006	Turkey	157 Small and Middle Sized Industrial Enterprises	<ul style="list-style-type: none"> - Market orientation has no direct impact on operational performance. - Innovativeness has direct positive impact on performance. - Learning orientation has positive impact on innovativeness. - Market orientation has positive impact on learning orientation. - Learning orientation acts as a mediator between market orientation and innovativeness.

Source: Generated by authors.

In this approach, which forms the model of the study, it is presumed that the market orientation approach must essentially exist in firms, but only the market orientation culture is simply not meaningful in terms of the performance of organizations. For organizations to properly obtain and interpret market information, they must also be learning-oriented. On the other hand, these two approaches are seen as a necessity to be innovative at a high level. Therefore, the basic hypothesis of the research is as follows:

H1: Learning orientation and innovation act as a mediator in market orientation's impact on firm performance.

Sub-hypotheses related to the H1 hypothesis:

H1a: Market orientation has an impact on learning orientation.

H1b: Learning orientation has an impact on innovativeness.

H1c: Innovativeness has an impact on performance.

H1d: Learning orientation acts as a mediator in market orientation's impact on innovativeness.

H1e: Innovativeness acts as a mediator in learning orientation's impact on performance.

In order to test the hypotheses, a survey designed and the Structural Equation Modeling (SEM) technique was used in the present study by Lisrel 8.3.

6. Method

6.1 Sample and Procedure

Survey was consisting of four scales and they were administered to the firms serving in the logistics sector in Turkey. All scales were administered by the researcher. In order to motivate the managers to get fully involved in filling the questionnaires, they were told that they would be informed about the results of the study.

Data for this study was collected from 102 dyads. The sample universe is composed of firms serving in the logistics sector in Turkey. In this context, the member list of the Association of International Transportation and Logistics Service Providers (UTIKAD) (352 members) was used. Firms subject to the research are usually native partnerships (47.1%), have an operating period range of 6-10 years (35.3%) and employ 1-50 people (32.4%). The study was carried out with the participation of enterprises owners, CEOs, deputy CEOs, region/branch managers, marketing directors and other executives.

6.2 Measurement

In order to measure the variables, four questionnaires were used; in each one, items are measured according to a 7-point Likert Scale (for market orientation, learning orientation and innovativeness 7=Strongly Agree...1=Strongly Disagree and for performance 7=Very

High...1=Very Low) to rank each of the items, with a higher score indicating a greater orientation or performance.

Market Orientation: There are direct and indirect measurement methods to measure the level of market orientation. Direct measurement refers to the measurement of how much managers comply with the philosophies of the firm and the classification of the organization's tendencies. However, due to various restrictions, research studies had to develop indirect measurement instruments. These instruments may be classified as cultural (Narver and Slater, 1990), information-based (Kohli and Jaworski, 1993) and alternative (Ruekert, 1992; Deng and Dart, 1994) scales (Harris, 2002).

Various scales designed for market orientation are as follows: MKTOR developed by Narver and Slater (1990); Ruekert's (1992) market orientation scale; MARKOR developed by Kohli and et al. (1993); the scale which Deshpande et al. (1993) developed via the Quadrant analysis, and in which they approached market orientation as customer orientation; Deng and Dart's (1994) scale of multi-factor and multi-variable approach; MORTN, developed by Deshpande and Farley (1998); the limited question scales developed by Gray et al. (1998) by taking existing scales as a basis; MOS developed by Lado et al. (1998) and MOS-R, a version of MOS which was later developed; and MOPRO, which is based on MKTOR, developed by Narver et al. (2005) by conducting rearrangements over variables and items in MKTOR.

As a result of these findings unearthed by the researchers, as also mentioned by Farrel and Oczkowski (2002), the first market orientation scale MKTOR whose validity is already approved (Lado et al., 1998), developed by Narver and Slater (1990), was preferred due to its psychometric features and advantages.

While the Cronbach alpha (α) value related to the market orientation was .82, the reliability at sub-dimensions was .67 for customer orientation, .80 for competitor orientation and .78 for interfunctional coordination.

Learning Orientation: In the literature, three basic organizational values (commitment to learning, shared vision, open-mindedness) aimed at organizations' tendency towards learning are discussed (Day, 1991; 1994b). These three values were measured by means of a scale including eleven items in total by Sinkula and his colleagues (1997). The scale was later developed by Baker and Sinkula (1999a; 1999b) through addition, and then applied by other researchers as well with identical or similar items included in order to measure organizations' tendency towards learning.

Among three variables mentioned in the literature in relation with learning orientation, the commitment to learning was developed and measured through 4 items by Sinkula et al. (1997) which depends on Galler and van der Heijden (1992), Garratt (1987) and Tobin (1993) scales and then again developed and measured through 6 items by Baker and Sinkula (1999a,b).

The scale related to the shared vision was developed and measured through 4 items by Sinkula et al. (1997) which depends on Senge (1990; 1992) and Tobin (1993) scales and then again developed and measured through 6 items by Baker and Sinkula (1999a; 1999b).

The open-mindedness scale was developed and measured through three items by

Sinkula et al. (1997) which depends on Day (1991; 1992), Senge (1990; 1992) and Slater and Narver (1994) scales and then again developed and measured through six items by Baker and Sinkula (1999a; 1999b). In addition to these three basic variables, the sub-variable known as organizational information sharing was measured through five items which were dealt together with other elements of the learning orientation by Calantone et al. (2002) and developed by Hult and Ferrel (1997). There are five reverse expressions on the learning orientation scale. These expressions were indicated with an “®” mark and included in the measurement by being reverse coded in analyses. While the α value of the learning orientation scale was .92, and the reliability at sub-dimensions was as high as .86 for the commitment to learning, .89 for shared vision, .80 for open-mindedness and .82 for intra organizational knowledge sharing.

Innovativeness: Different types of scales were designed for concepts which are sometimes meshed and otherwise used as replacements for each other, such as innovation, innovation capacity, innovation performance, innovativeness, innovation orientation, etc. However, for the sake of the purpose of the study’s and in terms of the compliance with the study’s variables, items adapted by Calantone et al. (2002) from Hurt et al. (1977), Hurt and Teigen (1977) and Hollenstein (1996) and also used by Keskin (2006) in Turkey were preferred. There is no sub-dimension on the innovativeness scale and reliability was found to be at .82 level.

Performance: In research studies based on the approach of this study, although objective performance criteria (investments made, investments’ return rate, turnover, sales volume, market share, etc.) are usually used, perceived performance criteria of a subjective nature are also frequently used. For this purpose, the subjective measurement technique was preferred by researchers in order to increase the reply rate, and also because it was an approach which researchers frequently apply to. As the scale, criteria that are important and generally accepted in performance measurement as in the literature were used. There is no sub-dimension in this variable, which is known as the dependent variable with a reliability of .90 level.

Since various researchers have used measurement instruments related to the variables for many years, as set forth in the literature, in different countries, sectors and samplings, there is no problem in regard to its structure, validity and reliability. When correlation between variables is considered, all variables are meaningful at the $p < .01$ level, as shown in Table 5.

Table 5: Structural Correlations

	Market Orientation	Learning Orientation	Innovativeness	Performance	Mean	Standard Deviation
Market Orientation	1.000	.680(**)	.451(**)	.508(**)	5.9986	.42727
Learning Orientation		1.000	.607(**)	.422(**)	6.0145	.50476
Innovativeness			1.000	.529(**)	5.7794	.68945
Performance				1.000	5.4199	.95807

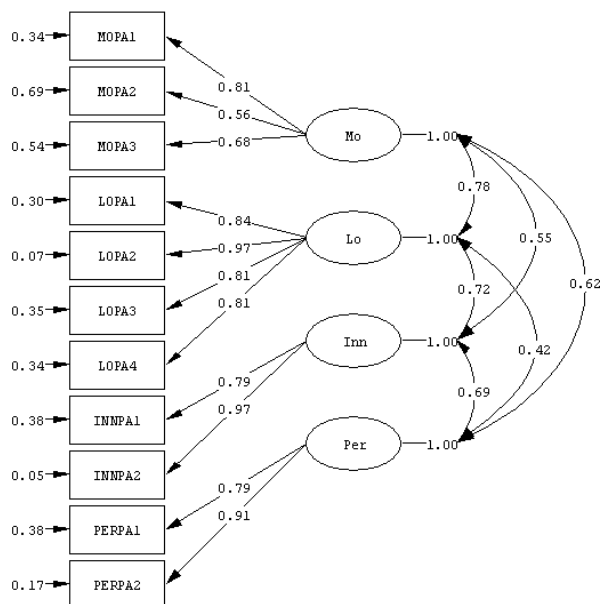
Note: ** $p < .01$

6.3 Analysis and Results

The structural equation modeling (SEM), which is a technique aimed at examining the relationship between implicit variables mentioned in the theory, by removing manipulation in relations between variables, eliminates measurement errors and presents researchers with truer and more refined results when compared to other techniques. This technique becomes effective, especially in the simultaneous explanation of a series of related variables in managerial and behavioral matters (Cheng, 2001). The most fundamental feature of SEM studies is that they are fully based on theory and able to test specific hypotheses. Structural equation modeling (SEM) was performed using the maximum likelihood method to test the hypotheses. This procedure permitted an assessment of the integrity of the measures, as well as an evaluation of the degree to which the observed relations among variables fitted the hypothesized network of causal relationships, as shown in Figure 1.

One of the techniques which used in SEM studies is parceling. Bandalos and Finney (2001) mentioned that among the most frequently confronted situations concerning the reasons for use of the item parceling comes the number of variables on the scale and insufficiency of the number of universal units (Holt, 2004). Kline (1998) expresses that, if sample is <100, a small-scaled volume is referred to and a limited number of analyses are permitted; if sample is 100-200, a mid scaled volume is referred to, if sample is >200, a large-scaled volume is referred to and thus, more meaningful results can be achieved as the number of samples increases. Again, it is mentioned in research studies related to this scale that if the ratio of sample volume to the number of items is 5:1, statistically suspicious

Figure 1: Measurement Model Standardized Solution



Note: Chi-Square = 71.12, df = 37, p-value = 0.00063, RMSEA = 0.086

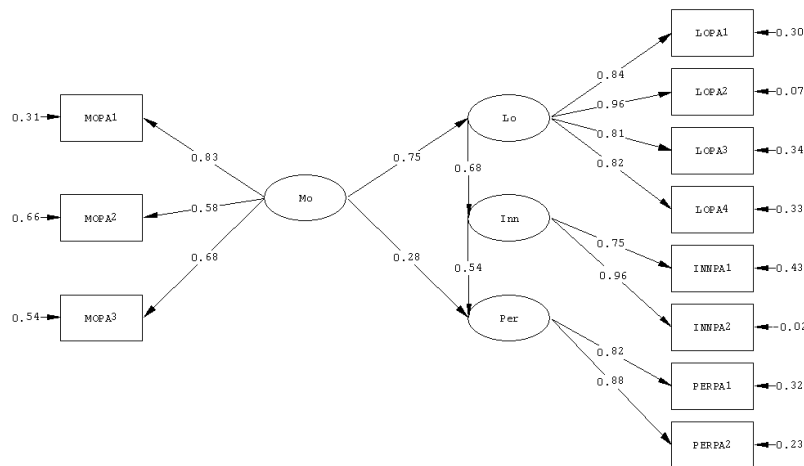
results will be obtained; if 10:1, realistic results and if 20:1, expected and reliable results will be achieved (Kline, 1998, p. 112).

The number of items (observed variables) on the study's scales are Market Orientation (MO)=14, Learning Orientation (LO)=23, Innovation (INN)=6, Performance (PER)=6 and N=102. In this case, when the 1:10 ratio is requested to be used in order to obtain realistic results, it will be seen that this criterion cannot be met in testing of the learning orientation scale. This situation leads to some deviations in factor analysis. On the other hand, although the factor structure of the observed variables which are again related to implicit variables is clearly mentioned in the theory and this scale structure has been used for many years, a deviation is observed in the factor distribution of some variables due to problems originating from respondents' perception or casualty of the variables. The fact that observed variables does not demonstrate an orthogonal structure may be one of the reasons to be considered. The parceling technique was used in the structural equation modeling in the study due to listed reasons.

One of the parceling techniques is the parceling based on the factor analysis structure, mentioned by Aluja and Blanch (2004) among different parceling techniques. Therefore, parcel determination as many as the number of factor groups included in each of the latent variables is a way. The market orientation scale was sorted into three, learning orientation scale into four, innovation scale into two and performance scale into two by taking into account such criteria as the following: determination of at least two parcels for each latent variable and the necessity that determined parcels have to express a one dimensional variable.

In the measuring model, the relationships between each of the latent variables and the degree to which parcels related to the latent variable explain such a variable are presented. A standardized analysis in respect to the measuring model is shown in Figure 2. When the measuring model is examined, it is seen that there is no discrepancy regarding error variances.

Figure 2: Structural Model Standardized Solution



Note: Chi-Square = 85.46, df = 39, p-value = 0.00003, RMSEA = 0.109

As can be understood from Figure 1, and as shown in Table 6, there is a relationship between all latent variables. These relations are meaningful at the $p < .01$ level.

Table 6: Correlations between the Latent Variables in Standardized Solution

	Market Orientation	Learning Orientation	Innovativeness	Performance
Market Orientation	1.000	.78(**)	.55(**)	.62(**)
Learning Orientation		1.000	.72(**)	.42(**)
Innovativeness			1.000	.69(**)
Performance				1.000

Note: ** $p < .01$

Having established that there is a meaningful relationship between latent variables; the direction of such relationships is tested and identified in the structural model. In the measurement model, t values with respect to whether the latent variable each parcel belongs to are statistically meaningful or not indicated. When standardized values and t Values shown in Table 7 are analyzed, all values are found to yield meaningful results.

Table 7: Measurement Model Values

Latent Variables	Parcells	Standardized Values	t Values
Market Orientation	MOPA1	0.81	8.78
	MOPA2	0.56	5.55
	MOPA3	0.68	7.07
Learning Orientation	LOPA1	0.84	10.30
	LOPA2	0.97	13.10
	LOPA3	0.81	9.76
	LOPA4	0.81	9.84
Innovativeness	INNPA1	0.79	9.14
	INNPA2	0.97	12.49
Performance	PERPA1	0.79	8.86
	PERPA2	0.91	10.69

The acceptability of the standardized values and t values shown in Table 7 indicates that the model is reasonable; however, the Goodness of Fit Indices (GFI) must be taken into account for an adequate assessment. The GFI in respect to the measurement model are shown in Table 8.

Table 8: Measurement Model Goodness of Fit Statistics

Goodness of Fit Statistics		Values	Estimated Values
Absolute Fit	RMR	0.46	≤.05
	SRMR	0.05	≤.05
	RMSEA	0.86	≤.80
	GFI	0.89	≥.90
	AGFI	0.89	≥.90
Comparative Fit	NFI	0.90	≥.90
	NNFI	0.92	≥.90
	CFI	0.94	≥.90
	IFI	0.94	≥.90
	ECVI	1.31 < 8.39	M < DM
Parsimonious Fit	PNFI	0.61	≥.05
	AIC	129.12 < 132.00	M < DM
	CAIC	234.24 < 371.25	M < DM

GFI in respect to the measurement model indicate whether data collected within the scope of the research fits the model built on theoretical foundations. When the indices are examined, it is found that the expected values for RMSEA, GFI and AGFI in precision of fit were not exactly achieved; however, all other fits were at the expected levels. Since X^2/df (71.12/37) is less than five and generally the goodness of fit values are at acceptable and reasonable levels, it is understood that the measurement model was verified within the framework of the structural equation modeling and that it is time to move on to the next step, the testing phase of the structural model.

After the conformity of the measurement model was tested, the relationships between variables in the suggested theoretical model were subject to analysis. The structural model was tested by means of nested models in line with the suggested model. Figure 2 shows standard analysis of the structural model. Four meaningful paths were identified in the structural model and the model was drawn up accordingly.

The strength and meaningfulness of relations between the variables in the structural model is shown in Table 9.

Table 9: Structural Models Values

Latent Variables and Parcels	Standardized Values	t Values
MO – PER Market Orientation → Performance	0.28	2.35
MO – LO Market Orientation → Learning Orientation	0.75	6.81
LO – INN Learning Orientation → Innovation	0.68	5.86
INN – PER Innovation → Performance	0.54	4.64

In the modeling based on the theory and in line with hypotheses, no meaningful relationship between market orientation and innovativeness was found (the path value was less than 10); therefore this path was removed from the model. The GFI for the structural model shown in Table 10 indicate conformity of data gathered within the scope of the research with the model, which is based on theoretical foundations.

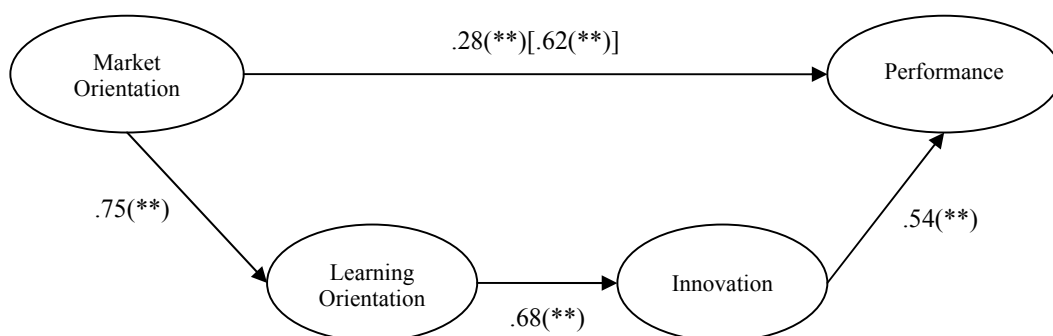
Table 10: Structural Model Goodness of Fit Statistics

Goodness of Fit Statistics		Values	Estimated Values
Absolute Fit	RMR	0.05	≤.05
	SRMR	0.06	≤.05
	RMSEA	0.11	≤.80
	GFI	0.87	≥.90
	AGFI	0.87	≥.90
Comparative Fit	NFI	0.89	≥.90
	NNFI	0.90	≥.90
	CFI	0.93	≥.90
	IFI	0.93	≥.90
	ECVI	1.31 < 8.39	M < DM
Parsimonious Fit	PNFI	0.63	≥.05
	AIC	132.00 < 847.04	M < DM
	CAIC	371.25 < 886.92	M < DM

When the indices are examined, it was found that the obtained values were convergent with the expected values. The fact that X^2/df (85.46/39) is less than five and the CFI, SRMR and RMSEA values in particular were at the expected levels with $N < 250$ and $m \geq 30$ shows that the GFI values are generally reasonable (Hair et al., 2006, p. 753). In this context, it can be concluded that the structural model was verified within the framework of the SME and that a model, which fits the tested hypothesis of the research, emerged. As far as it is understood from the structural model, and due to the fact that the GFI are at acceptable levels, the thesis of research, which is “learning orientation and innovativeness are variables in the relationship between market orientation and performance”, is confirmed. The verified model of the research is presented in Figure 3.

The results obtained support the hypotheses of the research. First of all, it is shown that the market orientation’s impact on performance is significantly provided through learning orientation and innovativeness (H1). The market orientation’s total impact on performance (which was originally .62) showed a dramatic fall (down to .28) as learning orientation and innovativeness are statistically controlled; in other words, as they are defined as mediator variables in the model. Thus, we see that the relationship between market orientation and performance is meaningful; however, such a relationship becomes meaningless as learning orientation and innovativeness variables are included in the model. It is seen that market

Figure 3: Conceptual Diagram of the Study



orientation – learning orientation and innovativeness have an impact on performance, while learning orientation and innovativeness also act as a partial mediator variable in the relationship between market orientation and performance.

It is clear that such a conclusion supports the main hypothesis of the research study, as well as its sub-hypotheses. As can be understood from the model, the fact that the impact of market orientation on performance is provided through learning orientation and innovation firstly states that market orientation has an impact on learning orientation (H1a), that learning orientation has an impact on innovativeness (H1b) and innovativeness has an impact on performance (H1c). Thus, it is clear that learning orientation mediates between market orientation and innovation (H1d) and that the learning orientation's impact on performance is provided through innovation (H1e), which, in turn, is a verification of the main hypothesis (H1) and all other sub-hypotheses.

As again can be understood from Figure 3, parameters in respect to market orientation-learning orientation, learning orientation-innovativeness, innovativeness-performance, market orientation-learning orientation-innovativeness and learning orientation-innovativeness-performance have an impact size at middle and high levels, which, in turn, refers to the fact that they are also statistically meaningful.

In respect to hypothesis H1a, in the relationship between market orientation and learning orientation, the t value is 6.81 and p is meaningful at the $p > .01$ level.

In respect to hypothesis H1b, in the relationship between learning orientation and innovativeness, the t value is 65.86 and p is meaningful at the $p > .01$ level.

In respect to hypothesis H1c, in the relation between innovativeness and performance, the t value is 4.64 and p is meaningful at the $p > .01$ level.

In respect to hypothesis H1d, while the t value regarding the relationship between market orientation and learning orientation is 6.81, as set out in hypothesis H1a, the t value regarding the relationship between learning orientation and innovativeness is 5.86 as mentioned in hypothesis H1b. Here, the learning orientation acts as a full mediator variable between market orientation and innovativeness, which can be explained as follows: in the measurement model, the relation between market orientation and innovativeness is

clearly seen (.55), but in the structural model, as learning orientation is included in this relationship, the degree of the relationship between variables drops (0.02) and becomes fully meaningless.

In respect to hypothesis H1e, while the t value regarding the relationship between learning orientation and innovativeness is 5.86, as mentioned in hypothesis H1b, the t value regarding the innovativeness-performance path is 4.64 as mentioned in hypothesis H1c. At this point, we reach the conclusion that innovativeness acts as a partial mediator variable between learning orientation and performance, which can be explained as follows: the relationship between learning orientation and performance, which is .42 in the measurement model, falls away to become meaningless in the structural model.

In conclusion, concepts such as market orientation, learning orientation and innovativeness, which are discussed to increase corporations' performance and to provide a competitive advantage, were analyzed in the sampling composed of logistics service providers in Turkey. The results obtained bear similar qualifications with the results of the researches, which have been conducted in different countries, sectors and, types of organizations since the 1990s.

7. Conclusions and Discussion

It is concluded that values such as market orientation – learning orientation and innovation are important in terms of increasing the performance of service providers operating in the logistics sector in Turkey, and that the such three variables have a compound impact on increasing performances of logistics service providers.

When the nature of the sector is considered, it can be stipulated that if supply chain elements, with which logistics service providers have some relation, exhibit similar features, this situation is expected to create a synergic impact on performance. Logistics enterprises' ability to guide their customers will be facilitating in this aspect.

In this research study, analysis was conducted at the unit (enterprise) level. Classified analyses specific to logistics service providers can be carried out in following studies. Again, through qualitative research design, deeper findings can be achieved through a case study in logistics enterprises showing high performance.

This study can be conducted as a comparison of replies of the two sides, service users and service providers. Thus, it would be possible to reach more comprehensive deductions in respect to the sector.

In future research studies, such studies for obtaining comparative results through the use of MKTOR and MARKOR scales may be considered together in the same research and deriving a new scale which is valid, reliable and adapted to the Turkish culture via studies to be made on scales.

This study aims to be pioneering to the extent that a model which is not frequently seen in the literature scanning conducted in Turkey is tested within a sector in which it is never questioned and by means of a unique method. Later research studies are expected to lead to further expansions specific to the Turkish Logistics Sector, while guiding the development

of suggestions that are aimed at increasing performance in terms of practitioners within the framework of cultural and sector-specific conditions.

8. Implications for Management

Various research studies performed by different researchers in respect to the impacts of market orientation – learning orientation and innovativeness on operational performance indicate that there is a strong relationship between these concepts. As is known, there are various tendencies, which increase operational performance. In theories set forth as well as in empirical research studies conducted, various relationships have been established between market orientation and performance, learning orientation and performance, market orientation-learning orientation and performance, in particular. As studies are advanced in the theory, such hypotheses underlining that innovativeness, like learning orientation, has an impact on the relationship between market orientation and performance are set forth and then confirmed in such studies.

Logistics has been a rising sector, particularly in the last decade within the new economic structure in which services have gained importance. As a field of services based on technology and information, it is a sector, which requires a focus on customers. Market orientation is a necessary approach in terms of meeting customers' needs, satisfying them and defining those needs which customers are not yet aware of. In the logistics sector, where diversified services are expected to be presented to different customers, the collection of correct information on customers, presentation of more advantageous solutions by analyzing the competitors and establishment of a joint strategy by sharing gathered information across the organization must be deemed as practices of market oriented enterprises.

Market orientation refers to the recognition and identification of customers within the supply chain, while providing them with a cost advantage. In respect to market orientation, organizations have to bear the learning ability in order to gather market information, and use and share it. The learning ability that must be possessed, also as an important element of the supply chain, must be attached further importance to by logistics service providers. For an effective supply chain operation and performance, a maximum level of information sharing among the links is required. From this point of view, logistics service providers act as an important center where information is produced, stored and distributed within the chain. Therefore, the existence of a learning-oriented approach is compulsory within the organizational culture of logistics service providers.

Since market orientation sometimes causes a tendency towards merely satisfying the existing requirements of customers, it may lead to myopia, and in this aspect, may reduce innovativeness. Therefore, it must be stressed particularly that in the market oriented approach, organizations should not just tend towards customers' requirements and expectations.

The fact that the logistics sector is based on information and communication provides sector practices to be innovative and efforts shown to create continuous cost advantage within the supply chain become a forcing power for enterprises to produce more

innovative solutions. Innovation, for the logistics sector, can aim at both its own processes and processes of the customers. When considered from this point of view, innovative practices of logistics service providers will contribute to their own success, as well as their customers' success through the advantageous methods they offer their customers. A basic task of logistics service providers is to reflect technological developments and innovative practices to their customers as well as other elements within the supply chain.

9. Directions for Future Research

Theoretical discussions and empirical research studies have put forward, both in management and marketing literatures, the relationships between market orientation and performance, learning orientation and performance, innovativeness and performance and between these three concepts and various components of performance. In research studies conducted according to the sales, types and sectors of different enterprises, three-way relationships were found. While generally positive relationships (Narver and Slater, 1990; Ruekert, 1992) are found, some others presented opposite results (Hart and Diamantopoulos, 1993). Some of the research studies, on the other hand, revealed that there is a compound relationship (Kohli and Jaworski, 1993). After the year 2009 research stream is changed and researches started to examine market orientation, learning orientation and innovativeness with some other variables (*e.g. organizational competencies Subramanian et al. (2009), corporate social responsibility Qu (2009), innovation speed Carbonell and Escudero (2010), job satisfaction and commitment Rodrigues and Pinho (2010), autonomy barnabas and Mekoth (2010), JIT, TQM and Agility Zelbest et al. (2010), e-marketing Tsiotsou and Vlachopoulou (2011), six sigma Eng (2011)*).

In future research studies, it is necessary to conduct new research studies and ensure validity of the model through use of different scales and comparisons between sectors.

10. Strengths and Limitations

The basic limitation of the research is the fact that, in the relations between market orientation, learning orientation and innovativeness variables, it is not yet fully clear which one is the primary variable, as well as the fact that different results are obtained in different studies when these variables are evaluated within the same model. The assumption adopted in this study is that market orientation is a pioneer for the other two variables.

Another limitation is that logistics is a new sector in the world but particularly in Turkey. Therefore, academic studies in respect to the sector are just recent. Within the framework of conducted scans, no study was discovered in respect to the variables establishing the study's model and linked to general operational performance, which are market orientation, learning orientation and innovativeness.

The fact that the database related to the Turkish logistics sector is not yet established causes all data regarding the classification of enterprises in the sector to the sectors they provide to be disordered and inadequate. Although there are some associations in the

logistics sector, which people and corporations playing key role in the sector are members of databases prepared by these associations are far from giving clear and healthy information about the sector. Selection of the universe and sampling of logistics service providers to be included in the scope during the design of the research has been an important limitation for it.

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Maritime Tourism Tax Revenues in Greece: A New Framework for Collection

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Abstract

This research is designed to help government and tourism policy-makers evaluate the efficiency and consequences of the Greek taxation system on maritime tourism. The tax revenues generated by the taxes and dues imposed by the state are measured using the Tourism Satellite Account (TSA). Tax evasion is considered to be the major cause of the high deficit of the Greek economy. The effectiveness of the taxation system can be evaluated by comparing the total value of taxes actually collected by each activity of maritime tourism and by category given the initial budget, also revealing possible tax evasion or laxity in collecting taxes.

Keywords: Maritime tourism, Tax Revenues, Greek economy, Tourism Satellite Account

JEL classification: H250, H260, H710, K340, L830, R150

1. Introduction

Tourism has become more significant to the economies of many countries, but since tourism spans many economic sectors, its impact cannot be measured in the national accounts (Smeral, 2006). For a country to effectively develop its tourism, it needs a national tourism policy to identify strategies for marketing, ecotourism, cultural tourism, international and regional cooperation, land and infrastructure, employment and human resources, community participation, investment and financing, legislation and fair market competition, and institutional infrastructure (Sharma and Olsen, 2005). Tourism legislation constitutes an important factor in the development and growth of the industry (McGehee and Meng, 2006). An important relationship exists between government and tourism, since successful tourism requires cooperation among government, private, and non-profit agencies (Hall, 1994).

A tourism development policy must allow stakeholders to estimate its economic impact on the nation (Dwyer and Forsyth, 1996, p. 37). The more essential tourism is to the national economy, the more systematic and continuous the estimate should be.

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Greece is going through its greatest economic crisis since World War II, which mainly concerns the extremely high deficits. The expenditure of the Greek government is not higher than that of the European Union (EU) average, but “revenue is much below because of tax evasion, which is the main source of Greece’s deficits” (Meghir et al., 2010, p.9). Tax evasion is deeply engrained in the Greek economy, not because it is in the genes of Greek taxpayers, but because not enough incentives are in place to discourage it (Meghir et al., 2010, pp. 9-12).

Fighting tax evasion should be one of the first priorities for the state, not only to increase tax revenues and become able to provide high quality of public services, but also to deter the illicit competition between the enterprises that are reliable and those that evade tax payments.

The purpose of this paper is to introduce a practical and scientific process to estimate the budgeted public revenues expected to flow into the Greek economy. The flow includes all types of taxes collected by the state resulting from the consumption of maritime tourism products, as well as from all other goods and services consumed by tourists during maritime tourism activities.

2. Literature review

Studies focusing on tourism’s economic impact, including public revenues, have targeted regions such as Miami (Mescon, Vozikis, 1985), the Maldives (Sathiendrakumar and Tisdell, 1989), the Seychelles (Archer and Fletcher, 1996), Brazil (Wagner, 1997), Canada (Smith, 2000), Spain (Blake, 2000), South Africa (Poonyth et al., 2002), Turkey (Tosun, 2002), Indonesia (Sugiyarto et al., 2003), Scotland (McNicoll, 2003), the UK, (DCMS, 2004), Tanzania (Sharma and Olsen, 2005), Mauritius (Gooroochurn and Sinclair, 2005), and the Balearic Islands (Aguiló et al., 2005).

Additionally, several studies have focused on the economic impact of maritime tourism, including taxes. “The Economic Impact of Tourism in Seychelles” by Archer and Fletcher (1996) addresses the effect on income and on government-owned income from taxes. Dwyer and Forsyth (1996) in their study, “Economic Impacts of Cruise Tourism in Australia,” include in the cruise expenditure table income tax, customs duty and departure tax, all of which affect the national and regional economy.

In Greece, as in most countries, since a portion of tourism spending accrues to the government as taxation, it should not be considered as direct economic injection to the economy (Bryan et al., 2006).

The importance of tourism for the Greek economy is reflected in Table 1.

The Greek Tourism Ministry, recognizing the economic value of maritime tourism, established the Maritime Tourism Committee in 2010. The Committee’s mission is to investigate the necessary legislative regulation required to make Greek maritime tourism as well-managed as comparable activities in neighbouring and competitive countries, such as Turkey and Croatia. The competition for the Greek ports of leisure crafts comes from the countries of the Northwestern Mediterranean (France, Italy, Spain), as well as from those of the Northeastern Mediterranean (Turkey, Croatia) (Diakomihalis, 2007, p. 446).

Table 1: Tourism key factors for Greece

	2010	2020 trend
The contribution of travel and tourism to gross domestic product (GDP)	15.5% EUR 33.9bn	17.3% EUR 60.7bn
Real GDP Growth for the travel and tourism economy	0.9%	3.5% per annum
The contribution of the travel and tourism economy to employment	18.8% 785,000 jobs	21% 916,000 jobs
Export earnings from international visitors (exports)	26.2% EUR 10.3bn	22.4% EUR 24.6bn
Travel and tourism investments	14.2% EUR 5.6bn	14.6% EUR 9.6bn

Source of Data: World Travel and Tourism Council, 2010

Maritime tourism, as the total tourism industry, is a seasonal activity, and therefore, it often complements other activities (education, agriculture) leading to greater para-economy in tourism compared to other industries (Buhalis, 2001, p. 443).

The contribution of tourism to the Greek economy is substantially greater than the official figures present, since the official figures ignore the “para-economy” (black or parallel economy), estimated to reach 50% of the official GDP (Buhalis, 2001, p. 443). Table 2 depicts Greece’s initiatives, considered the key drivers for resuming growth, among which tax evasion is one of the tasks in progress.

Table 2: Long-term growth drivers

<i>In Progress</i>	<i>In Progress</i>	<i>Being planned</i>
Fiscal Consolidation Deficit Public Administration Tax Evasion	Structural Reforms Labor, State Assets Business Environment Regulation	Business Reforms Legislation Liberalization Privatizations PPP (Purchasing Power Parity) FDI (Foreign Direct Investment)

Source: Ministry of Finance, Eurobank EFG Equities Research, Sept. 2010, p. 9.

The Greek market in maritime tourism includes cruising, yachting and coastal tourism shipping. Turkey and Croatia are the main competitors of Greece, not only in yachting, but also in the cruise market. Since the *mixed cruises* of 3-7 days duration with departure points at Greek ports usually consist of both domestic and foreign ports in their programs, most of the time the ports of Cyprus, Turkey, Italy, Egypt, Israel, and Croatia are included.

Interventions on the imposition or modification or reduction of taxes and dues, are the result of the estimated as well as the anticipated income. Additionally, they are the outcome of an attempt to harmonise taxes with the corresponding ones of the neighbouring-competitive countries, or the pressure of the sector's professionals for tax alleviation.

Most of the maritime tourism enterprises, especially those active in yachting and coastal tourism shipping are small and family owned firms. Tax evasion by family owned and very small firms is hard to detect, forcing government to maintain a high tax rate, and to collect the taxes from larger firms, which cannot evade them as easily (Meghir et al., 2010, pp. 11-12).

Tax revenues due are estimated by the government on the basis of the income received by the public tax collecting offices. Tax effects on a specific economic sector cannot be determined precisely, whether in total or by category, since taxes are levied by various institutions and collected by different authorities. However, a methodological tool such as the Tourism Satellite Account (TSA) can help reveal information on expected taxes. Without a complete and systematic estimate of an activity's economic contribution, governments cannot have a full picture in order to evaluate an effective legislative and economic frame of the specific activity. The incentive of governments and the objectives of legislative and developmental intervention are the inflow of foreign exchange and growth of employment. This would occur through the increase of the Greek Maritime Tourism's share from the total product of the (Eastern) Mediterranean market.

An effective policy requires the estimation of the value added for each tourist activity, including maritime tourism. This estimation includes the output that the activities add to the economy and includes employees' compensation, the operating surplus, the gross profit of enterprises, the public revenues derived from *taxes on products* and the *taxes on production: other*.

The ability to measure public income that should be collected from maritime tourism, both in total and by category (taxes, dues etc.), is an important tool for the Greek government, although it has not yet implemented a Tourism Satellite Account. Recognising the need for such a tool, a consortium of three private companies took on the development of a Greek Tourism Satellite Account and delivered the supporting software in 2008. The project has not been set in function up to present.

The methodology and the outcomes of the research are important for the government, especially since Greece now faces enormous public finance problems.

Deficits of the Greek economy would have definitely been much smaller if the government had been able to collect all budget taxes, and Greece would not be incurring a serious debt problem today. The greatest cost of tax evasion is the deprival of income which prevents the government from providing a welfare state (Meghir et al., 2010, p. 11).

Research can contribute in order to detect tax evasion in specific activities as well as in the tax categories in which it takes place. The major contribution of this paper to policy-makers, government and businesses is the introduction of a modified TSA table for maritime tourism.

3. Methodology

Techniques such as input–output analysis commonly used to estimate the economic impact of changes in tourism expenditures have serious limitations. As a result, alternative techniques have been developed (Dwyer et al., 2004). Although based on similar types of data and assumptions, computable general equilibrium (CGE) models are designed to relax some of the constraints inherent in input-output models, especially price variation constraints. With these types of models, the “supply and use” tables compiled for a given year represent a balance among the different variables of the system. Unlike input-output models, whose form, operation, data requirements and interpretation are widely known and agreed upon, CGE models vary in the data required, assumptions and structure. Many are proprietary and not intended for public evaluation or use, making them unsuitable for international comparisons. (UNS, WTO, CEC, OECD, 2008).

Globally there has been progress in the production of Tourism Satellite Accounts (TSAs) for consistent accounting of tourism activity that can be set alongside national income accounts (Jones and Munday, 2007). The TSA thus becomes a mainstream functional component of tourism development and policy analysis (Sharma and Olsen, 2005).

The “*Tourism Satellite Account: Recommended Methodological Framework 2008*” version is basically an update of the former “*TSA:RFM 2000*” that takes into account the new 2008 *International Recommendations on Tourism Statistics* (UNS, WTO, CEC, OECD, 2008, p. 8). The updated TSA tables are formally similar to those of the TSA: RMF 2000, but their content has been clarified, and the presentation has been improved (UNS, WTO, CEC, OECD, 2008, p. 43). The main differences between the 2000 TSA: RMF and the updated *TSA:RFM 2008* document basically refer to the clarification of the concepts of tourism expenditure and tourism consumption, that of the treatment of goods acquired by visitors, etc (UNS, WTO, CEC, OECD, 2008, p. 9).

TSA:RFM 2008 presents “taxes less subsidies on products nationally produced and imported” for each tourism industry, but government tax revenue is not broken out (UNS, WTO, CEC, OECD, 2008, pp. 41-44 and pp. 61-62).

The TSA tables of the TSA: RMF 2000 assess the yield of tax revenues from tourism. Therefore, public revenues can be measured and policymakers can judge the level of taxes dependent upon tourism activity in order to identify other features like the “balance of tourism trade” (DCMS, 2004, p. 16).

TSAs bring together the supply and demand of tourism commodities. The Organization for Economic Cooperation and Development’s guidelines are flexible enough to let countries capture the specifics of their tourism industry at the national level. At the same time, they provide a framework which is sufficiently robust for international comparisons of a country’s tourism sectors (UNS, WTO, CEC, OECD, 2008; OECD, 2000). The two main categories of public revenues derived from tourism are “tourism net taxes on products” and “tourism taxes less subsidies on production: other”. These categories do not appear in the final TSA methodological framework of 2008, but they can be measured

in the TSA 2000 tables. Therefore, the required calculations derive from the TSA tables of the TSA framework of 2000.

Taxes less subsidies on products are taxes on accommodation services, excise taxes, and retail or wholesale taxes paid by visitors who are not part of the output of the tourism industries generated by tourism demand. They are calculated by apportioning to each commodity the proportionate tax rate(s).

Taxes less subsidies on production: other are taxes on land and payroll taxes paid by an industry as a result of its production. They are calculated by decomposition of an industry's value added at basic prices, into compensation of employees, gross operating surplus and *taxes less subsidies on production: other*. Total taxes less subsidies on production resulting from tourism demand can be measured by adding the two above mentioned tax categories.

The derivation of tourism value added (TVA) is central to the development of a TSA. Value added tax (VAT) is shown in separate columns of the TSA tables. Subtracting TVA from total economy output at purchase prices results in net taxes on products of the accounts reported at basic values. The typical tourism industries, along with all other commodities having a tourism element, are shown in the TSA tables. Consequently, public revenues by category, that is, the VAT of characteristic industries, VAT of all other commodities purchased on board and in ports of call, net taxes on production (by type of visitor) can be shown in the TSA tables. The tax rates for various industries are available in the tax legislation in effect.

The following formula indicates how the basic information assembled to construct a TSA can be used to derive TVA (OECD, 2000, p. 97).

The TVA assessment results from the equation:

$$TVA = TCE + TGOS + GMI + TTPO \quad (1)$$

where:

TCE = Tourism Compensation of Employees.

TGOS = Tourism Gross Operating Surplus.

GMI = Gross Mixed Income

TTPO = Tourism Taxes Less Subsidies on Production: Other.

Therefore, having evaluated the TVA from the TSA tables, and the two components, TCE and TGOS, will allow the **Tourism Taxes less subsidies on Production: Other** estimation.

The requirement for supply and use to be equal requires converting supply's basic values to purchase prices in which consumption is valued, showing tourism net taxes on production.

Total Supply (Domestic Production + Imported Production) at basic prices +
Net Taxes on Production + VAT + Trade & Transport Margins. = Total Supply
at Purchaser's Prices = Total Consumption at Purchaser's Prices

Total Production at Purchase Prices – Net Taxes on Production – VAT- Trade &
Transport Margins = Total Supply at Basic Prices

Total Consumption at basic values * Domestic Production percentage =
Supply of Domestic Products at basic values = Domestic Consumption at basic prices

$$\left\{ \left[\frac{TP_{pp} - NTP}{(1 + VAT)} \right] / (1 + TTM) \right\} * DP = SDP_{bv} \quad (2)$$

TP_{pp} = Total Production at Purchaser's Prices

NTP = Net Taxes on Production

VAT = VAT rate

TTM = Trade and Transport Margins

DP = Domestic Production Percentage

SDP_{bv} = Supply of Domestic Products at basic prices

Using a similar calculation, the imported supply consumed by maritime tourists can be estimated as follows:

$$\left\{ \left[\frac{SI_{pp} - NTP}{(1 + VAT)} \right] / (1 + TTM) \right\} * IP = SI_{bv} \quad (3)$$

SI_{pp} = Supply Imported at purchaser's prices

IP = Imported Production percentage

SI_{bv} = Supply Imported at basic prices

Through the following calculations VAT and Taxes on Production are derived:

$$TS_{pp} = SDP_{bv} + SI_{bv} + NTP_{(SDP + SI)} + VAT_{(SDP + SI)} + TTM_{(SDP + SI)} \quad (4)$$

TS_{pp} = Total Supply at basic prices

SDP_{bv} = Supply of Domestic Products at basic prices

SI_{bv} = Supply of Imported Products at basic prices

$NTP_{(SDP + SI)}$ = Net Taxes on Production

$$\text{(of Domestic and Imported Supply)} = TS_{pp} * NTP_{rates} \quad (5)$$

$VAT_{(SDP + SI)}$ = Value Added Tax (of Domestic and Imported Supply)

$$= [SDP_{bv} + SI_{bv} + NTP_{(SDP + SI)} + TTM_{(SDP + SI)}] * VAT_{rate} \quad (6)$$

3.1 Empirical framework and data collection

The literature review includes empirical studies and academic papers on the maritime industry in general and the economic impacts in particular. The research falls into the following two main categories:

- (i) papers investigating the contribution of the sector to the national and local economy (Mescon & Vozikis, 1985; Dwyer & Forsyth, 1996, 1998; Dwyer et al., 2004; Vina & Ford, 1998; BREAA, 2001, 2002, 2003, 2004, 2005; Frechtling, 2006 and 2009; Diakomihalis and Lagos, 2008).
- (ii) papers focusing on Greek maritime tourism (Lekakou et al., 2005; Diakomihalis, 2007, Diakomihalis and Lagos, 2008).

The TSA is predominantly an accounting system, taking variables from a country's national economic accounts. Except for estimates of visitor expenditure and consumption derived from survey, and the proportion of value added attributable to those variables, the TSA uses accounting identities rather than assumed equations to develop its estimates. (Frechtling and Libreros, 2000; Frechtling, 2006; Frechtling, 2009). Unlike some modeling methods, the TSA definitions, standards and methodologies are detailed exhaustively and are strictly consistent with the concepts, definitions and classifications approved for basic tourism statistics. (UN and WTO, 2008; UNS, WTO, CEC, OECD, 2008). Therefore, data concerning visitor expenditure and consumption were collected from various sources, since there is not a single authority or database for the maritime tourism sector. All available pertinent data have been collected and included in the process of completing the TSA tables. The inadequacy or ambiguity of certain registered data led us to conduct primary research in published financial statements on the kind and amount of taxes included in enterprise income. Since cruising, yachting and coastal tourist shipping are not discrete activities, but a combination of other sectors, the overall estimation and evaluation of the sector demanded data from different but related governmental sources and professional associations.

Major statistical data for all three branches of maritime tourism concerning the number of tourists who purchased a cruise or a yacht tour, or the number of tourists who purchased a daily sea tour, the number of calls of cruise ships in Greek ports, the total yacht charters, the number of tourist day-ships etc., were collected from the Mercantile Marine Ministry (MMM), the Marine Pension Fund, the Port Authorities, the ships, the National Statistical Service of Greece (NSSG), and the Greek Tourist Organization (GTO).

The majority of data concerning cruising came from the Union of Passenger Ships Owners (U.P.S.O), the Piraeus Port Authority and the Hellenic Coast Guard. We obtained information also from interviews with key players in the sector, such as members of P.S.F (Pan-Hellenic Seamen's Federation), the Ships Public Revenue Office, and the Ministry of Mercantile Marine as well as with executives of cruise, yachting and day ship companies. The empirical research for cruising on taxes accrued was based on statistical and financial data from the sector as well as on passenger use of seven cruise companies: Louis Hellenic Cruises, Golden Star Cruises, Festival Cruises, Royal Olympic Cruises, Dolphin Hellas Shipping, Lindos Maritime, and Helios Shipping.

Foreign cruise companies are exempted from VAT in Greece, according to the 89/67 law. Greek companies also are VAT-exempted in all of their transactions, provided that they approach a harbour out of the Schengen Treaty (1156/97 Act). All cruise programs include the call to at least one port out of the Schengen Treaty in order to ensure VAT tax exemption

for the total of the cruise. All the goods and services offered on cruise ships are also VAT-exempted. The other goods and services in the tourist package, including transfers, travel agents, organizer margins, hotels, and health spas are VAT-imposed.

The cruise itself constitutes an indivisible package which includes accommodations, full board, recreation on board and, of course, the voyage to various ports of call. It may include services such as sightseeing tours and be part of a tourist package with transfers (by air or land) from (and to) the place of residence to (and from) the port of embarkation, hotel accommodations before and after embarkation, etc. Air transfers pertain to foreign clients and are part of a package offered by tourist agents from the client's country of origin.

Data on yachting come from professional associations through personal and telephone interviews: the Hellenic Professional Yacht Owners Association (HPYOA), the Greek Professional Yacht Owners Bareboat Association (GPYOBA), the Hellenic Yacht Brokers Association (HYBA), and the Panhellenic Professional Association of Skippers (PPAS). We also used questionnaires.

The primary research concerns the statistical and economic elements of yachting enterprises and the tourists who use their products, including:

- A sample of 47.3 percent of the total of 3,600 professional sailing boats (bareboat and manned yachts).
- Interviews with 11 owners of yachting companies, eight marine managers, 18 executives of chartering bases and 31 skippers.

To estimate and structure yachting tourist use in the destination ports, we used questionnaires and interviews covering a sample of 376 tourists.

Freighting and imputed freighting of yachting are VAT-imposed, in the low factor (8 percent until 2005), discounted by 50 percent. The other products that compose the tourist package of private marine tours are charged according to the VAT factors in effect (9% or 19%). The components of a private tourist package, apart from the chartering of the vessel, include transfers (usually by land), hotel accommodations and the vessel. Tourist packages which include air transfers and hotel accommodations are offered to clients from Europe and the US. The chartering of a sailing boat may or may not include crew. Extra services in a tourist package may consist of transfers by bus, limousine or taxi, hotel accommodations before and after the charter, purchase or rental of a mobile phone, scheduled sightseeing tours, and car rental.

Data for coastal tourist shipping come from the financial statements of the sector's enterprises that are part of the Pan-Hellenic Union of Tourist Day-Ships (PUTDS). We sampled 161 shipping companies out of a total of 600 (26.7%) to calculate time of employment, number of passengers, and income and expenses per category. We collected additional information on the economic elements of the daily ships, including the prices of sea excursions, additional expenditure of passengers for consumption on the boats, and the cost of fuel and maintenance. To estimate and structure coastal tourist shipping tourist consumption in the destination ports, we used questionnaires and interviews covering a sample of 1,457 tourists.

The daily sea cruises offered by coastal tourist shipping bear a low VAT factor, while all other products in the tourist package of the daily cruise belong some to low and some to high VAT factors. All other goods and services purchased by consumers onboard or at the ports of destinations are subject to VAT factors in effect. VAT is based on supply in basic prices plus net taxes on products (domestic and imported) plus net taxes on production: other, plus retail, wholesale and transport margins. Coastal tourist shipping packages come in the form of daily sea excursions (cruises) organised and sold by entrepreneurs (ship owners). They are separate from maritime transfers, including board, land transfers, sight-seeing tours, guided tours, picnics, beach parties, etc. The transfer activity of the day vessels constitutes part of a tourist package organised and sold by tourist agents.

4. Results

Tables 3, 4 and 5 show the supply by tourism and other industries to meet tourism demand by different types of visitors on a net basis and at current prices for each activity.

Table 3: Cruising: Supply by tourism and other industries to meet tourism demand by different types of visitors: net basis* current prices (in million €)

	1	2	3	4	5	6
<i>Characteristic commodities</i>	Total domestic Supply	Tourism consumption				Total tourism demand
		Non-residents	Residents			(2+3+4+5)
Output (at basic prices)			Households	Business	Government	
Cruising:	489.38	450.23	39.15	0.00	0.00	489.38
Transfer (Transport: Bus. Taxi Air, Water)	0.18	0.17	0.01	0.00	0.00	0.18
Travel Agents/Organizers Margins	5.24	4.82	0.42	0.00	0.00	5.24
Hotels - Health spas	1.26	1.16	0.10	0.00	0.00	1.26
Total Output of Characteristic Maritime Tourism Commodities	496.06	456.38	39.69	0.00	0.00	496.06
<i>Other</i>	-	-	-	-	-	-
Total Output at Basic Prices	735.50	672.04	58.44	5.02	0.00	735.50
VAT of characteristic industries (package tour)	10.02	9.22	0.80	0.00	0.00	10.02
VAT (of all other commodities purchased on board)	0.09	0.08	0.01	0.00	0.00	0.09
VAT (of all other commodities purchased in ports of call)	20.81	19.15	1.66	0.00	0.00	20.81
TOTAL VAT	30.92	28.45	2.47	0.00	0.00	30.92
Net Taxes on Production	49.71	45.74	3.98	0.00	0.00	49.71
Total	816.14	746.23	64.89	5.02	0.00	816.14
Net Taxes on Production: Other	4.15					

*Net Treatment of Package tours

Table 4: Yachting: Supply by characteristic tourism and other industries to meet tourism demand by different types of visitors: net basis* Current prices (in million €)

	1	2	3	4	5	6
	Total domestic Supply	Tourism consumption				Total tourism demand
Output (at basic Prices)		Non-residents	Residents			(2+3+4+5)
<i>Characteristic commodities</i>			Households	Business	Government	
Yachting Chartering Revenues:	136.07	131.99	4.08	0.00	0.00	136.07
Yachting Imputed Revenues:	1.12		1.12	0.00	0.00	1.12
Transfer (Transport: Bus, Taxi)	7.59	7.36	0.23	0.00	0.00	7.59
Travel Agents/Organizers Margins	15.36	14.90	0.46	0.00	0.00	15.36
Hotels - Health spas	2.96	2.87	0.09	0.00	0.00	2.96
Single purpose consumer durables	1.32	1.28	0.04	0.00	0.00	1.32
Total Output of Characteristic Marine Tourism Commodities	164.41	158.40	6.01	0.00	0.00	164.41
<i>Other</i>	-	-	-	-	-	-
Total Output at Basic Prices	302.48	289.31	10.06	3.11	0.00	302.48
VAT (of characteristic industries)*	13.51	13.06	0.45	0.00	0.00	13.51
VAT (all other industries)	19.72	19.13	0.59	0.00	0.00	19.72
TOTAL VAT	33.23	32.19	1.04	0.00	0.00	33.23
Net Taxes on Production	24.73	23.99	0.74	0.00	0.00	24.73
Total	360.44	345.49	11.84	3.11	0.00	360.44
Net Taxes on Production: Other	11.05					

* Net Treatment of Package tours

**Table 5: Coastal Tourist Shipping: Supply by characteristic tourism and other industries to meet tourism demand by different types of visitors: net basis*
Current prices (in million €)**

	1	2	3	4	5	6
	Total domestic Supply	Tourism consumption				Total tourism demand
Output (at basic Prices)		Non-residents	Residents			(2+3+4+5)
<i>Characteristic commodities</i>			Households	Business	Government	
Coastal Tourist Shipping	49.21	44.29	4.92	0.00	0.00	49.21
Meals (Picnic, Beach-party)	3.55	3.20	0.36	0.00	0.00	3.55
Transfer (Transport: Bus, Taxi)	4.81	4.33	0.48	0.00	0.00	4.81
Travel Agents/ Organizers Margins	7.08	6.37	0.71	0.00	0.00	7.08
Food and Beverages	2.38	2.14	0.24	0.00	0.00	2.38
Retail, Wholesale and Transport Margins	0.96	0.75	0.08	0.12	0.00	0.96
Total Output of Characteristic Maritime Tourism Commodities	67.99	61.08	6.79	0.12	0.00	67.99
<i>Other</i>	-	-	-	-	-	-
Total Output at Basic Prices	143.74	128.07	14.23	1.44	0.00	143.74
VAT (of characteristic industries)	6.18	5.57	0.62	0.00	0.00	6.18
VAT (of all other industries)	10.25	9.22	1.02	0.00	0.00	10.25
TOTAL VAT	16.43	14.79	1.64	0.00	0.00	16.43
Net Taxes on Production	12.92	11.62	1.29	0.00	0.00	12.92
Total	173.09	154.49	17.17	1.44		173.09
Net Taxes on Production: Other	0.65					

* Net Treatment of Package tours

The results from the elaboration of the above TSA Tables are presented in the following Table 6.

Table 6: Public Revenues (VAT, net taxes on production and net taxes on production: other) (in million €)

Characteristic Maritime Tourism Industry	VAT			Net Taxes on Production of Maritime Industries			Net Taxes on Production of all Other Industries			Net Taxes on Production: Other	Total Public Revenues by Industry
	Non Residents	Households	Total	Non Residents	Households	Total	Non Residents	Households	Total		
Cruising:	28.45	2.47	30.92	20.48	1.78	22.26	25.26	2.19	27.45	4.15	84.79
Yachting	32.19	1.04	33.23	0.00	0.00	0.00	23.99	0.74	24.73	11.05	69.01
Coastal Tourist Shipping	14.79	1.64	16.43	2.16	0.24	2.40	9.46	1.06	10.52	0.65	30.00
TOTAL	75.43	5.15	80.58	22.64	2.02	24.66	58.71	3.99	62.70	15.85	183.79

The segmentation of taxes derived from each activity of maritime tourism is as follows:

- 1) **Cruises** generate the highest percentage, **46.12 percent** of *total tax income* of the maritime tourism industry. In the categories of tax income origin per activity, cruises rank second (30.92 million €) in *VAT* due to the exemption from VAT in the price of cruising. In revenues derived from *net taxes on production of maritime industries*, cruises provide the overwhelming percentage, at 90.27 percent, mainly because of the high Port Authority dues and port taxes. The attendance *net taxes on production of all other industries*, of the cruise sector is 43.80 percent (27.45 million €). Cruises are in second place with 26.18 percent (4.15 million €) in the *net taxes on production: other* category of income.
- 2) **Yachting** generates **37.55 percent** of *total tax income*. It ranks first in *VAT* with 33.23 million €. Yachting presents zero attendance in *net taxes on production of maritime industries*. It ranks second in *net taxes on production of all other industries* with 39.44 percent (24.73 million €). Yachting provides a considerably higher percentage, 69.72 percent, in the *net taxes on production: other* category of income because of the ongoing dues for mooring and sheltering yachts in marinas or other harbours (11.05 million €).

- 3) **Coastal tourist shipping** ranks in third place with **16.32 percent** of total tax income. The total VAT generated by Coastal tourist shipping is roughly half the contribution of the two other activities (16.43 million €). 9.37 percent of *net taxes on production of maritime industries* is attributed to coastal tourist shipping. Coastal tourist shipping is in third place in *net taxes on production of all other industries* with attendance at 16.80 percent. Coastal tourist shipping is in last place with 4.1 percent in the *net taxes on production: other* category of income with 0.65 million €.

The contribution of maritime tourism tax revenues is presented in Table 7.

Table 7: Public Revenues (taxes)

ALL MARITIME TOURISM ACTIVITIES	CONTRIBUTION TO THE TOTAL NATIONAL ECONOMY			0,41%
MARITIME TOURISM ACTIVITIES				
TAXES SEGMENTATION OF EACH ACTIVITY	Cruising	Yachting	Coastal Tourist Shipping	Total
PUBLIC REVENUES (TAXES)	46,13%	37,55%	16,32%	100,00%
PUBLIC REVENUES TO TOTAL TOURISM CONSUMPTION	9,49%	17,27%	16,61%	12,47%

Public revenues from each maritime tourism activity and by tax category are presented in Table 8.

Table 8: Net Taxes and VAT contribution by activity

Cruising	Net taxes on production (products)	VAT	Net taxes on production (products) +VAT	Net taxes on production (products)	VAT	Net taxes on production (products) +VAT
	/ Domestic output			/ Total supply		
Cruising	4,55%	0,00%	4,55%	4,35%	0,00%	4,35%
Package tour	5,05%	2,02%	7,07%	4,33%	1,73%	6,06%
All other commodities purchased by visitors	10,31%	8,73%	19,04%	7,83%	6,63%	14,46%
Total sector economy	6,76%	4,20%	10,96%	5,56%	3,46%	9,02%
	/ Domestic output			/ Total supply		
Yachting	Net taxes on production (products)	VAT	Net taxes on production (products) +VAT	Net taxes on production (products)	VAT	Net taxes on production (products) +VAT
	/ Domestic output			/ Total supply		
Yachting	0,00%	4,00%	4,00%	0,00%	3,84%	3,84%
Package tour	2,21%	8,22%	10,43%	1,78%	6,60%	8,38%
All other commodities purchased by visitors	15,27%	14,28%	29,56%	10,81%	10,11%	20,93%
Total sector economy	8,18%	10,99%	19,16%	6,19%	8,32%	14,50%
	/ Domestic output			/ Total supply		
Coastal Tourist Shipping	Net taxes on production (products)	VAT	Net taxes on production (products) +VAT	Net taxes on production (products)	VAT	Net taxes on production (products) +VAT
	/ Domestic output			/ Total supply		
Coastal Tourist Shipping	4,88%	7,50%	12,38%	4,34%	6,67%	11,01%
Package tour	6,69%	9,09%	15,78%	5,74%	7,79%	13,53%
All other commodities purchased by visitors	11,05%	13,53%	24,58%	8,26%	10,12%	18,38%
Total sector economy	8,99%	11,43%	20,42%	7,15%	9,10%	16,25%

6. Conclusion

This research aims to provide government authorities with an easy and reliable calculation of public income resulting from maritime tourism in Greece. The taxes and the dues per category and per activity that should have been collected are displayed in the tables. The research outcome constitutes a useful tool for tourism and taxation policy involving VAT and other taxes for the maritime tourism sector. Comparing the results of taxes owed with actual collected tax revenues reveals possible tax evasion or laxity in collecting taxes.

The figures of maritime tourism tax revenues, shown in Table 7, confirm the prevailing opinion that “taxing tourism is relatively less politically conflicting since tourists are not taxpayers (Gooroochurn, 2004, p. 2) and they are rarely voters in the destination country they visit” (Gooroochurn and Sinclair, 2005, p. 479).

Policy-makers would benefit from an in-depth analysis of public revenues from each maritime activity and by tax category, as shown in Table 8. The findings presented in Table 8 indicate the proportion of net taxes on products and VAT on domestic and total output analytically for each activity.

Although the quantitative contribution of the three activities to public income puts cruises in first place and coastal tourist shipping in last place, a fact attributed to the gap in the activities’ gross income, the comparison on the basis of domestic production and of total supply puts coastal tourist shipping in first place and cruises in last.

The ability to estimate taxes accrued from an economic sector also affects the power of enterprises to negotiate, which can call upon the government’s contribution to the arrangement of their problems, such as infrastructure works via the levies attributed to the government. Additionally, in times of recession, in order to become more competitive, the government can pursue a reduction of cost via the reduction of taxes.

Gooroochurn and Sinclair (2005, p. 479), in their research on tourism taxation, claim that “taxes can be both inefficient and inequitable, if not set at optimal welfare maximizing levels, and may lead to retaliation by other countries”. Therefore, the precise estimation of public income from tax imposition provides a useful tool for the state budget.

The research findings and their implications for the Greek economy form solid ground for the exercise of policy via legislative regulations and fiscal intervention. Maritime tourism is a global market with supply and demand aspects. Effective fiscal policy can increase competitiveness, public income, employment and investments as well as other benefits.

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The Causality between Government Revenue and Government Expenditure in Iran

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Abstract

The causal relationship between government revenue and government expenditure is an important subject in public economics especially to the control of budget deficit. The purpose of this study is to investigate the relationship between government revenue and government expenditure in Iran by applying the bounds testing approach to cointegration. The results of the causality test show that there is a bidirectional causal relationship between government expenditure and revenues in both long run and short run. Therefore, the results of this paper are consistent with fiscal synchronization hypothesis. The policy implication of results suggests that because of existing interdependence relation between government expenditure and revenue, the government makes its expenditures and revenues decision simultaneously. Under this hypothesis, the fiscal authorities of Iran should try to increase revenues and decrease expenditure simultaneously to control the budget deficits.

Keywords: Government revenue/expenditure, Bounds testing approach, Granger Causality, ARDL

JEL classification: C22, H10, H50

1. Introduction

The subject of causal relation between government revenue and expenditure has important implications for the political economy of fiscal policies in the field of public finance. Furthermore, budget deficits have been widely discussed in the literature of public finance. Understanding the behaviour of budget deficits for all economies has been a continuing to develop research agenda and it is important from a policy point of view, especially for a country like Iran, which is suffering from persistent budget deficits. In addition, this discussion is vital, since it corroborates the size of government and the

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structure of taxation and expenditure themselves. In which, the size of government in Iran is important issue in a few years.

Direction of causal relationship between revenue and expenditure and its implication in order to budget deficit has not been empirically resolved. Four alternative hypotheses have been used to describe the relationship between these variables in the budgetary process: (I) the tax-and-spend hypothesis, (II) the spend-and-tax hypothesis, (III) the fiscal synchronization hypothesis, and (IV) the fiscal neutrality hypothesis or institutional separation hypothesis. Over the last four decades, different studies have focused on different countries, time periods, proxy variables and different econometric methodologies to investigate the relationship between government revenues and expenditures. The empirical outcomes of these studies have been varied and sometimes found to be conflicting results. The results seem to be different on the direction of causality. The policy implications of these relationships can be significant depending upon what kind of causal relationship exists between variables.

The aim of this paper is to investigate the relationship between government revenue and expenditure in the Iranian economy. This paper tests whether government revenue causes government expenditure or whether the causality runs from government expenditure to government revenue, and if there is bidirectional causality. In investigating the government revenue and expenditure nexus, this study differs from existing studies because this study uses real per capita variables including real per capita government expenditure/ revenue and real per capita GDP.

The structure of the paper proceeds as follows: In the next section, the overview of the theoretical and empirical literature for analyzing the government revenue and government expenditure relationship is explained. The data and methodologies are explained in section 3. In section 4, the empirical results are discussed. In the final section concluding remarks and some policy implications are provided.

2. Literature Review

In this section, first theoretical literature is reviewed; thereafter the selected empirical studies in developed and developing countries have been presented. From point of view of theoretical studies, there are essentially four schools of thought on the direction of causation between government expenditure and revenue or variables in the budgetary process.

The first school known as *tax -and- spend* school, proposed by Friedman (1978) and Buchanan and Wagner (1978). Friedman (1978) argues that there is a positive causal relationship between government revenue and expenditure. While, Buchanan and Wagner (1978) stated that the causal relationship is negative. According to Friedman, increasing taxes will simply lead to more spending. Therefore, decreasing taxes is the appropriate remedy to budget deficits (Keho, 2010; Moalusi, 2004). On the contrary, Buchanan and Wagner (1978) propose an increase in taxes revenue as remedy for deficit budgets. Their point of view is that with a decline in taxes the public will perceive that the cost of government programs has fallen.

The second school known as *spend-and-tax* school has been proposed by Peacock and Wiseman (1961; 1979). This school advocated that expenditure cause revenue, suggesting that first governments spend and then increase tax revenues as necessary to finance expenditures. The spend-and-tax hypothesis is valid when spending hikes created by some special events such as critical situations, that governments necessitate increasing taxes. As higher spending now will, lead to higher tax later, this hypothesis suggests that spending decreases are the desired solution to reducing budget deficits.

As the third school, *fiscal synchronization* hypothesis argues that governments may concurrently change expenditure and taxes, (Meltzer and Richard, 1981; Musgrave, 1966). This implies bidirectional causality between government expenditure and revenue. In addition, governments take decisions about revenues and expenditures simultaneously.

A fourth hypothesis introduced by Baghestani and McNown (1994) relates to the institutional separation of the expenditure and taxation decisions government. This perspective suggests that revenues and expenditures are independent of one another. This school is known *fiscal neutrality* school or institutional separation hypothesis.

The causality relationship between government revenue and government expenditure has important for policy implications, as explained earlier. Hence, there are numerous studies dealing with the causal relation between the government revenue and expenditure around the *world*. We provide lists of the empirical literature on the causality between government revenue and expenditure by authors, periods, countries, methodologies and empirical results in Table 1 and 2.

As it can be seen from the brief review of the findings, the evidence on the direction of causality is mixed. These variety results arise due to the different data set, alternative econometric methodologies and different countries' characteristics. Despite the fact that the *relationship* between government revenue and government expenditure is important to evaluate how to address fiscal imbalances, empirical research on this issue in Iran is scarce as there has been no published research in the case of Iran, which authors are aware. Nevertheless, the acceptance of any hypothesis depends on its credible explanation of the economic existence across countries with different economic structures, structural of governments and political systems.

In the case of Iran, government expenditure is financed mostly through oil exports revenues that accounted for about 60% of total government revenues in past four decades (CBI, 2010). In this study, our goal is to examine the relationship and causality between government expenditure and government revenue for Iran. Testing the empirical relationship *between* government revenues and expenditures is a substantial step in understanding the future path of the budget deficit. To pursuing this aim, we use the bounds testing approach to cointegration advocated by Pesaran et al. (2001) or existence of a long-run relationship among these variables and error correction models to causality tests. However GDP per capita include in the model is a control variable. Chang and Chiang (2009) argue that this approach allows us to distinguish between the direct causality relation between revenues and expenditures and the indirect causality effects via GDP. This study estimated two models one with GDP per capita and one without GDP per capita.

Table 1: Summary of empirical studies on government revenue–expenditure nexus for country-specific studies

Authors	Countries studied and period	Method	Empirical Results
Von Furstenberg et al. (1986)	USA (Quarterly Data 1954-1982)	VAR	GE → GR
Anderson et al. (1986)	USA (1946-1983)	VAR	GE → GR
Manage and Marlow (1986)	USA (1929-1982)	VAR	GR → GE
Baghestani and McNow (1994)	USA (Quarterly Data 1955-1989)	ECM	GR --- GE
Darrat (1998)	Turkey (1967-1994)	EG and Johansen (1988) Cointegration test, ECM	GR → GE
Li (2001)	China (1950-1997)	ECM	GR ↔ GE
AbuAI-Foul and Baghestani (2004)	Egypt (1977-1998), Jordan (1975-2001)	VAR, ECM	GR → GE (Egypt) GR ↔ GE (Jordan)
Al-Qudair(2005)	Saudi Arabia (1964-2001)	EG and Johansen Cointegration test, ECM	GR ↔ GE
Carneiro et al. (2005)	Guinea-Bissau (1981-2002)	Granger causality test and ECM	GE → GR
Nyamongo et al. (2007)	South Africa (monthly data, Oct. 1994 -June 2004)	Seasonal Unit Roots, Johanson Cointegration and VECM For Causality	GR ↔ GE in long-run GR --- GE in short-run
Gounder et al. (2007)	Fiji Islands (1968-2003)	Johansen test for cointegration and Granger causality	GR ↔ GE
Eita & Mbazima (2008)	Namibia (1977 - 2007)	VAR , Johansen (1988; 1995) and Granger causality test	GR → GE
Wahid (2008)	Turkey (1975 – 2003)	Granger causality (1969)	GE → GR
Chaudhuri &Sengupta (2009)	4 southern states in India (1980-2005)	ECM and Granger Causality Test	GR → GE: Karnataka GR ↔ GE: Andhra Pradesh and Kerala GR--- GE: Tamil Nadu
Aslan and Taşdemir (2009)	Turkey (1950-2007)	EG & GH Cointegration test, Granger-Causality Test	GR ↔ GE

Source: Authors compilation

Notes:

1. GE → GR: means that the causality runs from government expenditure to government revenue (spend and tax hypothesis).
2. GR → GE: means that the causality runs from government revenue to government expenditure (tax and spend hypothesis).
3. GR ↔ GE: means that the bidirectional causality between government revenue and government expenditure (Fiscal synchronization hypothesis).
4. GR --- GE: means that no causality exists between government revenue and government expenditure (fiscal neutrality hypothesis).
5. Abbreviations are defined as follows: VAR=Vector Autoregressive Model, VEC=Vector Error Correction Model, ARDL=Auto Regressive Distributed Lag, ECM=Error Correction Model, GDP=Real Gross Domestic Product, EG: Engle-Granger cointegration test & GH: Gregory-Hansen Cointegration test.

Table 2: Summary of empirical studies on government revenue–expenditure nexus for multi-country studies

Authors	Countries studied	Method	Empirical Results
Payne (1998)	48 states USA (1942-1992)	EG for Cointegration, ECM	GR → GE: twenty-four states GE → GR: eight states, GR ↔ GE: eleven states five remain states failed the diagnostic tests for ECM
Cheng (1999)	8 Latin American countries	Hsiao's Granger Causality Method	GR → GE: Columbia, the Dominican Republic, Honduras and Paraguay GR ↔ GE: Chile, Panama, Brazil and Peru
Fasano and Wang (2002)	6 GCC Countries	Johanson cointegration test, ECM	GR → GE
Chang et al. (2002)	10 Countries (1951 to 1996)	Johansen(1988), Johansen and Juselius (1990), Granger causality	GR → GE: Japan, South Korea, Taiwan, UK, USA GE → GR: Australia and South Africa GR ↔ GE: Canada, GR --- GE: New Zealand and Thailand
Narayan (2005)	9 Asian countries	ARDL bounds testing approach, VECM	GR → GE: Indonesia (1969–1999), Singapore, Sri Lanka (1960–2000) in the short-run and for Nepal (1960–1996) in both the short- and long-run GE → GR: Indonesia and Sri Lanka GR --- GE: India (1960–2000), Malaysia (1960–1996), Pakistan (1960–2000), Philippines (1960–2000), Thailand (1960–2000), Singapore (1963–1995)
Narayan and Narayan (2006)	12 developing countries	Toda and Yamamoto (1995) causality test	GR → GE: Chile (1973-1996), El Salvador (1954-1996), Mauritius (1966-2000), Paraguay (1958-1993) and Venezuela (1950-1996) GR ↔ GE: Haiti (1967-1997) GR --- GE: Ecuador (1950-1996), Guatemala (1958-1996), Guyana (1961-1996), Peru (1970-2000), South Africa (1960-2000) and Uruguay (1969-1996)
Wolde-Rufael (2008)	13 African countries	Toda and Yamamoto (1995) causality test	GR → GE: Ethiopia (1964–2003), Ghana (1965–1998), Kenya (1970–2004), Nigeria (1969–2003), Mali (1976–2003) and Zambia (1964–1999) GE → GR: Burkina Faso (1973–2003) GR ↔ GE: Mauritius (1966–2003), Swaziland (1971–2003) and Zimbabwe (1976–1997) GR--- GE: Botswana (1971–2003), Burundi (1967– 2003) & Rwanda(1968–2002)
Afonso and Rault (2009)	25 European countries (1960-2006)	Bootstrap Panel Analysis	GR → GE: Germany, Belgium, Austria, Finland, UK, and for several EU New Member GE → GR: Italy, France, Spain, Greece, and Portugal
Chang and Chiang (2009)	15 OECD countries (1992-2006)	Panel Cointegration and Granger Causality	GR ↔ GE

Source: Authors compilation

Note: See notes in Table 1.

3. Data and Methodology

3.1 Data

This study uses annual time series data and covers the period 1963 to 2007. We select these period because time series data on government revenue and government expenditure are only available for this period. The data are obtained from Central Bank of Iran. Total government revenue, total government expenditure and GDP in the real and per capita form are the three variables used in the estimation. The logarithm of the real government expenditures and revenues per capita and GDP per capita are used in the empirical analysis. The transformation of the series to logarithms is intended to eliminate the problem of heteroskedasticity.

3.2 Methodology¹

To examine the long-run relationship between government revenue and government expenditure, we employ the bounds testing approach to cointegration, proposed by Pesaran et al. (2001). In what follows, we give a brief account of the bounds testing approach. By defining a *vector* of three variables, z_t where $z_t = (GE_t, GR_t, GDP_t)$, GE_t is the dependent variable, GR_t and GDP_t are two independent variables, we can implement the bounds test in the form of a conditional error correction model (CECM) as follows:

$$\begin{aligned} \Delta GE_t = & \beta_0 + \delta_1 GE_{t-1} + \delta_2 GR_{t-1} + \delta_3 GDP_{t-1} + \sum_{j=1}^p \vartheta_j \Delta GE_{t-j} + \\ & + \sum_{j=0}^p \phi_j \Delta GR_{t-j} + \sum_{j=0}^p \varphi_j \Delta GDP_{t-j} + \mu_t \end{aligned} \quad (1)$$

Here, Δ is the difference operator, GE is the logarithmic of the real government expenditures per capita, GR is the logarithmic of real government revenues per capita and GDP is the logarithmic of real gross domestic product per capita, δ_1 , δ_2 , δ_3 are the long-run multipliers and β_0 is the drift term. It should be noted that Equation (1) is estimated using both variables, GR and GE , as dependent variables. Two models estimated: one without per capita real GDP and one with per capita real GDP. Here in lies one of the main assets of this technique, for it proffers exactly which is the dependent variable and which is the independent variable in a particular relationship. Lagged values of ΔGE_t , current and lagged values of ΔGR_t and ΔGDP_t are used to model the short-run dynamic structure. On the selection of lag lengths, namely p , Pesaran et al. (2001: 308) observe, “there is a delicate balance between choosing p sufficiently large to mitigate the residual serial correlation problem and, at the same time, sufficiently small so that the conditional

¹ The description here is based on Narayan (2005).

ECM is not unduly over-parameterized, particularly in view of the limited time series data which are available”.

The bounds testing procedure for the absence of any level relationship between the variables is through the exclusion of the lagged levels variables GR_{t-1} , GE_{t-1} and GDP_{t-1} in Equation (1). This exercise amounts to the null hypotheses $H_0 : \delta_1 = \delta_2 = \delta_3 = 0$ implying no cointegration, in the first step is tested by computing a general F - statistic using all the variables appearing in log levels.

The F -test, which has a non-standard distribution, depends upon: (a) the non-stationarity properties of the data, (b) the number of independent variables, and (c) the sample size. Pesaran and Pesaran (1997) for 500 observations and Pesaran et al. (2001) for 1000 observations report two sets of critical values for a given significance level. One set of critical values assumes that all variables included in the ARDL model are $I(0)$, while the other is calculated on the assumption that the variables are $I(1)$. When the calculated F -statistic is greater than the upper bound critical value (UCB) the null hypothesis of ‘no cointegration’ is rejected, and when the calculated F -statistic is less the lower bound critical value (LCB) the null hypothesis is accepted. However, if the computed F -statistics falls between the UCB and LCB, then the results are inconclusive.

The bounds procedure has several advantages over alternatives such as the Engle and Granger (1987) two-step residual-based procedure for testing the null of no cointegration and the system-based reduced rank regression approach pioneered by Johansen (1988, 1995). These advantages can be summarized as follows:

1. The bounds procedure can be applied to models consisting of variables with an order of integration less than or equal to one. This approach, hence, rules out the uncertainties present when pre-testing the order of integration. To this end, Pesaran and Pesaran (1997, p. 184) observe that “pre-testing is particularly problematic in the unit-root cointegration literature where the power of unit root tests are typically low, and there is a switch in the distribution function of the test statistics as one or more roots of the X_t process approach unity”.

2. The CECM is likely to have better statistical properties than the two-step Engle–Granger method because unlike the Engle–Granger method the CECM does not push the short-run dynamics into the residual terms (Banerjee et al., 1993, 1998).

3. It can distinguish dependent and independent variables. For instance, by taking say variable GE_t as a dependent variable and GR_t as an independent variable if one finds that based on the bounds F -test there is cointegration between the variables then it implies that GE_t is the dependent variable in this relationship.

In addition, the Granger-causality tests are examined by testing whether all the coefficients of ΔGE_{it-1} or ΔGR_{it-p} are statistically different from zero as a group based on a standard F -test and/or the coefficient of the error correction is also significant (denoting long-run causation). The F -tests on the differenced explanatory variables depict the short-term causal effects, whereas the significance or otherwise of the lagged error correction term denotes whether there is a long-run relationship, (Narayan, 2005; Odhiambo, 2010).

4. Empirical results

4.1 Unit root test

We begin our empirical analysis by testing for unit roots in the government revenue, government expenditure per capita and real GDP per capita. The bounds testing approach is based on the assumption that the variables are $I(0)$ or $I(1)$. Therefore, the implementation of unit root tests in the ARDL procedure might still be necessary in order to ensure that none of the variables is $I(2)$ or beyond. To establish the integrational properties of the series, we apply the conventional Augmented Dickey and Fuller (ADF, 1979) test and Phillips-Perron (PP, 1988) test. The ADF test and PP test methodology is widely used and known; hence, we do not repeat these methodology here. The calculated t -statistics together with the lag length selected using the Akaike Information Criterion (AIC) and the critical values at the 5% level of significance in ADF and PP tests have reported in Table 3. The calculated t -statistics for the levels of GE, GR and GDP series are greater than the critical values at the 5% level of significance. This implies that we cannot reject the unit root null hypothesis in both ADF and PP tests. However, when we convert these series into first difference and subject the series to the ADF test and PP test, the calculated t -statistic for all three variables is smaller than the critical values at the 5% level. This implies that we can reject the unit root null hypothesis for three series in first difference form. As a result, all variables are integrated of order one.

Table 3: Unit root test results

Variables		Test	ADF		PP	
			Intercept and Trend	Intercept and no Trend	Intercept and Trend	Intercept and no Trend
<i>Level</i>	GE		-0.202, [1] (-2.931)	-2.478 [2] (-3.521)	-0.049 [4] (-2.929)	-1.753 [4] (-3.516)
	GR		0.182 [0] (-2.928)	-2.588 [3] (-3.524)	-0.015 [3] (-2.929)	-1.851 [4] (-3.516)
	GDP		1.164[1] (-2.931)	-1.942[2] (-3.521)	1.569 [4] (-2.929)	-1.655 [4] (-3.516)
<i>First difference</i>	Δ GE		-4.423 [0] (-2.931)	-4.365 [0] (-3.518)	-4.551 [3] (-2.931)	-4.497 [3] (-3.518)
	Δ GR		-5.204 [0] (-2.931)	-5.162 [0] (-3.518)	-5.299 [3] (-2.931)	-5.258 [3] (-3.518)
	Δ GDP		-3.345 [3] (-2.937)	-3.629 [3] (-3.527)	-4.223 [4] (-2.931)	-4.527 [4] (-3.518)

Notes:

† numbers in brackets represent lag length in ADF test, which is selected using the Akaike Information criterion and these numbers denote Bandwidth in PP test by applying Newey-West using Bartlett kernel.

‡ Numbers in parentheses represent critical values at the 5% level of significance.

4.2 Cointegration, the ARDL approach results and causality test

At this stage, our test for cointegration is based on the bounds testing approach. To capture the effect of the Iran/Iraq war period (1980-1988) as an important structural break in Iran's economy, a dummy variable (DU80) included in the model which is equal to one if ($t > 1980$) and zero otherwise.

Furthermore, since we use 45 annual observations, we choose two as the maximum lag length in the ARDL model using the AIC. The F -statistics together with the exact critical values are reported in Table 4 when GE and GR are dependent variables in two models. The calculated F -statistic when per capita real government expenditure is the dependent variable is 6.46 in model (1). Given the upper critical bound value of 6.05 at the 5% level of significance, we are able to reject the null hypothesis of 'no cointegration'. In addition, following Bannerjee et al. (1998) to determine the long-run relationship among the variables of interest, we also use the t -test. Based on the results in Table 4, the calculated value of the t -test is -10.86, which absolute value is more than the critical value -3.28 (at 5% significance level) tabulated by Bannerjee et al. (1998), so the presence of the long-run relationship is confirmed. In addition, the F -statistics in model (2) shows that we cannot reject the null hypothesis of 'no cointegration'. But according to Bannerjee et al. (1998), the calculated value of the t -test is -10.28, that we reject the null hypothesis.

Table 4: The Estimated Autoregressive Distributed Lag Models based on AIC; dependent variable: GE

Model(1)- ARDL(1,0,0)			Model(2)- ARDL(1,0)			
Regressor	Coefficient	T-Ratio	Regressor	Coefficient	T-Ratio	
GE(-1)	0.399***	7.211	GE(-1)	0.473***	9.223	
GR	0.406***	7.366	GR	0.495***	10.587	
GDP	0.168***	2.635	INT	-0.068	-1.366	
INT	-0.136***	-2.564	DU80	0.070***	3.474	
DU80	0.0357	1.553				
$R^2 = 0.998$	$\bar{R}^2 = 0.998$	$F(4,38)=726.4$ [0.00]	$R^2 = .998$	$\bar{R}^2 = 0.998$	$F(3,39)=839.4$ [0.00]	
GE(0)	F-stat.=6.464	LBC=5.076 [†]	UCB= 6.052 [†]	F-stat.=3.682	LBC=6.689 [†]	UCB= 7.451 [†]
	T-test=-10.86	CV(0.05)=-3.57		T-test=-10.288	CV(0.05)=-3.28	
GR(0)	F-stat.= 5.109	LBC=5.076 [†]	UCB= 6.052 [†]	F-stat.= 15.741	LBC=6.689 [†]	UCB= 7.451 [†]
	T-test=-4.379	CV(0.05)=-3.57		T-test=-5.609	CV(0.05)=-3.28	

Notes:

1. [†] Critical value at level 95%
2. ***, **, *: Null hypothesis rejected at 1%, 5% and 10% significant level, respectively.
3. CV denotes critical value of Bannerjee et al. (1998) and numbers in parentheses are a level of significant.

Nevertheless, when per capita real government revenue is the dependent variable, the calculated F -statistic is only 5.11 in model (1), that it falls between the upper critical bound (UCB) and lower critical bound (LBC), and then the results are inconclusive. But, according to Bannerjee et al. (1998), the calculated value of the t -test is -4.38, which is absolute value greater than the critical value -3.57 (at 5% significance level) tabulated by Bannerjee et al. (1998), so the presence of the long-run relationship is confirmed. In the model without per capita real GDP when GR as dependent variable both F -statistic and t -test confirmed the cointegration relationship. To conserve space, the details of ARDL models when GR is as dependent variable are not reported here but are available from the authors upon request.

Diagnostic tests for serial correlation, functional form, normality and heteroscedasticity of the models in part I Table 5 show that there is no evidence of autocorrelation and the models passes all of the reported diagnostic tests. We also applied autoregressive conditional heteroscedasticity test of residuals that applied for time series data and these results are reported in part II Table 5. The results indicate there is not any autoregressive conditional heteroscedasticity (ARCH) and reject the null hypothesis that exist heteroscedasticity.

Table 5: Diagnostic tests results

	Model (1)		Model (2)	
Part I	LM Version	F Version	LM Version	F Version
A: Serial Correlation	1.012[0.314]	F(1,37)=0.892[0.351]	0.132[0.717]	F(1,38)=0.117[0.734]*
B: Functional Form	0.108[0.742]	F(1,37)=0.094[0.761]	1.601[0.206]	F(1,38) = 1.47[0.233]
C: Normality	6.162[0.046]	Not applicable	3.353[0.187]	Not applicable
D:Heteroscedasticity	0.004[0.949]	F(1,41)= 004[0.951]	0.014[0.905]	F(1,41) = .0135[0.908]
A: Lagrange multiplier test of residual serial correlation		C: Based on a test of skewness and kurtosis of residuals		
B: Ramsey's RESET test using the square of the fitted values		D: Based on the regression of squared residuals on squared fitted values		
Part II- Autoregressive Conditional Heteroscedasticity Test of Residuals				
LM Statistic CHSQ (1) = 0.129[0.720] F(1,37)= 0.111[0.741]		LM Statistic CHSQ (1) = 0.513[0.474] F(1,38)= 0.459[0.502]		

Based on indicating the cointegration in previous stage, we can now estimate the long-run coefficients of the ARDL model. One of the more important issues in applying ARDL is choosing the order of the distributed lag functions. The optimal number of lags for each of the variables using the AIC are show as ARDL (1,0,0) in model (1) and ARDL (1 and 0) in model (2). The results on the long-run coefficients are reported in Table 6. The empirical results reveal that in the long run all of the coefficients are significant at %5 in two models except DU80 in model (1). However, empirical results indicate when

government revenue increased by 1 percent, government expenditure increased by 0.67, 0.94 percent in model (1) and (2), respectively. These results indicated that dummy variable (DU 80) has a positive effect on government expenditure, so the Iranian revaluation and Iran/Iraq war has a positive effect on the size of Iranian government. In addition, results indicated that when government revenue is a dependent variable, DU80 is a negative and strongly significant effected on Iranian government revenue.

Table 6: Estimated long run coefficients using the ARDL approach- Dependent variable: GE

Regressor	Model (1)		Model (2)	
	Coefficient	T-Ratio	Coefficient	T-Ratio
C(INTERCEPT)	-0.226***	-2.939	-0.129	-1.453
GR	0.675***	7.474	0.939***	55.884
GDP	0.280***	2.921	-	-
DU80	0.059	1.552	0.133***	3.951

Note: ***, **, *: Null hypothesis rejected at 1%, 5% and 10% significant level, respectively.

Table 7 reports the short-run coefficient estimates obtained from the ECM version of the ARDL model. The error correction term indicates the speed of the equilibrium restoring adjustment in the dynamic model. The ECM coefficient shows how quickly/slowly variables return to equilibrium and it should have a statistically significant coefficient with a negative sign. Bannerjee et al. (1998) holds that a highly significant error correction term is further proof of the existence of a stable long-term relationship. Table 7 shows that the expected negative sign of the ECM is highly significant. The estimated coefficients of the ECM (-1) is equal to -0.53 and -0.60 in model (1) and (2) when GE is as a dependent variable; respectively, suggesting that deviation from the long-term GE path is corrected by 53 and 60 percent over the following year, thus 53% and 60% of the budgetary disequilibrium in mitigated within 1 year.

Although, the long-run relationship between the variables indicating the existence of causality between variables at least in one direction, but cannot determine direction of granger causality. As explained earlier, in this study error correction model applied for causality test. The short-run causality is supported by the *F*-statistics, which are statistically significant in the both government revenue and government expenditure equation. As we find the coefficients on lagged GR in the GE equation to be significant at the 5% level, also while those on lagged GE in the GR equation are significant, we conclude that there is a bidirectional short run causal relationship. The coefficients on the ECTs in the GE equation and in the GR equation are significant at the 1% level. Therefore, we conclude that there is a bidirectional long-run causal relationship.

Table 7: Error Correction Model (ECM) results

PART A: dependent variable: dGE					
Model (1)			Model (2)		
Regressor	Coefficient	T-Ratio	Regressor	Coefficient	T-Ratio
dGR	0.406***	7.366	dGR	0.495***	10.587
dGDP	0.168***	2.635	dDU80	0.070***	3.474
dDU80	0.036	1.553	ECM(-1)	-0.527***	-10.289
ECM(-1)	-0.601***	-10.862			
$R^2 = 0.782$		$\bar{R}^2 = 0.76$	$R^2 = 0.743$		$\bar{R}^2 = 0.723$
DW-stat. = 2.267		F(4,38)=34.168[0.00]	DW-stat. = 2.097		F(3,39)=37.525[0.00]
PART B: dependent variable: dGR					
Model (1)			Model (2)		
Regressor	Coefficient	T-Ratio	Regressor	Coefficient	T-Ratio
dGE	0.507***	2.821	dGE	1.314***	8.777
dGDP	1.350***	5.243	dGE(-1)	0.309**	1.965
dGDP(-1)	0.388**	2.053	dDU80	-0.094**	-2.522
dDU80	-0.093***	-3.040	ECM(-1)	-0.793***	-5.609
ECM(-1)	-0.561***	-4.379			
$R^2 = 0.842$		$\bar{R}^2 = 0.815$	$R^2 = 0.729$		$\bar{R}^2 = 0.693$
DW-stat. = 2.232		F(4,38)=38.279 [0.00]	DW-stat. = 1.976		F(3,39)= 24.944[0.00]

Note: ***, **, *: Null hypothesis rejected at 1%, 5% and 10% significant level, respectively.

In summarize, the results reported in Table 7 show that in the short run and long run there is bidirectional causality between government revenue and government expenditure in two models. This outcome is consistent with Musgrave (1966) and Meltzer and Richard (1981). However, the evidence of Granger causality between government expenditure and government revenue is consistent with the findings of Payne (1998), Cheng (1999) for Chile, Panama, Brazil and Peru, Li (2001), Chang et al. (2002) for Canada, AbuAI-Foul and Baghestani (2004) at the case of Jordan, Al-Qudair(2005), Gounder et al. (2007), Aslan and Taşdemir (2009), Chang and Chiang (2009). In addition, Wolde-Rufael (2008) founds a same result for Mauritius, Swaziland and Zimbabwe.

The policy implication of the results suggests that there is interdependence relation between government expenditure and revenue infers the governments make its expenditures and revenues decision simultaneously. Under this hypothesis, the fiscal authorities of Iran should try to increase revenues and decrease expenditure simultaneously in order to control the budget deficits.

Finally, the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMQ) applied to analyzing the stability of the long-run coefficients together with the short-run dynamics, (see, Figure 1 and 2). The results clearly indicated the absence of any

instability of the coefficients during the investigation period because the plots of the two statistics are confined within the 5% critical bounds pertaining to the parameter stability.

Figure 1: Plots of CUSUM and CUSUMQ statistics of Model(1); dependent variable GE (GDP included)

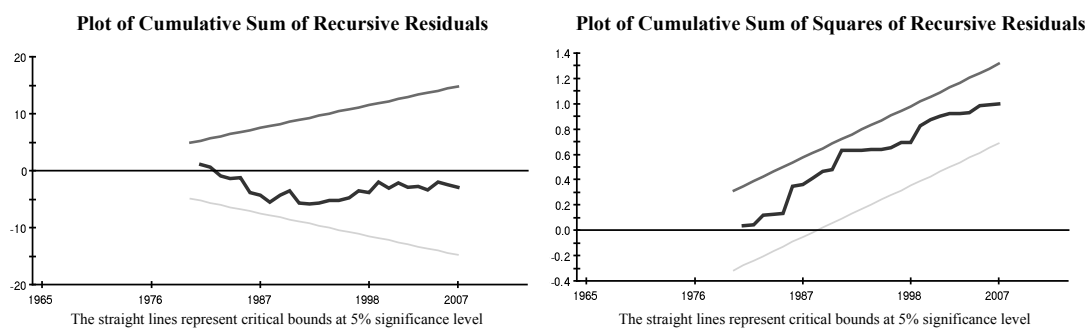
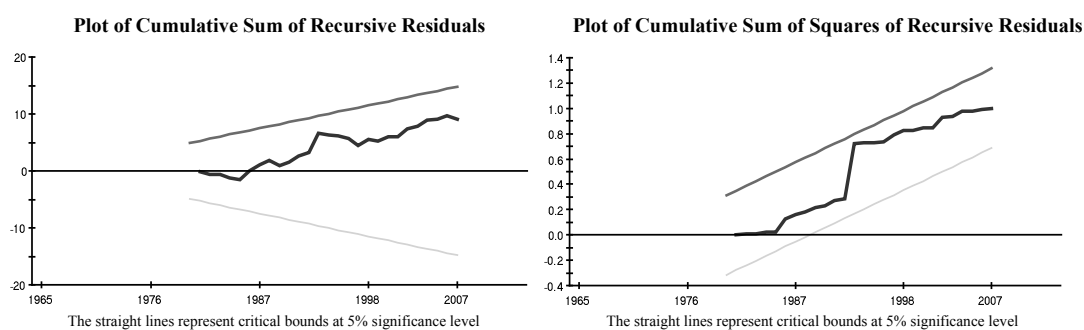


Figure 2: Plots of CUSUM and CUSUMQ statistics of Model(2); dependent variable GE



5. Conclusion

This study re-examined an important subject between government expenditure and revenue in the area of public economics, also the study attempts to answer one critical question. Is there a causal relationship between government expenditure and government revenue in Iran? We investigated this issue by applying the bound testing approach to cointegration, ARDL and the causality test. Analyzing data properties using the ADF and PP unit root tests indicating that the series are I(1). We find a cointegration relationship between government revenue, expenditure and GDP; all variables in real per capita form. However, applying the ECM version of the ARDL model shows that the error correction coefficient, which determines the speed of adjustment, has an expected and highly significant negative sign. The results indicated that deviation from the long-term growth

rate in government expenditure (revenue) is corrected by approximately 53 to 60 (56 to 79) percent in the following year. We found the estimated model passes a battery of diagnostic tests and the graphical evidence (CUSUM and CUSUMQ figures) suggest that the models are stable during the sample period.

Moreover, the paper tests whether government revenue causes government expenditure or whether the causality runs from government expenditure to government revenue, and if there is bidirectional causality. The results show that there is bidirectional causality from government revenue to government expenditure. So, these result consistent with the *fiscal synchronization* hypothesis.

The policy implication of the results suggests that there is interdependence relation between government expenditure and revenue. The government makes its expenditures and revenues decision simultaneously. Under this scenario, the fiscal authorities of Iran should try to increase revenues and decrease expenditures simultaneously in order to control the budget deficits. That may be reason to the fact that government's decisions depends on its oil revenues that fluctuate over time which in turn affect the government expenditure and the growth of the economy. On the other hand, increasing government expenditure stimulates economic activities, which in turn increase government non-oil revenues. In addition, the bidirectional causality between government expenditure and revenues might complicate the government's efforts to control the budget deficit.

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Measuring and Decomposing Sources of Productivity Performance in India's Paper and Pulp Industry under Liberalized Regime: A Nonparametric Approach

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Abstract

The purpose of this study is to develop a methodology in measuring productivity growth by decomposing it into technical change and technical efficiency change in India's paper industry. The prime objective of this article is to assess the impact of liberalization on productivity growth of India's paper industry. Specifically, this study quantifies the level of technical efficiency and technical change in this particular manufacturing sector. The paper applies Malmquist Productivity Index method to different sub-sectors of India's Paper and pulp industry at aggregate level in order to have trend in productivity growth covering a period of 28 years commencing from 1979-80 to 2006-07. Finally, regressing the log difference of the measured productivity growth on the log difference of the capacity utilization rate which is a proxy for business cycle, attempt has been made to find out capacity utilization adjusted TFP growth. The result of this study reveals decline in growth rate of TFP during post-reforms (1991-92 to 2006-07) period showing adverse impact of liberalization at aggregate level. Results also indicate that during the study period, industry also experienced regress in technological progress along with stagnation in technical efficiency. Non-responding technical efficiency change and the deteriorating technical change were the main ingredients responsible for declining productivity change in Indian paper and pulp industry. Moreover, removal of short run variations in capacity utilization from the estimated TFP growth hardly affects its overall movement but remarkably mitigates its variation because variations between sub-periods are lesser after adjusting capacity utilization as cyclical factor.

Keywords: Indian Paper Industry, Total Factor Productivity, Economic Reforms, Malmquist Index, Data Envelopment Analysis

JEL classification: L60, O25, D24

1. Introduction

Productivity growth is considered indispensable to produce higher quality goods in a more efficient manner which results in lower cost to consumers and also to raise per

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capita incomes over time. Every industry is continuously in a process of self-appraisal and in search of tools for measuring its own current performance in comparison with the various targets, past achievements and productivity growth. Business decision and policy formulation mostly depend on such economic indicators. Total factor productivity (TFP) is comprehensively recognized as an advanced indicator of industrial performance as compared to labour productivity and multi-factor productivity for characterizing industry-level productivity performance. Estimating productivity level and growth rate as well as analyzing productivity determinants to evaluate the efficiency in use of resources in the industry gained a renewed interest among economists. Theoretically, TFP is a relevant measure for technological change by measuring the real growth in production value, which cannot be explained by changes in the input that is, labour, capital and intermediate input. However in reality, most works on TFP measurement are limited on the basis of two factor inputs- capital and labour. But, the increasing role of materials inputs in productivity has compelled researchers to reconstruct their productivity measurement model to incorporate all factor inputs, labour, capital and intermediate inputs.

2. Literature Review

Empirical studies suggest that trade reforms promoted total factor productivity (TFP) in Indian manufacturing during 1980s (Goldar, 1986; Ahluwalia, 1991; Chand, and Sen, 2002). There is adequate reason to suppose that manufacturing sector responds to liberalization and the high growth rate during 1990s was 'due to continued structural reforms including trade liberalization, leading to efficiency gains'. (WTO, 2001, p. 1). This view has been supported by Krishna and Mitra (1998) and Unel (2003) who found that growth of TFP was higher in 1990s compared. Turning to the trends in productivity in the post-reform period, the evidence from empirical studies by researchers was ambiguous, though subjective evidence, especially of trends of recent years shows significant increases in productivity growth. Tata Service Ltd (TSLs, 2003) has reported a faster growth rate in TFP in Indian manufacturing in post-reform period as compared to pre-reform period. Despite ambiguity regarding acceleration in TFPG, evidence suggests that trade liberalization since 1991 had a positive impact on the TFPG in India (Krishna and Mitra, 1998; Chand and Sen, 2002; Topalova, 2004).

Several studies find TFP growth in Indian manufacturing deteriorated during 1990s compared with that of 1980s. (Das, 1999; 2003; Singh et al., 2000; Srivastav, 2001; Goldar and Kumari, 2003). Balakrishnan et al. (2000) reports a significant decline in the growth rate of TFP since 1991-92 in five manufacturing industries in India but they failed to find a link between trade reform and TFP growth. Most of the studies on productivity in India have focused on the growth in TFP in Indian manufacturing. Other studies suggest a decline in total factor productivity growth until 1970s, with a turnaround taking place in mid 1980s, pursuant to the reoriented trade and industrial policies and improved infrastructure performance (Brahmananda, 1982; Ahluwalia, 1991; Balakrishnan and Pushpangadan, 1994; Majumder, 1996; Rao, 1996; Pradhan and Barik, 1999). The proposition that the

TFPG accelerated during the 1980s would be consistent with the recent debatable view associated with Rodrik and Subramanian (2004) who argued that transition to high growth phase occurred around 1980- a full decade before economic liberalization-that started being adopted during the 1980s. Given this ambiguity, the effect of trade reforms on total factor productivity growth is an empirical issue. Goldar and Kumari (2003) analyzed the impact of liberalization on the productivity growth of Indian manufacturing industries and found productivity accelerated in paper, paper products, printing and publishing industry in the 1990s. Pattnayak and Thangavelu (2005) studied the economic reform and productivity growth in Indian manufacturing, including paper and paper products industry and found a little increase in the growth of TFP of paper and paper product industry during post-reform period. Sindhu and Balasubramanyam (2006) computed Malmquist index of productivity growth of Indian paper and paper products industry during pre-reform period. The rate of growth was 3.1 per cent and this was due to the improvement in technical change. Kiran and Kaur (2008) estimates the trend in output (value added) and inputs (labour, capital) as well as partial productivity and total factor productivity for all India manufacturing at aggregative as well as disaggregate level for twenty two industry groups. Their study applies translog function using the data from Annual Survey of Industries (ASI) by Central Statistical organization, Government of India for the analysis. The comparative picture of their study during pre-liberalization and post-liberalization period depict a slower growth of manufacturing sector of India in the post-reform era for aggregative and disaggregate level.

In view of the above literature review, it has been established that although there have been voluminous studies carried on upon productivity growth, relatively a small number of studies have been conducted so far in India regarding sources of productivity growth. The Malmquist index decomposes the total productivity growth into 'efficiency change' and 'technical progress'. TFP can be increased by using its existing technology and factor inputs more efficiently which is termed as 'efficiency change'. The TFP of an industry may enhance if the industry adopts innovations or technological improvements, which is referred to as 'technological change'. Therefore, changes in TFP from one period to the next are the products of both efficiency change and technological progress. Most previous studies conducted in India have failed to consider the sources of such changes in productivity growth.

The study aims at measuring productivity growth by decomposing it into technical change and technical efficiency change in India's paper industry and assessing the impact of liberalization on productivity growth of Indian Paper industry. Specifically, this study quantifies the level of technical efficiency and technical change in this particular manufacturing sector and examines trend in TFPG after adjusting economic capacity utilization.

The paper is organized as follows: Section 3 depicts the economic snapshot of Indian paper industry under liberalized regime, Section 4 depicts the methodology utilized to estimate the Malmquist productivity index. The result of productivity growth in Indian paper and pulp products industry is evaluated in Section 5. Section 6 analyses trend in TFPG after adjusting capacity utilization and section 7 presents summary and conclusion.

3. Economic Snapshot of Indian Paper and Pulp Industry under Liberalized Regime

In late 1970s, Government of India started implementing some reforms such as “reducing the barriers to entry and expansion, simplifying procedures, and providing easier access to better technology and intermediate material imports” (Ahluwalia, 1991). There were some additional reforms during 1980s, but the most radical reforms were initiated since 1991, after the severe economic crisis in the fiscal year 1990-91. The major policy changes initiated in the industrial sector since July 1991 include removal of entry barriers, reduction of areas reserved exclusively for public sector, rationalization of approach towards monopolistic and restrictive practice, liberalization of foreign investment policy, far reaching liberalization of import policy with respect to intermediate and capital goods, measures to bring about regional balance, especially the development of backward areas and encouraging the growth of employment intensive in small and tiny sector (Madheswaran et al., 2007).

Therefore, Indian economy was under the protected trade policy regime till July 24, 1991 and the policy measures were liberalised and entered in free trade regime after 1991. These two policies led to different impact on Indian manufacturing in general and Indian paper and paper products in particular. The Government of India has completely delicensed the paper industry with effect from July 1997. The Indian Paper industry is a priority sector for foreign collaboration and foreign equity participation up to 100 percent which receives automatic approval by Reserve Bank of India. Several fiscal incentives have also been provided to the paper industry, particularly to those mills which are based on non-conventional raw material.

The paper industry is the second industry which was liberalized in India after the cement industry. Much before initiation of liberalization process since July, 1991, the paper industry was partially de-licensed in 1984-85, especially the agro-based paper mills segment. Delicensing was extended to other segments of the industry in 1991. Thus the industry has witnessed far-reaching policy changes starting from a controlled policy regime to a liberalized one. These changes have affected various fields of operations and given a more flexible approach to decision-making.

With the advent of economic liberalization and stricter environmental regulations, the promotion of larger more efficient paper mills has been initiated. Presently, large paper mills are more efficient, using better and more modern technologies and appropriating economies of scale. Additionally, they provide chemical recovery facilities which reduce both emissions and external energy requirements. However, the large paper mills also face severe basic problems such as high production costs, raw material constraints and low productivity. Overall performance has been best in medium size firms with regards to average profitability (Sharma et al., 1998).

Small and medium size paper mills became important when due to a severe paper shortage in the early 1970s, the government promoted the immediate establishment of small, readily available paper units. As a result of the paper shortage and overall

government pricing policy, the small and medium sector with more than 300 paper mills accounted for almost 50% of installed capacity and production in 1992. They produce primarily low quality paper such as kraftpaper and paperboards from recycled paper and various agro-fibers. (Meadows, 1997; Sharma et al., 1998). Yet, the small units suffer from high production costs, uneconomic operation, low quality and negative impacts on the environment.

About 150 small mills were closed or sitting idle (Meadows, 1997). Already old when imported the units have further degraded since, which has led to the current situation of low productivity, low efficiency, excessive resource consumption, obsolete technologies, capacity underutilization and low scale of operation. International competition and the high quality and low production costs of imported paper will also force many small mills to close. Furthermore, most small and medium size pulp and paper mills cannot economically provide chemical recovery and pollution control systems. Therefore, they are highly polluting industries contributing substantially to the overall level of emissions and environmental problems. (Datt and Sundharam, 1998).

The paper industry in India is highly energy intensive. It is ranked sixth largest energy consumer in the country. The average energy cost for Indian paper mills is about 15–20 percent of total production cost, as against 10 percent in USA, Sweden, Finland, and other major paper producing countries. The Indian paper industry accounts for about 1.6 percent of the world's production of paper and paperboard and is expected to grow with an annual rate of 6-7 percent in near future. This sector provides employment to about 3.5 million people directly and indirectly. The paper consumption in India is about 7 kg per capita as against the world average of 50 kg per capita (Central Pulp and Paper Research Institute, 2007). The total output of Indian paper industry is about 7.4 MT, with a turnover of about Rs 160 billion. It contributes about Rs 25 billion to the state and central exchequers by way of various duties and taxes. It is a capital-intensive, energy-intensive and pollution emitting industry. The Indian pulp and paper industry recorded a steady average annual growth rate of 5.47 percent over the past couple of years. Broadly, there are two types of paper products: paper and paper boards, and newsprint. Paper and paperboard can further be subdivided into industrial grade (wrapping and packaging, specialty, kraft etc.) and cultural (writing and printing) paper. Based on the installed capacity, the Indian mills are categorized into two types: (1) large mills (capacity > 100 tons per day) and (2) small mills (capacity < 100 tons per day). The number of large paper mills is less as compared to the small mills that account for 50 percent of the production capacity. The production of paper and paperboards increased from 5.56 million tons in 2003-'04 to 5.79 million tons in 2004-'05. At present, about 60.8 percent of the total production is based on non-wood raw materials (agriculture residue and waste papers) and 39.2 percent on wood. The supply and demand projection up to 2015-'16 are 10 million tons and 13 million tons respectively, leading to a shortfall of 3 million tons. The growth rate of writing and printing varieties is expected to be 4-6 percent per annum, while that of industrial paper is estimated to be 12 percent. The higher growth rate of industrial paper is due to the substitution of conventional packaging of products by paper and paper board. Imports of paper and paper products were growing over the years.

However, it has increased during 2001-‘02 after a fall in 2000-‘01. About 1,40,000 tons of paper was exported in 2000-‘01 mainly to the neighbouring countries.

There are 666 pulp and paper mills with installed capacity of 9.5 MT and production of 6.5 MT of paper and paperboard, and 0.9 MT of newsprint. The paper production can be classified on the basis of raw material—forest based (32%), non-wood based (30%), and waste paper based (38%). The large mills utilize, mainly, hardwood and bamboo, while the smaller ones use agro residue such as bagasse, wheat and rice straw, jute, and recycled fibers. The country is almost self-sufficient in manufacture of most varieties of paper and paperboards. Import, however, is confined only to certain specialty papers. To meet part of its raw material needs the industry has to rely on imported wood pulp and waste paper. Production of paper and paperboard during the year 2002-‘03 (up to December, 2002) is 24.52 million tons. At present about 60.8 per cent of the total production is based on non-wood raw material and 39.2 per cent based on wood.

4. Analytical Framework and Methodological Issues

4.1 Description of data and measurement of variables

The present study is based on industry-level as well as firm level time series data taken from several issues of Annual Survey of Industries, National Accounts Statistics, Center for Monitoring Indian Economy (*CMIE*) and Economic Survey, Statistical Abstracts (several issues), *RBI* Bulletin on Currency and Finance, Handbook of Statistics on Indian Economy, and Office of Economic Advisor, Ministry of Industry etc. Selection of time period is largely guided by availability of data¹. In the ASI, the paper and paper products industry is conveniently classified under 3 sub-sectors for which consistent data are available, at three and four-digit industrial classification levels.

The output in the current model is the modified gross value of output (Y). It is defined as the total output produced by the firm. In order to avoid over estimation due to ignoring contribution of material input on TFP, a third variable of intermediate inputs (material including energy input, see, Appendix A1)² has been incorporated in the value-added function as such to obtain gross output. Pradhan and Barik (1999) argued that the gross output, instead of value added, appears to be the appropriate choice of TFP estimation in India. Generally, TFP growth estimates based on value added terms are over estimated

¹ Till 1988 – 89, the classification of industries followed in ASI was based on the National Industrial classification 1970 (NIC, 1970). The switch to the NIC, 1987 from 1989-90 and also switch to NIC, 1998 requires some matching. Considering NIC, 1987 as base and further NIC, 1998 as base, Paper industry has been merged accordingly. For price correction of variable, wholesale price indices taken from official publication of CMIE have been used to construct deflators.

² Earlier studies that have not treated material including energy as separate factor of production, has failed to pick-up significant economies that are likely to generate in the use of such input. Jorgenson (1988) has observed that in a three input production framework, the contribution of intermediate inputs like material, energy etc. are significant sources of output growth.

since they ignore the contribution of intermediate inputs on productivity growth (Sharma, 1999). Therefore, modified gross value of output so calculated has been used as a measure of output. It has been suitably deflated by wholesale price index of manufactured and material, labour and fixed capital stocks are our aggregate input proxies. Total number of persons engaged in Indian paper and pulp sector is used as a measure of labor inputs. It is reported in ASI which includes production workers and non-production workers like administrative, technical and clerical staff (Goldar et al., 2004). Deflated gross fixed capital stock at 1981-82 prices is taken as the measure of capital input. The estimates are based on perpetual inventory method (see, Appendix A2). Following the same line as adopted in deflating energy input, the reported series on materials has been deflated to obtain material inputs at constant prices.

This paper covers a period of 28 years from 1979 -80 to 2006-07. The entire period is sub-divided into two phases as pre-reform period (1979 -80 to 1991-92) and post-reform period (1991-92 to 2006-07), sub-division of period being taken logically as such to assess conveniently the impact of liberalization on TFPG .

4.2 Non parametric approach to productivity measurement:

Data Envelopment Analysis (DEA) is a non-parametric approach of frontier estimation. The term DEA was invented by Charnes, Cooper and Rhodes (1978). DEA measures the relative efficiency of a set of firms. In production theory, there are two types of efficiency measures at the firm level. The first is the technical or production efficiency, which measures the level of success a firm has reached by producing maximum output from a given set of inputs. The second one is the price or allocated efficiency, which measures a firm's success in choosing an optimal set of inputs for a given set of input prices. DEA is a technique based on linear programming that places a non-parametric surface frontier (a piecewise linear convex isoquant) over data points to determine the efficiency of each firm in relation to the frontier. The aim of DEA is to estimate relative efficiency among similar decision units that have the same technology (processing procedure) to pursue similar objectives (outputs) by using similar resources (inputs). The higher efficiency is denoted by one, while the lowest is denoted by zero. DEA constructs the production-possibilities frontier from the data by using linear programming. The efficiency of a firm, or a decision making unit (DMU) as firms are called in most DEA literature, using "n" different inputs to produce "m" outputs, is measured as the ratio of weighted outputs to weighted inputs. Once the frontier is constructed, the measure of efficiency for any DMU is derived by comparing Euclidean distances from points on the frontier, with corresponding distances from the axis to points which are below the frontier. DMUs that lie on the frontier are efficient, while DMUs under the frontier are considered inefficient, since they use the same level of inputs but produce less output, or have the same output but employ more inputs.

Data Envelopment Analysis in a linear-programming methodology is used here where we use input and output data for Decision Making Units (DMU). In our study, we

have taken 28 firms within the entire industry and industry is divided into 3 broad sub sectors comprising of all the firms under our consideration, each firm is considered as Decision Making Unit (DMU). The DEA methodology was initiated by Charnes et al. (1978) who built on the frontier concept started by Farell (1957). The methodology used in this paper is based on the work of Fare et al., 1994 and Coelli et al., 1998. We have used the DEA- Malmquist Index to calculate the total factor productivity growth in Indian paper industry which measures changes in total output relative to input. This idea was developed by a Swedish statistician Malmquist (1953). It is a suitable methodology because of following reasons (Mahadevan, 2001). First, the data envelopment analysis approach is an improvement over translog index approach. In translog approach, technical inefficiency is ignored and it calculates only technical change which is wrongly interpreted as TFP growth. While in the literature of productivity, TFPG is composed of technical change and technical efficiency. Second, DEA also identifies the sources of TFP growth which will help the policy makers to identify the specific source of low TFP growth. Another advantage of nonparametric nature of DEA is that it reveal best practice frontier rather a central tendency properties of frontier. In DEA, there is also no need to estimate any production function. It only requires data input and output quantities, and no price data is needed to determine appropriate weights as is necessary with either econometric or index number approaches (Lambert and Parker, 1998). This Malmquist productivity index can be decomposed into efficiency change, technical change and total factor productivity growth. TFPG is geometric mean of efficiency change and technical change. Fare et al. (1994) suggests that if suitable panel data are available, the required distance measures of Malmquist Total Factor Productivity Index can be calculated using DEA. They have defined the output based MTFPI as a geometric mean of two indices. Contrary to Fare et al. (1994), who considered an input based Malmquist index, we use an output based Malmquist index in the current paper.

Non-parametric Data Envelopment Analysis (DEA) and parametric Stochastic Frontier Analysis (SFA) have become very popular in the analysis of productive efficiency. There are multiple techniques to calculate or estimate the shape of the efficiency frontier. Most investigations aimed at measuring efficiency are based either on parametric or nonparametric methods. The main difference between the parametric and the non-parametric approach is that parametric frontier functions require the *ex-ante* definition of the functional form of the efficiency frontier. The non-parametric approach constructs an efficiency frontier using input/output data for the whole sample following a mathematical programming method. This frontier provides a benchmark by which the efficiency performance can be judged. This technique is therefore primary data-driven. The advantage of this approach is its transparency and its facility to handle multiple outputs. Moreover, this approach does not require assumptions about the specific functional form of the production function, i.e. no data on input and output prices are required, since the frontier relies on the input and output data only. The main disadvantage of this approach is its deterministic nature. Results tend to depend heavily on the composition and size of the sample as well as

the selection of input and output variables used. Moreover, non-parametric methods tend to be sensitive to measurement errors, statistical noise and outliers.

A very common parametric approach is the Stochastic Frontier Analysis (SFA). It is a statistical method to fit the frontier. It is based on econometric methods. This approach assumes a specific functional form for the relationship between input and output. The advantage of this method is that it is able to cover the effects of exogenous shocks, i.e. nondiscretionary factors. The model can specify the equations based on such assumptions.

The main difference between the various methods of estimation is based upon the approach chosen for the decomposition of the residual between the random disturbance and the efficiency term. Stochastic Frontier Approaches (SFA) relies on distributional assumptions for both components of the residual to disentangle them, while DFA is based on more intuitive assumptions allowed by the use of panel data. DEA simply assumes that the residual represents the whole inefficiency term, which can overestimate the inefficiencies. Moreover, parametric approaches specify a functional form for the efficiency frontier, while nonparametric approaches do not need this assumption. This can be viewed as a disadvantage of the parametric approaches, as the functional form may not fit to data.

A parametric approach uses econometric techniques and imposes *a priori* the functional form for the frontier and the distribution of efficiency. A non-parametric approach, on the contrary, relies on linear programming to obtain a benchmark of optimal constant production-factor combinations. The most popular methods are Stochastic Frontier Analysis (SFA), which is stochastic and parametric, and Data Envelopment Analysis (DEA), which is deterministic and non-parametric.

Malmquist TFP Index and decomposing components:

In this study, the Malmquist (output-based) productivity index (MPI) has been used to measure the productivity change and to decompose this productivity change into the technical change index (TECHCH) and the technical efficiency change index (EFFCH). Technical efficiency changes was further decomposed into pure technical efficiency (PEEFCH) and scale efficiency (SCH) components using the Data Envelopment Analysis (DEA) framework of Färe et al. (1994).

We start by considering firms which use n inputs to produce m output. Denote $x \in R_+^n$ and $y \in R_+^m$ as, respectively, the input vector and output vector of those firms. The set of production possibilities of a firm at time t can be written as:

$$S^t = \{(x^t, y^t) \mid x^t \text{ can produce } y^t\} \tag{1}$$

Färe, Grosskopf, Norris & Zhang (1994) followed Shephard (1970) to define the output distance function at time t as:

$$D_0^t(x^t, y^t) = \inf\{\theta \mid (x^t, y^t / \theta) \in S^t\} = (\sup\{\theta \mid (x^t, \theta y^t) \in S^t\})^{-1} \tag{2}$$

The subscript o is used to denote the output-based distance function. Note that, $D_o^t(x^t, y^t) \leq 1$, if and only if $(x^t, y^t) \in S^t$, and $D_o^t(x^t, y^t) = 1$, if and only if (x^t, y^t) is on the frontier of the technology. In the later case, Farrell (1957) argued that the firm is technically efficient.

To define the Malmquist index, Fare et al. (1994) defined distance functions with respect to two different time periods:

$$D_o^t(x^{t+1}, y^{t+1}) = \inf\{\theta \mid (x^{t+1}, y^{t+1} / \theta) \in S^t\} \quad (3)$$

and

$$D_o^{t+1}(x^t, y^t) = \inf\{\theta \mid (x^t, y^t / \theta) \in S^{t+1}\} \quad (4)$$

The distance function in (3) measures the maximal proportional change in output required to make (x^{t+1}, y^{t+1}) feasible in relation to technology at time t . Similarly, the distance function in (4) measures the maximal proportional change in output required to make (x^t, y^t) feasible in relation to technology at time $t + 1$. The output-based Malmquist TFP productivity index can then be expressed as:

$$M_o(x^{t+1}, y^{t+1}, x^t, y^t) = \frac{D_o^{t+1}(x^{t+1}, y^{t+1})}{D_o^t(x^t, y^t)} \left[\frac{D_o^t(x^{t+1}, y^{t+1})}{D_o^{t+1}(x^{t+1}, y^{t+1})} \frac{D_o^t(x^t, y^t)}{D_o^{t+1}(x^t, y^t)} \right]^{\frac{1}{2}} \quad (5)$$

The term outside the brackets shows the change in technical efficiency while the geometric mean of the two ratios inside the brackets measures the shift in technology between the two periods t and $t + 1$; this could be called technological progress. So:

$$\text{Efficiency change} = \frac{D_o^{t+1}(x^{t+1}, y^{t+1})}{D_o^t(x^t, y^t)} \quad (6)$$

$$\text{Technical change} = \left[\frac{D_o^t(x^{t+1}, y^{t+1})}{D_o^{t+1}(x^{t+1}, y^{t+1})} \frac{D_o^t(x^t, y^t)}{D_o^{t+1}(x^t, y^t)} \right]^{\frac{1}{2}} \quad (7)$$

In each of the formulae above, a value greater than one indicates a positive growth of TFP (an improvement) from a period t to $t+1$ and a value smaller than one represents deteriorations in performance over time.

We can decompose the total factor productivity growth in following way as well.

$$\text{MTFPI} = \begin{array}{l} \text{Technical Efficiency Change} \quad \times \quad \text{Technical change} \\ \text{(Catching up effect)} \qquad \qquad \qquad \text{(Frontier Effect)} \end{array}$$

MTFPI is the product of measure of efficiency change (catching up effect) at current period t and previous period s (average geometrically) and a technical change (frontier effect) as measured by shift in a frontier over the same period. The catching up effect measures that a firm is how much close to the frontier by capturing extent of diffusion of technology or knowledge of technology use. On the other side, frontier effect measures the movement of frontier between two periods with regards to rate of technology adoption. DEA-Malmquist TFP Index does not assume that all the firms or sectors are efficient; therefore any firm or sector can be performing less than the efficient frontier. In this methodology, we will use the output oriented analysis because most of the firms and sectors have their objective to maximize output in the form of revenue or profit. It is also assumed that there is constant return to scale (CRS) technology to estimate distance functions for calculating Malmquist TFP index and if technology exhibits constant return to scale, the input based and output based Malmquist TFP Index will provide the same measure of productivity change.

5. Empirical Results of Malmquist TFP growth

The discussion will be divided into two sub-sections. In the first section, we will generally look into the descriptive analysis of the variables. The main target is to understand the behaviour of the variables itself, by looking at the distribution of mean, median, maximum, minimum, standard deviation, skewness, kurtosis and the Jarque-Bera test value of each variable. The next subsection will be focusing on the estimation results of productivity growth.

The mean, median, maximum, standard deviation, skewness, kurtosis and Jarque-Bera value can determine the statistical behaviour of the variables. The descriptive statistics of the variables of the model are summarized in the Table 1 below. The relatively bigger figure of standard deviation indicates that the data dispersion in the series is quite large. This finding suggests that almost all the firms within paper industry included in the sample were having large dispersion level of output, material, labour and capital across time series.

Data shows negative skewness for material and positive skewness for capital, labour and output. All the variables have positive kurtosis indicating leptokurtic distribution. Positive kurtosis would indicate a peaked distribution, which is said to be leptokurtic. That means flatter tails than the normal distribution. In terms of shape, a leptokurtic distribution has a more acute peak around the mean and fatter tails. The Jarque-Bera test, a type of Lagrange multiplier test, was developed to test normality, heteroscedasticity, and serial correlation (autocorrelation) of regression residuals. The Jarque-Bera statistic is computed from skewness and kurtosis and asymptotically follows the chi-squared distribution with two degrees of freedom.

Table 1: Descriptive statistics

Statistical measures/ Variables	Capital	Labour	Material	Output
Mean	5859.800	152552.3	1136.560	2592.880
Median	4782.000	146650.0	1300.000	2507.000
Maximum	10321.00	185461.0	1693.000	4459.000
Minimum	2072.000	125153.0	600.0000	1112.000
Std. Dev.	2933.390	20134.50	364.4422	1156.615
Skewness	0.360203	0.195586	-0.135537	0.168130
Kurtosis	1.553683	1.505112	1.539930	1.579510
Jarque-Bera	2.719603	2.487195	2.297173	2.219648
Probability	0.256712	0.288345	0.317085	0.329617
Observations	28	28	28	28

Source: Author's own estimate

Jarque-Bera test statistics is used for testing whether the data series is normally distributed. The high probability value estimated above accepts null hypothesis that the data series is normally distributed. The outcome were supported by the small figure of JB test (Jarque-Bera probability test), where the null hypothesis (that the data are normally distributed) can not be rejected. While testing for normality, it was found that Jarque-Bera statistics with p values 0.256712 for capital, 0.288345 for labour, 0.317085 for material, 0.329617 for output (all are greater than 0.05) implies that variables under our consideration are normally distributed.

In this section, we have calculated total factor productivity growth and its components using Malmquist Productivity Index under three inputs- material, labour and capital and one output framework. We have estimated the Malmquist productivity index and its two components for 3 Indian paper and paper products industry over the pre (1979-80 to 1991-92) and post (1991-92 to 2006-07) liberalization periods. Coelli's (1996) computer program, DEAP 2.1, which adopts the non-parametric linear programming techniques of Fare et al., (1994), was employed in the estimation of the Malmquist productivity index and its two components. Estimates of MTFPI of Indian paper Industry at aggregate level are presented in Table 2.

Table 2: Malmquist Index Summary of Annual Means

YEAR	EFFCH	TECHCH	MTFPCH	YEAR	EFFCH	TECHCH	MTFPCH
1979-80	-	-	-	1991-92	1.001	0.944	0.945
80-81	0.998	0.949	0.947	92-93	1.001	0.971	0.972
81-82	0.995	1.107	1.101	93-94	0.971	0.906	0.880
82-83	1.006	0.977	0.983	94-95	1.032	0.933	0.963
83-84	1.000	0.989	0.989	95-96	1.000	0.948	0.948
84-85	0.975	0.902	0.879	96-97	0.999	0.921	0.920
85-86	1.014	0.990	1.004	97-98	1.001	1.607	1.609
86-87	1.003	0.983	0.986	98-99	0.995	0.860	0.856
87-88	1.009	0.937	0.945	99-'00	0.982	0.936	0.920
88-89	1.000	1.849	1.848	00-01	1.002	0.849	0.851
89-90	1.000	0.867	0.868	01-02	1.001	1.288	1.289
90-91	0.996	0.987	0.983	02-03	0.952	0.803	0.765
91-92	1.001	0.944	0.945	03-04	1.038	0.853	0.886
				04-05	1.017	1.063	1.081
				05-06	1.014	0.948	0.962
				06-07	1.000	0.913	0.913
Mean	0.9997	1.052	1.0549	Mean	1.00097	0.9642	0.967

Source: Author's own estimate by *DEAP, version 2.1*.

We have calculated Malmquist total factor productivity and efficiency change, technical change for all the years in the sample. A summary description of the average performance of sub sectors within the paper industry over the entire period is presented in Table 3.

Table 3: Malmquist Index Summary of Firm Means (:1979-80 to 2006-07)

Sub sector	EFFCH	TECHCH	MTFPCH
1. Manufacture of Pulp, Paper and Board including Manufacture of Newsprint.	1.000	0.930	0.930
2. Manufacture of Containers and Boxes of Paper and Paper Board	1.000	0.992	0.992
3. Manufacture of Paper and Paper Board Articles and Pulp Products + Manufacture of Special Purpose Whether (or) not Printed etc.	1.000	1.057	1.057
Mean	1.000	0.992	0.992

Note: all Malmquist index averages are geometric means.

Source: Author's own estimate.

In Table 3, it has been noticed that paper industry experienced an overall negative TFP growth of 0.8% during 1979-80 to 2006-07. The overall TFP growth is negative due to decline in technical change of 0.8%. This result reveals that decline in the industry's TFPG is due to their productivity based frontier capability. On the other side, it can be said that since the technical change is less than unity, it has a negative effect on the overall TFP growth. The overall technical change in the industry is less than 1 which is a main cause in dampening the total factor productivity for paper sector. Technical efficiency change is the result of pure technical efficiency change and scale efficiency change. With regards to pure efficiency change, it is one or more than one in most of years (not shown in the table). In case of Scale efficiency change, value close to unity shows that in most of the years, industry is operating at optimum scale. Therefore, both Scale efficiency and pure technical efficiency have contributed to the improvement in Technical efficiency.

Lower productivity growth rate reflects a lower growth rate in the output and higher or moderate growth rates in the uses of all three inputs. The decomposition of the MTPI provides guiding principle for an explanation for the measured productivity growth. Technical efficiency change can make use of existing inputs to produce more of same product. As one gets more experience in producing some product, it becomes more and more efficient in it. Labour finds new ways to produce by making minor modifications in the process of manufacturing which contribute to higher productivity. The second important source of total factor productivity growth is the change in the technology. Squires and Reid (2004) articulated that technological change is the development of new technologies or new products to improve and shift production frontier upward.

On average, the technical change (TECHCH) also decreased 0.80% while the efficiency change index (EFFCH) seemed to be remaining the same. This reflects that the declining total factor productivity in paper sector's production caused from the non-upgradation in innovation of technology rather than the improvements in technical efficiency. Moreover, the results of decomposition suggests that the nearly stability in pure efficiency and in scale efficiency resulted in the stability in efficiency change. As for the zero efficiency change, there seems to be reason for this that some of the firms within the paper sector, still had the problem of excessive labor utilization in producing output and hence, suffered from slight scale inefficiency (decreasing return to scale).

Table 4: Growth rate of Malmquist productivity, technical change and technical efficiency change

Sub sector	Pre-reform period (1980 -81 to 1991 - 92)			Post- reform period (1991 -92 to 2006 -07)			Entire period (1980-81 to 2006 - 07)		
	EFFCH	TECHCH	MTFPCH	EFFCH	TECHCH	MTFPCH	EFFCH	TECHCH	MTFPCH
1. Manufacture of Pulp, Paper and Board including Manufacture of Newsprint.	-0.03	-5.94	-5.88	0.081	-6.51	-6.22	0.000	-7.0	-7.0
2. Manufacture of Containers and Boxes of Paper and Paper Board	0.0083	9.44	10.2	0.11	-4.61	-4.37	0.000	-0.8	-0.8
3. Manufacture of Paper and Paper Board Articles and Pulp Products + Manufacture of Special Purpose Whether (or) not Printed etc.	0.0092	12.14	12.14	0.10	0.39	0.69	0.000	5.7	5.7
Mean	-0.0042	5.21	5.49	0.097	-3.58	-3.3	0.000	-0.8	-0.8
Trend growth rate of MTFP for the entire period									-0.11

*Trend growth rate for the entire period is obtained from semi log function. $\log Y = a + bt$, where $Y =$ TFP index, $a =$ Constant, $t =$ Time in years, $b =$ Regression coefficient.

Source: Author's own estimate.

Table 4 above shows that total factor productivity growth during pre-reform period shows positive TFP growth rate which is posted as at 5.49% and in post-liberalization period, it further declined to -3.3%. Table 4 displays the average growth rates of EFFCH, TECHCH and TFP in each sub-sector of Indian paper and paper products industry. Table 4

illustrates that the growth rate of TFP is abruptly declining in the post-reform period (-3.3 %) than in the pre-reform period (5.49%). Two sub-sectors (1&2) evidenced negative TFP growth in the post-reform period, whereas one sub-sector (1) had negative TFP growth in the pre-reform period. Only sub sector 3 evidenced positive but declining TFP growth in both periods. In the post-reform period, TECH decreases in negative fashion and EFFCH slightly increases. As a result, since there was decrease in TECH, it results in a modest decrease in TFP. After economic reform, in all sub sectors, slight efficiency improvement is noticed. But, sub-sector 1 and 2 displays technical regress during post-reforms period.

Total factor productivity growth has been estimated by various studies. Those studies report positive or negative trend in TFP growth depending on the time period selected and time period considered.

Table 5: Comparison of our estimate with that of Sathaye

Period	Own estimate	Sathaye
Entire Pre-reform period (1979-80 to 1991-92)	5.49	9.5(1982- '90)
Entire Post-reform period (1991-92 to 2003-04)	-3.3	-13.3(1990- '93)
Entire period (1979-80 to 03-04)	-0.80	-2.2(1973- '93)

Our study of TFPG of Indian paper industry is compared with the study of Sathaye (Table 5) where both estimates show similar trend in sign condition (either positive or negative) during pre-liberalization, post-liberalization and entire period. Sathaye's estimate displays high positive growth rate in TFP during pre liberalization period (9.5%) but dismal declining negative growth rate in TFP during post liberalization (-13.3%) and entire time frame (-2.2%) although sub-periods demarcated as pre and post-reform periods in two studies are not consistently uniform. But our estimated result shows that in all the three demarcated period-pre liberalization, post liberalization and entire period, growth rate in TFP (either positive or negative) are lesser as compared to Sathaye.

Moreover, for regressing time(t) on productivity indices (TFP) to capture effect of period changes on productivity growth, we use the equation as follows:

$TFP = a + bt$ where TFP is the malmquist productivity index, t is time.

The result of the regression is as follows:

$$TFP = 1.0458 - 0.0025t$$

$$(-0.432)$$

The result shows that period change does not have any noticeable significant impact on productivity growth.

6. Trend in Total Factor Productivity Growth with Adjustment for Capacity Utilization

Economic activity fluctuates over the business cycle, periods of high demand alternates with downturns in demand. Capital stocks are hard to adjust rapidly, so periods of low demand are typically periods of low capital utilization. A residual calculated using capital stock data thus fluctuates procyclically along with the rate of utilization. These fluctuations tend to obscure the movements in the longer run components of the residual and make it hard to distinguish significant break in trends. Productivity measures can be biased if variations in capacity utilizations are not taken into accounts (Jorgenson, 1967; Morrison, 1985). It has long been recognized that the existence of temporary equilibrium which is connected with the business cycle, can bias measured productivity growth away from its long run path. Earlier researchers have attempted to a variety of cyclical adjustments in order to take account of variations in the utilizations of stocks of factors of production. Some, like Norsworthy, Harper and Kunze (1978), select time intervals for which the capacity utilization is widely believed to be nearly one which is called the 'peak to peak' adjustment method. Jorgenson and Grileches (1967) adjust for the variation in capital utilization using the relationship between electricity consumption and the horse power rating of electric motors. Denison (1979) in a number of studies uses variations in capital's share of income. These adjustment procedures have been controversial primarily because they have appeared to be *ad hoc* as well as not theoretically motivated. Unfortunately, the process that generates the data is unknown and it is difficult to assess the validity of such adjustments.

Therefore, an adjustment to productivity measure is of vital importance in order to capture the effect of variation in capacity utilization on TFPG. This section estimates how TFPG measure may be changed with the variation in capacity utilization. We regress the log difference of the measured productivity growth on the log difference of the capacity utilization rate which is a proxy for business cycle. Subsequently, we have adjusted the average of the regression error term so that it equals the original productivity measure when the productivity measure is adjusted for cyclical factors.

$$\Delta \text{Log TFP}_t = a + b \Delta \text{Log CU}_t$$

$$\Delta \text{Log TFP} = -0.0015 - 0.0998 \Delta \text{Log CU}_t$$

(-2.39)

Where CU is economic capacity utilization (derived from optimization procedure as shown in Appendix: A-3) and t statistics are given in the parenthesis. $R^2 = 0.505$

Our regression result shows that effect of CU on measured productivity growth is significant at 0.05 level.

Rate of changes in CU are found to be positively correlated with TFP growth rate. This implies that among many other factors like growth in output, import of capital goods, advanced technology, trade policy etc. that affect TFPG, CU may have a resultant positive effect on TFPG rate. With the adjustment of capacity utilization, positive growth rate of TFP (5.49%) in 80's becomes smaller and sharper and displays a noticeable deceleration in growth rate in TFP (-0.159%) in 90's, and CU adjusted TFPG sharply declined during the entire time frame on an average (-0.061).

Table 6: Growth rate after adjusting capacity utilization, 1980 -81 to 2006- 07

Time interval	TFP growth rate (% per annum).					
	Unadjusted values			Values adjusted for capacity utilization		
	EFFCH	TECHCH	MTFPCH	EFFCH	TECHCH	MTFPCH
Pre-reform period i.e. 1980 -81 to 1991 – 92	-0.0042	5.21	5.49	-0.010	-0.148	-0.159
Post- reform period i.e. 1991 –92 to 2006 –07	0.097	-3.58	-3.3	0.009	-0.027	-0.019
Entire period i.e. 1980-81 to 2006 – 07	0.000	-0.8	-0.8	0.003	-0.062	-0.061

Growth rates for the entire periods are obtained from the semi- log trend.

Source: Own estimate.

On the contrary, it is found from the comparison between pre and post- reform period that difference in average annual growth rate between pre-reform (1980-81 to 1991-92) and post-reform period (1991-92 to 2003-2004) becomes smaller after incorporating effect of CU into TFP growth calculation; while unadjusted Malmquist measure implies a slowdown of -8.79% (-3.3% minus 5.49%), capacity adjusted TFPG measure suggest comparatively smaller improvement of 0.14% (-0.019% minus -0.159%) following trade reform. In a nut shell, inspection of entries in table 6 reveals that removal of cyclical effect from the estimated TFP growth does not affect its overall movement but remarkably mitigates its variation because variations between sub-periods are smaller after adjusting capacity utilization as cyclical factors.

7. Conclusion

The estimates of productivity changes in the Indian paper and paper products industry during the period 1979-80 to 2006-07 disclose despairing results at the aggregate and sub-sectoral levels. The average TFP growth rate of Indian paper industry at aggregate level was 5.49% in the pre-reform period, but it was -3.3% in the post-reform period. This result

suggests that economic reforms have adverse impact on paper sector's productivity growth resulting declining TFP growth rate. This declining trend is prevailing also to all the sub-sectors of the industry. Productivity growth during the pre-reform period was attributed to technical change both at the aggregate and sectoral level. During the post-reform period, Indian paper and paper products industry as whole witnessed a decline in the productivity change largely due to the greater drop in the technical change although efficiency slightly improved. The declining growth in technical change and failure to adopt it efficiently along with nearly constant technical efficiency change has contributed to the decreased productivity growth of Indian paper and paper products industry. Moreover, removal of short run variations in capacity utilization from the estimated TFP growth hardly affects its overall movement but remarkably mitigates its variation because variations between sub-periods are lesser after adjusting capacity utilization as cyclical factors.

However, there are some weaknesses associated with a non-parametric approach. First, since a non parametric method is deterministic and attributes all the variation from the frontier to inefficiency, a frontier estimated by it is likely to be sensitive to measurement errors or other noise in the data. In other word, it does not deal with stochastic noise. Another noise of non para- metric method is that it does not permit statistical test and hypotheses to pertain to production structure and the degree of inefficiency. In this paper, a nonparametric approach is used because it is less data demanding i.e it works quite well with a small sample size, compared to a parametric approach. Thus, the small sample size of 3 subsectors comprising of 28 firms, is conducive to the use of a nonparametric approach.

In conclusion, it can be emphasized that there is an urgent need for the implementation of specific policies to improve technical progress as well as efficiency change in order to enhance long-run TFP growth. Sectors and firms within the industry should be encouraged to use existing technology more effectively through enhanced expertise and training.

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Appendix

A1 Energy Inputs: Industry level time series data on cost of fuel of Indian Paper sector have been deflated by suitable deflator (base 1981-82 = 100) to get real energy inputs. An input output table provides the purchase made by manufacturing industry from input output sectors. These transactions are used as the basis to construct weight and then weighted average of price index of different sectors is taken. Taking into consideration 115 sector input -output table (98-99) prepared by CSO, the energy deflator is formed as a weighted average of price indices for various input-output sectors which considers the expenses incurred by manufacturing industries on coal, petroleum products and electricity as given in I-O table for 1998-99. The WIP indices (based 1981- 82) of Coal, Petroleum and Electricity have been used for these three categories of energy inputs. The columns in the absorption matrix for 66 sectors belonging to manufacturing (33- 98) have been added together and the sum so obtained is the price of energy made by the manufacturing industries from various sectors. The column for the relevant sector in the absorption matrix provides the weights used.

A2 Capital Stock: The procedure for the arriving at capital stock series is depicted as follows:

First, an implicit deflator for capital stock is formed on NFCS at current and constant prices given in NAS. The base is shifted to 1981-82 to be consistent with the price of inputs and output.

Second, an estimate of net fixed capital stock (NFCS) for the registered manufacturing sector for 1970-71 (benchmark) is taken from National Accounts Statistics. It is multiplied by a gross-net factor to get an estimate of gross fixed capital stock (GFCS) for the year 1970-71. The rate of gross to net fixed asset available from RBI bulletin was 1.86 in 1970-71 for medium and large public Ltd. companies. Therefore, the NFCS for the registered manufacturing for the benchmark year (1970-71) as reported in NAS is multiplied by 1.86 to get an estimate of GFCS which is deflated by implicit deflator at 1981-82 price to get it in real figure. In order to obtain benchmark estimate of gross real fixed capital stock made for registered manufacturing, it is distributed among various two digit industries (in our study, paper industry) in proportion of its fixed capital stock reported in ASI, 1970-71)

Third, from ASI data, gross investment in fixed capital in Indian paper industry is computed for each year by subtracting the book value of fixed in previous year from that in the current year and adding to that figure the reported depreciation on fixed asset in current year. (Symbolically, $I_t = (\beta_t - \beta_{t-1} + D_t) / Pt$) and subsequently it is deflated by the implicit deflator to get real gross investment.

Fourth, the post benchmark real gross fixed capital stock is arrived at by the following procedure. Real gross fixed capital stock (t) = real gross fixed capital stock (t - 1) + real gross investment (t). The annual rate of discarding of capital stock (D_{st}) is assumed to be zero due to difficulty in obtaining data regarding D_{st} .

A3 Econometric Model in estimating capacity utilization and data description: Considering a single output and three input framework (K, L, E) in estimating CU, we

assume that firms produce output within the technological constraint of a well-behaved production function.

$Y = f(K, L, E)$ where K , L and E are capital, labour and energy respectively. Since capacity output is a short-run notion, the basic concept behind it is that firm faces short-run constraints like stock of capital. Firms operate at full capacity where their existing capital stock is at long-run optimal level. Capacity output is that level of output which would make existing short-run capital stock optimal.

Rate of CU is given as

$$CU = Y/Y^* \quad (1)$$

Y is actual output and Y^* is capacity output.

In association with variable profit function, there exist a variable -cost function which can be expressed as

$$VC = f(P_L, P_E, K, Y) \quad (2)$$

Short run total cost function is expressed as

$$STC = f(P_L, P_E, K, Y) + P_K \cdot K \quad (3)$$

P_K is the rental price of Capital.

Variable cost equation which is variant of general quadratic form for (2) that provide a closed form expression for Y^* is specified as

$$\begin{aligned} VC = & \alpha_0 + K_{-1} \left(\alpha_K + \frac{1}{2} \beta_{KK} \left[\frac{K_{-1}}{Y} \right] + \beta_{KL} P_L + \beta_{KE} P_E \right) \\ & + P_L \left(\alpha_L + \frac{1}{2} \beta_{LL} P_L + \beta_{LE} P_E + \beta_{LY} Y \right) \\ & + P_E \left(\alpha_E + \frac{1}{2} \beta_{EE} P_E + \beta_{EY} Y \right) + Y \left(\alpha_Y + \frac{1}{2} \beta_{YY} Y \right) \end{aligned} \quad (4)$$

K_{-1} is the capital stock at the beginning of the year which implies that a firm makes output decisions constrained by the capital stock at the beginning of the year.

Capacity output (Y^*) for a given level of quasi-fixed factor is defined as that level of output which minimizes STC . So, the optimal capacity output level, for a given level of quasi-fixed factors, is defined as that level of output which minimizes STC . So, at the optimal capacity output level, the envelop theorem implies that the following relation must exist.

$$\partial STC / \partial K = \partial VC / \partial K + P_K = 0 \quad (5)$$

In estimating Y^* , we differentiate VC equation (4) w.r.t K_{-1} and substitute expression in equation (5)

$$Y^* = \frac{-\beta_{KK} K_{-1}}{(\alpha_K + \beta_{KL} P_L + \beta_{KE} P_E + P_K)} \quad (6)$$

The estimates of CU can be obtained by combining equation (6) and (1).

Output is measured as real value added produced by manufacturers ($Y = P_L L + P_K K_t + P_E E$) suitably deflated by WIP index for manufactured product (base 1981 – 82 = 100) to offset the influence of price changes. In CU measurement, variable cost is sum of the expenditure on variable inputs ($VC = P_L L + P_E E$). Total number of persons engaged in glass sector are used as a measure of labour inputs. Price of labour (P_L) is the total emolument divided by number of labourers which includes both production and non-production workers. Deflated cost of fuel has been taken as measure of energy inputs. Due to unavailability of data regarding periodic price series of energy in India, some approximations become necessary. We have taken weighted aggregative average price index of fuel (considering coal, petroleum and electricity price index, suitably weighted, from statistical abstract) as proxy price of energy. Deflated gross fixed capital stock at 1981-82 prices is taken as the measure of capital input. The estimates are based on perpetual inventory method. Rental price of capital is assumed to be the price of capital (P_K) which can be estimated following Jorgenson and Griliches (1967):

$$P_K^t = r_t + d_t - \frac{P_K^*}{P_K}$$

where r_t is the rate of return on capital in year t , d_t is the rate of depreciation of capital in the year t and $\frac{P_K^*}{P_K}$ is the rate of appreciation of capital. Rate of return is taken as the rate of interest on long term government bonds and securities which is collected from RBI bulletin (various issues). The rate of depreciation is estimated from the reported figures on depreciation and fixed capital as available in ASI which Murty (1986) had done earlier. However, we have not tried corrections for the appreciation of value of capital in the estimates of price of capital services.

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