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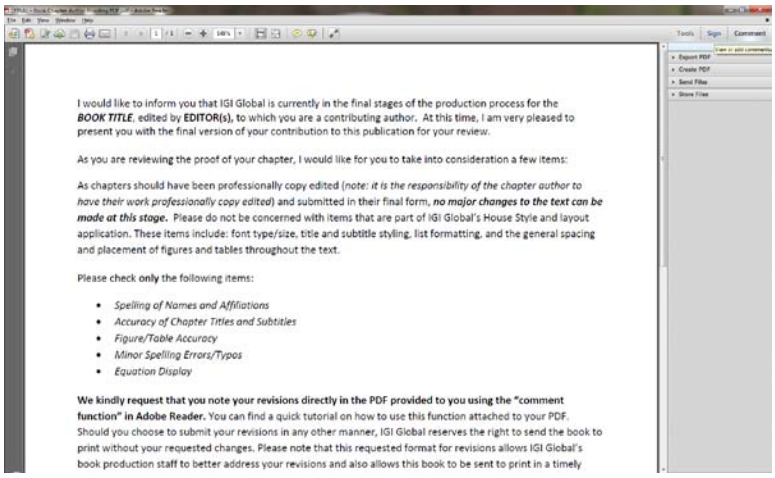

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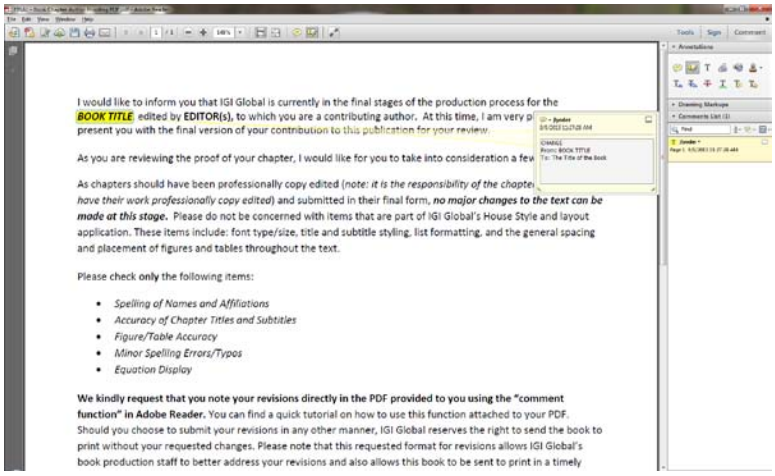

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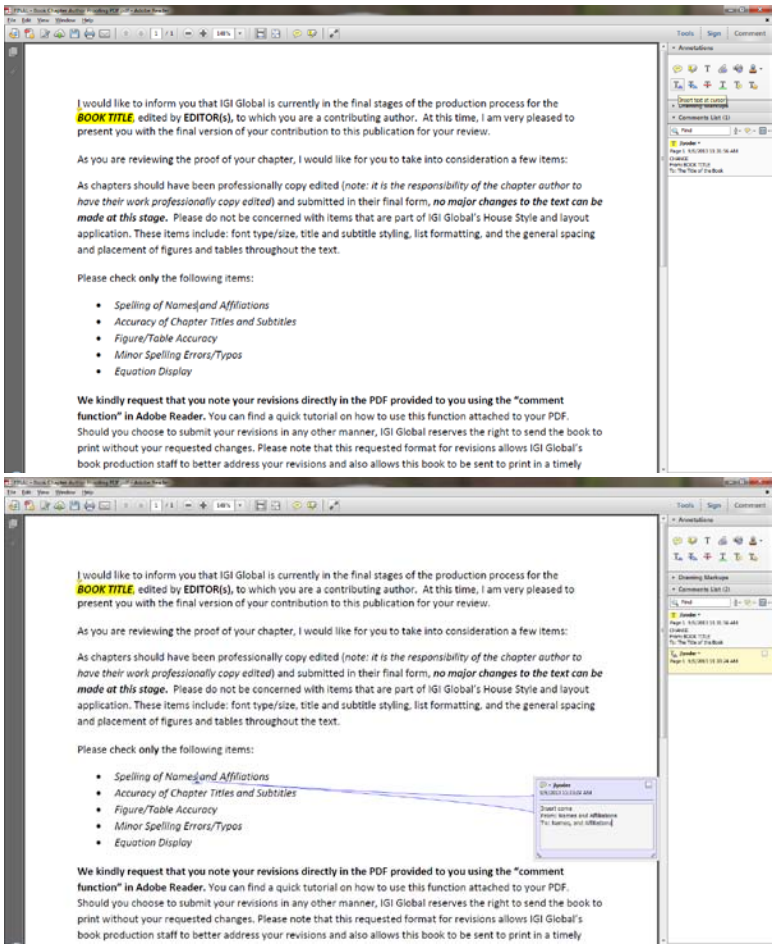

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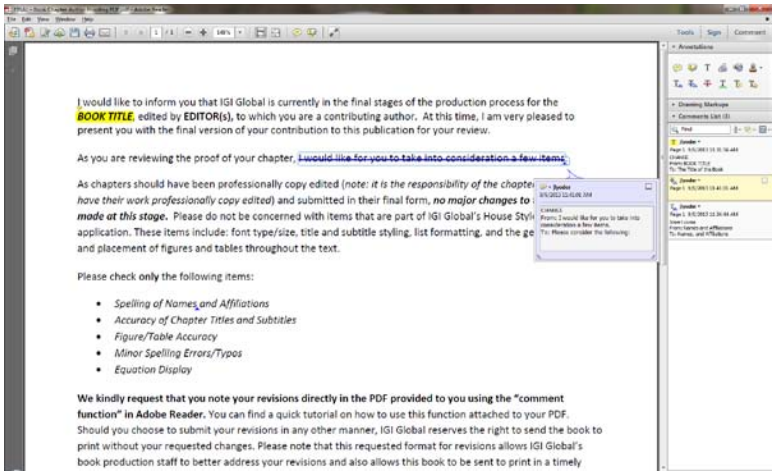

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Tools and Techniques for Economic Decision Analysis

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Detailed Table of Contents

Preface xii

Chapter 1
Investment Decision Making: A Review of Contemporary Literature 1
Aleksandar Šević, Trinity College Dublin, Ireland
Srđan Marinković, University of Nis, Serbia

This chapter is a review of different approaches academics take to find right answers on the question how investors' community makes decisions on optimal portfolio of securities and how this process converges toward capital market equilibrium. Authors will try to reconcile the approaches that come from different intellectual traditions. The authors start with the Capital Assets Pricing Model (hereafter CAPM). For decades long the model has been a cornerstone of modern finance literature and a guide for investment decision making. The model assumes that the choice of investment portfolio is directed toward optimization between statistically defined risk and observable return of a universe of available investments, in the setting of rational and homogeneous agents where information is common knowledge. The rigidity of CAPM assumptions led to a plethora of studies where some of those assumptions are relaxed. An important breakthrough to the extant body of knowledge has been made by the introduction of the asymmetric information in the decision-making process.

Chapter 2
Application of Markowitz Portfolio Theory by Building Optimal Portfolio on the US Stock Market. 25
Martin Širůček, Mendel University in Brno, Czech Republic
Lukáš Křen, Mendel University in Brno, Czech Republic

This paper is focused on building investment portfolios by using the Markowitz Portfolio Theory (MPT). Derivation based on the Capital Asset Pricing Model (CAPM) is used to calculate the weights of individual securities in portfolios. The calculated portfolios include a portfolio copying the benchmark made using the CAPM model, portfolio with low and high beta coefficients, and a random portfolio. Only stocks were selected for the examined sample from all the asset classes. Stocks in each portfolio are put together according to predefined criteria. All stocks were selected from Dow Jones Industrial Average (DJIA) index which serves as a benchmark, too. Portfolios were compared based on their risk and return profiles. The results of this work will provide general recommendations on the optimal approach to choose securities for an investor's portfolio.

Chapter 3
Do Judgmental Factors Lead to a Good Decision on Investing in a Currency or Mislead the Financial Player? An Application in Turkey 44
Aykan Akincilar, Gazi University, Turkey

Since decision on making an investment in exchange rate is one of the main problems faced by financial players acting in markets around the world, it is extensively discussed in the literature. In this study, it is investigated whether judgmental factors affect the decision in behavioral environment or not, and, if such an effect exists, its impact is whether positive or negative. In order to achieve that purpose, multi-criteria decision making approach is integrated with time series analysis approach which leads to clearly question the existence and direction of such an impact if it exists. The proposed model is applied to the Turkish market, indicating that judgmental factors prevent the financial player from misleading which is caused by considering solely profitability criterion. Thus, it is demonstrated that judgmental factors have a positive impact on the decision regarding exchange rate selection problem. Ultimately, it is demonstrated that the proposed integrated model provides accurate and reliable results.

Chapter 4
The Effects of Prudential Supervision on Bank Resiliency and Profits in a Multi-Agent Setting 65
Alexandru Monahov, University of Nice "Sophia Antipolis", France

This chapter utilizes multi-agent modeling to study the effects of prudential supervision on bank resiliency and profitability within a simulated environment of persistent crisis conditions. It focuses on the stabilizing effect of prudential supervision introduced alongside three "traditional" regulatory instruments: a norm, a market-based CDS insurance mechanism and a tax in the form of a bail-in instrument. The results show that: (1) supervision enhances the regulatory instruments' efficiency, (2) the regulatory norm can postpone the bank's default, but not avoid it, (3) the CDS mechanism only produces positive results on resiliency and profitability if the regulator supervises, and (4) the tax bail-in instrument is the most powerful tool in the regulator's arsenal as it potentiates profitable bank operation under long-lasting crisis conditions.

Chapter 5
Measuring Governance: The Application of Grey Relational Analysis on World Governance Indicators 104
Vesna Petko Jankovic-Milic, University of Niš, Serbia
Marija Džunić, University of Niš, Serbia

The governance concept has become very popular in recent decades and in this regard has increased interest in measuring its quality. The most widely used measures of governance are World Governance Indicators, which represent composite perceptions-based indicators, published by World Bank Institute. There are six composite indicators and the data for constructing those indicators are obtained from 32 individual data sources. The objective of this chapter is to highlight the applicability of Grey Relational Analysis in the ranking of EU countries according to the governance quality. The Grey Relational Analysis entails calculation of Grey relational grade for governance quality. The final stage of the Grey Relational Analysis procedure involves ranking of EU countries according to Grey relational grade and their comparison with ranks obtained from World Bank Institute. The full contribution Grey Relational Analysis arises on this stage, where ranks of countries have been changed.

Chapter 6
Export-Led Recovery in Portugal: Can It Also Sustain Growth? 129
Gonçalo Carvalho, University of Coimbra, Portugal
Marta Simões, University of Coimbra, Portugal
António Portugal Duarte, University of Coimbra, Portugal

The recent expansion of Portuguese exports can not only promote post crisis recovery but also accelerate economic growth if the theoretical predictions on the relationship between exports and growth are correct. The export-led growth hypothesis advocates that export expansion is key in promoting long run performance. However, controversies remain on the causal relationship between the variables. We investigate this nexus for Portugal over the period 1970-2012 by estimating a bivariate VAR model with output and exports and applying cointegration, Granger causality and impulse response analysis. The results show a long-run equilibrium relationship between exports and output supporting the export-led-growth hypothesis. We also investigated the growth impact of exports of manufactured and non-manufactured products. The findings point to the existence of a positive impact of manufactured exports on output and a "limiting" effect of non-manufactured exports supporting in this way the view that what a country exports matters for growth.

Chapter 7
Modeling Labor Market Flows on the Basis of Sectoral Employment in Europe 151
Mirko Savic, University of Novi Sad, Serbia
Jovan Zubovic, Institute of Economic Sciences, Serbia

By tracking the cross-sectoral distribution of employment growth, it is possible to significantly improve the ability to understand aggregate fluctuations of labor force. Adequate model can provide information which sectors have stronger impact on unemployment-to-employment transitional probability. The main goal of this research is modeling the influence of sectoral employment on outflow rate across Europe during economic crisis. Authors argue that shifts in sectoral demand have strong influence on cyclical variation in unemployment-to-employment transition. Study also uncovers highly linear relationships of outflow rate from unemployment to employment and job flows at sectoral level. Empirical data proved a strong positive correlation between dispersion of employment growth across sectors and outflow rate in Europe. Shifts in demand from some sectors to the others are responsible for significant fraction of unemployment-to-employment transition probability. Reallocation shocks accounted for about 70 to 80 percent variability of outflow rates across Europe, during the 2008-2012.

Chapter 8
Typologies as Management Tools: Understanding the Environmental Attitudes and Economic Prospects of Mussel Farmers in Greece 170
Alexandros Theodoridis, Aristotle University of Thessaloniki, Greece
Athanasios Ragkos, Alexander Technological Educational Institute of Thessaloniki, Greece
Panagiotis Angelidis, Aristotle University of Thessaloniki, Greece
Christos Batzios, Aristotle University of Thessaloniki, Greece
Vagis Samathrakis, Alexander Technological Educational Institute of Thessaloniki, Greece

Mussel farming in Greece constitutes an important economic activity for the areas where it is concentrated. This paper presents the results of a survey of mussel producers in Thermaikos Gulf, Northern Greece, where almost 90% of the total mussel production in the country takes place. Using data from a questionnaire

survey of 66 mussel producers in the area, a typology is elaborated, by means of which three types of mussel farmers are discerned. "Professionals" are the ones continuing their family tradition, "Newcomers" are those who chose mussel farming as their main occupation and recently invested in the sector and "Aged amateurs" are the oldest and least educated group, members of which plan to pass their farm to younger family members. There is strong evidence that the sampled "Newcomers" achieve considerably higher financial results, however the sample size is not adequate to generalize for all results except for the farm income. When it comes to their environmental attitudes, mussel farmers comply to bans in cases where high toxin concentrates are detected, but they are not convinced about the effectiveness of controls. They discern very clearly between the environmental and regulatory measures necessary to boost the productivity of the sector, but they seem to proclaim by far the latter type of adjustments, including the resolution of location issues. Based on the profile of each cluster and the general results of the sample proposals are made concerning the implementation of the new Common Fisheries Policy.

Chapter 9
Decision Making under Risk and Uncertainty in the Oil and Gas Industry 181
Christopher Boachie, Central University, USA

The energy system studies include a wide range of issues from short term to long term horizons. The decision making chain is fed by input parameters which are usually subject to uncertainties. The art of dealing with uncertainties has been developed in various directions and has recently become a focal point of interest. Decision making is certainly the most important task of Oil and Gas managers and it is often a very difficult one. The purpose of this chapter is to review and investigate the decision making processes under risk and uncertainty of Oil and Gas companies. Questionnaires were distributed to eight Oil and Gas companies in Ghana to solicit their view on decision making under risk and uncertainty. Results indicate that most managers use Maximax, Minimax Regret and Expected Value when making decisions under risk and uncertainty.

Chapter 10
Crisis Communication and Crisis Management during the Crisis: Case Study of Croatia 208
Bilić Ivana, University of Split, Croatia
Franka Vrkić, University of Split, Croatia

Corporate managers are faced with one important role in managing company's overall communications, especially when one crisis event occurred. Since the whole business world was preoccupied with the crisis that has gripped the year 2008, it is interesting to explore the content and the level of development of crisis management teams and crisis communications guidelines in the biggest Croatian companies. The results of research showed that Croatian companies do not stay behind their peers in the rest of the business world in the terms of establishment and development crisis management and crisis communications. Deep business crisis did not stop Croatian companies to invest in their workforces and their communication skills in order to achieve competitiveness in the market. Even though the business environment was very turbulent during the observed period, and suffered from many cutoffs the research results showed even some improvements in 2014 compared to the research from 2011.

Chapter 11
Multi-Criteria Decision Making Approach for Choosing Business Process for the Improvement: Upgrading of the Six Sigma Methodology 225
Marija Radosavljevic, University of Nis, Serbia
Aleksandra Andjelkovic, University of Nis, Serbia

Dynamic and global environment, does not offer a spot for managers that improvise and make business moves without relevant information. In order to gain relevant information, it is necessary to observe processes through which value is generated. This implies adoption of process orientation and, based on it, business process management, as a way of running a business. Useful concept for operationalization of business process management is the Six Sigma. One of very important managerial decisions under the Six Sigma concept implementation concerns choosing the process for the improvement. Very often managers must take into the account subjective data, based on their opinion and experience, as personal impression. However, subjective data may become objective when adequate tools and methods for the analysis are used. Quantification is necessary for making decisions and, also, for tracking the results of their implementation. Beside statistical, significant information may provide methods from multi-criteria decision making.

Chapter 12
Rethinking Social Capital Measurement 248
Laurence Saglietto, University of Nice-Sophia Antipolis, France
Delphine David, University of Paris 13 Sorbonne Paris Cité, France
Cécile Cezanne, University of Paris 13 Sorbonne Paris Cité, France

Social capital is decisive to many of strategic objectives of organizations. Although it has been extensively defined in the literature, social capital continues to be discussed in particular concerning its measurement. What is the usability of the existing indicators of social capital? How do managers decide which one they would prefer? An overview of the literature reveals that there are very few measurements of social capital and those which have already developed are very complex. Direct measurements appear to provide a better understanding of the complexity of relationships than aggregated measurements. Yet, we show that they are of unsatisfactory quality. Using simple counter-examples, we advance that they give rise to contradictions. From this discussion and using Graph Theory, we propose two complementary indicators of social capital which we call "relational strength" and "relational potential". These operational indicators can be handled by any actors to position themselves within their social sphere.

About the Contributors 270

About the Contributors

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Chapter 8
Typologies as Management Tools: Understanding the Environmental Attitudes and Economic Prospects of Mussel Farmers in Greece

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ABSTRACT

Mussel farming in Greece constitutes an important economic activity for the areas where it is concentrated. This paper presents the results of a survey of mussel producers in Thermaikos Gulf, Northern Greece, where almost 90% of the total mussel production in the country takes place. Using data from a questionnaire survey of 66 mussel producers in the area, a typology is elaborated, by means of which three types of mussel farmers are discerned. "Professionals" are the ones continuing their family tradition, "Newcomers" are those who chose mussel farming as their main occupation and recently invested in the sector and "Aged amateurs" are the oldest and least educated group, members of which plan to pass their farm to younger family members. There is strong evidence that the sampled "Newcomers" achieve considerably higher financial results, however the sample size is not adequate to generalize for all results except for the farm income. When it comes to their environmental attitudes, mussel farmers comply to bans in cases where high toxin concentrates are detected, but they are not convinced about the effectiveness of controls. They discern very clearly between the environmental and regulatory measures necessary to boost the productivity of the sector, but they seem to proclaim by far the latter type of adjustments, including the resolution of location issues. Based on the profile of each cluster and the general results of the sample proposals are made concerning the implementation of the new Common Fisheries Policy.

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INTRODUCTION

The sea aquaculture constitutes today one of the most dynamic economic activities of the primary sector in Greece. It consists of the fish and mussel farming sub-sectors, whose main characteristic is their intense export orientation. Approximately 80% of Greek fish aquaculture production, principally European seabass (Dicentrarchus labrax) and Gilthead seabream (Sparus aurata) and 90% of Mediterranean mussels (Mytilus galloprovincialis) are exported, mainly to the European market (FAO, 2015; Karagiannis et al., 2013; Theodorou et al., 2011). According to the Greek and European Statistical Authorities, the production of farmed fish in Greece, 95% of which is seabass and seabream, reached up to 90.7 thousand tons in 2013 with a value of 408.5 million €, while mussel production averaged 17,193 tons with a value of 6.7 million € (European Commission, 2014). Today, aquaculture is the leading agricultural sector in Greece, and fisheries constitute a strategic product for the national economy (European Commission, 2014). Apart from the decline in the traditional fishing sector, the rapid growth of aquaculture in Greece in the last three decades can be attributed to the extended and sheltered coastline of the country, the prevailing favorable climatic conditions and the increased demand for fresh marine products of high nutritional value (Theodorou et al., 2010; Theodorou et al., 2011).

Although Greece is one of the largest producers in seabass and seabream in the EU, the country's mussel farming sector has not been developed according to its growth potentials. The Greek mussel sector entails a strong impact on the rural economy, providing employment for a significant part of the local population and producing a high quality product. More than 300 farms, located mainly in the Thermaikos Gulf (North Aegean Sea, Region of Central Macedonia) are engaged in mussel farming. The farms operating in Thermaikos Gulf account for almost 90% of the annual harvest in the country, constituting the main centre of mussel production in Greece (Theodorou et al., 2010; Galinou-Mitsoudi et al., 2006).

The legislative framework for the operation of aquaculture in general, including, of course, mussel production, is the Common Fisheries Policy (CFP). Its basic goal is to ensure that the sectors of fisheries and aquaculture are environmentally, economically and socially sustainable and that they produce healthy food for EU citizens. At the same time, the CFP seeks to promote the dynamics of the fisheries sector and to ensure reasonable standards of living for fishermen and their communities. A basic principal of the CFP in the 2015-2020 period is to ensure the viability of fish stocks over time, through a safe approach which recognizes the impact of human activities in all elements of water and marine ecosystems. It aims at rendering fish fleets more selective in their choice of catches. As a result, CFP promotes regulatory measures for farmers, including mussel producers, whose intentions, needs and basic characteristics should be explicitly recognized in order to understand their dynamics and anticipate their impact on the environment and the growth of the sector. Then, the implementation of relevant measures could become less generalized and more targeted on the particular profiles of farmers, thus significantly increasing their efficiency in the achievement of the strategic goals set by the EU.

The purpose of this paper is to examine the profile and the attitudes of Greek mussel farmers, based on data from a questionnaire survey on a sample of 66 mussel farmers of Thermaikos Gulf. Respondents were categorized into clusters and differences in their economic performance were tested and analyzed. In addition, their environmental attitudes and proposals for the future of the sector were examined, in order to gather valuable information for policy makers, under the light of the new CFP.

THE MUSSEL PRODUCTION SYSTEM

In Thermaikos Gulf, the center of mussel production in Greece, mussel farming is a family-based activity that tries to adopt an entrepreneurial orientation; however, it confronts with serious environmental and institutional problems that jeopardize its development. The environmental issues in the sector stem from the geographical position of the Gulf, as it is influenced by the material inputs of three rivers (Loudias, Axios, Aliakmon), and from the designation of the neighboring area as a Ramsar Convention site. As a result, mussels are produced legally within the Ramsar protected area, facing however institutional restrictions. In addition, mussel farms operate under a strict monitoring system aiming at the timely detection of the potential presence of five types of shellfish toxins (paralytic SP, diarrheic SP, Amnesic SP, yessotoxins, azaspiracid). If the concentration of these toxins exceeds a predetermined threshold level, mussel harvest should stop (Angelidis, 2007); these levels are implied in the Reg. (EC)/853/2004 concerning the monitoring of bivalves. The decision is taken and implemented by the Regional Rural Economy and Veterinary Service. Toxin occurrence in the area has been examined before, for instance Economou et al. (2007) reported massive hospitalization of individuals having consumed mussels, which was due to high concentrations of toxic algae Dinophysis acuminata in the water ofThermaikos Gulf. According to the authors, measures of suspension of mussel harvesting were taken immediately and no sporadic cases or outbreaks were reported in the subsequent period (2000 – 2005).

Concerning the institutional problems, the most important concerns the licensing of farm operation, as due to Ramsar restrictions the on-table production system (pole cultivation) is – not complete - prohibited in the area and legitimate producers only apply the long-line system, although the former exhibits some important benefits (Angelidis, 2007). In general, the current institutional framework and the unsatisfactory organization of relevant public services, seriously hinders the development of the sector and compels active mussel farmers to take "shortcuts" in order to operate successfully their businesses. The final aim is the designation of areas for the proper establishment of mussel farms, where all the necessary controls will be implemented and producers will be able to function without competition from rival users. A part of the Thermaikos Gulf – in Pieria Prefecture - was designated as an Area for Organized Aquaculture Development ("POAY") in 2013, as a result of the implementation of a 2011 Greek law (31722/04-11-2011). This area of 1,208 ha and of 12,000 ton mussel production capacity was the first "POAY" established in Greece, setting the example for the designation of other Greek areas as well. Besides the strategic goals of the designation of the "POAY", including environmental protection and sustainable management of water resources, other goals are also pursued, such as the elimination of bureaucratic complications and restrictions and the development of an integrated development framework for mariculture, within which synergies will be accomplished among actors and policies.

METHODOLOGICAL FRAMEWORK

The Profile of the Survey

The data used for the typological analysis of mussel farmers in the study area were gathered through a survey which took place in 2013-2014. A sample of 66 mussel farmers was surveyed by means of personal interviews in their place of residence and economic activity, all situated in three areas (Chalastra, Kymina and Makrygiallos) of the Thermaikos Gulf region. Respondents were approached by enumerators

and answered a set of open-ended and close-ended questions included in a structured questionnaire. The collected data concerned the profile of the head of the farm, technical and economic indicators describing the operation of the production units (expenses, yields, prices, capital endowments, labor requirements) and the opinions and attitudes of mussel farmers concerning institutional and environmental aspects of the sector. Overall, the survey was conducted in a relatively smooth way, as the mussel farmers approached were generally eager to participate. The questionnaire was not very extended, so that it might have caused fatigue issues; on the contrary, several respondents were willing to discuss the issues raised within the survey and to share some of their personal experiences, views and aspirations, further than the survey questions themselves.

Theoretical Background of the Analysis

Established methodological tools were used for the analysis of the survey data. First, the sampled farms were categorized to clusters/groups with common characteristics based on the personal characteristics of their owners, using the Two-Step Cluster Analysis (TSCA) method. TSCA constitutes an extension of a typical cluster analysis aiming at the determination of clusters which share common characteristics based on categorical and/or continuous variables (SPSS, 2002). Then, in order to detect significant differences between the financial results achieved by farms categorized in different clusters, methods of statistical inference for parametric and non-parametric hypotheses testing, such as analysis of variance (ANOVA), Kruskal-Wallis test and Wilcoxon rank sum test (Mann-Whitney U-test), were employed. The non-parametric tests were applied in cases where the assumptions about either variability or the form of the distribution of the population were seriously violated, with or without transformed data (SPSS, 2002). As a final step, a Factor Analysis was used in order to reduce the original set of variables proposing alternative ways for the improvement of the productivity of the sector into a smaller set of uncorrelated components that represent most of the information found in the original variables (Nurošis, 2012).

RESULTS AND DISCUSSION

Farm Typology

The sampled mussel farmers were clustered according to their personal characteristics on the basis of four variables:

1. Level of education;
2. The type of job they do besides mussel farming;
3. Their age; and
4. Whether their parents were also mussel producers.

Table 1 presents the results of the TSCA. It can be seen that the four variables are all significant in the formulation of the clusters and the importance of the typology is fair (slightly over 0.3).

Cluster 1 is the largest, as it includes 25 respondents (37.9% of the total cohort). The common characteristic of the farmers categorized here is that they are all also employed in fisheries and mussel production is their main or secondary source of income. Their decision to engage in this activity was

Table 1. Results of the Two-Step Cluster Analysis (TSCA) – categorization of mussel farmers

	Clusters				
	1	**2**	**3**	**Total**	**Importance**
Cluster size (%)	25 (37.9%)	20 (30.3%)	21 (31.8%)	66	0.30
Education	25	20	21	66	1.00
Primary School	2	1	21	24	
Secondary School	13	3	0	16	
High School	1	8	0	9	
Technical education	6	5	0	11	
Higher education	3	3	0	6	
Other job	25	20	21	66	0.61
Other	0	9	7	16	
Fisherman	25	3	13	41	
None (Unemployed)	0	8	1	9	
Age (mean)	46.48[a]	46.8[a]	60.43[b]	51.02[c]	0.53
Parents	25	20	21	66	0.46
Yes	19	7	1	27	
No	6	13	20	39	

Note: Values with different superscripts in each row indicate statistical difference between clusters (p-value≤0.05)

largely due to the fact that the business was started by their parents, as 76% of the farmers categorized in this cluster come from a family of mussel producers; nonetheless only 6 out of 19 farmers coming from a family of mussel producers claimed that this was the main factor affecting their decision to undertake the activity, although there was no significant statistical association. Most of them are of low and average educational backgrounds, as the majority attained low secondary education (the compulsory level of formal education in Greece); however a significant percentage of farmers attended some type of higher education, either a University Faculty or a Technical School. They are the youngest farmers among the three groups. Based on the profile outlined here, these farmers can be called "Professionals", as they followed a family tradition, thus inheriting relevant know-how, and are also engaged in fisheries.

Cluster 2 includes 20 farmers (30.3% of the sample). This cluster consists mainly of persons who are not engaged in fisheries alongside with mussel production; they are either employed in sectors other than fishery (45%) or mussel farming is their only activity (40%). In fact, 8 out of the 9 persons stating that mussel farming is their only source of employment are categorized in this cluster. More than two thirds of respondents do not come from mussel-producing families; instead the majority (55%) chose this profession because they wanted to, unlike respondents in other clusters who revealed other motivations behind their decision. Their average age is 46.8 years, which is significantly lower than the sample average (51.02 years). Concerning their education, they attended high school (40%) or some type of post-graduate education (40%), so it can be safely argued that the average participant of this category is fairly educated and of a considerably higher educational level than the typical participant of the remaining two categories. Based on these observations, Cluster 2 is named "Newcomers" because it consists

of persons with no prior family know-how about mussel production, who chose this profession as an alternative to unemployment because they felt appealed by it.

Cluster 3 consists of the remaining 21 respondents (31.8% of the sample). These producers are significantly older than the sample average, but also than the producers categorized in the other two groups (mean age 60.43 years). Their level of education is low as none of them proceeded in school after Primary School (six years in Greece). Apart from their low level of formal education, 33% of these producers have not attended any type of formal or vocational training on mussel production, which is the highest rate among the three clusters (the corresponding percentages are 16% for "Professionals" and 25% for "Newcomers"). They initiated their own mussel production business, as only one of them comes from a family previously engaged in mussel farming. The majority are simultaneously employed as fishermen (62%) and only one person claimed to practice mussel farming as their sole activity. Examining their reasons to enter the sector, a significant motivation was detected in the compulsory choice of mussel farming, compared to the remaining two clusters, as their only employment alternative. According to this profile, Cluster 3 is named "Aged amateurs" as they only sought for vocational training at a low degree and their considerable higher age than the sample average indicates that they are going to leave the sector soon. Note, however, that they plan to pass the mussel business to their children after they leave the sector (71% compared to 48% and 40% for the remaining two clusters respectively, although a chi-square test of homogeneity did not reveal a significant difference).

Management Diversities Among Cluster Profiles

Table 2 presents the main financial results achieved by the sampled mussel farms. In absolute numbers, "Newcomers" achieve considerably higher financial results; indeed, their gross output is almost 80% higher than the average gross output of "Professionals" and "Aged amateurs", while the differences between their production costs are much lower. This high gross output of "Newcomers" is justified by their high production. Accordingly, the net profit reflects this difference, with "Professionals" achieving net losses, the "Aged amateurs" achieving profits marginally over zero and the "Newcomers" being the most profitable of all. The farm income exhibits the same pattern, being higher for "Newcomers" and very lower for the remaining two types of farmers. Also, "Newcomers" achieve the highest farm income. The financial results per 100kg of product are also presented in Table 2 in order to make comparisons. Under this basis, the economic performance of "Newcomers" does not exhibit the same extended differences compared to other groups.

Despite the evident differences between the financial results achieved by the average farm of each cluster, the Kruskal – Wallis test did not reveal statistically significant differences. The reason behind this lies in the low sample size, as a survey extended to more mussel farmers would generate the data necessary to account for such differences. Significant differences were only detected between groups, namely "Professionals" and "Newcomers" considering the profit and the farm income they achieve.

Table 3 presents the responses of mussel producers regarding some environmental and territorial issues linked to the operation of their production system. Concerning the implementation of the "POAY", 81.8% of respondents believe that it is an effective solution for the territorial issues of mussel farming; however, a significant part of "Professionals" did not seem convinced by its effectiveness. On the other hand, most of respondents acknowledge the efficiency of controls in order to resolve location issues of mussel farms, but a non-trivial part of "Newcomers" (30%) stated otherwise. It is also interesting to stress that although the vast majority of respondents claims compliance with bans due to marine biotoxins

Table 2. Financial results of the three types of mussel farms

	Clusters						Average	
	1 ("Professionals")		2 ("Newcomers")		3 ("Aged amateurs")			
	Mean (.000€) (S.D.)	**Mean (€/100kg) (S.D.)**	**Mean (.000€) (S.D.)**	**Mean (€/100kg) (S.D.)**	**Mean (.000€) (S.D.)**	**Mean (€/100kg) (S.D.)**	**Mean (.000€) (S.D.)**	**Mean (€/100kg) (S.D.)**
Gross Output	42.75 (53.59)	43.3 (7.8)	76.45 (124.19)	44.0 (11.1)	44.14 (41.04)	40.0 (6.3)	53.40 (79.51)	42.5 (8.6)
Total Costs	45.27 (62.06)	49.2 (15.7)	50.81 (49.27)	41.6 (14.3)	43.11 (37.13)	41.8 (16.1)	46.26 (50.65)	44.5 (15.6)
Net Profit	-2.52[1] (17.86)	-6.6 (14.7)	25.64[2] (76.27)	2.2 (16.6)	1.02[1,2] (8.91)	-1.0 (13.3)	7.14 (44.68)	-2.1 (15.1)
Gross Margin	21.87 (38.53)	17.1 (10.9)	45.00 (89.31)	22.2 (13.8)	19.71 (16.00)	19.4 (9.1)	28.19 (55.53)	19.4 (11.3)
Farm Income	15.16[1] (17.34)	14.3[a] (10.1)	47.56[2] (93.60)	23.2[b] (11.9)	20.44[1,2] (23.14)	17.0 [ab] (6.6)	26.66 (55.08)	17.9 (10.3)
Production (.000kg)	96.2 (108.6)		179.4 (316.7)		114.4 (111.4)		127.2 (196.9)	

Note: Values with different superscripts in each row indicate statistical difference between clusters (p-value≤0.05)

presence, there were three out of 66 respondents who did not comply with such bans, two of which were "Professionals". It has to be mentioned here that although 95.5% of respondents comply with the bans, 39.4% of them questioned the results of state laboratories regarding the presence of coliforms and marine biotoxins and 51.5% believe that the ban decisions do not correspond to actual phenomena. Responses about these issues do not vary significantly among clusters. When it comes to harvesting dead mussels, two out of three respondents confirmed it, with no significant variations among clusters; of them, six producers expressed concerns about the deaths being due to the presence of toxics.

As a final step, respondents were asked to state their opinions concerning the amelioration of the performance and productivity of the sector. For this reason, they were asked to agree or disagree with eight proposals and their responses were analyzed using a factor analysis. The frequency analysis of the corresponding variables is presented in Table 4. The most important adjustments are linked to laboratory quality controls (62.1%), the establishment of effective legislative framework (60.6%) and the provision of technical and scientific support (62.1%). Proposals of less importance include the coordination of relevant services – i.e. the simplification of processes which would lead to less bureaucracy – (57.6%) and the resolution of location issues – also related to the implementation of the "POAY" - (51.5%), as well as the establishment of a price observatory in order to improve information flows between markets and producers (48.5%). Interventions to prevent the adverse effects of toxic phytoplankton are of less importance to respondents.

The results of the factor analysis are presented in Table 5. The proposed adjustments are loaded in two factors, which explain 54.96% of the total variance and describe two distinct types of issues affecting the performance and productivity of the sector. Variables describing the effectiveness of ban measures, the establishment of a price observatory and the effective resolution of location issues of mussel farms are loaded in Factor 1 with the highest loadings. In Factor 2, the variables describing the toxic phytoplankton

Table 3. Environmental attitudes of mussel farmers

		Cluster 1 "Professionals" N (% of cluster)	Cluster 2 "Newcomers" N (% of cluster)	Cluster 3 "Aged amateurs" N (% of cluster)	Total N (% of cluster)
Will the "POAY" resolve location issues?	Yes	16 (64.0)	19 (95.0)	19 (90.5)	54 (81.8)
	No	9 (36.0)	1 (5.0)	2 (9.5)	12 (18.2)
Systematic control for the resolution of location issues	Yes	23 (92.0)	14 (70.0)	18 (85.7)	55 (83.3)
	No	2 (8.0)	6 (30.0)	3 (14.3)	11 (16.7)
Compliance with bans of mussel consumption due to marine biotoxins	Yes	23 (92.0)	20 (100.0)	20 (95.2)	63 (95.5)
	No	2 (8.0)	0	1 (4.8)	3 (4.5)
Trust in controls of state laboratories concerning the presence of toxins	Yes	15 (60.0)	12 (60.0)	13 (61.9)	40 (60.6)
	No	10 (40.0)	8 (40.0)	8 (38.1)	26 (39.4)
Do bans correspond to actual phenomena?	Yes	12 (48.0)	10 (50.0)	10 (47.6)	32 (48.5)
	No	13 (52.0)	10 (50.0)	11 (52.4)	34 (51.5)
Harvesting dead mussels	Yes	16 (64.0)	14 (70.0)	14 (66.7)	44 (66.7)
	No	9 (36.0)	6 (30.0)	7 (33.3)	22 (33.3)
Presence of toxins	Yes	1 (4.0)	2 (10.0)	3 (14.3)	6 (9.1)
	No	24 (96.0)	18 (90.0)	18 (85.7)	60 (90.9)
Alternative uses of shells	Recycle	19 (76.0)	17 (85.0)	10 (47.6)	46 (69.7)
	Storage	1 (4.0)	2 (10.0)	1 (4.8)	4 (6.1)
	Burn	5 (20.0)	1 (5.0)	9 (42.8)	15 (22.7)
	Bury	0	0	1 (4.8)	1 (1.5)

controls exhibit the highest loadings. Hence, Factor 1 concerns structural and regulatory issues, while Factor 2 deals with human health and quality issues.

FUTURE RESEARCH DIRECTIONS

The most important limitation of this study is the lack of statistically rigorous results which could be generalized to the whole population. The reason behind this lies in the low sample size, as a survey expanded to more mussel farmers would generate the data necessary to account for such differences. However, it is difficult to approach more producers because many of them have issues with the license of operation of their farms, which renders them cautious and uncommunicative towards such surveys. However, the findings of this study provide an indicative image of the sector which can be of use for policy makers and for actors engaged in it.

Table 4. Proposals concerning the productivity of the sector – Descriptive analysis

		Cluster 1 "Professionals" N (% of cluster)	Cluster 2 "Newcomers" N (% of cluster)	Cluster 3 "Aged amateurs" N (% of cluster)	Total N (% of cluster)
Rapid and effective control laboratories	Yes	16 (64.0)	13 (65.0)	12 (57.1)	41 (62.1)
	No	9 (36.0)	7 (35.0)	9 (42.9)	25 (37.9)
Better technical and scientific support	Yes	18 (72.0)	11 (55.0)	12 (57.1)	41 (62.1)
	No	7 (28.0)	9 (45.0)	9 (42.9)	25 (37.9)
Effective and not precautionary bans to actual phenomena	Yes	16 (64.0)	12 (60.0)	12 (57.1)	40 (60.6)
	No	9 (36.0)	8 (40.0)	9 (42.9)	26 (39.4)
Coordination of services to safeguard the legality of farms	Yes	13 (52.0)	12 (60.0)	13 (61.9)	38 (57.6)
	No	12 (48.0)	8 (40.0)	8 (38.1)	28 (42.4)
Rational location of mussel farms	Yes	14 (56.0)	9 (45.0)	11 (52.4)	34 (51.5)
	No	11 (44.0)	11 (55.0)	10 (47.6)	32 (48.5)
Price observatory	Yes	13 (52.0)	10 (50.0)	9 (42.9)	32 (48.5)
	No	12 (48.0)	10 (50.0)	12 (57.1)	34 (51.5)
Effective control of toxic phytoplankton in water	Yes	7 (28.0)	6 (30.0)	6 (24.0)	19 (28.8)
	No	18 (72.0)	14 (70.0)	15 (76.0)	47 (71.2)
Effective control of toxic phytoplankton in mussel flesh	Yes	6 (24.0)	7 (35.0)	5 (23.8)	18 (27.3)
	No	19 (76.0)	13 (65.0)	16 (76.2)	48 (72.7)

CONCLUSION

The analytical framework in this paper revealed the existence of three distinct types of mussel farmers in the study area, each one of which requires different approaches and is in need of different structural

Table 5. Proposals concerning the productivity of the sector – Factor analysis (Rotated component matrix)

	Factors	
	1	2
Effective control of toxic phytoplankton in water	0.110	0.945
Effective control of toxic phytoplankton in mussel flesh	0.170	0.928
Effective and not precautionary measures to actual phenomena	0.720	0.245
Rapid and effective control laboratories	0.504	0.080
Price observatory	0.641	0.192
Coordination of services to safeguard the legality of farms	0.607	0.139
Rational location of mussel farms	0.743	0.079
Better technical and scientific support	0.605	-0.049

* VARIMAX rotation method

* Bartlett's test of sphericity (KMO) chi-square = 150.335, p<.000

adjustments and institutional interventions in order to ameliorate their performance. "Newcomers" are the ones achieving the best financial results, partly as a result of their conscious decision to undertake mussel farming and of their relatively high educational level. It can be supported that "Newcomers" are the ones able to support the growth of the sector, being endowed with the necessary characteristics to promote the sector. They are the ones proclaiming an even stricter monitoring and control system as a prerequisite to the sector's development. On the other hand, "Aged amateurs" achieve lower financial results, while they seem deprived of the necessary characteristics to be the target group of innovative practices and environmental friendly policies - note that a significant part of "Aged amateurs" supports burning mussel shells instead of recycling them (Table 3). Taking into account their age, they are the ones who will be leaving the sector shortly giving their place to younger successors. Finally, "Professionals" do not perform satisfactorily from an economic point of view but they support changes in the regulatory framework. Being the successors of their families' farms, they are endowed with considerable know-how, which constitutes an important asset for the development and expansion of the sector. Policies should support them in capitalizing this experience.

It is clear that mussel farmers clearly discern structural and regulatory issues from hygiene and environmental ones. They prioritize institutional issues for the improvement of their performance; nonetheless, some of these are expected to contribute to the solution of the environmental ones, for instance through the establishment of efficient laboratories in charge of monitoring and control. The qualitative information gathered by the enumerators during the interviews demonstrated that most of the mussel farmers were not dissatisfied from their incomes but mainly from the institutional framework. They were highly preoccupied concerning unexpected changes and uncertainty, while a non-trivial part of respondents thought the resolution of issues relating to quality and control are the most important prerequisites for the development of the sector. A post-analysis examination revealed that these views mainly came from "Newcomers" but also from a small percentage of "Professionals", although the qualitative nature of this information cannot permit robust statistical analyses to be undertaken. Note that the new CFP provides useful tools not only in the institutional aspect but also in the provision of financial support to mussel farmers.

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