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Proposal/Contract No. **044283**

Project acronym: **FOODIMA**

Project title: **Food Industry Dynamics and Methodological Advances**

Instrument: **Sustainable Management of Europe's Natural Resources**

Thematic Priority: **Sixth Framework Programme Priority 8.1 B.1.1**

FOODIMA PUBLISHABLE FINAL ACTIVITY REPORT
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Project co-ordinator name: **Prof. Konstadinos Mattas**

Project co-ordinator organisation name: **Aristotle University of Thessaloniki**
School of Agriculture

Project Web Site: www.eng.auth.gr/mattas/foodima.htm

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I.1 Summary Description of Project Objectives

The FOODIMA project aims to develop a concise set of methodological tools suitable for a systematic economic assessment of the EU food chain. These tools will provide an evaluation of the structural changes and economic performance of selected food sectors in representative countries of the enlarged EU, along with a detailed description of the entire European food chain.

Specifically, the objectives of the FOODIMA project are the following:

1. *To provide a consolidated and solid methodological framework suitable for applying in food chain analysis.*
2. *To generate a descriptive analysis and a concise outlook of the entire EU food industry.*
3. *To explore the dynamics of the food industry and assessing the effects of the productivity patterns and the level of integration on the economic performance of the food chain.*
4. *To analyze the competitiveness and strategic interactions of the food industry, particularly the influence of mergers and acquisitions activity.*
5. *To model technology adoption and R&D incentives in the EU food supply chain.*
6. *To evaluate the regulatory environment and the most significant causes of change in the food industry, with particular emphasis placed on the influence of policy measures on food quality, standardization, and labeling.*
7. *To assess the interactions and integration of the food industry and the agricultural sector and to demonstrate its contribution to the development of rural areas.*
8. *To generate policy recommendations for EU and national officials.*

I.2 List of Participants and Contractors Contact Details

Participant 1: Aristotle University of Thessaloniki, School of Agriculture, (AUTH), Greece, Prof. Konstadinos Mattas (Coordinator), e-mail address: mattas@auth.gr

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The FOODIMA project logo is the following:

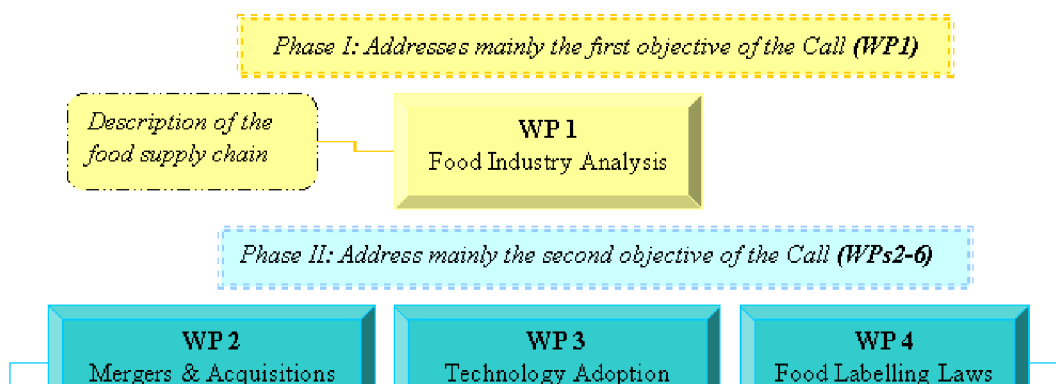


I.3 Work Performed

The objectives of the project were fulfilled through the implementation of the following Work Packages (WPs):

- WP1.** State Of The Art in Food Industry Analysis: Main characteristics of Food Supply Chain and the Regulatory Environment.
- WP2.** Strategic Interactions and Sectoral Competitiveness: An Analysis Of M&A (Mergers and Acquisition) Activity in the EU Food Supply Chain.
- WP3.** Market Performance and Welfare Evaluation: Technology Adoption and R&D Incentives in the EU Food Supply Chain.
- WP4.** Market and Welfare Effects of Purity Standards in Food Labelling Laws.
- WP5.** Assessment of the Economic Performance of the Food Supply Chain.
- WP6.** Analysis of the Socio-economic Effects of the Food Supply Chain in Remote Rural Areas.
- WP7.** Demonstration and Dissemination of the Results.
- WP8.** Project Management and Assessment.

The organization of the WPs is depicted in the following figure:



Concerning **WP1**, an identification and review of tools and methods used to analyze the EU food industry and the food supply chain in general was conducted.

Furthermore

a detailed description of the entire EU food chain, on the basis of existing information and literature was performed. Specific attention was paid to meat slaughter, processing and distribution, dairy processing and distribution and retailing sectors. Finally, a documentation and evaluation of the existing policies and EU legislation pertinent to the agri-food supply chain was undertaken. These tasks produced deliverable D1.1 “A Protocol of Literature Reviews and a Coded Elaborated and Critical List of the Applied Methods in the Food Industry”, deliverable D1.2 “An In-Depth Picture and Evaluation of the Market Structure, Concentration and Competition of the Food Supply Chain in the EU” and deliverable D1.3 “Documentation and Analysis of the Existing Policies and Regulatory Framework”.

Regarding **WP2**, an extensive search of the literature (including “grey” as well as formal sources) was performed in order to observe the M&A activity in the food supply chain industries and understand the major effects on market structure and performance. This task resulted in deliverable D2.1 “A Report and a Detailed Database on the M&A Activity During the Last Decades in the Food Supply Chain”. In addition, the time pattern of merger activity in the EU food industry was explored and spectral analysis was applied to data upon merger activity in the food manufacturing, food wholesaling, and food retailing sectors over the period from 1983 – 2006. The analysis included eight European countries (Finland, Denmark, Germany, France, UK, Netherlands, Spain and Italy) covering 90% of domestic and 79% of inward or outward mergers in the EU food industry during the period 1983-2006. The result of this task was deliverable D2.2 “An Empirical Evaluation of M&A Waves Observed Throughout EU”. Furthermore, a theoretical microeconomic model of dynamic M&A activity incorporating the different influencing factors was developed and incentives for mergers and acquisitions in both the downstream and upstream level of the food supply chain were examined in an extended framework. These tasks resulted in deliverables D2.3 “A Consistent Microeconomic Model for the Analysis of the Dynamics of M&A Activity” and D2.4 “An Integrated Game-Theoretic Model for the Analysis of Strategic Interactions of M&A Activity”. Finally, a quantitative evaluation of the dynamics of M&A activity observed during the last decades in UK and Greece was performed implementing a hazard rate model. The outcome of the analysis was deliverable D2.5 “An Empirical Assessment of the Driving Forces of M&A Activity in the Food Supply Chain”.

Worked performed in the context of **WP3** referred to market performance and welfare evaluation and especially, the R&D incentives in the food supply chain. First of all, a database comprising all relevant literature dealing with the determinants of technology diffusion and R&D spending was established producing deliverable D3.1 “A Report and a Database on the Technological Innovations and R&D Activity in the EU Food Supply Chain”. Next, a theoretical framework was constructed in order to explore the impact of the main industry features on prices, outputs, profits and consumer and total welfare. The vertical contracting of the food industry was endogenized and the determination of the contract terms was examined on the basis of various market characteristics such as product differentiation, market concentration and product variety. These tasks resulted in deliverable D3.2 “A Game-Theoretic Model for the Analysis of Vertical Trading Forms in Food Supply Chain”. In deliverable D3.3 “An Integrated, Theoretical Framework for the Analysis of Firms Innovative Incentives and their Impacts on Market Efficiency and Welfare”, a theoretical model that captures the main characteristics of the food industry’s structure was developed and the incentives of food processors to invest in product and process innovation were explored. Furthermore, the implications of their investments on market efficiency and welfare were analyzed. Deliverable D3.4 “An Empirical Analysis on the Adoption and Diffusion of Technological Innovations in the Food Supply Chain” provided the results of an empirical estimation of the role played by learning-by-doing and learning-from-others in the adoption of technological innovation decision of farmers and firms. Finally, a report was prepared which summarises policy recommendations that will improve the efficiency of the food supply chain as well as the consumer’s welfare based on the analysis of the previous constructed models. This task ended up in deliverable D3.5 “A Portfolio of Policy Recommendations for the Improvement of the Food Supply Chain and a Set of New Merger Guidelines”.

As far as **WP4** is concerned, an extensive literature search on practice and analysis of both European and US food labeling laws as well as a historical analysis of the regulatory framework on food labelling resulted in deliverable D4.1 “A Report on the European and US Food Labelling Laws and Purity Standards”. Furthermore, a novel methodological framework was developed in order to analyse the effect of allowing the presence of GM material in non-GM foods on the prices and quantities of the GM and non-GM products, the profits of the product suppliers, and consumer welfare. The methodology followed and results are presented in deliverable D4.2&4.3 “Market and Welfare Effects of Purity Standards in Food Labelling Laws”. In deliverable D4.4 “A Quantitative/Simulation Analysis of the Market and Welfare Effects of European Food Labelling Standards” a comparison between the equilibrium quantities and prices, as well as consumer’s and producers’ welfare before and after changing the purity standards was carried out. This analysis helped determining the market and welfare effects of different

purity thresholds. Finally, small-scale surveys in Greece and Denmark were conducted in order to get qualitative insights on the perceptions of key actors in the food supply chain regarding relations with up- and downstream partners, the future dynamic of the food sector, the influence of policy intervention etc. This task produced deliverable D4.5 “A Synthetic Report on the Perceptions of the Food Chain’s Actors”.

In the context of **WP5**, firstly, two theoretical models for the measurement of productivity change and its decomposition to its components were presented in deliverable D5.1 “Development of Food Industry Models for Dynamic Productivity Measurement for the EU Food Supply Chain”. Next, the evolution of TFP (Total Factor Productivity) change in the EU food supply chain was examined. Case studies were presented for the primary dairy production sector in Germany, the Netherlands and the UK, and the sheep and goat farming system in Greece. Additionally, TFP change was estimated and decomposed for the EU 15 food processing sector. The above tasks resulted in deliverables D5.2 “Generate Measures of the Decomposition of the Contributions to Productivity Growth in Selective Sectors of the Food Supply Chain” and D5.3 “Analysis of the Relative Contributions of how the Food Industry is Extracting its Potential from Existing Technologies”.

The first task in the context of **WP6** was to develop the theoretical foundations for the construction of a comparable regional I-O (Input-Output) scheme. This task was accomplished with the production of deliverable D6.1 “A Theoretical Framework for the Construction of a Complete Regional I-O Model”. Next, the methodology developed in D6.1 was used in order to provide an analysis of the economic structure of selected regions in three countries (Czech Republic, Germany and Greece) with detailed presentation of the food sector. Finally, a synthetic report analysing the socioeconomic importance of the food supply chain in the selected regions was presented. The former task resulted in deliverable D6.2 “A Report Presenting the Constructed Regional I-O Tables along with the Linkage Coefficients and the Eliminating Process” while the latter in deliverable 6.3 “A Synthetic Report Analyzing the Socioeconomic Importance of the Food Supply Chain in the Selected Remote Rural Areas”.

WP7 included the efforts made to demonstrate and disseminate the results. Two leaflets were prepared, one describing Project’s goals and objectives and one (in English and all Partners’ languages) presenting the main conclusions from the empirical research. These two leaflets correspond to deliverables D7.1 “A Leaflet Describing Project’s Broader Goals, Objectives and Expected Benefits” and D7.2 “A Leaflet (in English and all Partner’s Language) Summarizing the Results of the Empirical Research”. In addition, a workshop was held in Brussels (15th March 2010) where the empirical results from the undertaken research were presented and policy makers were invited to participate and discuss the findings and contribute to further collaboration and analysis. This task corresponds to deliverable D7.3 “A Workshop on the Analysis of Food Industry Dynamics”. Furthermore, a short course was organized (2-9th August 2009) in Rethymno where members of the Project’s Consortium offered lectures to scientific audience and PhD students aiming at teaching them the developed modelling tools and how to use them. This task is described in the ANNEX as deliverable D7.6 “A Short Course on Modelling Tools”. The modelling tools were also compiled in a CD-ROM so as to be available to the Commission and anyone who is interested in using them in other analyses or teaching initiatives. This task corresponds to deliverable D7.5 “A CD-ROM containing all the modelling tools”. Further work included in WP7 involves all publications related to work performed within the context of the Project. Partners managed to publish parts of the theoretical and empirical results in international seminars and conferences as well as in prestigious scientific journals. These efforts produced the completion of deliverable D7.4 “Publication of the Research Results in Scientific Outlets”. Finally, research results obtained from all Work Packages were combined so as to produce synthetic reports on the situation of the food industry in each participating in the Project country. These reports were also all combined so that an overall summarising section, based on the findings of the individual country synthetic reports, was provided. This task resulted in deliverable D7.7 “Six Synthetic Reports including an overall summarising section”.

Conclusively, concerning **WP8**, deliverables D8.1 “A Handbook/Guidelines for the Executive Committee”, D8.3 “Work Package specific evaluation (2 Mid-Term Reviews)” and D8.4 “A Final Report on the Research Activities” were completed and delivered. Furthermore, the FOODIMA website, which corresponds to deliverable D8.2 “FOODIMA Website”, was created and it served as a central location where progress reports, guidelines to the Partners, descriptions of the scheduled tasks and work plans for the whole Project were uploaded throughout the duration of the Project. All final deliverables as well as meeting presentations and minutes can be accessed through the Project’s website. The Project meetings, organised and supervised by the Project Coordinator, were held regularly so that Partners has the opportunity to discuss issues related with the scheduled tasks, corrections needed and provisions for the following steps. The seven Project meetings took place in Thessaloniki, Greece (19th January 2007), Copenhagen, Denmark (18th June 2007), Wageningen, the Netherlands (20th November 2007), Warwick, UK (9th June 2008), Prague, Czech Republic (25th November 2008), Halle,

Germany (12th June 2009), Rethymno, Greece (27th November 2009). One final meeting was organised in Brussels on 15th of March 2010 in which the Coordinator and members of the Consortium presented Project's outcomes to EU officials and experts, providing thus the opportunity to enrich results with further discussion and comments.

I.4 End Results

Project's deliverables have been completed without major deviations from the work plan. The end results of the Project are discussed and analyzed in detail in corresponding deliverables. Deliverables include an executive summary and a "policy recommendations" section where results are clearly presented and discussed. In the following paragraphs the main end results of the research are presented.

Strategic Interactions and Sectoral Competitiveness: Analysis of Merger and Acquisition Activity in the EU Food Supply Chain (WP2):

- Level of merger activity in the EU food industry is neither random nor unpredictable. Instead it follows a cyclical pattern which is determined by cyclical movements in the business and capital markets.
- Trends in manufacturing and retailing mergers are not uniform throughout EU countries. The cyclical pattern of mergers in these two sectors varies from country to country and this may be due to distinct national characteristics. This may be due to the fact that the industry is at different stages of development in each country but the variations also depend on cultural and national regulatory differences.
- The increased merger activity in the retailing may be caused by similar activity in the manufacturing which in turn stresses the strategic interdependence along food supply chain sectors. This further implies that mergers may have contributed to jump of food prices caused by structural changes in the market.
- A merger among food manufacturers is desirable from a welfare point of view, only when it takes place in a market which is neither sufficiently concentrated nor it changes significantly the degree of the market's concentration. In all other cases, the antitrust authorities should not allow the mergers to go through even though they lead to efficiency gains.
- The antitrust authorities should be more skeptical towards mergers in the food retailing sector than towards mergers in the food manufacturing and processing sector. The mergers of food manufacturers/processors could generate efficiency gains and end up, under certain conditions, leading to an improvement in welfare.
- Whether merger activity in the European food supply industry should be further encouraged or discouraged (or left alone) will depend to a considerable degree upon (i) whether the industry is considered excessively concentrated or not, and (ii) whether merger activity will generate increases in productivity and efficiency perhaps through placing resources in more capable hands.
- When merger cases in the food industry are being examined, the examination should encompass some forward looking analysis that takes into account that one merger would be followed by another.

Market Performance and Welfare Evaluation: Technology Adoption and R&D Incentives in the EU Food Supply Chain (WP3):

- An increase in the competition among food manufacturers, captured as an increase either in the number of food manufacturers, in product substitutability or in the product variety, has a negative impact on the wholesale prices, and subsequently on the final prices. In contrast, an increase in the market size and in the concentration of the food retailing sector tends to lead to an increase in the wholesale prices charged by food manufacturers.
- The food industry tends to perform better in terms of consumer and total welfare when it is characterized by increased competition both in the food manufacturing and the food retailing sectors, by strong product differentiation, as well as by high product variety and economies of scope. However, when entry in the food manufacturing sector is endogenous, higher product variety decreases the manufacturers' entry incentives, and thus, it leads to an increase in the upstream concentration. The opposite holds when goods become more differentiated, the economies of scope get stronger and the food retailing sector becomes more competitive.
- When the competition among food manufacturers gets stringer, due to either an increase in the number of food manufacturers or an increase in their products' substitutability, the incentives for investments in product variety and in process innovation decrease. Instead, when the number of food retailers increases food manufacturers undertake higher investments both in product and process innovation.
- An increase in the competition of the food industry tends to increase both the consumer and the total welfare. However, an increase in the number of food manufacturers could lead to decrease in total welfare when the upstream market is not sufficiently concentrated.

- An increase in product differentiation (e.g. better product labeling in both primary and processing sectors) creates incentives to innovate.
- Education, training and diffusion of information about new technologies in the processing sector are important factors contributing to innovation adoption.
- Bureaucratic procedures hinder response to new consumer trends developing worldwide (health versus convenience, functional foods).
- Market research can help identifying new products that take into account changing demographics in most European cities.
- E.U. policies aiming at enhancing the adoption and diffusion of new technologies in farm sector should include the following actions:
 - Ü Provision of public extension programs that will be directed to peer farms in pure rural areas with professional farming activities that are highly educated between 40-50 years of age with big profitable farm operations. Farmers with these characteristics were found to be the more influential ones among rural population generating an important informational cascade among farmers in the area.
 - Ü Provision of agricultural practices seminars that will be directed to young farmers with high level of education and professionals big-sized farms, who were found to be the most innovative characters among rural population.
 - Ü Provisions of subsidies during the initial stages of adoption, since later their effects on farmers' adoption decisions are reduced.
- E.U. policies aiming at enhancing the adoption and diffusion of new technologies in processing and retailing sector should include the following actions:
 - Ü Provision of public extension programs that will be directed to big-sized multinational firms that undertake high R&D activities. Firms with these characteristics were found to adopt more easily product and process innovations creating at the same time significant information spillovers.
 - Ü Provision of funding sources to processing and retailing firms directed to R&D expenses, which were found to be the most decisive factor in adopting new technologies.
 - Ü Provision of appropriate motives to enterprises and public institutions for the development of cooperation actions between them. In general, public institutions were found to create an important spillover to the market enhancing adoption decisions for both processing and retailing firms.
 - Ü Development of appropriate measures which will enable information cascades developed during innovative activities. Such measures would enhance mainly the adoption in retailing sector.

Market and Welfare Effect of Purity Standards in Food Labeling Laws (WP4):

[1]

- The market and welfare effects of increased AP (Adventitious Presence) thresholds are shown to be case-specific and dependent on the relative magnitude of the associated cost and utility effects, the distribution of consumer preferences and the level of aversion to GM products; the production, processing, and marketing costs along the GM and non-GM supply chains; the segregation and labelling costs of the two products; and the market power present in the supply channels of the GM and non-GM products. Under certain circumstances (i.e., high cost effect and/or low utility effect), it is possible to improve the welfare of *all* consumers through a more liberal AP threshold for non-GM foods.
- A change in the AP threshold can create winners and losers not only among the consumers but also among the suppliers of the two products. The identity of these winners and losers is determined by the relative cost and utility effects. The very same group could either support or oppose an increase in AP thresholds depending on the particular market conditions (that determine whether such increase would lead to gains or losses). This finding provides some rationalization of seemingly "irrational" behaviors in the marketplace.
- At low AP thresholds, even small changes in these thresholds could have large welfare and distributional effects. This finding can help explain the strong disagreements that have been observed in EU negotiations for seemingly minute shifts in AP thresholds.
- The common belief that an "as low as technically feasible" threshold corresponds to maximum consumer welfare is not always correct. Under certain circumstances (a high cost effect and a low utility effect), it is possible to improve the welfare of all consumers through a reduction in purity standards.

Assessment of the Economic Performance of the Food Chain (WP5):

- There is evidence that technical progress is favoring larger farms. If this direction of technical progress continues, a large

number of small farms are likely to disappear. If a reversal of the trend of farms becoming fewer and larger is desirable, then policy makers should stimulate R&D for technical innovations that are appropriate for small farms.

- In the food processing sector, an increase in demand for the food industry product is necessary to sustain its future productivity growth. Production of highly processed (e.g. ready-made) food and directing output to developing countries are two ways for the industry to increase its productivity growth.

Analysis of the Socioeconomic Effects of the Food Supply Chain in Remote Rural Areas (WP6):

- The food sector remains important in regional economies and the loss of employment caused by its demise would be difficult, if not impossible, to compensate. Furthermore, the food sector can act as a stabilizing sector during periods with negative demand shocks (recent financial crisis).

The end results of the Project totally fulfill the Project's objectives (see section I.1) and reach the two primary targets, namely the analysis of the food chain and food industry in the EU and the development of quantitative and qualitative tools, methods and models for the analysis of this industry. Indeed, the results have drawn via various methodological approaches. Recognizing that there is not a unique methodological approach to provide a reliable and complete analysis as well as the existing methodologies have their own limitations, work performed provided several novel and solid methodological approaches suitable for the analysis of the food chain.

I.5 Methodologies and Approaches Followed

Several methodologies have been developed and applied in order to capture the complexities of the food chain in EU. The aim was not only to describe the food chain from various perspectives (structure, concentration, law etc.) but also to evaluate the impact of the key factors on its performance as well as to determine the contribution of the food chain on the development of rural areas. The following paragraphs present the main methodologies applied:

- A microeconomic model and a game-theoretic model for the analysis of the dynamics and the strategic interactions of M&A in the food supply chain. First, a model of mergers' dynamics was built in an attempt to shed some light on the driving forces of merger waves. The model incorporated simultaneously three groups of merger explanation (the macro determinants of mergers, motives stemming from industry specific factors, and motives related to firm specific financial characteristics) in order to show their relative importance, but it placed particular emphasis on valuation dispersion of firms and provided answers on the long standing question of merger waves. The model provided testable implications and can be applied directly on merger cases in the food supply chain providing thus empirical evidence on the dynamics within merger waves. Furthermore, it is the first time that incentives for M&A in both the downstream and the upstream level of the food supply chain were examined in an extended framework. Second, a multistage game-theoretic model was developed. The food industry was modelled as a three-tier vertically related industry with a large number of farmers, a small number of food manufacturers/processors and a small number of food retailers operating respectively at its upper and downstream sector. Two different games were considered. In the first game, it was assumed that in the beginning the upstream firms decide whether or not they will merge horizontally. After the merger decision is taken, the upstream firms choose their contract terms and finally the downstream firms choose their quantities. In the second game, the downstream firms are the ones that decide whether or not they will merge. Both games were extended in order to allow for investments in product innovation.
- Game theoretic models for the analysis of trading forms and technology adoption between food manufacturers and retailers, as well as for their market and welfare implications. The innovative features of these models include the capturing of technology diffusion patterns of raw agriculture, while they allowed for upstream food manufacturers and downstream retailers to be involved in R&D activities that reduce costs, enhance final product quality or increase the variety product spectrum. Unlike with the existing literature, the negotiations about the type and the terms of trade were modeled as a two-stage process where the negotiating parties first determine their form of trading and then bargain over the specific form chosen in the previous stage. Next, downstream competition was modeled as a quantity or price game between retailers whose products are horizontally differentiated. A clear innovation of the followed methodology was the modeling of R&D activities as a clear long-run decision which precedes vertical trading negotiations and is non-contractible.
- A game-theoretic model for the analysis of the effects of purity standards and labelling laws on the market of conventional, organic and GM products. The model analyzed consumer's preferences on GM (Genetically Modified), conventional and organic food products based on the existing consumer models extended to account for the current trends in the sector. The model is innovative in the sense that it was built upon a set of recent and sophisticated consumer choice

as well as production and technology adoption models. Specifically, the three products (i.e. GM, conventional, organic) were modelled as vertically differentiated goods as all of them are uniformly quality ranked by consumers. Once the methodological framework was developed, the equilibrium corresponding to a situation where no-GM ingredients are allowed was determined providing the opportunity to focus on the market and welfare effects of alternative purity thresholds for non-GM food products. The methodological framework added to existing literature which focuses on partial equilibrium models, accounting for all three types of products.

- Models of TFP (Total Factor Productivity) change measuring the economic performance of the food chain. These models explicitly take into account the dynamic decision-making process regarding factor inputs at the firm level. Special emphasis was given to the evolution of quasi-fixed input stocks over time. The novelties incorporated into the models were built upon the dynamic theory of production decisions by taking into account adjustment costs which are important in analyzing a dynamic sector like the food chain. Furthermore, specific elements of R&D and technology adoption were considered. The existing literature is based on a static framework in analyzing productivity growth neglecting that important aspect of production decisions. In the analysis of productivity growth measurement (i.e., its decomposition into efficiency change and innovation-related components) however, taking adjustment costs into account is vital since its presence can result in a reduction in productivity when more of the dynamic factors are consumed or released so quickly. Adjustment costs are costs due to changes in decision protocols as well as due to changes in physical capital arising from both internal and external sources.
- A general equilibrium, regional I-O (Input-Output) model for the analysis of the structure of the rural areas and the socio-economic importance of the food industry. Among the innovative features of this model is the fact that it was comparable (cross-region and cross-country), it was based upon a recent and superior LQ (Location Quotient) technique that overcomes shortcomings of the other, more commonly used techniques, and it introduced a “gradually eliminating approach” of the food industry to capture its contribution to rural development. In addition, a small survey was undertaken that allowed the final general equilibrium model to be as much closer to the real inter-industry transactions as possible. To that extent, the advantages of LQ approach were combined with the information sought from business survey overcoming one of the major criticisms appearing in the relevant literature.

All of the developed models were applied in selected, representative countries so as not only to demonstrate their appropriateness, but also to derive concrete, quantifiable findings thereby further strengthening the characterisation and description of the EU food chain. The developed methodological approaches provide important theoretical contributions in the relevant scientific areas; while in addition, they have an interdisciplinary nature going from supply chain and policy evaluation to microeconomic and macroeconomic analysis.

I.6 Achievements of the Project to the State-of-the-Art

The scientific work produced in the context of the FOODIMA Project contributes significantly to the state-of-the art. The main aspects of this contribution are the following:

- A solid background description of both the economic structure of the food industry across the EU (e.g. competitiveness, concentration) as well as of the existing tools for the analysis of its dynamics focusing on the following: *i*) the economics of the food supply chain; *ii*) the degree and extent of vertical integration; *iii*) the vertical linkages between farms-distributors, processors-distributors; *iv*) the role of the retailing sector on the performance of food supply chain; *v*) the competitiveness and the market power at all stages of the food supply chain; *vi*) the institutional arrangements in the procurement of products (contracts, auctions, spot markets, other vertical arrangements); *vi*) the extent of globalization in the food industry and; *vii*) the network structure of the food industry. Thus, a huge and complete literature review regarding the food industry and the developed tools to analyse it was built.
- The construction of a complete set of theoretical models for the empirical analysis of the effects of M&A activity in the food industry, the technology adoption and diffusion, the market and welfare effects of different food and labelling standards for conventional, organic and GM food products, the economic performance and the dynamics of the food supply chain, the interactions and integration of the food industry with the farm sector and the industry’s contribution to the development of rural areas. The developed methodological approaches have been further developed and enhanced. Furthermore, all models were constructed in a connected and interrelated framework.
- Through the intensive course that was organized in the context of the Project (Rethymno, 2-9 August 2009) several PhD students were given the opportunity to be taught the modelling tools and how to use them. Thus, PhD students can further apply the new knowledge and Project’s techniques.

I.7 Main Elements of the Management Activity

The aim of the management activities was to enhance the cooperation among Partners so as to produce the highest quality scientific results and to organize and successfully complete each Work Package. Furthermore, the management had the responsibility to supervise the compliance with EU priorities and administrative, financial and legal issues. The main elements of the management activity are the following:

- The Project Management: The Project coordinator also acted as Project manager undertaking the organisation, supervision and management of the research project, regarding all legal, ethical, contractual, financial and administrative aspects. Specifically, Project manager was responsible for the coordination of all partners, ensuring that the rights and obligations of the participants were in compliance with the Contract signed with the Commission and the Consortium Agreement, which will was prepared under his direction. He scheduled and organized the project's meetings, supervised the preparation of progress reports and financial statements, ensured the completion of each WP in the scheduled time and was in charge of the overall communication with the European Commission (negotiations, submission of deliverables, etc). He also chaired the Executive Committee.
- The Consortium Agreement: The Consortium Agreement was designed and signed before the beginning of the Project by all partners. It included, in detail, the organization and the rules for the operation of the Consortium. Partners advised the Consortium Agreement throughout the duration of the project.
- The Executive Committee: The Executive Committee was chaired by the Project Coordinator. The Committee's role was to monitor the proper running and completion of the Project and the efficient exploitation of the results. Indeed, the Committee decided upon timetables and quality of deliverables. Furthermore, the Committee resolved any scientific and administrative disputes among partners.
- The External Advisory and Reviewing Committee: The aim of the External Advisory and Reviewing Committee was to further ensure the quality of the project's outcome. Its role was to oversee the progress of the project and provide counselling regarding possible improvements.
- Financial Reports: The Project's Coordinator prepared a version of the Partners' duties for the FOODIMA partners along with the necessary documents for reporting provided by the Commission. These documents were distributed to the partners and uploaded to the Project website.
- Audit Certificates: Audit Certificates were a valuable asset for the Project's reporting and financial evaluation. Audit Certificates were prepared and submitted by each partner at the end of each reporting period.
- The FOODIMA website: The Project website (www.eng.auth.gr/mattas/foodima.htm) was constructed from the very beginning of the Project. It was developed and maintained mainly by the Project coordinator. The website was a major tool for the successful management and coordination of the partners, but also a critical tool for the sufficient dissemination and exploitation of the generated results.

In addition to the above elements, a number of meetings were organized for the better cooperation and communication among partners. In total, 8 meetings, a short course and a policy workshop were organized as follows:

1st meeting: Thessaloniki, Greece, 19 January 2007

2nd meeting: Copenhagen, Denmark, 18 June 2007

3rd meeting: Wageningen, Netherlands, 20 November 2007

4th meeting: Warwick, UK, 9 June 2008

5th meeting: Prague, Czech Republic, 25th November 2008

6th meeting: Halle, Germany, 12 June 2009

7th meeting: Rethymno, Greece, 27 November 2009

8th meeting: Brussels, Belgium, 15 March 2010

Short course: Rethymno, Greece, 2-9 August 2009

Policy workshop: Brussels, Belgium, 15 March 2010

I.8 Main Elements of the Plan for Using and Disseminating the Knowledge

The dissemination of knowledge was among the priorities of the Project. Many activities were carried out with the aim to disseminate the information and knowledge gained within the duration of the Project. The initiation was the development and maintenance of the Project's website (www.eng.auth.gr/mattas/foodima.htm) which contained all actions undertaken by partners. Other activities towards the dissemination of knowledge were the following:

- CD-ROM: A CD-ROM containing all the developed methodologies and modelling tools applied in the Project was created and provided to the Commission.
- Short course: A one week short course was organized and held in Rethymno, Greece. During the course PhD students and other academic members had the opportunity to learn and study the modelling tools and the advanced techniques developed in the context of the Project.
- Policy workshop: In 15th of March 2010 a meeting was organized in Brussels where FOODIMA partners presented the main outcome of the Project to EU Commission experts. The meeting was particularly useful for discussing and highlighting policy related results of the Project.
- Leaflets: Two leaflets were prepared and circulated. One, in the beginning of the Project, describing Project's broader goals, objectives and expected results and one, in the final stage, summarizing the results of the empirical research. The latter leaflet was designed in all partners' languages.
- Organizational meetings: The organized Project meetings served as a main communication tool among the partners.
- Shared e-mail list: A common e-mail was issued and used throughout the duration of the Project. In this way all partners were kept informed of any e-mail exchange and discussion concerning the Project.

In addition, all partners tried to publish the theoretical and empirical results of the Project in international seminars and conferences as well as in prestigious specialized scientific journals. Indicative working papers presented in conferences and seminars or published in journals are:

Kastrinaki, Z. and Stoneman, P., (2009) 'Merger Patterns in the European Food Supply Chain, *European Review of Agricultural Economics*, under review.

Kastrinaki, Z. and Stoneman, P., (2009), "An examination of the driving forces of merger activity in the food supply chain: the UK and Greek experience", 113th EAAE Seminar, September 3-6, 2009, Maich, Crete, Greece

Kastrinaki, Z. and Stoneman, P. (2008), "Valuation dispersion of firms and merger waves", Hellenic Finance and Accounting Association Conference, December 12-13, 2008, Chania, Greece

Kastrinaki, Z. and Stoneman, P., (2009), "UK merger cycles and their synchronization with business and capital market cycles: a frequency domain approach" *Oxford Bulletin of Economics and Statistics*, under review.

Kastrinaki, Z. and Stoneman, P., (2010), "An accelerated failure time approach to modeling merger waves", *Journal of Business and Economic Statistics*, under review

Giannakas K, Kalaitzandonakes, N., Magnier, A. and Mattas, K. "Economic Effects of Purity Standards in Biotech Labeling Laws." *Journal of Agricultural Economics* (under review).

Giannakas, K. (2009), "Economic Effects of Purity Standards in Food Labeling Laws." Department of Agricultural Economics, Kansas State University, February 2009.

Giannakas, K. (2008), "Market and Welfare Effects of Purity Standards in Biotech Labeling Laws." Mansholt Seminar, Wageningen University, The Netherlands, June 2008.

Giannakas, K. (2008), "Economic Effects of Purity Standards in GM Food Labeling Regimes." Institute of Food & Resource Economics, University of Copenhagen, Denmark, May 2008.

Giannakas, K. "Theory and Models of Consumer Demand in Vertically Differentiated Markets." Chapter 7 in Lusk J., J. Roosen, J. Shogren (eds.) *Oxford Handbook on the Economics of Food Consumption and Policy*, Oxford University Press, 2010 (forthcoming).

Mattas, K. and Tsakiridou, E. (2010), "Shedding fresh light on food industry's role: the recession's aftermath" *Trends in Food Science and Technology*, 21, pp. 212-216.

Konstantinidis, Ch., Sergaki, P., Mattas, K., and Kontogeorgos, A. (2008), "Factors affecting the competitiveness of the Greek wine enterprises and cooperatives". Presented at: XIIth Congress of the EAAE "People, Food and Environments: Global trends and European strategies". Ghent, 26-29 August 2008.

Konstantinidis, Ch. (2009), "The Competitiveness of the Greek meat processing enterprises". Presented at: 113th EAAE Seminar "A resilient European food industry and food chain in a challenging world". Crete, 3-6 September, 2009.

Emvalomatis, G., Stefanou, S.E. and Oude Lansink, A.G.J.M. (2009), "Dynamic Decomposition of total factor productivity growth in the EU food, beverages, and tobacco industry: The effect of R&D". In: 113th EAAE Seminar A resilient European food industry and food chain, Chania, Greece, September 3 - 6, 2009. - Chania: A resilient European food industry and food chain, 2009-09-03/ 2009-09-06.

Emvalomatis, G., Stefanou, S.E. and Oude Lansink, A.G.J.M. (2009), "A model for autocorrelated inefficiency in

production. Application to dairy farmers in Germany and the Netherlands”. In: Book of Abstracts XI European Workshop on Efficiency and Productivity Analysis (EWEPA), Pisa, Italy, 23 - 26 June, 2009. - Pisa: University of Pisa.

Mattas, K. (2009), “Competitiveness of the agro-food industry: issues and challenges at Greek level”. European Agrofood Conference: Promoting and Supporting Entrepreneurship, 6-7 March 2009, Thessaloniki, Greece.

Galanopoulos, K., Karantininis, K., Mattas, K. and Karelakis, C. “Exploring the Relations, Bargaining Forms and Dynamics of the EU Food Supply Chain Under the Perspective of the Key Actors: Evidence from Greece and Denmark”. Paper prepared for presentation at the 119th EAAE Seminar ‘Sustainability in the Food Sector: Rethinking the Relationship between the Agro-Food System and the Natural, Social, Economic and Institutional Environments’, Capri, Italy, June, 30th – July, 2nd, 2010.

Bavorova, M. “German Agri-food Complex Structure”. *Agricultural Economics Czech* (accepted for publication).

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The GM content allowed in non-GM food.