146th EAAE Seminar

Technology transfer as a driver of innovative entrepreneurship in agriculture and the agri-food industry

Book of Abstracts

European Association of the Agricultural Economists (EAAE)

Agricultural University of Athens (AUA)

Mediterranean Agronomic Institute of Chania (MAICh)

Chania, Greece, 14 – 16 July, 2015

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Parallel Session A-I

Consumer Issues of New Products

Variables that affect consumer choice for food products with sustainable attributes

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Extended Abstract

Consumers are affected by market imperfections, which may stem from the lack of information they have at the time of purchase. This sometimes leads them to make choices based on the quality perception of a product without having the possibility to reach the desired level of food safety (Henson and Traill 1993) and to understand which are the environmentally and socially friendly products.

Consumers are increasingly taking on a role in making the food chain more sustainable. Food consumption choices have an impact on which foods are being produced and how they are produced. All the actors in the food chain affect the overall sustainability of the chain itself (Grunert, 2011). Recent studies demonstrate a widespread interest among consumers with regard to the environmental impacts of their food choices, but when investigating their actions during everyday shopping their behaviour is not so consistent (Banterle and Ricci, 2013).

Among the attributes that affect food choice, environmental certifications of producer's water footprint or carbon footprint are assuming growing importance. Recent research has sought to understand to what extent consumers prefer food products labelled with carbon and water footprints. These studies show that consumer preferences for low carbon and water footprints differ among unprocessed and processed food products. How environmental and safety attributes can have potential impacts on consumer choices of short chain? Which are the variables that explain these choices?

Consumer choices depend on consumer preferences that related to intrinsic and extrinsic product characteristics. Extrinsic product characteristics, though not physical, such as brands, indications of the origin, the tradition of the production process, the use of organic

agriculture, the animal welfare, the defence of the environment, and the presence of ethical requirements (Cluskey et al. 2009) all play important roles in consumer choices. Looking at the quality attributes of food products (Peri, 2006), they belong to several classes of requirements that can be synthetized in the following classes (Hooker and Caswell, 1996): food safety, value attributes, packaging attributes and process attributes. Food safety is concern for nutritional qualities of food (Drichoutis et al., 2006) and properties of unfamiliar foods, such as genetically modified food.

The solicitation of the consumer toward high-quality products and the diversification of agricultural activities encourage the development of new marketing channels based on the direct relationship between producer and consumer (Raffaelli et al., 2009). The short food supply chain can therefore be treated as an opportunity of competitive advantage for small and medium-sized enterprises to encounter the new demands of the consumer which is increasingly sensitive to the food security issues and to the benefits of traceability and quality which are linked to the territory that these models favour (Goodman, 2003; Higgens et al. , 2008).

Nowadays, consumer is always more interested in getting information about the products even paying higher prices. But apart from niche market of well-informed and concerned consumers, is the organic and green label a good motivation to purchase more expensive products and to encourage consumption of products with sustainable attributes? Which are the variables that explain consumer attitudes towards short chain? The purpose of this paper is to present the methodology adopted and the main results achieved by an exploratory study on consumers attention to short chain with a special focus on the green, traditional, local and social credentials on the label.

Methods – Our study, conducted on primary data on a sample of 240 consumers. The questionnaire was administered in the city of Naples. The interviews were conducted face-to-face during the months of October, November and December 2014 by interviewing the purchaser after shopping in a major retail shop. In order to have different groups of consumers within the sample, the questionnaires were administered at three different times: in the morning from 09.30 to 12.30, in the late afternoon from 16:30 to 18:00 and in the evening from 19:00 to 20:30.

Data were processed with a Probit model, was aimed at identifying the factors that may affect consumer response in relation to their preference for short chain. Starting from

theoretical models, several factors held responsible for defining consumer preference for short chain were used as explanatory variables.

Results - Our results show that despite the appearance of attention to the environmental problem that in the literature have been associated to this emerging consumer, there remains the problem of the consumer's lack of knowledge concerning environmental labelling and other attributes of sustainable products.

Discussion and Conclusions - Results seem directed to model the preferences about product with sustainable attributes with particular emphases on the role of organic, green and social properties of the product.

According to our findings, the opportunities to develop the short chain and product with sustainable attributes depend on appropriate measures to enhance consumer information. While there are many policy interventions acting in this direction elsewhere in Europe, in Italy there is still scant attention paid to such issues.

This is in line with many other studies (Grebitus et al. 2012; Grunert, et al., 2014). In particular, Grunert (et al., 2014) investigated the relationship between consumer motivation, understanding and use of sustainability labels on food products, which are increasingly appearing on food products. Their results showed, in line with our results, that respondents expressed concern with sustainability issues at the general level, but lower levels of concern in the context of concrete food product choices. This imply that sustainability labels currently do not play a major role in consumers' food choices, and future use of these labels will depend on the extent to which consumers' general concern about sustainability can be turned into actual behaviour.

Increasing consumer knowledge about sustainability of food products can act to create a virtuous circle between private companies and public sector benefits.

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The role of brand in consumer perception of food safety

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Extended Abstract

Theoretical background

Consumers are affected by market imperfections which may stem from the lack of information they have at the time of purchase. This sometimes leads them to make choices based on the quality perception of a product without having the possibility to reach the desired level of food safety (Henson and Traill, 1993). Sometimes the consumer believes that there is monitoring of the label and the advertising aimed at protecting them from false and distorting claims about the product (Golodner, 1993). There is considerable informational asymmetry between producer and consumer and despite the recent EC Regulation No. 1169/2011 on the provision of information to consumers on food, that will become fully operational only after 2014 and which provides for greater transparency on the label, there remain blind spots in the information problem which has been widely debated in the literature (Johnston, 2012). In this context, there are limits to efficiency in establishing food safety products in order to achieve a perfectly competitive market.

Against this background, our study was designed to find answers to the following research questions:

- What is the level of attention towards food safety attributes?
- What factors most affect the difficulty in understanding the level of food safety?

- What information does increase label clarity?
- What are the main sources of information used for food choice based on generational and educational issues?
- How important is the brand to identify a product as safe?
- How information campaign must be implemented to be effective?

Methods

The study, conducted on primary data collected through 600 questionnaires in the Province of Naples aimed to identify the factors that may have affected consumer response in relation to difficulties in interpreting food safety of processed food products.

The questionnaire was based on the theory identified by the economic literature in similar studies. Data analysis was carried out according to a two-step procedure in a multivariate statistical framework: in the first stage, multiple correspondence analysis was performed in order to detect and represent underlying structures in the dataset and to reduce the original space into a more suitable representation; in the second step, the single-link (nearest neighbour) cluster analysis allowed three homogeneous groups of consumers identified on the basis of their specific socio-demographic characteristics.

Results and Discussion

Results will give an idea of different cluster of consumers derived from the different attention and perception of food safety and the different role of brand in consumer perception.

Results will provide support to both policy makers and food companies. For companies, results will help to implement new marketing strategies to target the emerging trends of postmodern consumers towards food safety. For policy makers results can give support to implement information campaigns aimed at increasing knowledge regarding the food safety in order to improve levels of awareness in consumer choice.

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Restart in agri-food chains: the case of alternative food networks

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Introduction (objectives and research questions)

Fresh fruit and vegetable are the basis of many people's daily nutrition habits. Therefore many different distribution systems have been developed to cover daily supply needs. However the final consumer's demands and needs is the core of this whole process. So, consumer's preferences regarding the supply networks of agricultural goods are very important for each distribution channel of agricultural products. The aim of this study is the investigation of the factors that affect the demand of agriculture products, the attitude of consumers and whether they support the idea that the products should go from the producer directly to retail without middlemen. It also aims to examine consumer attitudes as to which factors are taken into consideration when buying agriculture products via innovative internet applications as well as their opinion on new agricultural supply/distribution channels. Finally, we will investigate whether they would use new technologies and applications that would help them follow the distribution channels and products and finally whether they prefer alternative distribution channels or not-particularly e-commerce.

Methodology and potential results

The methodology will be a quantitative and qualitative research design. The study will be conducted on a simple random sample, a type of probability sample, of consumers living in Thessaloniki which is the second largest city in Greece and it is located in central Macedonia.

Stractual Equation Modelling was considered an appropriate tool in this analysis, since it is a well-established method to estimate the interrelationships among consumer behaviour and choices in alternative agricultural distribution channels.

Therefore, having a clear idea of consumers preferences could lead to the development of effective policies and applications. The contribution of technological innovations, which are applied in this specific agriculture distribution channel, is remarkable since they could develop a new environment and trends for consumers as well as for entrepreneurs (producers- wholesalers- retailers).

Thus, the findings of the study contribute to society, more specifically there will be implications of our findings for both consumers and producers. Especially, producers can use our finding in order to understand better what customers want from an agricultural product and what they actually need. This way, they will have the knowledge which will allow them to make innovative, profitable choices. Moreover, the State could organize events and campaigns which will have as core the findings from this research. Therefore, this will be a great opportunity for consumers to get informed about the benefits of alternative distribution channel of agricultural product. The policy makers could adjust current legislation towards more environmentally friendly distribution channelTherefore, the findings will be useful both the relationship business to business and the relationship business to consumer. Lastly, our study could be a stepping stone in the development of the technology transfer used as a driver of innovative entrepreneurship in agriculture and in policy making regarding the agricultural sector generally.

Keywords: Sustainability, innovations, agri-food chains, consumer behavior, agriculture distribution channels, e- commerce.

Investigation of consumer behaviour: a study on organic wine

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It is a fact that sustainability not only helps the business case getting stronger, but also embraces a sustainability agenda which can stimulate innovation, pushing companies to rethink their operations, products and business models. In addition, during the past few years the demand for organic wine has increased. Specifically, many Greek businesses have successfully entered the market, advertising the superiority of organic wine. Organic wine comes from wine yards, where there is no use of pesticides or fertilizers. This way, the development of biodiversity is enhanced and environmental pollution is avoided.

Sustainability and innovation have always been significant factors regarding the development and progress in the field of agriculture and particularly in the evolution of the supply chain. Moreover, new methods are developed in order to meet growing human needs. The main objective of this study is the need for implementation of new technologies in the distribution and supply of organic wine in the city of Xanthi. Furthermore, the investigation of consumers' attitude will constitute the basis for further development of business strategies regarding sustainability and innovation in agri-food chain.

There are expected benefits of our study in the field of consumer attitude. More specifically the findings of the study aim to contribute to the holistic development of new trends. Furthermore, we will investigate whether consumers accept organic wine via new technologies (i.e. e-commerce) and sustainability initiatives.

From the quantitative and qualitative data, the statistical analysis will provide findings on consumer behavior, attitudes, new trends, and the factors that affect the choice of organic

wine. Finally, the current paper represents the general consumer stance towards organic-products.

Keywords: *Sustainability, Branding, Organic wine, New trends*

Parallel Session A-II: Productivity

Technological change effects on the production performance in the Hungarian food economy

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Extended Abstract

The comparison of farm performance in Central and Eastern European countries has been investigated in many papers before EU accession (for a review, see Gorton and Davidova, 2004), but after EU enlargement very few papers have compared farm performance of these countries in a period when the competition has been intensified. There is an increasing body of literature dealing with the estimation of the production performance of the Hungarian agriculture (Bakucs et al. 2010, Baráth et al. 2010a, Bakucs 2011, Baráth és Fertő 2015), while this type of investigations focusing on the food industry are missing. Moreover there are no studies in the literature examining and comparing the production performance of these two components of the food value chain based on the efficient frontier technics.

International literature in many sectors of the economy widely uses frontier methods based on firm level data to measure production performance. A comprehensive literature has been developing in the topic after the pioneering work of Koopmans (1951), Debreu (1951) and Farell (1957). Frontier methods assess performance by defining the performance frontier on the best performing decision making units (benchmark) showing the maximum output that can be achieved at different input levels or the minimum input that can be used to achieve a certain level of output by applying the best available technology. The method attributes to the lagging behind decision making units from the frontier the lack of technical efficiency. More detailed discussion of technical efficiency and total factor productivity measurement are provided by Fare et al. (1985, 1994),

Battese (1992), Greene (1993) and more recently by Kumbhakar and Lovell (2000) and Alvarez et al., (2012).
Comparisons of production performance in transition period of several countries including Hungary as well are published by Swinnen and Wranken (2009), Macours and Swinnen (2000), and Latruffe et al. (2012). Recent investigations of technical efficiency and total factor productivity of Hungarian agriculture were published in the last decade by (2012), Bojnec et al. (2014), Baráth és Fertő (2015).
The aim of the paper is to extend the production performance investigations beside the agricultural production to food processing industry Therefore the production performance is estimated by calculating efficiency and total factor productivity of Hungarian agricultural and food production industries based on the efficient frontier technics.

Investigations of production performance are planned using DEA method. The technological heterogeneity problems we are intend to tackle by following Alvarez and del Corral (2010) and Baráth and Fertő (2015). The dynamics of production performance in the Hungarian agricultural production and food industry is investigated following Kapelko et al. (2014) using Luenberger productivity index according to Serra et al. (2011), which decomposes productivity indicator into the contributions of dynamic technical inefficiency change, dynamic scale efficiency change and dynamic technological change. The impact of crisis on production performance is analyzed by specifying an impulse response function (IRF) estimated by the local projections method (Teulings and Zubanov, 2014).
The Hungarian representative FADN database is used for extracting the data for production performance and a complete income return database of National Tax and Custom (NAV) is used for production performance the Hungarian food industry production.

The comparative analysis of efficiency and productivity in Hungarian agriculture and food industry we expect to shed light on the relationship between production performance of agricultural production and food industry performance in the Hungarian agro-food value chain. The dynamic analysis of total factor productivity will enable to assess the effects of economic crisis on Hungarian agro-food value chain.

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Heterogeneity of inefficiency persistence under a bayesian framework

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Extended Abstract

Introduction

Innovation in agriculture plays a key role in addressing the increasing food demand and the necessity to deliver sustainable and secure food to consumers. However, several economic forces such as adjustment costs prevent farmers from adopting innovative technologies. Quasi-fixed factors of production such as capital are gradually adjusted because instantaneous adjustment entails higher costs. Therefore, farmers do not instantaneously adopt innovations but find it optimal to remain inefficient in the short run and keep using sub-optimal production techniques. This implies that inefficiency may persist from one
period to the next.

Farms are usually inefficient meaning that they operate below the production frontier (below the horizontal line where TE=1). When a new technology is introduced farms do

not instantaneously adopt it because of the aforementioned costs. A few farms use the innovative technology and the frontier shifts up (they define the horizontal line). At this point inefficient farms find themselves far away from the frontier (point A or B) and adopt the new technology to avoid being driven out of business. Besides, differences in the adjustment costs between farms and different managerial characteristics of farms' operators imply that some will adopt quicker/slower the new technology (i.e. the lines will be steeper/flatter).

The objectives of the paper are to model inefficiency persistence over time and heterogeneity in this persistence in the context of German dairy farming.

The underlying research questions are:

- Is there persistence of inefficiency over time?
- Is there heterogeneity of inefficiency persistence among farms?

Estimating the Italian olive oil production function

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Abstract

One of the main agricultural economic activities in the Mediterranean basin is the production of olive oil. In terms of volume of production capacity, Europe produces the 75% of the world production of olive oil. Italy is the second largest producer of olive oil (producing 19% of the total EU production). However, although Italy is one of the main producers and exporters of olive oil is also one of the main importers of olive oil. In 2013 Italy was the third importer, following USA and Brazil with a percentage of 9% and second exporter with the 30% of the worldwide export.

The objective of this research project is to estimate the Italian olive oil production function. In particular, it explores the different production technology factors with an impact on supply and domestic production of olive oil. Time series data derived from various sources (FAO, IOC, OECD, EUROSTAT) as well as farm level data derived from RICA will be used for the estimation of the determinants of the production function. The factors that affect the supply of olive oil are the price of olive oil, the cost of inputs (labour, capital, machinery and fuel) weather variations, area harvested and the relevant policies of the EU Common Agricultural Policy.

The input costs can be dived into two subcategories: current and long run costs. In the first category factors affecting the production of the olive oil are considered. More specifically, olive oil producer prices are referred to time t-1, since farmers are depending their decisions on the events of the previous year. According to Apostolopoulos *et al.* (2005), the estimation of the response to price changes in the quantity of the commodities is a key

point to understand the effects of government policies and prevent the effects in economic and social terms. Production costs include the cost for machinery, fuel, labour, fertilisers and crop protection costs. We suppose that the labour costs affect the final production, but less than other sectors, since the Italian farms are of small size (about 3 Ha) and the harvest of olive oil take place following the traditional way of hand picking and beating using a family labor. The olive area in Italy is fragmented and anchored, especially in Southern Italy. This has as a result that production costs in the case of the Italian olive oil will be higher when compared to other European olive oil producing countries like Spain, which has large production plants and a highly mechanized production system. This will also have a significant impact to the remaining variables. With this study, we will investigate if the investments in technology are of a limited scope or if there will be differences a territorial level. We should consider that the costs of machinery are high and don't allow small producers to buy new technologies. We should take into account also that in some cases, the farms are located in rural areas, so for them is not possible to use tractor and harvesting machineries.

Long run costs for the Italian olive oil farmers are represented by capital investment and land ownership/tenure. There is limited support of the Italian government in this sector. Moreover, the Common Agricultural Policy (CAP) is a tool for supporting the annual income of the farmers but this study we will investigate if the support is able to cover all the expenditure that these farms have. Currently the last reform in force provides that most of the support is paid in the form of an olive single farm payment (income subsidies) separated from production aid (decoupling). For the area dedicated to the production of olive oil, we should take into consideration the biological cycle of the plant. As shown by Rezitis and Sassi (2013), the biological cycle of the olive tree is approximately five years, and the production is subject of a seasonality of two years. Therefore we expect that the area with a lag of five years is significant for the production of olive oil.

Variations in climatic conditions have a significant impact on olive oil production. In particular, extreme weather phenomena can have a dramatic impact to the production of the farmer, and henceto income generation. In particular extreme winter phenomena (strong winds, heavy rainfall, frost, and hale) can destroy the production while on the other hand high temperatures in spring- beginning of the summer, not enough wind during the pollination of the crop and the increase of population in pests due to low temperatures can provoke effects on the final production.

Understanding how these variables are affecting the production is important under different points of view. Evaluate the effect of different factors like input and policies can give a representation about the actual situation of the investment in the Italian olive oil sector. This can help the policy makers to decide policies in line with the need of this sector.

In fact, due to the strong international competition from countries such as Morocco, Tunisia and Turkey, the European countries are encouraged to implement policies that make more competitive the production of olive oil, in terms of productive and commercial strategies. The competitiveness cannot be guarantee only by the quality of the product. In the next future, policy makers are called upon to review the political strategies of the sector in order to make companies competitive.

Keywords: Olive oil; supply; olive oil production; Italy; production function.

New Product Development in Agrifood Supply Chains: The Case of the Potato Sector in the UK

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As the Common Agricultural Policy (CAP) evolves towards a model where the broad objectives of sustainable management of natural resources and a more balanced territorial development become as important as economic competitiveness and food security, the sustainability of farming will necessarily become more dependent on the supply chains within which it operates.

Within this context, business decisions, including those relating to innovation, are expected to depend not only on individual factors affecting the willingness to adopt (see Feder et al., 1985 for a survey of some of the individual factors affecting individual adoption of innovations) but also on the supply chain they are inserted. The purpose of this paper is to study an important type of innovation, namely, new product development, in the UK potato sector, how innovations operate and what the role of farmers is by considering different potato categories. We focus the analysis on
the potato supply chain in the UK, not only because it is an important crop within the country and new product development is a dynamic activity not only on the crisps and frozen potato categories but also on fresh potatoes, which has shown one of the few cases of branding in fresh produce.

The empirical analysis comprises two consecutive parts: first, an analysis of competition in terms of new product development on the potato sector using Mintel's Global New Products Database (GNPD) for the period 1996 to 2014 concentrating on three potato categories: fresh potatoes, crisps and frozen potato products. Second, based on the analysis of the previous part, in order to understand how innovation operates within the

supply chains and the role of farmers (and other chain stakeholders), three case studies were considered: (1) a fresh potato supply chain (2) a
crisp supply chain, and (3) frozen potato supply chain. The analyses indicate that innovation (i.e., the new product development) occurs in a framework that combines a Schumpeterian competition between supply chains and where the competition is led "captains of the chain" (i.e., the leader firms in each supply chain) (Brown, 1984; Revoredo-Giha, C. and Leat, P., 2010).

As regards the new product development, the observed facts closely resemble the industrial organisation models of product proliferation and in particular Raubitschek's model (1988). According to the model these firms (or supply chains) aim at "hitting the jackpot", i.e., to introduce new products to the market that are successfully uptaken by consumers, and therefore, remain on retailers' shelves for a long time. Thus, firms focus their rivalry on new product introductions and even though the introduction of a new product is expensive and the failure rate is high, the rewards if one hits the jackpot can be quite high.

It is clear from the case studies that innovation in each chain is coordinated by the captain of the supply chain who has an active role allocating roles amongst participant stakeholder. As regards farmers, because the position they have in the supply chain, they have little chance to start potentially successful innovations (particularly as new product development) of their own and their best chance is to operate within a supply chain where the chain leader organises growers and proposes innovations that take into consideration what customers and consumers want. Furthermore, operating within a supply chain of collaborative characteristics, farmers have the possibility to build in the relationship risk management (like cost adjusted contracts) elements that
protect them in times of price volatility.

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Parallel Session B-I

Organizational and Institutional Innovations

Communication and Innovation in Cooperatives

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Abstract

The organizational communication literature establishes that communication is one crucial element of organizational governance, and it is highlighted as a domain of professional practice and as an important focus for academic reflection and research (Christensen & Cornelissen, 2011; Jablin & Putnam, 2001). White (1997) stated that organizations can themselves be regarded as communication structures; organizations could not exist without communication: they come into exist in the interaction that takes place between organization members and as a result of the communication between them.

Many researchers have studied communication within an organization. Cremer, Garicano, & Prat (2007) and Garicano & Wu (2012) have distinguished horizontal communication (HC) as peer-to-peer communication among specialists with overlapping knowledge to share information, in order to solve problems efficiently which cannot be done by single specialist with limited knowledge; and vertical communication (VC) as communication mediated by higher up "translators". Only when the knowledge is beyond the field of the specialists and costly to codify, does VC become necessary to facilitate the matching between problems and solutions.

Likewise two types of communication in an agriculture cooperative are distinguished in this paper: horizontal and vertical communication. HC is defined as the information exchange between farmers about the production methods of their products. Farmers communicate with each other to share their production knowledge. Due to that this HC may decrease the farmers' own marginal production costs, we advance the HC concept within an innovation perspective that associates HC with the process innovation. VC is the communication between the members (the farmers with superior production knowledge)

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and the CEO (with superior marketing experience). When the cooperative takes more responsibilities for the product than simply product sale, the product innovation is gradually taken over by the CEO. Production innovation activities include quality control and new varieties develop, in order to increase the price and demand in the market. We therefore perceive that within an innovation perspective, VC is associated with the product innovation.

Moreover, this article analyses communication in centralized versus decentralized cooperatives. A cooperative is an enterprise collectively owned by many members staying in a specified relation for a specific purpose (Helmberger & Hoos, 1962; Hendrikse & Feng, 2013; Robotka, 1947). The cooperative's main function is to process the products from its members and then sell them to the customers. However, members' firms are themselves business enterprises and economic entities. An agricultural cooperative is therefore an enterprise collectively owned (vertical relationship) by an association of many independent upstream agricultural producer firms (horizontal relationship). Observing the history of agricultural cooperatives, many governance structures have been adopted in this special kind of organization. Bijman, Hendrikse and Oijen (2013) discuss the governance structure in cooperatives regarding the allocation of decision right between the board of directors (BoD) and the professional management. Chaddad and Iliopoulos (2013) also address the delegation of formal and real authority to non-patron, professional managers as a key to improving the efficiency of collective decision making in cooperatives. We define (de)centralization in terms of the allocation of decision rights. In cooperatives, the delegation of the decision rights is from the society of member farmers to the CEO. Therefore, in a decentralized structure, the farmers decide regarding their own innovation and production. In a centralized structure, the farmers authorize the CEO to make innovation and production decisions for the cooperative.

The paper examines how HC and VC contribute to process and product innovation, and how it differs between decentralized and centralized cooperatives. In order to do so, we analyze a three-stage non-cooperative model with two farmers and a CEO. In the first stage the governance structure is chosen; in the second HC and VC levels are decided; in the last the production level is determined. The total payoffs consist of profits derive from the third stage minus any HC and VC costs incurred in the second stage. Demand is linear; VC leads to the product innovation which exhibit increasing demand. The cost of production is assumed to be constant. However, HC brings process innovation which

exhibit decreasing production cost. HC (VC) costs are defined with HC (VC) cost coefficients. Finally the following results are obtained: 1) both HC and VC cost coefficients negatively influence HC and VC levels, output level and profit of a cooperative; 2) when HC (VC) cost coefficient is low, higher VC (HC) is conducted in decentralized structure than in centralized structure; 3) output level is also compared between decentralization and centralization; 4) lastly efficient decentralization and centralization can be established under certain conditions regarding HC and VC cost coefficients.

To conclude, this study contributes in both theory and practice. We have clarified that both HC and VC associate with different innovation purposes. We also study the comparison between HC and VC in the decentralized and centralized governance structures. Lastly, we establish the efficient governance structures. It practice, it provides suggestions for cooperatives on the governance structure and communication effort choices.

Keywords: Agricultural cooperatives, communication, innovation, decentralization

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Organizational Models for Agricultural Cooperatives: Empirical Evidence for their Performance

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Extended Abstract

1. Introduction

It is well recognized that competitive strategies pursued by agricultural cooperatives in response to environmental and structural changes in the food system require substantial capital investments and organizational innovations. These organizational innovations could be examined through the examination of ownership and control rights. Chaddad and Cook (2004) have identified and analyzed five nontraditional cooperative models; one of them is the model of the cooperatives with capital seeking entities. This model attenuates the restriction that cooperative ownership rights are restricted to members- patrons while outside equity is acquired by a separate legal entity. This is the case for the Greek Cooperative businesses that were created during the 70s and 80s with the participation of agricultural cooperatives and the (state-owned) Agricultural Bank of Greece.

This paper examines these two different organizational models; traditional cooperatives and cooperatives with capital seeking entities (Greek cooperative businesses) to illustrate

performance differences by implementing a profitability equation model based on a panel data set comprised of annual reports data (balance sheets and income statement) for the period 2006-2010.

2. Theoretical Framework and Research Questions

The basic organizational attributes of traditional coops are the highly heterogeneous membership, the exclusive members' ownership as well as the high level of unallocated capital. Moreover, membership is open and voting principles highly democratic. Another determinant characteristic is the uniform pricing policy. They are mainly engaged in primary processing, selling undifferentiated products. As a result of the uniform cost calculation, there is an element of cross subsidization, where members with a high profitability and large delivered volumes are likely to "subsidize" less profitable members with lower volumes (Ohlsson, 2004; Kyriakopoulos et al, 2004). On the contrary, non-traditional cooperatives are more flexible as they have individualized equity according to the patronage, non-member parties funding, equitable pricing of coops' products and services, proportional decision control and allocation of benefits through price and personal shares (Chaddad and Cook, 2004). According to several authors (i.e. Kalogeras et al., 2007) the main benefit of the non-traditional cooperatives is that they can better accommodate the strategic-oriented goals of cooperative business and reinforce members' commitment and willingness to participate and invest in coop operations.

Nevertheless, it is important to investigate if non-traditional cooperatives, such as Cooperatives with Capital Seeking entities, are performing better than the traditional cooperatives. In the current study we are focusing only on traditional and cooperatives with capital seeking entities. It would be very interesting to address empirically the following question: ***Can we detect differences in economic performance between traditional agricultural cooperatives and Cooperatives with capital seeking entities?*** Thus, the main objective of this paper is to provide empirical evidence by answering the above question.

3. Methodology

The sample of this research is comprised the financial data of 34 agricultural cooperatives: 17 traditional cooperatives and 17 cooperatives with capital seeking entities that are the cooperative businesses established in Greece at 70s and 80s mainly by local agricultural

cooperatives and a national public bank (Agricultural bank of Greece). Data were collected through financial statements for a 5-year time period (2006-2010) obtained by the ICAP business directory and personal inquiries to cooperatives' top management staff. The dataset stops at that time on purpose, as from 2010 the severe economic crisis of Greece could distort our main question analysis.

There are many variables and econometric models, which have been used to investigate the factors that affect the performance of an enterprise (e.g. Slade, 2004). This paper is based on Structure - Conduct – Performance (SCP) paradigm of the industrial theory in order to examine the financial results of a cooperative. Thus, the following theoretical model was used to examine the profitability of traditional and non-traditional cooperatives.

$$\textit{Profitability} = a_0 + a_1 \textit{Size} + a_2 \textit{Liquitidy} + a_3 \textit{CapitalStructure} + a_4 \textit{Activity}$$

In order to compute more reliable estimators, panel data analysis methods were used that are based on the Generalized Error Structure model. The biggest advantage using this model is the fact that it is able to make estimates of the coefficients correcting heteroscedasticity and autocorrelation, both in general and for each separate cooperative. In this study, in order to have robust estimators we have applied the estimation approach with Driscoll and Kraay standard errors (see: Hoechle 2007).

4. Results

The analysis was conducted with the econometric program Stata/SE 13.0 for Windows. The model chosen to be further investigated is the following:

GrossProfit /SALes *(GPSAL)*= a_0 + a_1 **logTotal_Assets (logTA)** + a_2 **Quick Ratio(QR)** + a_3 **SAles /Total Assets (SATA)** + a_4 **SAles /INVentories (SAINV)** + a_5 **Total Liabilities /Total assets (TLTA)** + a_6 **NetWorth / FixedAssets (NWFA)** + u_{it}

The following table presents the results of our estimation

Table 1: *Profitability assessment model using Generalized Error Structure Models*

Profitability assessment model Variable	***Assessment model Regression with Driscoll-Kraay standard errors***	
	Cooperatives with Capital seeking Entities	**Traditional Cooperatives**
Dependent variable **GPSAL**		
logTA	0.0083 (1.6)	-0.0463 (-4.97)***
QR	0.0096 (1.78)*	0.0060 (0.59)
SATA	0.1440 (14.15)***	-0.0741 (-2.02)*
SAINV	-0.00001(-5.89)***	0.0124 (10.28)***
TLTA	-0.0286(-2.64)**	-0.0593 (-3.24)***
NWFA	0.0021 (5.14)***	-0.0039 (-2.53)**
Constant term	-0.0782(-0.73)	0.9734 (5.59)***
N (Comments)	78	78
F(6, 16)	99647.83	315.50
R^2	0.50	0.18

a Coefficient and t- value in the parenthesis,

*Note: * $\alpha < 0.10$; ** $\alpha < 0.05$; *** $\alpha < 0.01$*

The results of the analysis show that the same ratios have completely different importance for the two types of cooperative organization model. It is worth mentioning that size affects negatively and significantly (at 1% significance level) the performance of the traditional cooperatives. At the same time this ratio has a positive impact for the Cooperatives with Capital seeking Entities, however it is not significant at usual significance level. Our results could be used by practitioners such as cooperatives' directors and boards' members in order to direct their management efforts in order to achieve an improved financial performance for their cooperatives.

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Integrated Farming as an institutional innovation: insights from institutional economics

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Extended Abstract

Objectives and Research Questions

Integrated Farming (I.F.) is an ecologically sound form of agriculture, situated between conventional and organic farming. I.F. involves a series of principles and practices which have been standardized and codified in protocols of actions; it also implies both technological and organizational aspects, the creation of mechanisms for technical support, institutional structures to curry out complex tasks, as well as a high degree of coordination among diverse actors.

This innovative system first introduced in Greece in the production of peach for canning, a sector in which Greece holds a dominant position in world exports. After a serious crisis in this sector, the introduction of I.F. in the regional department of Imathia in 2000, marked the reversal of the sectors' declining course. Nowadays, more than 6,200 small farmers participate in 26 producer groups (PGs) implementing the I.F. standards, resulting to more than 10,000 ha, thus covering more than half of the peach producing land in the area.

Thus, this study aims at examining the introduction of I.F. from an institutional change point of view. In particular, we examine I.F. as a new institution in an area dominated by institutional inertia for a long time. In this context, we seek to answer two questions, first, how a new institution arises? and secondly, how this new institution is stabilized? Moreover, in the adoption of this new institution we try to identify both intentional and evolutionary processes.

Theoretical framework

I.F. is examined as a new institution in the context of a broader institutional change within an agrifood system in crisis. The process of institutional change is strongly connected to both exogenous and endogenous parametric shifts, while I.F. is considered a complex structure of institutional arrangements, involving various institutional linkages across multiple domains (Aoki, 2001). An institution is perceived as 'a system of rules, beliefs, norms and organizations that together generate a regularity of (social) behavior' (Greif, 2006).

Moreover, in the process of introduction of a new institution, some other issues are explored, such as the critical roles of an organization acting as a 'third party external to domains' (Aoki, 2007) or a 'political entrepreneur' and the identification and the roles of 'quasi-parameters' (Greif and Laitin, 2004). Whether this institutional change has a 'centralized-designed' or an 'evolutionary-decentralized' character, is another feature of the theoretical framework (Kingston and Cabalero, 2009).

Methodology

Interviews with 22 persons representing institutions, local and regional governments and authorities, researchers, agricultural cooperatives, farmers as well as with consultants and experts have been conducted in an attempt to analyze the implementation of I.F. Standards by large fruit growers' PGs in the regional department of Imathia (Central Macedonia region, North of Greece).

Results

For quite a few years before the introduction of I.F., the regional agrifood system has been dominated by institutional inertia (e.g. most of the subsidies were used for withdraw of production, corruption, strong links of PGs' leaders with the clientelistic political system).

This institutional structure fell into a serious crisis after retaliation measures on behalf of some competitors in the global market and a radical policy change (in the CAP for fruit and vegetable), which resulted in the loss of foreign markets for Greek canned peach industry. These and some other parametric shifts rendered the system inconsistent with the new broader environment. In the course of the crisis of the existing system, the legitimization of alternative options (such as I.F.) emerged as an opportunity (Roep and Wiskerke, 2004).

Thus, in the midst of a critical situation the launching in 2000 of an I.F. standard by a newly established organization ('Agrocert') was the triggering event of a broader institutional change. 'Agrocert' contributed in the creation of two critical new networks at the regional scale (one with some PGs leaders and another one with 'peripheral' actors at the established system of input-and-advice provision to farmers), while existing networks have been transformed, and the whole process involved new organizational arrangements and learning processes.

The initiation of the new I.F. standard for agricultural production and its rapid adoption by a large number of PGs and thus of their members-farmers, resulted in a viable alternative to the conventional agrifood system.

The introduction of the new institution has been accompanied by a series of developments in various domains (Aoki, 2007):

Developments in the economic exchange domain: The role of the certification authority (Agrocert) both as a third party that mediates in information dissemination and as a major contributor to the building of mutual trust.

Developments in the organizational exchange domain: I.F. as an organizational convention (an institutionalized organizational architecture). Through I.F. a new collective cognitive framework has been developed by actors in Imathia, involving a multitude of new roles for agronomists-consultants, provided to farmers through specific organizational arrangements.

Developments in the political exchange domain: A radical change in the opportunistic behavior of the leaders of agricultural cooperatives as far as the canned peach production is concerned (Demakis 2004, Iliopoulos and Valendinov, 2012), although this has been a partial process, since these leaders have kept their opportunistic behavior in the part of fresh peach production.

Also, some institutional linkages across the domains have been identified, such as a coordination of agents' strategies across more than one domain and the bundling of multiple domains.

Institutional complementarities: institutions evolving in each domain were interdependent and mutually reinforcing.

Through the abovementioned activities of Agrocert, in the context of new institutional arrangements, I.F. implies the provision of information to producers in repeated short courses; this, in the long run, along with the dissemination of information about individual good practices and the alteration of information into new knowledge continually incorporated into the production process, points to a process of endogenisation of information and knowledge and hence the identification of *information and knowledge as 'quasi-parameters'* (Greif and Laitin, 2004). I.F. has been transformed into a 'multi-purpose' instrument (as it successfully addresses environmental, economic and organizational problems), hence the changes in the 'quasi-parameters' are associated with a broader range of situations, contributing to the stabilization of the new institution (I.F.).

Therefore, in our case the stimulus for changing formal rules has come from a series of exogenous and endogenous parameter changes; the institutional change under examination combines both 'centralized-designed' and 'evolutionary-decentralized' elements. Finally, policy changes along with the appearance of a new coordinating agency which played the role of a 'political entrepreneur', proved critical in causing a change in the rules (Kingston and Cabalero 2009).

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Parallel Session B-II:
Open Innovation and Public-Private Partnerships I

How innovations change over the technology life cycle

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Innovative technologies evolve over time. They often follow a path under which their scope of usage and technological advancement proceed in distinct periods: an introduction stage is followed by a growth stage until maturity and eventually decline are reached. This so-called technology life cycle (TLC) is generally difficult to describe analytically as observable characteristics of technologies may not adequately capture the beginning or/and the end of a stage. As such, a large body of work has employed a number of indices based on patent documents as well as bibliometrics to capture and eventually measure the TLC for a number of innovative technologies.

This literature is the point of departure for our work as we employ its insights and tools to also map the TLC of a given technology --- polymerase chain reaction in our case. Then, extending previous work (Haupt et al., 2007), we describe how key features of the technology change over the life cycle. That is, we examine whether and how a) the value of the technology, b) its originality, c) its complexity, d) the speed it progresses within the intellectual property system (patent pendency) and e) its pace of technological progress, change as the technology moves from the introduction to the maturity phase.

Theoretically, we expect changes over the life cycle. We build this expectation on the notion that the breakthroughs of most innovative technologies tend to happen early in the life cycle and the marginal contribution of follow – ups is diminishing over time. If that proposition holds, we expect all the above-mentioned features of a given technology to

differ over the life cycle. For instance, we expect the more valuable and the most original forms of the technology in the early stages of the TLC.

As our case study we analyze the polymerase chain reaction (PCR) technology which was developed by scientists at Cetus Corp. in the early and mid-1980s. PCR is a method of rapidly producing large quantities of DNA from an initially small sample. The innovation that PCR became is now a standard piece of equipment in molecular biology laboratories in a wide range of disciplines. In fact, in 2002 alone, over 3% of all articles cited in PubMed referred to it (Bartlett and Stirling, 2003). From a technical standpoint, as we explain in detail in Section 3 PCR follows an identifiable life cycle with a long history which makes it a suitable template for studying changes in a TLC.

To implement the analysis we rely on patent data of the PCR technology sourced by commercial vendor Thompson Innovation. We have sourced 2414 US utility patents applied for from 1985 to 2008 and granted through 2012. These data allow us to identify the life cycle of the technology as well as to estimate how the value of the technology, its originality and remaining key features change over time. We find that the value of the technology generally diminishes after the introduction phase even though significant variations do exist; patent pendency and the pace of technological process follow a roughly U-shape path while originality increases over time and complexity does not exhibit significant variations.

Because the majority of the technology characteristics we study do change in the life cycle our analysis highlights the need to explicitly account for life cycle characteristics in studies explaining the value of technological innovations, the speed in which technologies are progressing in the patent system and so on. Also, the study adds to the scarce literature on the changes of observable characteristics that occur within a TLC (Haupt et al., 2007) by a) extending the technology under analysis and b) examining features of the technology that have not been studied previously (i.e. originality and complexity). All in all, given the descriptive character of our work we expect the study to assist in establishing some stylized facts that can subsequently initiate new research that can for instance analyze the underlying factors leading to those facts.

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Organizational Innovations in the French Cattle Beef Industry: A case Study of the Label Rouge Veau d'Aveyron et du Ségala

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Introduction

The French cattle beef industry is facing many challenges; part of the problem is that the industry is highly fragmented (Goy-Chavent, 2013; p. 119, 129, 140) particularly on the marketing side. Most producers sell directly to butchers or to middlemen who then sell to processors, themselves negotiating with a handful of retailers. Consequently, French bovine meat producers have currently a low level of market power and are struggling. One way to change this situation is to have producers regroup (Goy-Chavent, 2013; p. 173) to reach economies of scale and power, to be able to lobby for their rights and impact policies. In this paper, we present an example of a producers' group with the brand: Veau d'Averyon et du Ségala that has succeeded in improving the status of its producers. The goal of the paper is to understand how this producers' group came into existence, how it offers benefits to its followers and therefore tend to address the challenges mentioned by Goy-Chavent (2013) by innovating and differentiating.

Methodology

Literature review, case studies and qualitative surveys (realized in late 2014) are used here to study the initiative. The theoretical framework supporting this paper considers, on one hand, institutional environment and the importance of formal and informal rules (North, 1991) and, on the other hand, institutional arrangements, considering horizontal and vertical arrangements and complex forms of organizations (Lazzarini et al., 2001; Zylbersztajn and Farina, 2010). 15 producers were surveyed in September 2014: 10 being breeders of Veau d'Aveyron et du Ségala and 5 breeders not involved in the initiative to

serve as the control group. These five breeders were used as a control group. The president of the interprofessional association "in charge" of the brand Veau d'Aveyron et du Ségala and its director were interviewed. An extension agent, a sales representative of the slaughterhouse Arcadie, a board director of the cooperative SA4R and the president of the cooperative Fermiers du bas Rouergue; all involved in the initiative (IRVA, 2015) were surveyed. The director of one of the cooperatives, Unicor, involved in the brand was also surveyed.

The Initiative

The Veau d'Aveyron et du Ségala is a label rouge brand with a protected origin. The product is a pinkish veal meat produced in the Midi-Pyrénées region of France extremely appreciated by consumers for its tenderness and consistency. This initiative has its origin in the willingness of a few producers to join and regroup to create strict quality specifications and hence be able to secure retail markets. The initiative is under the umbrella of IRVA, an interprofessional association, created in 1989 (MPS, 2013; Mallet de Chauny, 2014). IRVA includes all the players of the supply chain, is in charge of the communicate of the brand and controls its breeders to make sure the specifications are followed (IRVA, 1993; Chambre d'agriculture du Cantal, n.d.). IRVA counts 700 breeders of Veau de l'Aveyron et du Segala (IRVA, 2015). For each calf, the farmer pays a contribution of 19 euros, used for the development and communication of the brand (Mouysset, 2014).

Main Findings

The producers' interviews indicate that breeders of veals involved in this interprofession have seen benefits. They now have secure markets to sell their animals. Producers also know in advance the price they will be receiving as a price grid has been approved since the beginning by the interprofession. The production of Veau d'Aveyron & du Ségala and therefore calves' births take place throughout the year allowing for continuous revenues for producers and avoiding having to deal with a lot of births at once. Producers are also keen on being part of a collective initiative that allows for them to meet with each other and exchange. It is particularly true with the younger population and with farmers who tend to otherwise often feel lonely (Bioulac, 2014). With this interprofession, breeders come to supermarkets to promote their product. Consumers appreciate meeting producers and producers appreciate hearing from the end client. Meeting with consumers is also

essential for producers to understand what consumers want and adapt their production in consequence (MPS, 2013; p9). Being part of a cooperative, through this interprofession, like Unicor also allows for the access to services at a lower cost (preventive veterinary services, more access to technical representatives, …). Cooperatives also have employees whose full time job is to find innovations to improve the business of its producers (Bioulac, 2014).

Of course, these benefits come with drawbacks as well. To reach a high quality meat highly differentiated from others, producers must bring calves to milk their mothers twice a day, 7 days a week. This happens all year long. Because the production is throughout the year, cleaning the buildings is challenging which can sometimes be the cause of sanitary problems with the herd. In addition, specifications are very strict and not always well justified to producers. Yearly controls by IRVA are also not always well appreciated. Several cooperatives are involved in the commercialization of the product. They don't all have the same specifications and pricing methods which sometimes creates tensions among producers. Some cooperatives also require that the majority of the production be sold to them which conflict with the willingness of liberty farmers crave.

Discussion

Organizational innovation observed through the grouping of producers in such initiative has allowed beef cattle farmers to enhance their access to upstream and downstream markets, to improve economies of scale and value-adding, to warranty rent appropriation, to mitigate information asymmetries along the chain and to foment other types of innovation, among others. Thus, it represents a relevant strategy for beef cattle farmers in French bovine chain.

The results presented here are a short summary of the results obtained so far for this research and will be completed by additional interviews prior to the conference.

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Sunflower Seeds Innovation to Improve yield Stability in a changing Environment

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Extended Abstract

The world oilseed production will be faced to an increasing demand in the next thirty years catapulted by a combination of many factors such as the development of the biofuels industry and more specifically biodiesel around the world, the needs for green chemistry and of course the additional demand of edible oil. Sunflower represents a major renewable resource for food (oil), feed (meal), and green energy. It is one of the main two oil crops in Europe in term of acreage and production, with strong environmental advantages especially when it is included in rotation systems. Sunflower, apart from its multiple agronomic and environmental characteristics,

presents also for farmers and for industry many market opportunities due to the various outlets that it presents. However, this crop seems to suffer severely from a competition with all the other massive crops and especially other oilseed crops. Thus, despite of many a priori advantages of this crop, its development seems to be rather moderate in many countries as it is the case in France. (Guinde et al., 2008) Sunflower has demonstrated sustained productivity gain over the last four decades, suggesting an important potential for further improvement. However, in the context of

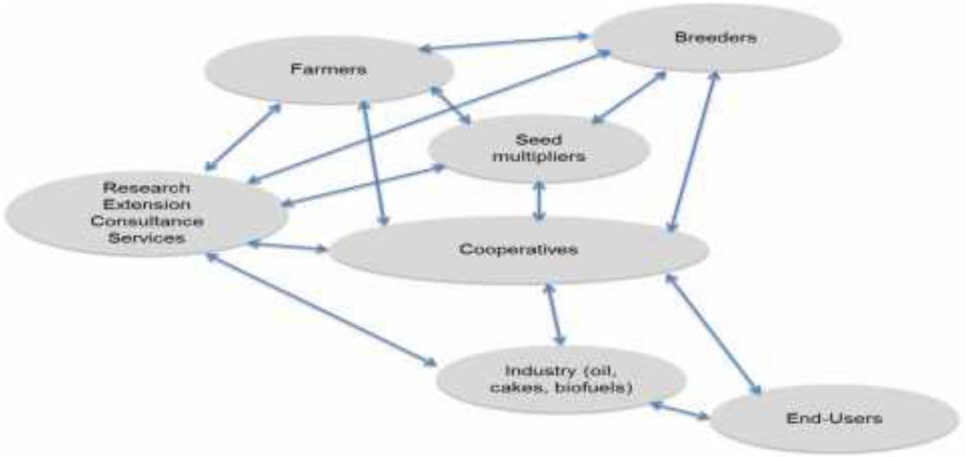
climatic change and of the increasing societal demand for an environmentally safe agricultural production, the next step in further improvement is expected from a better adaptation to limiting environmental conditions, which will lead to increase the stability of production and a better crop competitiveness for farmers and oilseed industry. The overall objective of the SUNRISE project is to contribute in the development of new sunflower varieties improving yield stability under limited water supply conditions.

Taking as an example the French sunflower industry, we tried to understand how the agricultural sector can be more sustainable (Bonneuil et al, 2006). The innovative varieties can serve different objectives. If the research of new varieties are mainly oriented towards to the "input traits" by improving the cultural criteria (disease resistance, herbicide, etc) other varietal innovations may have turned to "output traits", related to the quality of the final product (capacity for processing, nutritional quality, etc). Sunflower industry is interesting because it combines these two
objectives in order to create a homogenous framework for the adaption of the innovated seeds. Indeed, during 80's the sunflower industry developed an oleic chain by offering a richer ω9 seed and as a result, opened new markets for sunflower production (energy, biochemistry, food industry). This innovation on output changed
the target of innovative varieties and established new diffusion strategies, and France appeared to be the leader of this industry overtaking other producers such as Russia and Ukraine. This program allow us to produce a complete study of the innovative varieties markets and of the relations between the actors by determine the selection criteria of the innovative seed in order to examine the future and the opportunities of this industry. (Borredon et al, 2011;Jouffret et al, 2011)
The team of economists implied in the SUNRISE project research has been assigned a specific role. The purpose of our socioeconomic work is to analyze societal impacts of new sunflower ideotypes at different relevant scales (farms, supply chain(s), national or European etc). Our analysis is divided in two parts. Firstly, is farm-focused as individual unit of adoption of new practices. Secondly, is focused on the actors of agro-chains in order to identify coordination aspects which can enhance competitiveness and the conditions of acceptance of new hybrids. We will analyze impacts and diffusion conditions of such innovation in sectors and territories with specific focus on the collecting organizations, including agricultural cooperatives because of their role at the interface between farmers and the backing of the industry. Their capacity for organizing production and market appear predominant to enhance the sunflower production. Moreover, we aim to analyze the potential capacity of contractual relationships along the agro-industrial chains to adapt itself to the technological change linked with new hybrids. We will identify the nature of risks and

uncertainties perceived by the sunflower trade and transformation actors and will analyze the potential lock-in and new needs in the coordination arrangements.

In order to accomplice our objectives we will mobilize a wide range of quantitative and qualitative methods to meet the objectives identified in this program such as field surveys and interviews with various stakeholders (cooperatives, industry, consumer associations, professional organizations, government officials, etc.), scenario-building method with multi-criteria analysis, bio-economic modelling and econometrics of individual data, including contracts. Significant investment is expected to get the data needed to implement the different methods (data available from statistical agencies, professionals and project partners, or survey data that will be collected by us).
A first analysis shows that an innovation is an essential lever for the evolution of the sector, only if its adequacy with outlets and economic -but also societal - objectives will insure its diffusion, relevance and sustainability. The analysis of the whole sector was a crucial part of our work and reveal the co-evolution of market and innovations (illustrated by reconversion of oleic innovation to biofuel outputs toward food industry's one). Furthermore, only the understanding of the respective importance of the three main sunflower outlets (oil, cakes, hull) reveals the interest for a higher protein rate in seed, which enable (while keeping the oil yields), to propose cakes richer in proteins (and so reusable in animal sector as poultry, which are strongly dependent on imported soya cakes). Our analysis also highlights the importance of external factors which consequently impacts this co-evolution of innovation/market and establishes a sustainable strategy.

Socio-economic analysis of the sunflower crop sector



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Plenary Session C:
Technology Transfer in Agricultural University of Athens

Initiating Disclosure at a Newly Found Office of Technology Transfer: The Case of Agricultural University of Athens

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JEL Classification: O32, O33, O34

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Acknowledgements: We thank Stamatia Voulgaraki for excellent research assistance. Gratefully acknowledge financial support from Municipality of Athens of the grant "Innovation and Entrepreneurship – Valorization of Research by the Agricultural University of Athens." Reference No: 464052. The usual disclaimer applies.

Abstract

In most developed countries universities have founded Offices of Technology Transfer (OTTs) with the goal of passing invention disclosures by university researchers to the industry.[2] There are two main goals universities want to achieve technology transfer. The first, societal reason is that university inventions can deliver breakthrough welfare enhancing innovations or at least speed up the rate of innovation. Indeed Mansfield (1998) showed that a number of industry generated innovations would be seriously hampered or significantly delayed if corporations had not used university innovations or cutting edge know-how. The second reason is for universities in the long run to generate a steady stream of income that will compensate for reduced public funding.

Many universities in less technologically mature countries have tried to set up OTTs in an effort to emulate success stories from the Western world (cite a paper from handbook). Immediately, universities are faced with a problem that if not solved, will set the whole endeavor in jeopardy. Universities need to make sure that there is enough research output from the university that will sustain an OTT (Young 2007). In other words, there needs to be substantial input from the academic community that will be attractive to the industry in the form of disclosures of mature research output.

[2] In the US inventions disclosed to OTTs, patent applications filed by universities and licensing revenues have increased significantly over the last decades (AUTM 2013).

There are three ways why a university member (faculty, researcher etc.) may not participate in such OTT related activities. First, he may not have produced research that is either high quality of industry related. Second, the academic member may be unclear in the supportive actions that will be available to him/her if he chooses to disclose a mature research idea. This possibility is more likely in countries where university-industry collaborations and academic technology transfer are rare and therefore the academic community much more agnostic about benefits of a technology transfer program. Third, certain high quality faculty may not participate in these activities as they may already be connected to the industry and fear that such a technology transfer program will reduce the revenues accrued to them or hamper the relationships that have established with the industry.

In this paper, we discuss the case of Agricultural University of Athens which set an interim OTT (named AUA OTT from now on) with the goal to set it as a permanent institution. The first task of the AUA OTT was to inform and motivate the academic community of the merits that such an institution can have for them. After a lengthy process, approximately 24% of academic faculty disclosed a mature research idea to AUA OTT. The approach followed in informing the academic community and the challenges faced in obtaining disclosures by faculty members is discussed in detail. In the process, we also discuss how we dealt with any remaining problems.

The AUA OTT in the process of producing a research activities inventory and evaluation of business ideas followed the methodological approach of direct contact with faculty members and their research groups with a series of interviews. An informative email preceded the personal interviews of all faculty members aiming at attracting interest and setting date and time for a personal meeting.

This method had a positive impact, as 25 faculty members replied with interest and questions about the project and its objectives. However, it was not considered sufficient and due to tight timetable, telephone contact for setting date and time for a personal meeting was selected. This method proved very effective, as the project team was able to plan and meet with 142 faculty members within 50 days covering 78% of the faculty members.

Nevertheless, the fact that direct contact with the 40 remaining faculty members was not succeeded must be analyzed as to the causes of this effect. Contact and meetings were set for May-July 2014, which overlaps with the examination period of June. Interviews frequency was higher before and after June. In addition, many faculty members

noted that the heavy workload due to the exam period together with research pending issues before summer holidays do not allow them to get involved in this process. Other faculty members could not participate due to absence during this period (i.e. being on sabbatical). Another remark would be that as there is portion of faculty that does not respond to people who show no validity, the contact should not be executed by the AUA OTT personnel, but the Senate or even the Rector himself to show the determination of the Institution on this purpose. Finally, the ideological differentiation by a part of the academic community on entrepreneurship emanating from universities led some faculty to avoid contact either by email or telephone.

The personal interview had a specific structure. Primarily, initial presentation of the objectives of AUA OTT and the benefits that can be reaped by faculty members, their research group, the laboratory they belong, AUA as an Institution and of course the Greek society were given by the AUA OTT personnel. Later, the faculty member was asked to shortly present the research activities in recent years and the most important research results of his research group. Having in mind the research output, the AUA OTT personnel together with the faculty member proceeded in investigation of suspected presence of mature research idea / invention within the research activities presented. Finally, a discussion on the intention of the faculty member to disclose one or more innovative ideas / inventions in the context of the AUA OTT was carried out.

The methodology of direct interviews with faculty members could be considered successful, as 42 disclosures were submitted for evaluation in a total of 176 faculty members (participation rate 24%), which is quite significant considering the environment (first technology transfer approach at AUA).

It is noteworthy that faculty members whose research activity and level of research results technology readiness is of high excellence did not proceed with any disclosures. This failure to submit could be identified in the limited time to disclose their idea / invention. Being highly professionals, they refused to submit an incomplete disclosure form. Moreover, several faculty members of high excellence are between the academics that believe in separation of university research and industry.

In conclusion, it should be stressed that the private interview was a successful approach, because the faculty member is accessed directly and enjoys recognition (not only from academics of his field), is given the opportunity to propose applications of his research in the society and gets the feeling of mutual trust which reassures the interviewer that any information will be handled with professionalism.

The contribution of this paper is first important in terms of policy in Greece where while there have been intense discussions to promote university-industry relations. As pre-publications by the Ministry of Development have stated that there will be funding for the formation of OTTs in research-oriented universities, the first main challenge that they will face is to elicit disclosures by the academic community. Further, this challenge will also take place in other developing countries' universities that consider of founding OTTs.

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Likelihood and Technology Readiness of Disclosure at an Office of Technology Transfer

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Abstract

This paper examines the probability of disclosure of mature research idea by academic researchers to their institution by utilizing a unique setting. The Agricultural University of Athens was awarded a two-year grant to provide all the necessary supporting actions (e.g. technological and economic assessment of technologies, setting a network of financers, legal services, searching for potential licensees, business plan drafting) that are needed for an invention disclosure to pass to the marketplace. We examine which factors of each faculty member (demographic, research output, funding record etc.) are associated with the probability of disclosing a mature research idea to the University. We find that virtually no factor is associated significantly with the likelihood of disclosure. However, once we examine the disclosure's technological maturity and business potential, research teams, rather than lone faculty, are more likely to yield "better" disclosures. Certain faculty characteristics are also significant predictors.

Keywords: likelihood of disclosure, faculty characteristics, technological maturity, business potential, office of technology transfer, research teams.

JEL Classification: O32, O33, O34

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Acknowledgements: We thank Stamatia Voulgaraki for excellent research assistance. Kyriakos Drivas and Stelios Rozakis gratefully acknowledge financial support from Municipality of Athens of the grant "Innovation and Entrepreneurship – Valorization of Research by the Agricultural University of Athens." Reference No: 464052. The usual disclaimer applies.

1. Introduction

Universities are a key source of technical progress and economic growth (Jaffe 1989; Adams 1990; Berman, 2011). One of the two main functions of the university is to produce research output that will in turn increase the stock of knowledge in the economy and therefore enhance innovation.[3] The perennial policy issue has been whether and how to construct institutions that can efficiently and timely pass academic research to the economy (Colyvas et al 2002).

In the US, individual Offices of Technology Transfer (OTTs) have been founded in the majority of universities and have been set in charge of passing invention disclosures by university researchers to the industry. As a result, inventions disclosed to OTTs, patent applications filed by universities and licensing revenues have increased significantly over the last decades (AUTM 2013). A main reason, which has been proposed, that facilitated this increased tendency of universities to operate a formal technology transfer institution is the Bayh-Dole Act of 1980 which set a unified framework, of how universities can retain ownership of federally funded inventions (Eisenberg 1996).

In Europe, on the other hand, concerns were raised that while universities are producing comparable quantity and quality of research output as their US counterparts, such a performance was not followed by a comparable quantity of commercially-oriented output (European Commission 1995).[4] This reason has led a number of European countries to emulate the Bayh-Dole Act and also have taken initiatives to set up OTTs at their universities (Mowery and Sampat 2005). However, practitioners have warranted that universities first and foremost need to have the research capacity to sustain a technology transfer program and the willingness by both administrators and researchers to engage in technology transfer functions (Young 2007). For researchers, these two prerequisites translate in having research output and willing to disclose it in form of an invention to their OTTs.

Greece until recently had not set a formal strategy for technology transfer of university inventions. However, due to the financial crisis, innovation has come at the forefront of policy debates. In these debates universities possess a central role. Additionally, universities have started exploring such functions in an effort to complement for the decreasing public funding. Given the above, the Ministry of Development has

[3] The other main function of the university is naturally to educate students.

[4] While recent evidence have shown that this "European Paradox" is not as pronounced as it was initially estimated (Dosi et al 2005), the initial reports still had a significant influence to policy makers.

recently pre-published actions that will significantly support academic technology transfer. The main supporting action is to finance the establishment of OTTs in 15 universities that perform research and guarantee funding for the first four years of operation.[5] Given that there are additional actions to support academic technology transfer that are currently discussed, there is an urgent need to examine the capacity and willingness of academic researchers to disclose mature research ideas to university administrators.

This paper employs a unique quasi-natural experiment that has been taking place at Agricultural University of Athens (AUA). The municipality of Athens awarded a two-year grant to AUA to form a team that will act as an OTT (hereafter the Program). The grant, not only compensates the team but also all the actions that support technology transfer. In particular, it finances technological and economic evaluation of every disclosure, legal services, mentoring, full business plans for a subset of disclosures, formation of a financiers' network and other secondary supporting actions. The AUA is a university specializing in agricultural sciences with six departments and approximately 180 faculty members.

The first stage involved an exhaustive in-person discussion with each faculty member of the AUA to inform them in detail regarding the benefits that may acquire from the Program asked them if they have and are willing to disclose a mature research idea. The second stage was to perform technological and business evaluations for each disclosure. The evaluations were performed by third parties. In addition, we have collected detailed information of each faculty member with respect to demographics, scientific publications, patents and research grants.

The objective of this paper is twofold. First, it examines which faculty characteristics are associated with the probability to disclose a mature research idea. Second, it examines which faculty and disclosure characteristics are associated with the disclosure's technological maturity and business potential.

Our results show that virtually no faculty characteristic, except prior European Union (EU) funding, is significantly associated with the likelihood of disclosure. This result implies that upon setting an OTT, the academic institution should expect disclosures from all types of faculty. However, when we examine the disclosure's technological maturity and business potential, then we find that a research team will yield more

[5] http://www.kathimerini.gr/763099/article/oikonomia/ellhnikh-oikonomia/h-sthri3h-ths-kainotomias-apo-to-espa-anazwogonei-thn-oikonomia (In Greek).

advanced disclosures than a lone faculty. Further, we find a number of faculty characteristics to be associated both with the technological maturity and business potential; most notably, the age and prior funding experience.

The contribution of this paper is first important in terms of policy in Greece where while there have been intense discussions to promote university-industry relations, there has been little analysis for the propensity of university researchers to disclose inventions with the intent to pass to the marketplace. Second, such an analysis can inform other universities, especially in the agricultural sciences, where they consider of forming a technology transfer institution but have no picture of which faculty would disclose inventions at their OTT.

Our paper relates to the literature that examines the likelihood and quality of disclosures at an OTT. Specifically, this literature is concerned with whether faculty are incentivized enough to participate in a technology transfer program instead of pursuing by themselves entrepreneurial activities or simply not engaging in such activities (see Markman et al 2005 and Panagopoulos and Carayannis 2013 and the references therein). In this paper we offer insights on the characteristics of the faculty that disclose and also the technology and business characteristics of the disclosures.

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Invention Disclosures: Do they fit into the technology-push market-pull discussion?

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The literature has, to a large extent, debated whether innovations are driven by market demand or by technological advances. Drawing upon the traditional debate about the market-pull vs. technology-push question, this paper investigates whether market focus or technology posture constitutes drivers of radical new research ideas. By contrasting the basic elements of radical and incremental new research ideas, it attempts to explain whether the notion of market-pull (innovations are based on market needs) outweighs the technology-push (innovations are based on changes in technology) or vice versa.

Using a sample of 40 new research ideas submitted for evaluation and further support within a dominant University in Greece, namely the Agricultural University of Athens, this study provides some new empirical evidence on the choice between radical as against incremental new research ideas.

The empirical evidence reveals that new research ideas are triggered not only by market-pull or technology-push aspects but also by their combination. The findings are discussed in the context of Greece taking into account the specific conditions prevailing. Apart from providing some new evidence, they have also important implications for managers and policy-makers. In addition, they encourage further theoretical and empirical investigation.

Extending the research into the underlying driving forces behind product innovations in SMEs would be very useful. Given the strategic importance of innovative new products in SMEs, an interesting investigation would be to consider whether market orientation and technology policy influence the adoption of radical product innovations. This investigation could also embody the potential effect of entrepreneurial orientation.

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This force seems to outweigh the traditional forces of both market-pull and technology-push in guiding radical product innovation adoptions by SMEs. This not only justifies our investigation of entrepreneurial orientation but would also trigger off further theoretical and empirical investigation on this issue.

Stated differently, the argument of 'entrepreneurial-push' is elevated, and seems to outweigh the traditional debate of market-pull and technology-push.

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Project selection for technology transfer support activities in a public University

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Beside education and research, higher education institutions are inclined these days to promote research output for commercial activities. In an era of decreasing funds, especially in countries under public funds scarcity, public Universities venture in technology transfer without much experience and lacking entrepreneurial culture. An ad hoc tech transfer office supported by an ongoing project has received 40 innovative business ideas elaborated by faculty and research staff in the Agricultural University of Athens. These proposals may be classified in several types, such as new products in agriculture or in industry, innovative processes, novel test and/or certification methods, applications/software, services etc. Funding is provided for a small number of selected proposals to implement fully fledged business plans for appropriate action (spin-off, licensing, etc.) and contacts with potential investors.

In view of these considerations, the assessment is based on 3 dimensions and an overall set of sub-criteria, as briefly discussed below.

Technology – innovation: the proposals that will be selected need to have a sufficient level of technological maturity, excluding or giving low scores to ideas that still need a good deal of effort to reach the stage of commercial exploitation. In addition, this technology has to relate to problems dealing with economic/social challenges, as well as to be competitive with respect to alternative solutions, in order to ensure that chances of

commercialization are non negligible. The overall technology – innovation mark is used as a pass or failure criterion.

Market opportunity: the proposals would need to have a clear business focus with well-defined products / services and target groups. It is also important that the competitive advantage of the proposals has been sufficiently demonstrated, which would create a solid basis for a potential endeavor. A further aspect comes from a qualitative cost-benefit analysis for each application, looking at market size, expected societal effects, taking also into account any "spill-over" opportunities.

The business team: the main actors that will assume responsibility for the commercial exploitation of research results should be clearly identified, along with any alliances with suppliers / other entities needed. Two further key aspects are assessed: if all necessary business skills are available (or concrete plans in this direction) and if the key research personnel assume a role that will ensure the technology competitiveness of the venture.

The selection of a subset of alternatives using multiple criteria belongs to the ranking or sorting problematique. Despite the development of sophisticated methods traditional weighting average is usually applied by practitioners in such cases (Coldrick et al., 2005). In order to overcome compensation problems, projects have been plotted against two axes: namely the technology maturity and the business prospective performance (combining the business opportunity and the team perspectives). This classification put submitted projects into four groups with the north-east quotient to include the 16 most promising projects. Subsequently Promethee method has been implemented resulting in similar ranking with a few interesting differences which are separately discussed.

The decision situation becomes more complex if in addition to the multiple evaluation criteria the decision-maker has to comply with specific limitations e.g. segmentation or policy constraints that characterize the final selection. This is the case as the Tech transfer managers wish to select proposals in such a way that all University Departments and all different types of ideas are represented. Moreover, the University administration strategy may wish some kind of diversification, to target to a minimum number of spin-offs, a number of licences, providing services etc. These constraints distort the independence of the alternatives, a usual, underlying concept in most MADM methods (Brans and Mareschal, 1992). In the presence of segmentation constraints the decision problem becomes combinatorial and the actual options for the decision maker are the combinations of the alternatives that comply with the segmentation constraints.

Several applications are reported in the literature concerning resource allocations problems in IT, the academia and the industry (Mavrotas et al., 2006, 2008). One way to deal with is to use a two phase approach, an idea often reported in the literature (Shakhsi-Niaei et al., 2011): first obtain a multi-criteria evaluation of the individual alternatives then use this information in the objective function of an IP model that incorporates the constraints.

In the current work we apply an extension of the PROMETHEE V method, named PROMETHEE V2. This version fully exploits the advantages of the PROMETHEE family methods and offers more flexibility to the decision maker as illustrated in Mavrotas and Rozakis (2009) in the context of student selection. We use information provided by PROMETHEE I in the form of leaving (φ^+) and entering (φ^-) flows to formulate a bi-objective IP problem. In order to help the decision maker choose his/her most preferred solution a decision aid process is also developed. PROMETHEE V2 is particularly appropriate for group decision making as it can effectively and transparently incorporate the preferences of all the stakeholders in the final decision.

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Parallel Session D-I:
Technology Transfer and Adoption Challenges

INFLUENCE OF INSTITUTIONAL ENVIRONMENT IN BRAZIL AND FRANCE MILK PRODUCTION SYSTEM

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Extended Abstract

Institutions are set as "[…] the humanly devised constraints that structure political, economic and social interaction. They consist of both informal constraints (sanctions, taboos, customs, tradition, and codes of conduct), and formal rules (constitutions, laws, property rights)" (NORTH, 1991, p.97). This theoretical framework is broad enough to be applied in many research subjects, finding particular application in agribusiness (AZEVEDO, 2000). According to the author, the institutions that affect the agri-food systems are specific and especially important, having effects on the actions of those involved in the systems. Thus, in agribusiness context, in which prevails uncertainty and dependency between agents, the role of institutions is enhanced.

Thus, the object of study in this article is dairy system, discussing specific aspects of public and private policies identified in Brazil and in France. From a methodological approach of bibliographical review, supported on secondary data, we discuss the effects of institutional environment in the productive and organizational dynamics of primary production segment in both countries. In Brazil, dairy is a traditional business in the countryside; there are about 1.35 million farms producing milk, comprising about five million people (BRASIL, 2014). According to Melinski, Guedine and Ventura (2008), dairy system is an important activity for economic development of several regions. Milk activity contributes to keep workers in the field, reduce social pressures in urban areas and help to minimize unemployment and social exclusion. In addition, milk consumption in

Brazil has increased, especially when considering dairy products, although lower when compared to the main world consumers. In 2013, Brazil consumed 12 million tons of fluid milk and 606,000 tons of powdered whole milk, while producing 32.38 million tons of fluid milk (ANUALPEC, 2013). India, the world's largest consumer (54.40 million tons of fluid milk), yielded 141.12 million tons in the same period.

This study brings France as reference. France is the second largest milk producer in the European continent, with an average production of 23.6 million liters per year (CHIAVELLI, 2014). Another important aspect is French dairy consumption, which is the fifth highest of the world, with a per capita consumption of 404 kg per year (FAO, 2006). In particular, the effects of institutional environment are presented as important drivers in the advances of French production system at different aspects. Its comprehension may help to guide actions necessary for the performance of dairy system in Brazil and even anticipate possible restrictions. Thus, this paper aims to understand the influence of institutional environment in dairy system in Brazil and in France, seeking to characterize the changes in institutional environment and their impact on primary production segment. Thus, it proposes to identify how institutional changes have impacted on primary production, and its consequences downstream (processing, distribution and consumption). Considering France as a reference, our assumption is that in Brazil, the lack of processors' enforcement and incentive mechanisms for quality standards in milk production has limited improvements in quality and productivity in primary production segment.

In France, the institutional changes can be structured in four phases, with deep impacts on rural production segment: (1) stimulus-production phase, from 1962 to 1992; (2) response search phase, from 1992 to 2003; and (3) international issues, from 2003 up to the present. From 2003 to 2013, the strengthening phase of rural development guided public and private policies and, from 2013, the orientation has turned to the enhancement of competitiveness, sustainability and local production (COMMISSION EUROPEENNE, 2015). Thus, those guidelines impacted not only on the productive and organizational structure, but in the articulation of strategies necessary to support competitiveness of the various segments.

In Brazil, it is possible to identify institutional changes impacting on dairy system at the beginning of the 90s (JANK, FARINA, GALAN, 1999). The price deregulation of the market, in that period, intensified competition between all actors in the sector. Market opening, important political orientation of this restructuring, allowed multinational companies to start competing in domestic market, which generated geographical

restructuring of production, product standardization problems and range of an informal market (JANK, GALAN, 1998). In this context, requirements for rural production have expanded, considering the need for larger scale production, together with the adoption of higher technological levels, and higher quality standard (BANKUTI, 2007).

In such framework, one could see processors beginning the search for products aimed at improving their costs and quality mix (JANK, FARINA, GALAN, 1999). The introduction of new demands originating from the formal establishment of rules, introduced new requirements for both primary and production segment. In primary production, new requirements related to product quality were introduced, creating new technological and productive demands. In distribution, innovations in product, such as the introduction of UHT milk, allowed the strengthening of supermarkets power, from the possible scales gains (FARINA et al, 2005). In addition, according to Jank, Farina and Galan (1999), new product lines, exploring new segments and differentiation of companies and brands, led to the formation of a new consumer market, more targeted. These changes were supported by new forms of organization and coordination systems, given the necessary adoption of new technologies and production routines.

However, productive and competitive improvements in Brazil, especially in the rural segment, are still limited and strongly heterogeneous. This happens not only on the basis of existing spatial aspects, but yet due to the lack of public and private institutional mechanisms to adequately guide advances in the system. Comparing with French system, it can be considered that in Brazil the search for stimulus for rural production is still limited, and the development of the activity involves isolated joint initiatives in cooperatives and social contribution, without a support of public institutional environment. In this respect, minimum sanitary control is established as one of the main drivers, coming from public formal rules. This is responsible for inserting innovations in product and process, action that is supported by the low demand from processors for higher raw milk quality, and its insertion in a not so demanding market.

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Hosting foreign retailers: impacts on productivity and exports

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Extended Abstract

Multinational retailers (MRs) are major actors of the global economy. In 2010, the sales of world's largest one hundred retailers in the food sector were comparable to the size of the Italian economy. Most of these companies are based in industrialized countries, but saturated home markets, fierce competition and restrictive legislation have persistently pushed them to internationalize. The overseas expansion was especially strong for German and French retail companies, with foreign sales representing over 40% of their turnover. Emerging and transition countries with friendly legislation and high demand potential were their main targeted destinations. Recent studies show that the arrival of multinational retailers changes considerably the host country's retail supply chain, and increases the productivity of local firms. Durand (2007) and Javorcik, Keller and Tybout (2008) describe changes in supply chain governance on the Mexican market after the entry of Wal-Mart. Both papers find that the growing competitive pressure brought by Wal-Mart drove least productive supplying firms out of the market, and accelerated the modernization, innovation and growth of surviving local firms. Javorcik and Li (2013, 2014) show that in Romania the expansion of global retail chains led to a significant increase in the total factor productivity in the supplying manufacturing industries. Iacovone, Javorcik, Keller and Tybout (2015) build a theoretical model where the access of MRs to global sourcing networks forces local producers to compete with foreign (larger and more productive) suppliers and the least competitive firms to exit the market and validate the model's prediction on the case of Wal-Mart in Mexico.

In the current paper we take a step further and look how changes in the local retail and supplying sectors induced by the entry of a multinational retailer affect the export participation of host country firms. More precisely, we investigate the impact of incoming MRs on firms' productivities, the export participation of individual host country firms. The analysis consists of two steps. First, we estimate industry-specific Cobb-Douglas production functions and compute firm-level total factor productivities (TFP). Second,

after having obtained firm-level TFS, we estimate the impact of the presence of multinational retailers in each country on firms' TFP and export status:

Variable denotes the presence of foreign retailers in exporting country , or the intensity of their activity (volume of sales, number of retailers, number of origins of foreign retailers). Since the impact of MRs' arrival requires some time before it becomes noticeable, we use a one-year lag for these variables. We also include a set of firm-level productivity control variables and invariant country-specific fixed effects as additional explanatory variables in the above two equations. To check the robustness of our results we repeat the analysis replacing TFPs with Sales per employee.

Our first result, drawing on (firm-level data for a panel of 60 countries from the World Bank Enterprise Surveys 2002-2005, confirms the positive impact of MRs' presence on firms' productivity and export status. This result support the finding by Head, Jing and Swenson (2014) of a capability effect, according to which incoming MRs increase the overall export capacity of local firms (to any foreign market) via an increase in their productivity. The productivity of local firms increases due to reinforced competition in the upstream sector. The foreign retailer that enters the market can always source from its foreign suppliers (firms from which it sources for its outlets in other markets). Therefore, the MR's entry brings local firms in (in)direct competition with some of the largest and most competitive and firms in the global market in the upstream sector. Under such conditions, only local firms that adapt and have/reach a threshold productivity level can survive in the market in the long-run. In addition, firms that become local suppliers of the foreign retailer can increase their productivity even more as they generally benefit from financial and technological support from the latter.

An important limit of the World Bank Enterprise Surveys data source is the lack of firm identifiers, which limits the use of the panel dimension of the data. Therefore, we intend to perform the same analysis on a true firm-level panel, covering agri-food firms from the ORBIS-AMADEUS database, mainly from Central and East Europe and the European Union's neighborhood. The use of this data source will also permit to estimate more accurately firm-level TFPs using the Olley and Pakes (1996) and Levinsohn and Petrin (2003) approaches, which control for the correlation between unobservable productivity shocks and input levels.

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Multiple Sustainability Dimensions of Retail Sector in Serbia

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Extended Abstract

Serbia has experienced one of the most unstable political and economic transitions in Central and Southeastern Europe, among the countries formerly under communist or socialist regime. The transition process in Serbia moved at a fast pace in the beginning, but slowed down when the country found itself halfway through the reform process. Unlike other countries in Central and Eastern Europe (CEE), where the private sector immediately became the main bearer of the economic process, in Serbia it did not become the main drive force, even though its growth after the year 2000 is noticeable. One of the reasons of this phenomenon can be seen in the fact that the private sector was already relatively well developed even before the "democratic changes". Taking into consideration that one of the most demanding tasks in the process of economic transition is building a modern market and modern trade, in this paper we have analyzed the challenges met by the Serbian retail industry, its economic significance in creating value in Serbian economy, as well as its environmental and social performances. In other words, we have evaluated multiple sustainability dimensions (economic, environmental and social factors) of retail sector. The empirical data obtained from different sources such as Statistical Office of the Republic of Serbia, The Serbian business registers agency, Eurostat, Agency for Environmental Protection were examined through qualitative and quantitative methods.

Our work began with an overview of the Serbian economy and a description of a number of factors contributed to the Serbian economy of 2000 being half the size it was in 1990. After that special attention was given to comparative analyses of average sales (of all products, including food products) in retail chains in CEE countries and Serbia. Our study has show that food consumption per capita in Serbia, as well as the sale of food and non-

food products in the retail network is close to the average in the CEE countries. We also found that Serbia falls significantly behind the average in CEE countries when it comes to sale of food and non-food products through networks of modern grocery retailers and cash&carry/warehouse clubs (801.2 EUR vs. 979.2 EUR) which implies the insufficient development of these formats. Contrary, Slovenia, a former Yugoslav republic, which has a highly consolidated retail industry, has achieved the undisputed highest sales through modern retail formats. Also, we pointed to poor organization of the trade sectors. The data from the Statistical Office show that the number of stores in Serbia doubled in 2005, compared to the year 1999. For comparison, in the year 2006, the trade sector participated with 43% in the total number of business entities in the Republic of Serbia.

This analysis clearly indicates the significant share of trade, and retail sales in the creation of the Serbian economy performance. Distributive trade is an important branch of the economy, contributing with 11.2% to the GDP, 17.8% to total employment and with 28% to the total profit in 2012. Value added of Serbia in 2012 was worth about 25.5 billion EUR 11% of which was the share of distributive trade, or 3.7% share of retail trade. Our research has shown a generally negative trend, which started in the year 2008, excluding the participation of retail trade in the value added at factor cost. Comparison of the participation of the Gross Value Added (GVA) (at basic price) of wholesale and retail trade, transport, accommodation, and food services activities in total NACE activities of Serbia and certain EU countries in the period 2008-2012 shows that the participation of this sector in the total created value added is smaller in Serbia than it is in the EU 28, Croatia, Greece and Austria. In the year 2012, the above named value participation in NACE activities in the neighboring Greece was 23.2%, while it was 5.2% less in Serbia. The relative relation of GVA of wholesale and retail trade, transport, accommodation, and food services activities in total NACE activities in Serbia and in the EU 28 within the observed timeframe was 0.2:100.

Social performance of retail sector in Serbia was analyzed through following indicators: number of enterprises, number of persons employed and turnover. In 2012, retail participated with 7.5% in the total number of enterprises, 7.5% in the number of employed and 9.1% of turnover. These results are on the lower level compared to countries with developed market economies. It is encouraging that Green business is increasingly applied by both foreign and domestic retailers and the number of ISO 14001 certificates issued in

the trade sector in Serbia is increasing. According to Report on the state of the environment in the Republic of Serbia in 2012, participation of the sector in the total number of ISO 14001 certificate was 16 %, which represents a significant increase compared to 2010 (8.5%). EU Ecolabel (flower) is awarded 9 times until now (3 in 2010 and 6 more in 2012). Also, organic products sale has increased in retail in Serbia, but average expenditure on organic food per capita are significantly lower (5€) than in Croatia or Slovenia (19 €).

Finally, it can be concluded that Serbia is on the path to the concept of sustainable development in retail sector, but it is necessary to implement systemic measures for its improvement.

Impact of information transfer on farmers' uptake of innovative crop technologies. A structural equation model applied to survey data

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Extended Abstract

There is an ever growing literature analysing technology adoption behaviour in agriculture. Part of this literature focusses on the factors that influence decision making as regards adoption of technology (Fairweather & Keating, 1994; Beedell & Rehman, 2000; Nuthall, 2001). Among these factors, access to technology information and knowledge transfer are key influences on adoption behaviour. This study builds on the existing literature and analyses the impact of technology information transfer (among other *a priori* identified factors) on the adoption of innovative crop technologies by Scottish farmers.

The data used in this study were collected through a representative survey of 450 Scottish crop farmers, which was completed in September 2013, and investigated farmers' behaviour and intentions as regards uptake of novel technologies. We used structural equation modelling (SEM) with observed and latent variables to test the impact of factors on technology adoption intentions and behaviour, and assess the strength of these relationships, i.e. how much these factors influence one another and primarily the behaviour and intentions. The model consists of two parts, namely the measurement model, which specifies the relationships between the latent variables and their constituent indicators, and the structural model, which designates the causal relationships between the latent variables. We perform model estimation with the Diagonally Weighted Least Squares (DWLS) method using the statistical package Lisrel 8.80 (Jöreskog and Sörbom, 2007). DWLS estimation method is consistent with the types of variables included in the

model (i.e., ordinal and categorical) and the deviation from normality in some of these variables (Finney and DiStefano, 2006).

The variables included in the model are:

− crop technology adoption behaviour during the past ten years (precision farming technologies; new tillage practices; new or novel crops; GM crops; biological control methods, elicitors; varieties of nitrogen fixing plants and/or legumes);

− intentions to adopt crop technologies during the next ten years (precision farming technologies; new tillage practices; new or novel crops; GM crops; biological control methods, elicitors; varieties of nitrogen fixing plants and/or legumes);

− perceived usefulness of information sources (open days, monitor/ demonstration activities, meetings with other farmers, internet, agricultural consultants, government information sources, representatives of research/educational organisations);

− frequency of access to novel technology information (precision farming technologies; new tillage practices; new or novel crops; GM crops; alternatives to pesticides such as use of biological control methods, elicitors; varieties of nitrogen fixing plants and/or legumes);

− socio-economic characteristics (age, education, agricultural income, profit orientation, number of employees);

− changes in the amount invested in new technologies (actual change, intention to and perceived difficulty of change).

The model has a good fit according to the measures of absolute, incremental and parsimonious fit (Hair et al., 2006). The model explains 68 per cent of the variance in current adoption behaviour and 60 per cent of the variance in intentions to adopt new technologies. All variables have a statistically significant effect on uptake of and intentions to uptake innovative technologies. Perceived usefulness of information sources and frequency of access to technology information are among the main influences on both behaviour and intentions, together with education and perceived difficulty to change the amount invested in new technologies.

The results confirm findings from the literature that access to technology information and trust in/perceived usefulness of the different information sources will have an impact on technology uptake behaviour and intentions. The findings are highly policy relevant as

they give some indication on the factors influencing the process of targeting specific technology information transfer through the appropriate channels to the different segments of agricultural producers, which build a potential driver of behavioural change.

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Parallel Session D-II

Intellectual Property Rights

The Interplay between PDOs/PGIs and Trademarks

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Extended Abstract

Geographical Indications (GIs) are a type of Intellectual Property (IP) available to agricultural and food products used to differentiate them based on the region they are produced. While there have been various definitions of GIs, the one most commonly implied in policy and scholarly discussions is by the World Trade Organization's Trade Related Intellectual Property Rights (TRIPS) Agreement and states that GIs are "indications which identify a good as originating in the territory of a Member, or a region or locality in that territory, where a given quality, reputation or other characteristic of the good is essentially attributable to its geographical origin."

In 2010, agri-food products that were protected under GIs had sales within the European Union countries of €54.3 billion (Chever et al 2012). This constitutes a 5.7% of overall sales in the food and drink sector as the total was estimated at €956 billion. We focus here on products with either Protected Denomination of Origin (PDOs) or Protected Geographic Indication (PGIs). The difference between the two is the strength. For PGIs, one or some of the production stages of the product need to occur in a certain region; conversely for PDOs all production stages need to occur in that certain region. Hereafter we will jointly refer to them as PDOs/PGIs unless otherwise stated.

The literature on the consumers' Willingness-To-Pay (WTP) for PDOs/PGIs is rather mixed. Bonnet and Simioni (2001) did not find any significant WTP for French Camember cheese in the French national market. Fotopoulos and Krystallis (2003) similarly did not find significant WTP for PDO apples in Greece. Conversely, Galli et al (2011) found significant positive WTP for PDO cheeses in Italy. For a meta-analysis of the WTP of PDOs/PGIs see Deselnicu et al (2013)

The other major type of IP where producers have available in protecting their brands are trademarks. A trademark need not be just a word text. Specifically, a trademark can be "a word, phrase, symbol, design, color, smell, sound, or combination thereof that identifies and distinguishes one's goods and services from those of others." Graham et al (2013).

There are two key differences between trademarks and PDOs/PGIs. First, for an entity to claim a trademark name, it does not need to show any minimum quality levels or attach meaning to the trademark name. Conversely, in the case of PDOs/PGIs the applicant needs to show that the product is linked to a specific geographical region. Therefore, the investment to claim a PDO or a PGI is significantly greater than filing for a trademark. Second, a trademark is usually applied by an individual or an entity; subsequently that entity has the rights to the trademark and therefore the option to exclude anyone it wishes. Usually, the trademark owner will be the sole user or in certain occasions it can license the use of the trademark. On the other hand, applications for PDOs/PGIs are usually a collective effort by groups of farmers with the frequent participation of public institutions such as municipalities. Once a PDO/PGI is granted all producers within the region can produce the good as long as they satisfy the quality standards. Therefore, while a trademark has the nature of a private good, a PDO/PGI has the notion of club good (Josling 2006).

While the above two types of IP are two of the most important ones in branding an agrifood product, their interplay has only been recently received attention in the literature. Kireeva (2009) discusses international aspects of both GIs and trademarks and publicized cases where the two collided in the court. Menapace and Moschini (2011) examine in a theoretical model these two types of IP. They find that GIs have an additional positive consumer welfare effect and that in certain cases they can function as complements. On the other hand, Costanigro et al (2012) show that trademarks and GIs can function as substitutes in cases where producers have already incurred private investment and the quality signal through trademarks.

In this paper, we provide empirical insights in the relationship between trademarks and GIs. We not only examine trademark registrations in the home country but also in jurisdictions outside the home country where GIs are recognized and in the US where GIs are not. Specifically, we examine trademarks in three jurisdictions: the home country, the Office for Harmonization of Internal Markets (OHIM) which covers all European Union (EU) countries and the USPTO which PDOs/PGIs are not recognized.

Data on PDOs/PGIs are extracted from the Database of Origin and Registration of the European Commission[8] and trademark data by WIPO IP Statistics Data Center[9]. PDOs/PGIs are virtually eligible to all agricultural products and foodstuffs except wines.[10] Trademarks on the other hand can apply to all kinds of products and services. Therefore, a crucial step in the analysis was to link PDOs/PGIs with the appropriate types of trademarks.

When an entity files for a trademark, it needs to specify for which classes it needs the protection. The trademark classes most commonly used are the NICE classes per the Nice Agreement of 1957[11]. After a cursory review of both the product categories and the trademark NICE classes, we consider only the trademark NICE classes 29 and 30.[12]

Our preliminary results show that the relationship between trademarks and PDOs/PGIs is positive and significant regardless of the jurisdiction that we are focused on. Specifically, we find that the correlation between trademarks in the domestic market, by domestic entities is positively correlated with PDOs/PGIs. The same magnitude and significance holds when we examine trademarks at the OHIM and at the USPTO where in the latter PDOs/PGIs are not recognized. These results imply that private investment in branding, approximated by trademarks, and collective investment in quality attributes, approximated by PDOs/PGIs, appear to be complements rather than substitutes.

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[9] http://ipstats.wipo.int/ipstatv2/index.htm?tab=trademark.
[10] Wines have their own GI regimes which can also vary by country. For more see Skuras and Vakrou (2002) and the references therein.
[11] For more see http://www.wipo.int/classifications/nice/en/.
[12] Class 29 refers to "Meat, fish, poultry and game; meat extracts; preserved, dried and cooked fruits and vegetables; jellies, jams, compotes; eggs, milk and milk products; edible oils and fats" and Class 30 to "Coffee, tea, cocoa, sugar, rice, tapioca, sago, artificial coffee; flour and preparations Coffee, tea, cocoa, sugar, rice, tapioca, sago, artificial coffee; flour and preparations powder; salt, mustard; vinegar, sauces (condiments); spices; ice" according to WIPO website (see previous ftn).

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The effects of human capital, R&D and firm's innovation on patents: A panel study on Dutch food firms

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Extended Abstract

Research on knowledge-based firms have identified various conclusive drivers that explain the patenting behavior of firms. Usually, these drives (known as technology push and demand pull effects) that have been identified in the literature (e.g., see Hall, 2012 for references) include R&D (process, product, intra - and extramural), human capital, competitive effects and economies of scope in addition to geographical and industry-specific characteristics. Some literature has also emphasized a persistence of patenting whereby the knowledge covered by past patents can be used as an input to further patenting (see, for example Vancauteren et al., 2015). When looking at data characteristics, an important stylized fact is that given the innovative intensity of a firm, some firms decide to apply for patents while others do not (see Hall et al., 2012 for references). As a result, the skewness nature of patent statistics is prevalent in many studies. In particular, it is well known that that a large share of patents is applied for by only a small number of firms (see for example, Bound et al., 1984; Licht and Zoz, 2000; Vancauteren et al., 2015).

The main purpose of this paper is to analyze the determinants that explain firm-level patent behavior of firms in the Dutch food industry. The analysis explicitly takes into account the fact that (i) patents rather than other innovation outputs are used and (ii) that we particularly apply this analysis to the food processing sector. While most studies are conclusive about the economic valuation of patents (e.g;, Hall and Ziedonis, 2001; Hall et al., 2012), the motivation of this study is to provide more insights into patenting behavior of firms by focusing on the variation in patent propensities across firms within the food industry. More specifically, we explain the patent behavior of firms by determinants that are believed to be empirically important sources where we distinguish between the role of a workers' skills, intrinsic firm's innovation, other important firm characteristics as well as unobserved firm heterogeneity. Do firms patent because they employ a higher skilled

workforce or the firm itself is intrinsically more innovative? What about the role of other firm's characteristics such as, size, ownership structure, competition? Do we still observe large unobserved heterogeneity once we control for other subsumed characteristics? These are the main questions that we address in this paper.

The choice of selecting the Dutch food processing industry provides an interesting case study as it contains features that are common to also other industries. By focusing on one industry, it also increases us understanding of what factor may or may not be important when explaining the patent behavior of firms and in particular, the contribution of innovation disentangled from what is originated from workers and observed, unobserved firm characteristics.

The data on innovation is extracted from the (R&D) surveys, the Community Innovation Surveys and a database that matches the entire population of patents to firms for the period 2000-2008; data on measuring human capital is extracted from an employee-employer database; and data on other firm's characteristics come the production statistics. The data is available from Statistics Netherlands (and is therefore applicable to Dutch food firms)

The comprehensiveness of the dataset allow us to contribute to the literature in various ways. First, we take into account sample selection bias by including firms that do not necessarily report their R&D efforts. It is well known from patent data that a large share of patents is applied for by only a small number of relatively large firms (see for example, Vancauteren et al., 2015). As might be expected, larger patenting firms also tend to report R&D more often. Our data shows that about 10 percent of the patenting firms can be regarded as non-R&D reporting firms throughout the entire sample period. However, due to the nature of the data we find among the R&D reporting, patenting firms missing values in some of the accompanying years. Given their involvement with patenting, the exclusion of these firm-level observations could result in biased estimates when explaining firm-level patents behavior. To correct for this potential problem we follow Vancauteren et al. (2015), where we adopt a two-step sample selection model applied to panel data with unobserved firm-level heterogeneity.

Second, given that we can control for the presence of innovation, our analysis provides more insights on the determinants of a firm's patent propensities. The availability of R&D as a proxy for innovation enables us to assess the determinants of a firm's decision to patent as well as the level of patenting conditional on R&D appropriation. However, other determinants may also explain differences in patent propensities. By merging data at the

firm-level from different sources, we also take a closer look at the role of other firm-level characteristics that may affect the propensity to patenting. We pay specific attention to the role of skilled labor, firm's innovative activities (products and process innovation), a firm's ownership structure (foreign, group membership), competition (Herfindahl, markups) and economies of scope (range of goods). In addition, the richness of the panel data set enables us to control for firm-specific unobserved heterogeneity and dynamics into innovation. To provide more heterogeneity in patents as a proxy for innovation, we also include information on the "quality" of patenting derived from the future citations received by those patents. As a result, our study corroborates with a few existing studies of patenting and innovation at the firm-level while also controlling for the presence for other innovative measures (e.g.,Moser, 2009; Hall et al., 2013). By accounting for all these (observed and unobserved) characteristics, we are in a better position to assess the true determinants of a firm's patenting behavior.

A third way in which we depart from the literature on innovation and patenting is the econometric treatment where take into account that the distribution of patents is usually highly skewed reflecting overdispersion that we deal excess zeros. The consequence of this feature is that in many application using patent count data, distribution assumption according to Poisson, Negative binomial or any other popular discrete distributions may be wrongly specified if one does not deal with these issues. Zero-inflated count models takes these properties into account.

Some descriptive results of the data are presented in the annex of this extended abstract. Preliminary regression results for all firms over the period 2000-2008, yield positive and significant results of R&D intensity, worker skills while product and process innovation appear to be less important for patent propensities. Second, we find a U-shaped relationship between firm size and the propensity to patent, which can be attributed to a relatively large extent to economies of scale in the patenting activity.

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Patent holdup and the role of universities

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Abstract

The problem of patent holdup in biotechnology has been the subject of intense debate.[13] Big companies are increasingly dependent on strong IP portfolios which enable cross-licensing deals, and 'patent trolls' are buying up vast collections of IP which they aggressively defend. Single patents are becoming less valuable. Startups seem to avoid patenting all together; Graham *et al*. (2009), universities increasingly rely on trade secrets (Wellcome Trust Report, 2014)[14] and researchers do not know if they are infringing existing patents. (Kaye, Hawkins, and Taylor, 2007; Salzberg, 2012)

The increasing role of universities in patenting is well documented. Universities in the US have many gene related patents (Carbone, 2010) and increasingly universities have patents on small molecule drugs (Kotz, 2011). Patent holdup and university licensing are connected (Lemley, 2011). One way to describe the problem is to picture it as a commons/anti commons antinomy (Heller and Eisenberg, 1998). Yet, another way is to focus on a different criticism: property owners are greedy. The problem is exacerbated when Universities are the owners, and they too far too often behave in a greedy manner.

After all, when debating the Bayh-Dole act in the US (which allowed Universities to own inventions funded by government money), the question of reimbursement for drugs (that was not adopted, Schacht, 2012) shows an important aspect of the debate: Even if we allow commercialization of research funded by public money, how can we ensure that society gets back its fair share? The same questions are being asked again and again in different contexts, but in the context of universities the question is: What is the purpose of tech transfer offices of universities? To make money for the universities or maximise the social impact of their technologies? (Welcome Trust; Lemley, 2011)

We concentrate on the role of universities, to view the holdup problem as a problem of coordination: There is a single resource (for instance a drug) and many

[13]welcome trust report http://www.wellcome.ac.uk/stellent/groups/corporatesite/@policy_communications/documents/web_document/wtp057817.pdf

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[14]welcome trust report http://www.wellcome.ac.uk/stellent/groups/corporatesite/@policy_communications/documents/web_document/wtp057817.pdf

owners, universities being one of them. Bearing in mind the special mission of universities and addressing the coordination problem, the post grant stage of patent licensing acquires considerable importance. The problem of patent holdup does not only raise the question of whether we give a property right or not (and certainly this is a question that is relevant to the 15per cent of patents on DNA sequences that significantly block follow-on research, (Merz and Cho, 2005). It also raises the question of how patents are used by actors within certain limits imposed by the nature of the object of wealth (a pharmaceutical or diagnostic test). One third of the National Institutes of Health in the US (NIH) licensed research results in breakthrough biologics (and the NIH has specific guidelines with respect to licensing, Chatterjee and Rohrbaugh, 2014), and the licensing strategy in cystic fibrosis genetic testing (Chandrasekharan, Heaney, Conover, Cook-*Deegan, 2010*) are examples to the right direction, but these good practices are not the rule.

Many universities sell to non practicing entities to avoid bankruptcy, and the well known examples of exclusive licensing of genes (diagnostics) have raised disquiet for good reasons (Salzberg, 2012). The purpose of universities is not to make money (Lemley, 2011). Accepting that the purpose is commercialization, meaning the translation of university research in useful technologies, we propose a solution that focuses on the problem of coordination, and takes into account the special treatment afforded to academic institutions by patents law, (termed as university exceptionalism, Lee, 2013), which in turn brings forth the importance of using property with social utility within certain parameters and brings attention to the behaviour of certain patent owners, such as universities.

Tech transfer offices of universities are an important locus of the problem of coordination. When university staff apply for a patent through tech transfer offices, the way their invention will be put into use is hardly known. However, when a tech transfer office negotiates with potential licensors, then the uses become apparent. It is is then that a tech transfer office can see the social utility of the technology and negotiate licensing terms accordingly. The Association of University Technology Managers in the US has issued a White paper-(9 points to consider)- which already seeks to model best licensing practices (following to a large extent the NIH's guidelines)-and the easy access licensing model adopts the same line of thinking.[15]

[15] Building on the easy access model--. http://isis-innovation.com/wp-content/uploads/2014/10/Easy-Access-IP.pdf also see http://www.nature.com/scibx/journal/v7/n11/full/scibx.2014.303.html

University policies can be more sophisticated than the exclusive or non exclusive option-although there may be cases that clearly warrant the adoption of non exclusive licensing-as in platform technologies). We propose that beyond the dilemma of exclusive/non exclusive, and acknowledging that exclusivity can be important in many cases (although it can be of course limited for example to field exclusivity or exclusivity for commercial sales), in biotechnology exclusivity should be accompanied with provisions of diligent use and in particular imposing the obligation to disseminate technology. WE propose:

We propose that all patents granted with exclusive licensed (when and if it is so decided) that within a certain period have not managed to be embodied in a final product whose demand has not exceeded a pre-specified barrier must get a CL. This barrier does not have to be static. Instead it can evolve over time. For example, if a certain patented technology has not led to a product that captures $x_1\%$ of total demand 3.5 years after being granted a patent,[16] and/or $x_2\%$ after 7.5 years, and/or $x_3\%$ after 11.5 years, must get a CL. This proposal can be immediately applied to pharmaceutical products because the existing registration system allows authorities to have a detailed picture of demand.

This proposal addresses the uneasiness of granting a monopoly because the $x\%$ demand can be set as to imply a non monopolistic price, diminishing the dead weight loss, increasing the consumer surplus. The benefits do not stop there as getting a patent for reasons other than those envisioned by the lawmakers stops making sense. Dubious patents and patents held by non-practicing entities such as patent trolls (which are usually not embodied in a final product) will also exit the system. This means fewer patents, correspondingly reducing the patent thicket. Such a reduction in the number of patents will lead to clarifying the technological barriers of the remaining patents, whose claims will be easier to enforce, indirectly increasing patent breadth. In short, the system will become more predictable and above all less costly to use.

From the demand side the benefits are equally appealing, at least for pharmaceutical products. As firms must stride to increase demand they must actively address the barriers that increase drug prices to the benefit of the final consumer. For example, firms must adopt their distribution channels in ways that take out middle men and bottlenecks (e.g. through mobile drug stores, drug donations and lower drug prices), practices that can only improve life conditions for developing nations**.**

[16] For convenience the time lags displayed here correspond to the periods that patentees have to pay maintenance fees at the USPTO.

Moreover, legislation could condition the ongoing validity of patent rights on diligent efforts to disseminate the invention to users, allowing the revocation of university patents if the owner is not using it. This idea differs from march in rights in the Bayh-Dole Act (which allows to revoke exclusivity if in the interests of society-for example to satisfy unmet needs)-in that it is automatic/focuses on universities (university exceptionalism) and accounts for the idea that the value of the object (a drug or diagnostic) might require some proactive responsibilities of stewardship or some requirement of use.

Software Copyright, Patents and the "Software as a Service" case: An overview

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Introduction

Software is machine-readable instructions that directs a computer to perform specific operations. Depending on its use, it can be distinguished to (i) System software, which is designed to directly operate the computer hardware, to provide basic functionality and a platform for interacting with users (e.g. operating systems, device drivers, etc.) and (ii) Application software, which uses the computer system to perform special functions beyond the basic operation of the computer itself. There are also numerous software domains, like, Business Intelligence, Web development, Operating systems, Gaming, etc.

Modern economy is increasingly based on computers and hence on software. Consequently software industry has seen an exponential growth in the last twenty years. For instance in 2007, in United States of America, the software industry sector was employing 1.7 people, adding more than 260 billion dollars on the economy, experiencing a 14% real annual growth rate (BSA Software Facts and Figures, 2007).

Initially, software was considered as an intangible good. Clients would buy and use the features of software, in the same manner they were doing for music. The difference is that music does not possess functionality as software does and thus software can be patented apart from holding a copyright. Moreover the user cannot directly alter the functionality of the software because he usually does not have access to its high level code. Usually he acquires the needed binary code, termed as "objective" code, which is adequate to run and use the software but burdensome to translate that to the original source code and thsu he cannot practically alter the software itself.

With the advent of internet and the explosion of networking a new model of distributing has appeared, namely "Software as a Service" (SaaS), turning software from being a product to a service.

Software Copyright and Patents

Under the laws of the United States (and of European countries, through the Berne Convention, and of members of the World Trade Organization through the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights), copyright is automatically attached to every novel expression of an idea, whether through text, sounds, or imagery. The same holds for software.

Copyright law does not protect any particular idea but rather only the expression of that idea. This limitation to expressions excludes protection from copyright of creations that are not expressed in a tangible, reproducible medium but also a copyright does not need to be registered to be legally effective and comes into force when the protected work is created. Also copyrighted works are protected for a set period of time, measured either from the death of their creator or from the date of their creation. After the expiration of that period of time, the copyright protection on the work lapses as the work goes into the "public domain."

This limitation to the expressions of an idea is the principal distinction between the applications of patent and copyright. Unlike copyright, a valid patent does not protect the expression of an idea but the underlying substance of it. For example, a patent applicable to a microchip protects not the expression of the chip itself, or the electrical diagram describing it, but the idea that given circuits can be organized and made to operate in a particular way. Because of their potentially vast scope, patents are construed more strictly, require a registration process, and last for shorter periods than copyrights

Open Source Software

Software is both functional and dynamic. Each program contains code that is both functional, in the sense that it does work, and dynamic, in the sense that it can perform those functions in an entirely different context. As a result, each program that is created presents two distinct types of value. The first is its formal purpose as a database or another application. The second is a potential source of code for use in performing other functions.

When a consumer purchases a piece of software, say, Microsoft Excel, she acquires, along with the physical copy of the software and the manual (if there are such physical copies), the right to use the software for its intended purpose—in this case, as a spreadsheet program. By opening the plastic wrap on the box, the consumer becomes bound by the so-

called “shrinkwrap license” under which she is bound not to copy the work (beyond the single copy made for her own use), not to make derivative works based on the work, and not to authorize anyone else to do either of these two things. The elimination of these three restrictions is the foundation of open source licensing and its fundamental purpose is to deny anybody the right to exclusively exploit a work.

Publishers of open source software ordinarily do more than simply provide copies of both the source code and the object code when they distribute computer programs to the public. In addition, they establish the terms of use of the software by means of a license. A license is a contract through which the publisher allows recipients to use and modify the software, subject to certain conditions specified in the license. For example, the license might require that anyone who redistributes the software also make the source code of that software publicly available. Contracts that provide users with a sufficient set of privileges to access and modify the software's source code are deemed to be "open source licenses".

There are several open source licenses, like Apache 2.0 / BSD / GNU / MIT / Mozilla Public, etc, which all satisfy the Open Source Definition (OSD) set by Open Source Initiative (OSI). These are:

1. Free Redistribution
2. The program must include source code, and must allow distribution in source code as well as compiled form.
3. The license must allow modifications and derived works
4. The license may restrict source-code from being distributed in modified form
5. No Discrimination Against Persons or Groups
6. No Discrimination Against Fields of Endeavor
7. The rights attached to the program must apply to all to whom the program is redistributed without the need for execution of an additional license by those parties.
8. License Must Not Be Specific to a Product
9. License Must Not Restrict Other Software
10. License Must Be Technology-Neutral

In the rest of this chapter we focus on focus more on how open source changes the economic dynamic and have been fundamental to the success of the Internet. We will also

discuss why and how open source methods should be applied to innovation in agriculture (as it effectively had been historically).

SaaS challenges

The term "software as a service" (SaaS) is considered to be part of the nomenclature of cloud computing, along with infrastructure as a service (IaaS), platform as a service (PaaS), desktop as a service (DaaS), backend as a service (BaaS), and information technology management as a service (ITMaaS). SaaS is a software licensing and delivery model in which software is licensed on a subscription basis and is centrally hosted. This model significantly disrupt traditional technology vendor business mode.

In this paper we will discuss the implications of the SaaS model for open source software and how it can be applied to agriculture.

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Parallel Session E-I

Sustainability

Environmental efficiency and innovation performance: A meta-analysis

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Extended Abstract

Data envelopment analysis (DEA) is a non-parametric technique used to estimate the relative efficiencies of a set of Decision Making Units (DMUs). The efficiency evaluation process uses linear programming techniques and takes into account both multiple inputs and multiple outputs. There are two scale assumptions in DEA model: Constant Returns to Scale (CRS) and Variable Returns to Scale (VRS). In the CRS framework, DEA models assume that output will change by the same proportion as inputs are changed, while the VRS framework assumes a variable output with respect to the scale.

DEA models have been extensively applied in order to estimate eco-efficiency or environmental performance of different firms, regions, or countries (Tyteca, 1996). Different variants of DEA models have been applied in a set of countries for estimating country-level environmental performance (see for example Färe et al., 2004; Zhou et al., 2006; Prieto and Zofío, 2007; Zhou et al., 2008).

DEA framework can be used to model a general production process with undesirable outputs. Assume that there are $k=1,2,\ldots,K$ DMUs and for DMU$_k$ the observed data on the vectors of inputs, desirable outputs, and undesirable outputs are $\mathbf{x}_k=(x_{1k},x_{2k},\ldots,x_{Nk})$, $\mathbf{y}_k=(y_{1k},y_{2k},\ldots,y_{Mk})$, and $\mathbf{u}_k=(u_{1k},u_{2k},\ldots,u_{Jk})$, respectively. Also, if $\sum_{j=1}^{J}u_{jk}>0$ and

$\sum_{k=1}^{K} u_{jk} > 0$ the set of constraints for an environmental CRS DEA model can be expressed as (where z_k are virtual multipliers or weights for outputs and inputs):

$$\begin{cases} \sum_{k=1}^{K} z_k x_{nk} \le x_n & n = 1,2,\ldots,N \\ \sum_{k=1}^{K} z_k y_{mk} \le y_m & m = 1,2,\ldots,M \\ \sum_{k=1}^{K} z_k u_{jk} = u_j & j = 1,2,\ldots,J \\ z_k \ge 0 & k = 1,2,\ldots,K \end{cases}$$

Following Zhou et al. (2006, 2008), the efficiency evaluation process is based on two different cases of the aforementioned DEA model. In the first case, we consider only desirable outputs, while the second case takes into account undesirable outputs as well. This way, it possible to examine how a DMU behaves in actual and ideal conditions (with and without undesirable outputs). As shown in Figure 1, for each case the CRS and VRS efficiencies are estimated in order to calculate the actual and ideal efficiency indices. The overall Environmental Productivity Index (EPI) is calculated as the product of the previous efficiency indices.

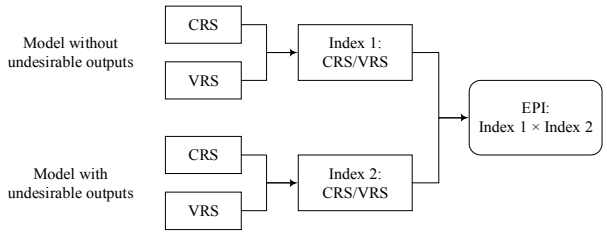

Figure 1: DEA methodology for calculating environmental performance

The DEA model of this study uses two main inputs (population and energy production), one desirable output (GDP), and three undesirable outputs (CO_2, SO_2, and NO_2 emissions). The selection of these inputs/outputs is mainly based on previous research efforts (see for example Zhou et al., 2006, 2008), while only international sources have been used in order to have a reliable set of indicators. Based on this set of indicators, a database containing data for 108 countries for the period 2002-2013 has been developed. Figure 2 presents the estimated EPI for selective countries, where a significant variance can be observed during the examined period. However, several countries appear to have a similar pattern. For example, Luxembourg Hong Kong are always ranked first in 2002-2013, while other emerging economies (e.g., China, India, Russia) are ranked at the bottom of this list. The performance of Scandinavian and North-European countries is also

relatively high, while Greece appears to have a moderate EPI value (rank 40-60). Additional analyses examine the estimated EPI with different national innovation indicators in order to identify potential patterns in the set of examined countries (see Carayannis and Grigoroudis, 2014 for the methodological approach). For example, Figure 3 shows a contour map between EPI, R&D expenditures, and high-technology exports. The main finding is that environmental efficiency is not directly related with innovation performance, although high values of particular innovation indicators are combined with high EPI values. Thus, additional factors, like the structure of a national economy, the orientation of the innovation efforts, and the effective use of R&D in environmental issues, play a significant role.

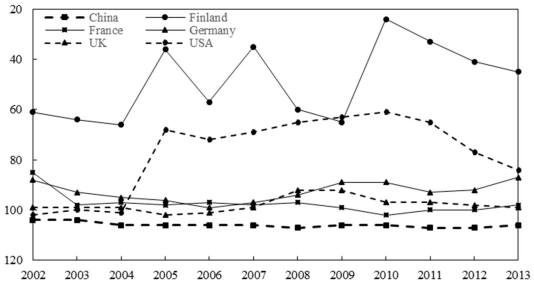

Figure 2: Ranking of selective countries based on EPI

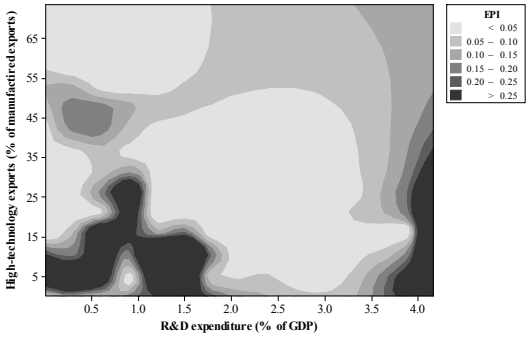

Figure 3: Contour maps of environmental and innovation performance

The main aim of this study is to present a general methodological framework for studying national environmental efficiency. The proposed approach takes into account new developments in DEA models and links environmental efficiency results with innovation performance in a meta-analysis step. The presented research are comparable to previous research efforts. Future research may focus on the considering additional data and the incorporating of innovation indicators in the DEA modeling.

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A Decision Support Tool for Financial Management on Irish Farm Forests: the Development and Use of a Forest Bio-economic Model

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1. Objectives

The recognition of the value of forests has led to international efforts to increase afforestation which delivers multiple benefits in that it provides public benefits in terms of carbon sequestration and private benefits in terms of higher financial returns from land than marginal agricultural activities. Ireland, unlike most European countries has a low land use share in forestry but farm afforestation has been promoted as a diversification measure by successive Irish governments. In recent years, public policy has adapted to incentivise the use of such financial planning technologies (e.g. the use of the eProfit Monitor financial planning tool as part of the Irish Dairy Efficiency Programme).

However, a number of challenges exist for farmers in making planting decisions. Afforestation is a long term decision with a significant time gap between planting and market financial returns; most farm forest owners or those considering forestry are inexperienced in relation to forestry and have poor knowledge of the regulatory and policy environment; there is in general poor financial and business planning knowledge amongst farmers; and there is in general a bias against planting forests due to the irreversibility of the decision and the reduced flexibility in terms of land use. In this context, the complexity of the farm afforestation decision demands the provision of targeted information and knowledge. This paper describes the development of a forest bio-economic model which provides the framework to develop a forestry extension tool to facilitate decision making in relation to diversified land use.

2. Theoretical Framework and Research Questions

The financial return to forestry is determined using the relevant growth curve for a given tree species. The growth rate or productivity of forest crops is a function primarily of

species, soil type, age and management practices. The financial return depends on the costs and benefits over the life-cycle of the forest rotation as well as the opportunity cost for the alternative land use. Key to developing a decision support tool therefore is to relate this inter-temporal net flow of income from forestry to the existing annual return from land use, in a manner that is understandable to the farmer. From an economic perspective, the implicit theoretical framework is life-cycle decision making (Ando and Modigliani, 1963).

3. Methodology

The methodology adopted in this paper is the development of a bio-economic model that reflects the biological growth process, associated subsidies and life-cycle costs, benefits and opportunity costs. Forest revenue streams are calculated on the basis of timber volume production, timber prices, forest subsidy and cost data and are presented in terms of net present value (NPV). The Teagasc Forestry Bio-Economic Model (TFBM) is constructed using UK Forestry Commission yield models, which estimate timber outputs based on forest productivity and species using financially optimum rotations which optimise the NPV (Edwards and Christie, 1981). Soil type is a determining factor for the productivity of both agricultural and forest enterprises. Estimates for forest productivity[17] generated by Farrelly (2011) are assigned to each of the Teagasc NFS soil categories thus enabling the incorporation of the comparative effect of soil type on both forestry and agricultural outputs.

The opportunity cost of existing land and the return from agricultural farm income data are also generated using data from the National Farm Survey (NFS). A weighted average gross margin (GM) (gross output less direct costs) for each agricultural system and soil category is derived using NFS data. These are included as opportunity costs of the change in land use. Values from 1995 to 2009 are included in the analysis but expressed in 2009 prices using the consumer price index (CPI) before being averaged. The discount rate employed is 5%, which is the standard rate applied to forest investments in Ireland (Clinch, 1999).

4. Results

[17] Forest productivity is measured as Yield Class (YC) - a stand of YC 18 is capable of producing on average 18m^3 timber ha^{-1} $year^{-1}$. The higher the yield class, the higher the volume produced by the forest.

Combining the different income streams, deriving from the growth curves on different soil types, we describe in Table 1 the average NPV of forestry planting on different farm systems net of the opportunity cost of the existing land use type.

Table 1. Average NPV (€/ha) 1995-2009 adjusted using the CPI

System	SC1 / YC24	SC2 / YC24	SC3 / YC20	SC4 / YC20	SC5 / YC18	SC6 / YC14
Dairy	-19603	-27230	-18381	-14572	-9189	-9167
Dairy other	-8005	-4723	-4303	-4198	1156	5574
Tillage	-1952	-5392	-5212	554	2322	-
Cattle	2244	3135	3118	4207	4410	3688
Cattle other	2248	3190	3039	4171	3141	4192
Sheep	1053	2244	2880	3406	5427	3766

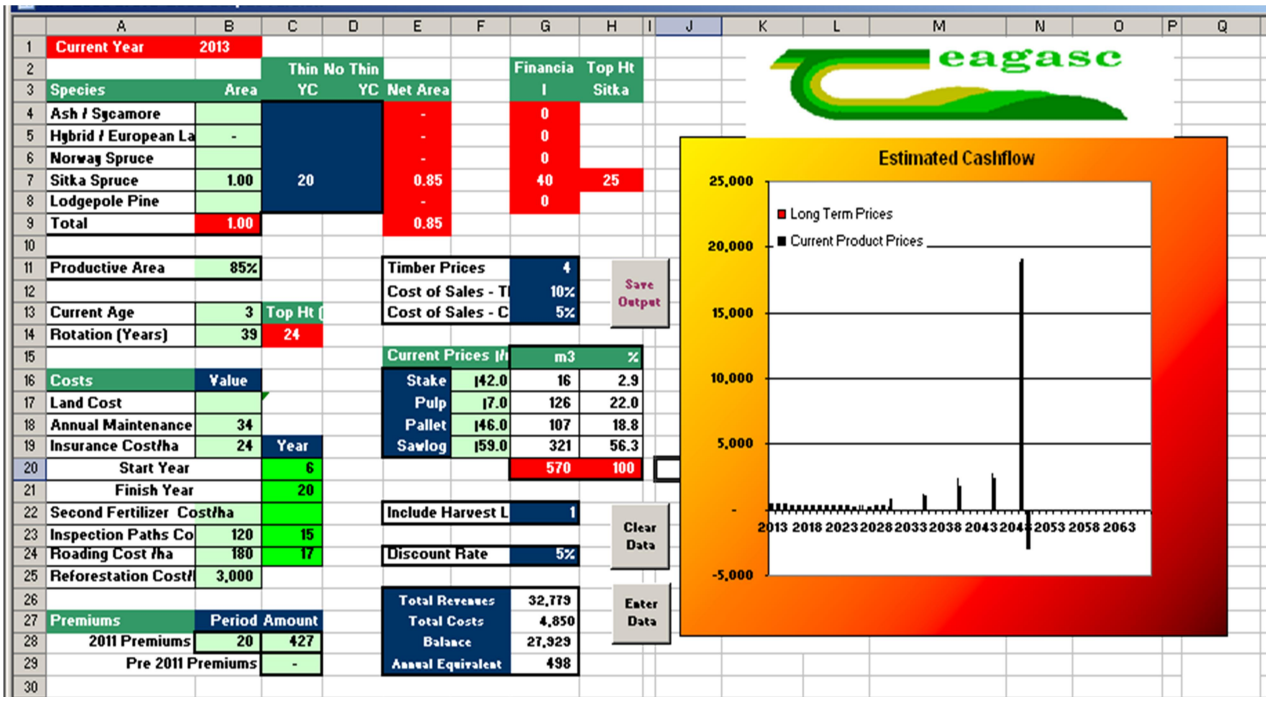
The largest returns arise where forestry replaces cattle systems on land that is limited for agriculture due to poor drainage and where sheep systems are replaced on land that is very limited from an agricultural perspective but is productive under forestry. The NPV of replacing dairy enterprises with forestry is negative across all the soil categories and is negative on the more productive soil categories for dairy other and for tillage enterprises. This information on the relative returns to different land uses is primarily of interest to researchers and policy makers. However, the bio-economic model can also be used to provide information of a more practical nature to facilitate land use decisions at farm level.

5. Using the Forestry Bio-Economic Modelling as an Extension tool

Testing and modification of the model was undertaken in conjunction with colleagues involved in both forest research and forest extension. Key outputs from TFBM include NPV, Total Revenue and Total Costs, however discussions with extension professionals indicate that many farmers are more comfortable when costs and returns are presented in the timeframe in which they occur as opposed to NPV which discounts the costs and revenues that occur during the rotation to present day values. Presenting cash-flow estimates in terms of an Annual Equivalent value per hectare allows extension advisers and farmers to compare forestry returns against relevant annual agricultural gross margins

per hectare. Figure 1 shows the extension interface which presents cash flow graphically over the forest rotation.

Figure 1: Sample Output from TFBM



This output allows farmers considering forestry to make an informed decision on land use diversification by facilitating comparisons between agricultural and forestry options, between different species and between different management regimes (such as thinning vs. no thinning). The model is used extensively in the promotion of forestry by Irish extension professionals and has potential to be further developed to generate estimates of carbon sequestration in farm forests under varying management regimes. As dairy farmers expand to exploit the lifting of milk quota restrictions, farmers may consider afforestation as a means of mitigating additional agricultural greenhouse gas emissions.

Appropriating investment returns under weak public enforcement

by Wytse Vellema, Marijke D'Haese and Claude Ménard

Introduction

Agricultural value chains are changing, spurring agribusinesses to explore new ways of sourcing products from smallholder farmers. Many of these sourcing arrangements are considered inclusive business models, "including low-income people (..) within the value chain, building bridges between business and the poor for mutual benefit" (UNDP, 2008). Despite substantial donor interest and a large number of reported cases (Prieto-Carrón et al., 2006; Wach, 2012), little is understood about what makes these models 'tick'. In this paper, we explore the central role played by appropriability hazards in determining governance structures of inclusive business models in agricultural sourcing arrangements in contexts with weak public enforcement.

Governance structures in agricultural sourcing from smallholders farmers are characterized by a stark imbalance in financial capacity between firm and farmer. The value creation required to make the relationship mutually beneficial therefore crucially relies on the willingness of the firm to invest in the relationship. This willingness to invest depends on the extent to which firms can protect and appropriate the benefits from the investment. Local justice systems are often slow and inefficient, making public enforcement prohibitively costly (Fafchamps, 2004; North, 1990). Therefore, appropriation of investment returns - mitigating appropriability hazards – depends on the private enforcement mechanisms inherent in the chosen governance structure.

Although agricultural sourcing arrangements with smallholder farmers have not been studied as a group before, one of the most common types, contract farming, has received ample attention. Most literature on contract farming in developing countries concerns its impact on the well-being of smallholder farmers and the question whether smallholders are excluded (see Oya (2012) and Prowse (2012) for recent reviews). Enforcement issues are recognized and specific risks explained (Gow & Swinnen, 2001; Key & Runsten, 1999), but little attention is paid to how these affect governance structures. This paper attempts to fill this glaring gap in the literature, by making the governance structure itself

the focal point of the analysis and considering a broader set of sourcing arrangements than just contract farming.

Theory

Without contracting hazards, the transaction-cost minimizing governance structure is a unilateral contract (Williamson, 1991). However, when pay-offs cannot be fully specified or activities cannot be perfectly monitored, moral hazard problems arise. These problems are prevalent in farming (Allen & Lueck, 2003).1 For example, farmers may not exert sufficient effort or sell part of their harvest to other firms. Absent effective public enforcement, opportunism needs to be kept in check with internal coordination mechanisms. Complete 1 This centrality of appropriability hazard is similar in technology transfers, although its source is different. In farming, it mainly originates from imperfect monitoring of activities, whereas in technology transfers it is due to difficulties in complete specification of tacit "know-how" (Oxley, 1997). vertical integration is unattractive due to capital requirements, limitations on land ownership, and 'mission drift' - straying too far from core business activities. Hence, most inclusive business models take hybrid modes of organization.

In order for a governance structure to create value from a transaction, some investment is required by the firm. The investment depends on the value it generates, and the cost of controlling its accompanying appropriability hazard. Given that only investments expected to generate a positive return are observed (created value > control costs), ceteris paribus, higher appropriability hazard is expected to lead to more intensive control by the lead firm, i.e. more hierarchical governance structures. Appropriability hazard is not equal for each type of investment; certain types of investment are easier to monitor or salvage than others. Hence, the intensity and type of control mechanisms in the governance structure are expected to depend not only on the level, but also on the type of investment.

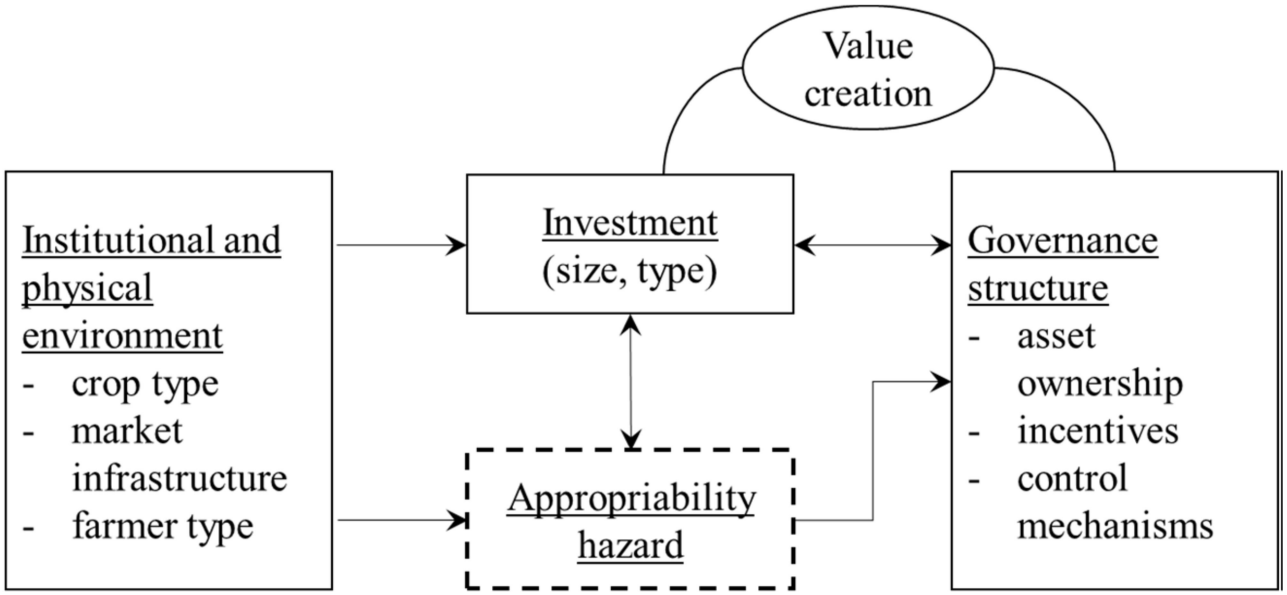


Figure 1: Conceptual framework

Both investment and appropriability hazards are shaped by the institutional and physical environment in which the governance structure operates. Environmental characteristics of particular relevance are the crop type, existing market infrastructure, and farmer type. Each crop has different requirements regarding input use or perishability, carrying different hazards and shaping required investments. When a local market exists, perhaps including transport, storage, or processing facilities, less investment is required from the lead firm. At the same time, developed local markets increase opportunities for side-selling. Farmer type, especially with regard to existing knowledge of required production practices and available productive assets, defines the shape of firm versus farmer commitment. As inclusive business models per definition include resource-poor farmers, firm investment shapes the governance structure.

Data

Ten case studies of inclusive business models in agricultural sourcing were selected over a variety of products and settings throughout Africa (see Sopov et al. (2014) for a complete description of the case studies). Interviews were held with all stakeholders in the model over a period of ten days per case study. Stakeholders were defined as broadly as possible, encompassing business management, entrepreneurs or employees, intermediaries, and where relevant, government representatives and employees of non-governmental organisations. Cases were selected based on short descriptions available from research and practitioner organisations throughout sub-Saharan Africa. Out of this group, ten cases were chosen that were as diverse as possible regarding their governance structure. Even

though the cases cover a variety of crops and countries, the same core problem was mentioned by all: “how to appropriate returns from the investments required to make the business model profitable”.

Results

The ten studied inclusive business models are shown in table 1 below. Due to space limitations, details on the type of investment and the factors driving these details have been left out. For the same reason, only those characteristics of the institutional and physical environment which affect the appropriability hazard have been included. Furthermore, only a single aspect of the governance structure, the control mechanism, is highlighted. This aspect was chosen because it is the most expensive of the used control mechanisms, and observed in almost all cases.2

Table 1: Summary of case study characteristics

country	product	other buyers	existing knowledge	firm investment	direct supervision
Mozambique	cassava	✓	✓	low	-
Kenya	dairy	✓	✓	low	-
Burundi	sorghum	✓	+/-	low	low
Ethiopia	sesame	✓	✓	low	medium
Ethiopia	teff, wheat, maize	✓	+/-	medium	medium
South Africa	sugarcane		✓	high	medium
Mozambique	fresh eggs	✓		high	high
Mozambique	broiler chickens	✓		high	high
Ethiopia	passion fruit			high	high
South Africa	vines			high	high

A mere glance at the table clearly shows that the extent of direct supervision increases with the size of firm investment. This seems intuitive, but requires some additional explication.

Looking at the columns to the left, we see that for products farmers are familiar with and which have an existing market for output products, firm investment is generally limited. The availability of alternative markets creates incentives for opportunism, as it makes side-selling of inputs and outputs possible. This high appropriability hazard causes firms to avoid making the investment in the first place.

Without alternative markets, the appropriability hazard falls substantially, and investment increases accordingly. In these cases, the main risk is limited to the farmer exerting belowoptimal effort. When alternative markets are available, as in the case of fresh eggs and broiler chickens in Mozambique, firms only invest substantially when the investment

offers sufficient returns to warrant the intensive supervision required. In addition to direct supervision, firms spend a lot of time on farmer selection, formally allow limited side-selling, and require farmers to co-invest in production facilities.

Conclusion

Appropriability hazard matters. In the context of weak public enforcement, the governance structure is an important mechanism for its mitigation. Because the farmers in inclusive business models are per definition resource-poor, the brunt of the responsibility for making value-creating investments is borne by the firm. These investments will only be made when appropriability hazard is reduced through lack of alternative markets or the product is sufficiently high-value and will be accompanied by intensive control mechanisms.

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Parallel Session E-II

Consumer and Adoption Challenges

A typology of impact pathways generated by a public agricultural research organization

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Abstract: This paper builds a typology of impact pathways generated by an agricultural public research organization, namely INRA (National Institute for Agronomic Research). The typology is built by codifying 32 standardized case studies providing rich qualitative information about the impact pathway and a quantitative assessment of a vector of impacts. We identify five classes of typical impact pathways characterized by specific mechanisms related to the positioning and role of actors in various networks of translation. One Class is characterized by long-term partnerships, generating high impacts. INRA coordinates complex research projects and structures the diffusion process to facilitate market access. In a second Class INRA conducts long term risky collaborative projects thanks to accumulated knowledge and infrastructures. Impacts are high. Market for technologies cases are pooled in Class 3 and correspond to classical IP commercialization. Impacts are lower. Cases in Class 4 are technological options allowing new possible uses that encounter diffusion obstacles. Class 5 encompasses all cases with political impacts as main dimension.

Keywords: Public agricultural research, societal impact, impact pathways, typology, evaluation.

1 Introduction

Shortage of public funds, New Public Management rules and changes in the research system pushed PRO to conduct evaluation of the societal impact of their research activities. In some cases, this evaluation exercise is even compulsory. We are far from the expectation that any investment in science is inherently good for society. On the contrary PROs are urged to evaluate not only their scientific performance but also performance

related to their societal utility, and provide evidence that science has a great value for society.

Research into societal impact assessment is at an early stage (Godin and Dorı, 2005). There is no stabilized method to evaluate the societal impact of the research produced by PROs. No accepted framework with adequate data set, criteria, indicators and methods exist for evaluating the societal impact of publicly funded research. However, some tendencies, commonly accepted have emerged. The literature focusing on evaluation of the societal impact of publicly funded research (Bornmann, 2013) usually takes into account social, cultural, political, environmental, health and economic returns. Case studies combining qualitative and quantitative indicators are considered as the state of the art in assessing the societal impacts of research (Donovan, 2011). These broader impact approaches thus account for a variety of impacts but also for the role of a multiplicity of actors in knowledge value and outcome generating processes. Qualitative approaches, such as case studies or historical tracing, are very useful to illustrate the range of mechanisms explaining impact generation.

Their main limitations reside in the difficulty to aggregate single stories enabling to understand the different impact pathways generated by a PRO. Many experiences of impact evaluation exist at the level of research organizations in the agricultural sector: ACIAR1, EMBRAPA2, CGIAR3 and USDA4. They use case studies to evaluate the societal impact of various research projects but do not provide an aggregate picture of what happens at the level of the organization. Our paper intends to partly fill this gap by developing a typology of impacts pathways generated at the level of INRA5. INRA conducts targeted research in agriculture, food, and the environment. Its research generates economic, health, environmental, and political impacts, all of which are taken into account in our impact pathways. INRA has a long tradition of partnerships with socio-economic actors and builds its innovation on that stable networks. The typology we built had to highlight a reduced number of impact pathways relevant to INRA and the underlying impact generating mechanisms. We built the typology out of the data of 32 case studies.

The methodology used is inspired from Kingsley et al., (1996). The contribution of our paper is twofold. The first contribution is methodological. We have built an original evaluation method based on theoretically based standardized case studies generating rich qualitative information about the impact pathway along with a quantitative assessment of a vector of impact (economic, health, environmental, social/territory and political). Thanks to the standardization, it is possible to codify in a systematic way a set of information for each case. The constituted data-base is used to build a typology of impact pathways. To the best of our knowledge, this type of exercise has not been conducted previously at the level of a research organization.

The second contribution emerges from the results generated by the typology. We show that a PRO such as INRA generates a limited number of types of impact pathways. Each class of pathway is characterized by a specific positioning and role of INRA in the various innovation networks arising along the pathways, and by underlying interessement and enrolment mechanisms. The magnitude, more than the types of impacts differs in each class of pathway. Our typology exhibits 5 classes.

Class 1 is characterized by long-term and stable partnerships between INRA and socio-economic actors, generating high impacts. INRA coordinates complex research projects and more originally structures the diffusion space to facilitate market access. In Class 2 INRA leads long term risky collaborative projects with its ability to accumulate over long periods of time knowledge and to build infrastructure. Impacts are high. Class 3, labeled

market for technologies, involves all cases of classical technology commercialization which consists in selling licenses (mainly exclusive) to industry. Impacts are lower. Cases in Class 4 are technological options allowing new possible uses that encounter present diffusion obstacles (resistance to change). Class 5 encompasses all cases with political impacts as main dimension.

In the remaining part of the paper, we first present a review of the literature that highlights the most recent trends in evaluating societal impacts (section 2). We detail the methodology used to build our typology (section 3) and present our main results (section 4). Section 5 discusses our results and concludes.

1Australian Centre for International Agricultural Research.(Pearce et al., 2006)

2 Empresa Brasileira de PesquisaAgropecuαria.(EMBRAPA, 2013)

3ConsultativeGroupon□International□Agricultural□Research.(Renkow□and□Byerlee,2010)

4 US Department of Agriculture.(Heisey et al., 2010)□

5□French□National□Institute□for□Agronomic□Research□

The Challenges of Implementing Open Innovation in a Public Research Institute

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1. Introduction

Innovation is a significant driver for economic growth in many sectors, including the agri-food industry. Besides research and development activities of private organizations, research performed at public research institutes and universities are important sources for innovation. However, developing and commercializing new concepts is becoming increasingly challenging. During the last decade, an increasing amount of research has been conducted on the topic of Open Innovation (Chesbrough, 2003). Within this approach, innovation is considered to be a systemic, participatory and collaborative effort of diverse actors. Organizations open up their boundaries to source in complementary external resources and source out internal resources to be externally developed.

Although the potential benefits (e.g. cost and risk sharing, reduced time to market, improved market acceptance) of the open innovation approach has been abundantly theorized and increasingly empirically studied, many organizations still follow more closed innovation approaches such as the technology push (Rothwell, 1994) or market pull approach (ibid). One explanation for this reluctance is the often challenging transition and management of this organizational innovation from relatively closed innovation activities towards more open innovation approaches. Although research on these management challenges and open innovation in practice is growing, studies on this topic are still scarce (Giannopoulou et al., 2011). More specifically, this type of research has mainly focused

on private, often high-tech organizations, and less on the public sector and low-tech organizations (Rampersad et al., 2010). With this study, we want to provide further insight into challenges experienced by researchers trying to implement open innovation practices in a public research institute researching topics and developing concepts for the relatively low-tech agricultural, fisheries and food industry.

Research on this topic offers valuable insights for researchers in such institutes as well as for managers of private organizations, especially of organizations collaborating in innovation projects with such universities and research institutions (Rampersad et al., 2010).

2. Research Aim and Methodology

This study aims to identify (i) the beneficial aspects experienced by the researchers applying an open innovation approach, (ii) the challenges experienced during the projects, and (iii) what tools or strategies were utilized to improve collaboration. Insights into these three aspects were developed through an in-depth comparative analysis of three cases within a publicly funded research institute. The institute mainly conducts technological research within the agricultural, fisheries and related sectors. It is primarily funded by the Flemish government (northern part of Belgium) or through project grants from public funding agencies. The research institute employs approximately 600 employees, 450 of them researchers. The three cases are part of a project to increase the valorization of underutilized biological byproducts. The project aims to develop innovations trough the three cases, following a multidisciplinary, participatory, iterative and flexible innovation approach. Each case is executed by one lead-researcher and at least one other researcher closely following up and assisting the lead-researcher. The three lead-researchers are further assisted by an advising committee consisting of ten researchers and a larger steering committee consisting of over thirty researchers.

The framework used for this study is based on that of Blackstock et al. (2007) for the analysis of participatory projects. Data was gathered through an extensive document study of, among others, meeting reports, project proposals, reports and other project publications. Additionally, semi-structured interviews with the lead researchers of each project, supporting researchers and external participating stakeholders were conducted. Questions were asked concerning the same topics (e.g. network configuration, maintenance and collaboration, institutional arrangements, and innovation approach) with

possibilities to elaborate on important case specific aspects or to dig deeper into answers given by the interviewee.

The study focuses on the idea generation and idea development phase of the three cases. Making the right assessments and decisions during these early stages of the process is crucial to avoid costly alterations in later stages of the project. Furthermore, the early stages of innovations are often challenging to manage. Therefore, this Fuzzy Front End (Sandmeier et al., 2004) of the innovation process is the focus of this research.

3. Results

One of the most important beneficial aspects experienced by the researchers is the availability of complementary knowledge through the network. Furthermore, by dividing certain tasks between actors in the networks, research time and costs were reduced. An important tool, used in all cases is a central database with stakeholder information to assist in the configuration and management of their innovation networks. Additionally, they used a variant on the layered collaboration scheme to collaborate with the different stakeholders. The different cases experienced several important challenges during the Fuzzy Front End of their projects. First, all lead-researchers had a significant amount of techno-scientific knowledge and experience, but only little economic background. This resulted in a lack of absorptive capacity, i.e. many of the researchers struggled to ask the right economic questions, acquire the relevant economic information and transform this information into opportunities for their projects. Second, the company culture of the research institute is considered unconducive towards collaborative innovation research. The general mindset within the research institute is still one of technology push with a focus on techno-scientific research aimed at publishing research papers rather than on developing innovations. Third, especially in one of the three cases, the direct leadership of the case did not fully support the open innovation approach of the project, hindering the collaborative efforts made in that case. Fourth, most researchers were not accustomed to conduct research in a collaborative setting. They indicated a lack of network management skills and knowledge such as, how to efficiently form a network, how to coordinate the efforts of different stakeholders and what institutional arrangements to use to facilitate information sharing and collaboration. A fifth important challenge indicated by all cases are the conflicting interests and goals between the researchers and the different stakeholders, more specifically the firms. While the researchers had to focus on

developing innovations through a research process that could yield research papers, firms focused more on maximizing applicability and profitability.

4. Contribution and practical implications

This study primarily gives insights into the challenges public research institute face when implementing and conducting collaborative innovation efforts. The study shows that some of the challenges are in congruence with other work on open innovation and on related collaborative innovation fields, while others are a result of the public nature of the institute or specific to activities of the institute. From the results of this study, decision makers in research institutes gain further insights on how to better organize their institutes for collaborative innovation projects. Furthermore, the findings provide opportunities for researchers preparing a collaborative innovation project to better prepare for potential pitfalls. Additionally, innovation managers, especially those involved in collaborative innovation projects, can also learn valuable lessons from this study to improve their collaboration with public research institutions.

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Performance and Sustainability in Academic Research: An Agricultural Higher Education Case

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Keywords: Data Envelopment Analysis, Academic Research Evaluation, Multicriteria Analysis, Agricultural University

Extended Abstract

The purpose of this study is to evaluate the performance of academic research units. The evaluation is achieved by the application of the Value Efficiency Analysis (VEA), an extension of the well-known Data Envelopment Analysis (DEA) approach. Data used consists of several research performance indicators (e.g. academic publications, citations, number of supervised doctoral students) available for the 42 research laboratories of the Agricultural University of Athens, Greece[18].

The first step of the analysis includes the estimation of technical efficiency using the traditional output-oriented variable returns to scale DEA model (known as BCC model) (Banker et al., 1988). The analysis is complemented with the decision maker's preference information so as to locate a point on the efficient frontier that has the most preferred inputs-outputs combination. This is done using the Pareto Race/VIG system (Korhonen and Wallenius, 1988; Korhonen et al., 2001). The main concept is to formulate a multiple objective linear programming model which characterizes the efficient frontier of the BCC-model.

[18] The major part of this data has been constructed and used by Drivas et al. (2014)

Value Efficiency Analysis incorporates the decision maker's preference information regarding a desirable combination of inputs and outputs into the analysis. This is in contrast with traditional DEA, which assumes that each input and each output is of equal importance. In this sense, Value Efficiency scores compare the inefficient units to units having the same value as the Most Preferred Solution (Joro and Korhonen, 2015).

The analysis of research performance is based on a set of criteria (the set of outputs) which are relevant from the decision maker's point of view and are defined using various indicators. In this study, we apply the following criteria: Quality of research, Research activity, Impact of research, Activity in educating young scientists and Activity in scientific community. The establishment of such criteria is the most difficult part of the research as the weights of the indicators are, by nature, subjective and difficult to be agreed among experts. For this reason, we perform a sensitivity analysis, using different weights for the indicators. In this sense, we apply alternative evaluation systems that give priority to different aspects of research and we explore how the relative efficiency ranking of the research labs changes.

One drawback of the analysis, is that it only evaluates the "pure" academic research performance. However, another important challenge for the academic units, is their ability to be sustainable. A research unit that cannot cover the cost of producing research will inevitably cease its activity. To take this aspect into account, we introduce one more criterion, which is purely based on research grants, or any other additional sources of income.

Results indicate significant differences in the efficiency levels of the research labs. Moreover, the preferences of the decision maker are of high importance as they can substantially change the relative efficiency ranking of the research labs. In other words, the academic performance of the research units can vary greatly when alternative evaluation systems that give priority to different aspects of academic research are applied. This is also arising by the introduction of the sustainability criterion to the analysis.

To conclude, this type of analysis can be extremely important in order to help administration to allocate research resources in the "best" possible way. Therefore, government research funding can be allocated to research units that demonstrate a track record of high quality research. Finally, this analysis can be easily adapt to various types of decision maker's preferences and therefore, can facilitate different strategies that a University or College likes to follow.

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Parallel Session F-I:
Open Innovation and Public-Private Partnerships II

The Economics of (Selective) Free Access to Food Product Innovations

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Abstract *– This paper shows that, under certain empirically relevant conditions, it can be economically optimal for profit-maximizing innovating firms to provide free access to their innovations (like drought-resistant, cost-reducing and/or quality-enhancing GM technologies) in hunger-stricken areas of the world. In addition to increasing the profitability of innovating firms and benefiting the hunger-stricken countries, such a free access strategy enhances technology transfer and has the potential to alter consumer attitudes towards the technology used to generate these innovations.*

Innovation activity and the management of intellectual property rights (IPRs) are key weapons in the fight against hunger and the pursuit of food security around the world (Giannakas, 2014). This research will analyze the economic effects of innovating firms providing free access to key GM innovations in hunger-stricken less developed countries (LDCs), where more than 800 million people have been facing malnutrition and hunger (FAO, 2013).

In particular, the **objectives** of this research are to:

1. Analyze the determinants of the *optimal enforcement of IPRs* for food product innovations
2. Identify the exact conditions under which free access to a product innovation is the optimal strategy of an innovating firm that seeks to maximize profits (and has incurred significant R&D costs)
3. Determine the impact of a *selective free access strategy* (i.e., a strategy that provides free access to the innovation in hunger-stricken countries only) on the interest groups involved (i.e., consumers and producers in the hunger-stricken LDC and the rest of the markets supplied by the innovator).

Methods

To analyze the economic effects of a selective free access strategy of innovating firms, the research develops a novel, empirically relevant, multi-market framework of heterogeneous agents and imperfectly competitive firms that seek to maximize profits. The framework is a network-externalities adaptation of the vertical product differentiation framework developed by Giannakas & Fulton and used in the analysis of numerous issues of relevance and significance to the agri-food marketing system (see Giannakas (2011)). Different scenarios on the public responses to various IPRs enforcement strategies and their implications for equilibrium prices, quantities, and the welfare of the groups involved (i.e., producers, consumers and innovating firms) are considered within this framework.

Context & Preliminary Results

While most of the literature on the enforcement of IPRs assumes that innovators desire the strong enforcement of their IPRs (ICTSD, 2009), preliminary results show that there could be cases that the innovating firms find it optimal to not enforce their IPRs in hunger-stricken LDCs. In fact, there are cases that innovators find it profitable to provide free access to their new technology in these countries. Intriguingly, this result holds even when the innovation is purely rival. For instance, if this enforcement strategy increased the innovator's goodwill in the LDCs (that get the technology for free) but also in developed countries (that can now associate the innovator *and* the innovation with a noble humanitarian endeavor), the benefits to the innovator could outweigh the lost royalty fees from these LDCs. If done correctly, such an IPRs strategy could result in significant benefits for hunger-stricken LDCs, the innovating firms, *and* the image of (and public attitudes towards) agricultural biotechnology as a whole. The latter could be particularly important in places like the European Union where the consumer opposition to GMOs has shaped the regulatory response to these organisms with significant ramifications for many hunger-stricken LDCs trading with the EU.

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The Impact of Formal Agricultural Education on Farm Level Innovation and Management Practices

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Introduction and Objectives

Formal agricultural education is an important driver and facilitator in helping technology transfer to aid in innovation in Agriculture The benefits of formal agricultural education are clear: agricultural education improves a farmer's technical efficiency (the more efficient use of a given amount of resources) and allocative efficiency (choice of better inputs and outputs, leading to a more efficient allocation of resources). There are three main reasons why formal agricultural education improves technical and allocative efficiency.

- Education by helping farmers make better use of information and finding solutions to problems makes them better managers allocating their resources more efficiently.
- Not only does education help farmers use existing information more competently but they also have better access to required information.
- Educated farmers are more likely to adopt new technologies or products early because of their access to information and their ability to better distinguish between promising and unpromising innovations.

That farmers themselves recognise that such an impact exists is evident from the increased demand for agricultural education courses. The focus of our study is on the impact of formal agricultural education in Ireland.

Theoretical Framework and Research Questions

Internal returns or impacts of education relate to the farm/farmer and are manifest in increases in productivity, efficiency, technology adoption, innovation and/or income at farm level. In a seminal contribution, Welch (1970) identified the benefits of agricultural education as the 'worker effect' and the 'allocative effect'. The worker effect is conceptually equivalent to what later commentators have called 'technical efficiency'

(Azhar, 1991) and describes how a farmer is able to use a given amount of resources more efficiently. The allocative effect is where a farmer has the ability to acquire and use information about the cost and productive potential of other inputs; this leads to a choice of better inputs and outputs. As a result, the educated farmer uses a different mix of inputs compared to other farmers; in other words (s)he allocates and uses resources more efficiently. It is argued that the main benefit of farmer education is as a consequence of the allocative effect and only a limited extent from the worker effect (Reimers and Klasen, 2011; Huffman, 1999).

It is useful to get a better understanding of the processes underpinning how allocative and technical efficiency arise and how education supports those processes. The classic contributions of Nelson and Phelps (1966) and Schultz (1975) are useful for understanding the role of education in these processes, and Reimers and Klasen (2011) have succinctly collated them into the following:

Innovation and technological change

The role of education in technological change and innovation is reflected in two classic contributions to the literature. In the adoption and diffusion of innovation literature spawned by Rogers (1962) and Griliches (1957), 'innovators' or 'early movers' are those farmers who first take up a technology and, therefore, start the diffusion process. Education is perceived to support such farmers to make these decisions in several ways:

- As education decreases risk aversion the probability of adoption and innovation is increased (Knight et al. 2003).
- Formal education is more likely to make farmers take the initiative in the adoption of innovations, either by introducing new ideas themselves or being the first to copy a successful innovation (Weir and Knight, 2004).
- Adoption decision-making among farmers is a human capital intensive activity and education and information reduce adoption costs and uncertainty, and thereby raise the probability of early adoption (Wozniak, 1987).
- Elsewhere, and relatedly, Schultz (1975) in a seminal contribution argued that the benefits of education to farmers are especially important in times of disequilibria, i.e. when there is pervasive and rapid technological change. In this case, education can help farmers respond more efficiently to disequilibria. The corollary to this is

that the returns to education should be higher in societies experiencing greater technical progress.

There is some existing Irish evidence on returns to agricultural education in terms of technological/practice change and innovation. Farmers who have completed formal agricultural education are 13% more likely to be prepared to grow GM crops (Keelan et al. 2009); are 3 times more likely to voluntarily soil test than those farmers without formal agricultural education (Kelly 2014); reseed more than 12% of their land in the past 3 years (Heanue and Buckley, 2012) and are 6% more likely to consider growing bioenergy crops (Clancy et al 2011).

The role of agricultural education in rapidly changing technological environments

There is a strong theme running through the literature that education plays a greater role in modernising rather than traditional agriculture. As mentioned previously, the argument is that education provides farmers with the capability to deal with the disequilibria caused by technological change and, therefore, educated farmers adjust more successfully (Schultz 1975; Ali and Byerlee 1991). Nelson and Phelps (1966) argue that the rate of return to education is greater the more technologically progressive is the economy. They argue that this finding has two social policy implications in terms of the optimal capital structure in a society in a broad sense. First, it may be that society should build more human capital relative to tangible capital, the more dynamic is the technological environment. Second, another point they raise is that their models show that innovations, if imitated, produce externalities. If that is the case, then education, due to its stimulation of innovation, also yields externalities. These later points highlight a possible source of divergence between the private and social rate of return to education.

In this paper we ask a number of research questions. This study focuses on factors that influence the decision to participate in Agricultural Education and the impact it has on farm level innovation and management practices. It presents two broad categories of evidence; descriptive data and the results of econometric analysis.

Results

Data

The main data source used in this study was the Teagasc Irish National Farm Survey (NFS) for the years 2001-2011. The NFS surveys a sample of approximately 1,100 farms

each year . The NFS is collected as part of the Farm Accountancy Data Network of the European Union. It determines the financial situation on Irish farms by measuring the level of gross output, costs, income, investment and indebtedness across the spectrum of farming systems and sizes and provides data on Irish farm income to the EU Commission in Brussels and a database for economic and rural development research and policy analysis (Connolly et al. 2010).

Participation in Agricultural Education

In an understanding of the factors that impact farmers' participation in formal agricultural education, the appropriate statistical method to analyse such participation decisions given the type of data used, is logistic regression. The effects of a variety of potential farmer, farm, location and policy categorical and continuous explanatory variables were hypothesised. Of particular interest was to explore the impact on farmer participation in formal agricultural education of the three potential exogenous variables 1) farmer's geographic distance from an agricultural college 2) whether a farmer was over 35 years of age in 1994 when the Stamp Duty Exemption for qualified farmers was introduced and 3) a variable capturing the interaction between distance and farmer's age in 1994.

Management Practice Innovation from Formal Agricultural Education

The second part of the analysis tries to get a deeper understanding of the particular pathways through which farm income is impacted by formal agricultural education. Two dependant variables, yield and intensity, were used for each of the four farming systems – Dairy, Cattle, Sheep and Cereals. For livestock sectors, yield equates to Gross Output per LU and intensity is reflected by LU per hectare. In the cereals sector, yield is synonymous with Gross Output per hectare and intensity is reflected by Cost per hectare.

For the dairy sector, both yields and intensity of output are affected positively and significantly by attending agricultural college. Although the positive effect on yields is strongest from having studied agriculture at university followed by agricultural college then agriculture certificate, by contrast, for intensity, the impact of having studied at agricultural college is stronger than that from an agricultural certificate.

For the cattle sector, both yields and intensity of output are affected positively and significantly by attending agricultural college, achieving an agricultural certificate and attending short courses. In addition, undertaking an agricultural course at university also positively and significantly affect yields. Although the positive effect on yields is

strongest from having studied at university followed by agricultural college, agricultural certificate and short courses, by contrast, the effect on intensity is strongest for agricultural college, followed by agricultural certificate and short courses. However, the differential impact between agricultural college and agricultural certificate is negligible.

For the sheep sector, intensity is significantly and positively affected by attending agricultural college, achieving an agricultural certificate and short courses. There is a negative sign on the short course variable in terms of productivity but it is not significant.

Next Steps

The analysis presented here represents a preliminary analysis of the data, using reduced form methods. In the next stage of the analysis, it is intended to incorporate a structural model of agricultural education participation to disentangle the participation decision into costs and benefits of attending full-time and part-time education, reflecting the opportunity cost of doing so. The intent is to understand the impact of opportunity cost of more intensive systems such as dairy, where there is a greater incentive to undertake part-time study due to the opportunity cost of hours milking as well as the differential return to farms of different sizes. In the second part of the analysis we will try to understand in greater detail the pathways to improved productivity via the differential technology adoption by higher educated farmers.

Agricultural transitions in proprietary regime(s): law, institutions, practices and interests in modern Greece (1920-2015)

Stathis Arapostathis and Kiriaki Klokiti (University of Athens)

The paper aims to provide an overview of the plant breeding practices and the management of knowledge in Greek Agriculture from 1920 to date. We argue that the intensification and mechanization of agriculture in rural Greece co-evolved with proprietary regimes of plants both patents and copyrights since the interwar period. Patents were sought for agrochemicals while seed circulation and economy of plant breeding were based on trademarks. The period from 1920 to 1987 was a period of transformation of the Intellectual property culture of Greece with major reforms that initiated with the 1920 industrial property law and completed after more than 60 years with the ratification of the 1973 treaty and the establishment of the European Patent Office and the 1987 Patent Law. The transformation and transition from a regime of patents as privileges to a regime of patents as rights that took six decades to be completed was a socio-institutional change that evolved co-currently with the European integration of Greece. The Europeanization of the country framed visions, rhetoric, public discourses, and public policies while excluding alternatives and marginalizing social practices well embedded in the local traditions and culture. Greek agriculture sector faced a radical change and a paradigm shift with science and technology to play a prominent role in the transition. Agrochemicals, pesticides, new machinery, new science-based plant varieties, large scale irrigation works, became the landmarks of this transition. Intellectual property protected agrochemicals and plant breeds configured the practices of farmers and linked them with a part of economy that was controlled by private sector interests and most importantly by big foreign or native companies. The last 20 years this model started to be questioned due to political, economic and cultural reasons. Agro-farming emerged as an alternative –yet marginal- way of management of natural resources and commons. It was linked to a different way of managing plant varieties and of plant breeding along with a different way of developing small scale agriculture well integrated in the environment. The case of Pelitis is studied as such a case and as an alternative exemplar of classifying, preserving and conducting plant breeding and farming outside proprietary regimes.

The key research questions that we aim to address in the paper are: How agriculture and more particularly farming co-produced with intellectual property strategies and institutional changes in the agro-chemical and plant breeding sectors? How social policies configured and changed existing social practices in farming? How new understandings and new models of organic farming reinvent existing social practices? After an introduction with the historiographic approach, the next section will be an overview of the intellectual property institutional setting in Greece and the changes occurred from 1920 to date. The subsequent section will provide a comprehensive analysis of the establishment of the dominant farming and plant breeding model since 1950s. The emergence of organic farming and the case of Pelitis will be covered in the third section. Finally we shall conclude by providing insights on the competing meanings, visions and practices for 21st century Greek farming. The paper will be based on analysis of agriculture and farming journals, onsite research and interviews (the case of Pelitis), parliamentary archives, public press articles.

Parallel Session F-II

Technology Transfer and Public-Private Partnerships

University and Alternative Food Networks collaboration: it is not always a bed of roses

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Extended Abstract

The basis of this paper are the results of a research work which has been carried out between 2010 and 2012 within the project 'Local agriculture and sustainable consumption in the alternative food networks' funded by the Ministry of Research (PRIN 2008). The main objectives of the project were to analyse the diffusion of the Gruppi di Acquisto Solidale (Solidarity Purchasing Groups; henceforth, GAS) in the city of Rome and to analyse their characteristics, current status and future prospects. The GAS are groups of households that cooperate in purchasing food and other goods directly from producers on the basis of ethical and environmental criteria and considerations of solidarity. They present themselves as a movement with a shared critique of the dominant model of consumption and production, a movement whose aim is to contribute to the construction of a more sustainable economy by promoting ecological citizenship and sustainable consumption.

Our aim, as university research team, was not just the production of academic papers, but also to start an interactive mutual learning process with the GAS movement. To that end we organised open and public presentation of the research project and since the beginning we planned the construction of a digital map intended as an information and management tool for the Gas movement. This plan was strongly contested by some representatives of the GAS movement. In this paper we try to discuss and reflect on the reasons at the base of such conflict.

The first step of the research was devoted to collect the data needed to test whether the five dimensions (localization, environmental sustainability, community building, collective action and the creation of new infrastructures of provision) envisaged by Seyfang (2006) as essential components for achieving the transition to sustainable consumption, are part of the theoretical framework guiding the action of the Solidarity Purchasing Groups (GAS) operating in Rome, Italy. At this aim two surveys were conducted: one on the Roman GAS and the other on their suppliers.

The information gathered through the survey allowed the research team to analyse the strategies used by GAS to make organic food accessible and food systems more sustainable (Fonte, 2013). The screening of the suppliers has disclosed peculiarities both in terms of business structures and organization. The common trait revealed by the interviews is that the suppliers in Rome (quite differently from results in other regions of Italy) feel they do not have the capacity to build networks among themselves or to be important collective actors of territorial development. On the contrary they put their trust on the ability of the critical consumers for facilitating the transition toward a sustainable food system and a stronger local economy.

The animation activity carried out during the research allowed the research team to further interact with the participants to the GAS movement and better understand how well the movement is conscious to have revealed a market opportunity. At the same time, they are conscious that such opportunities may be harvested by other innovative food business activities that, for example, substitute the personal direct relationship between consumers and producers with a computer-mediated communication.

The participants to the GAS movement feel the movement, though successful, is still fragile in terms of organizations. This explains why they feel the need to operate in niches separated from the dominant market, i.e. in spaces that shelter them from mainstream competition and protect them against too harsh selection, in this way allowing nurturing and experimentation with the co-evolution of technology, user practices, and regulatory structures (Schot and Geels, 2008). This voluntary segregation from the dominant market is also the rationale of the criticisms moved to the mapping project developed by the research team. The participants to the GAS movement were for example worried by the chance that conventional farmers, aimed at harvesting the business opportunity being created by the GAS movement, may have free access to the list of providers selected with great care by the purchasing groups in this way mining the consumer trust.

In conclusion, a mismatch between researchers' and movement's interests emerged. First, the university research team needed to be effective in the time established by the research program, while the GAS movement needs to be participative, without times limits. Second, the research team interpreted the digital map as an efficient instrument of information able to solve the demand-supply mismatch problem, while the movement reaffirmed its preference to rely on information that travel by words of mouth in order to keep a direct control on producers, to check if their behaviour responded to the political-ethical concerns of the movement and to avoid markets manipulations. In other words, at present, the GAS movement needs more to strengthen its identity rather than to represent itself toward the exterior: they are not aimed at growing fast, but at growing slowly while consolidating their identity.

The criticism moved to the mapping project actually impeded the appropriation of the map by the GAS movement. The data collected will be, anyway, used by a new project financed by the Province of Rome that aims to create an open data bank on the solidarity economy.

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Promoting technology transfer in a Greek University

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In recent years the role of the university has gradually shifted from an isolated environment servicing pure science to that of a key player in the knowledge-based economy. Today's university is an active player in addressing problems of a technological, economic and social nature, together with its private-sector counterparts. This transition was largely supported by the creation of Technology Transfer Structures (TTS) in public academic and research institutions, with a clear mission to develop and strengthen the links between scientific knowledge and areas/applications of industrial, commercial and/or societal relevance.

More recently, Technology Transfer has received increased attention in the context of regional development and the new approaches related to "smart specialization". The key novelty observed in the policy area is that regions in the European Union and other developed economies plan their growth by concentrating their efforts on competitive strengths that can be turned into high added-value economic activities, with due input from research and innovation.

It is against this background that the Agricultural University of Athens (AUA) has initiated a Programme to support commercial exploitation of its research, with funding from the City of Athens. A broader objective was to enable researchers to efficiently manage the spillover of scientific discoveries, inventions and improvements into key

sectors of the regional and national economy that AUA's scientific and technological fields are strongly connected with.

The Programme was based on an integrated approach to Technology Transfer, which comprised: (a) an internal promotion campaign aiming to generate exploitation proposals from as many University research teams as possible; (b) the assessment of these proposals according to criteria that examined their technological and commercial potential, with emphasis on short to medium term perspectives; and (c) the design and provision of customized consulting support and training for the researchers to pursue their attempts till the launch of the entrepreneurial endeavour.

The paper concentrates on the issues involved in each of the above steps and looks in particular into:

- the characteristics of the proposals submitted, highlighting the different types of applications envisaged that are shown to be linked with particular research approaches,
- the corresponding strengths in terms of tecnology readiness, innovation potential and exploitation perspectives, and
- the way assessment results were used to design consulting support for the research teams.

This pioneering Programme introduces a paradigm that could be used to strengthen research exploitation initiatives in Greek universities and public research centres. Of particular importance are the lessons learned through this hands-on approach, as well as the conclusions relating to the matters to be addressed for sustainable Technology Transfer structures to be developed in the country.

Technology transfer as a mechanism for dynamic transformation of the food sector

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Extended Abstract

The perception of traditional sectors which are conventionally considered as low and medium low - tech sectors, is based on the standard classification of industries based on their average R&D intensity (R&D/total output). According to this classification sectors with R&D intensity less than 3% are considered as low and medium low-tech (LMT) (Hatzichronoglou, 1997). However, there is a growing questioning of the exclusive use of such a classification for academic research and policy design, as low and medium low-tech sectors might have developed through time a rich knowledge base related to non R&D activities (i.e. knowledge generated from professional and business practice) but in addition, they can rely on high-tech technologies to develop new products or processes.

In addition, when focusing in LMT sectors we should consider that due to high persistence and stability of these industries, entrepreneurial activities and a successful deviation from established practices and technological paths open strong opportunities for building competitive advantage and gaining high profitability (Hirsch-Kreinsen, Schwinge, 2011).

In the agro-food industry, which on the one hand is relatively traditional while on the other it implements advanced technologies, intensifying trends of globalization, liberalization of world trade and agricultural markets and new emerging markets create a highly challenging situation. Although agro-food industry's R&D and innovation are low, technological change related to other sectors concerns the whole value chain from raw materials to final consumers and calls for exploitation of opportunities arising from

technological advancements in fields such as ICTs, biotechnologies or health-care (EC, 2009).

In this context, technology transfer is a mechanism that enables the use of knowledge from external sources and the use of advances occurring in other industries (mostly high-tech).

In this paper we investigate the impact of technology transfer on the business performance and competitiveness of European firms from the food sector.

We use data from the AEGIS large-scale survey on newly (in the 2000s) established entrepreneurial ventures in ten European countries, namely Croatia, the Czech Republic, Denmark, France, Germany, Greece, Italy, Portugal, Sweden and the UK. The survey collected 4004 responses from several groups of sectors (high-, medium-and low-tech) including 297 questionnaires from the food sector (NACE rev 1.1. 15).

We shed light on specific characteristics of these firms, in terms of their technological capabilities and their technology strategy, trying to investigate whether there are firms that although operating in a low tech sector they use knowledge from external sources to produce innovative solutions that go beyond established technological regimes and could be subjected to a transformation process towards knowledge intensive activities.

The general picture that we get from our sample is that a high percentage of these firms do innovate although they are characterized by low levels of R&D. More precisely 66% of the firms operating in the food sector have introduced a new or significantly improved product or service and 81% a process innovation. In addition, 25% of the firms included in this sample have implemented some kind of agreement with a technological objective.

Given these characteristics, we explore whether the firms that have used some type of technology transfer mechanism, present better business and competitive performance than firms that operate with a less open strategy. When referring to the business performance, we use information for the evolution of sales, where as exports are considered as a proxy for competitiveness.

We expect that firms of the food sector exploiting knowledge and technology from external sources a) should better overcome competitive pressures from low-wage economies as they build on ‘exploitative’ learning and b) should create new economic value by exploiting knowledge bases “belonging” to other sectors such as chemicals, ICTs, new materials etc.

There are some important policy considerations regarding countries where their specialization pattern is based on LMT industries, and the food sector plays a prevalent role, as technology transfer could be considered a reasonable strategy for promoting their dynamic transformation.

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