

Southern Taiwan University  
Graduate School of Business Administration  
Master's Thesis

Quality Standards and Competition: Market  
Access of Peruvian Quality Coffee Beans to  
Specialized Markets

Graduate Student: Orly Deulme Calle Roalcaba

研究生：羅真

Advisor: Hsu Su-Ying

指導教授：許淑嫻

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# ABSTRACT

First, we provide an overview of the quality coffee industry in Peru, and then analyze the impact of a minimum quality standard (MQS) on it using a vertically differentiated model. Depicting the trade between coffee producers in a developing country and consumers in a developed country, we compare the results derived in a closed economy, wherein the MQSs are determined by the government of the developing country, and in an open economy, wherein the MQSs are determined by the government of the developed country. In addition, we examine the MQSs under the citizens' initiative in the context of the treaty of Lisbon in the European Union in order to identify their influence in the market access of coffee producers from developing countries. The results indicate that the MQSs determined by a developed country's government attempts to maximize its social welfare and therefore, results in reducing the profit of both high- and low-quality exporting firms; consumers benefit the most from this trade. Furthermore, it is indicated that under the citizens' initiative, the citizens attempt to establish the highest MQSs in order to increase their wealth; therefore, a rather demanding MQSs in an importing country makes it less attractive for any exporter.

*Keywords:* Minimum quality standards, Open economy, Developing country, Organic production, Vertical differentiation, Lisbon Treaty.

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# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1. Research Background**

Who does not like the aroma of coffee? Every morning, this black gold enables us to stay awake, or accompanies us while we read the newspaper. However, coffee is not only a beverage but also a commercial product; peasants depend on it for their livelihood worldwide.

Coffee is a rather important commercial product for the economies of Latin American countries. In Peru, coffee is the principal export crop (Greenberg and Rice, 2000). The livelihood of over 150 thousand families directly depends on this crop, and an average of 1.5 million people belongs to sectors that are associated with the coffee business. Volatility or decline in coffee prices directly influences access to education, housing, food, medical services, and other basic necessities for people whose livelihood depend on coffee.

According to the United States Department of Agriculture's (USDA) Foreign Agricultural Service (FAS), coffee production for the marketing year 2011 (April/March) in Peru is forecasted at 3.8 million 60-kilogram bags, which is a significant increase from the 3.05 million 60-kilogram bags produced during the marketing year 2010. With exports of 193,534 metric tonnes in the coffee year 2009, valued at \$571 million, coffee remains Peru's primary agricultural export. The average price for coffee during the marketing year 2010 has been estimated at approximately \$130 and \$165 per hundredweight for conventional coffee and organic-fair trade coffee, respectively.

Quality is a major concern for selling products in international markets (see Giovannucci, 2001). Commercial quality standards provide not only a common trading platform for both buyers and sellers but also a reference for quality control. Standards are important to farmers and firms in a developing country because they determine the extent of access to specific market segments (e.g., in defining products that are

environment friendly), to specific countries (e.g., through regulations and technical requirements), and the terms for participating in global value chains (e.g., through matching quality standards) (Nadvi and Waltring, 2002; Wilson and Abiola, 2003; Gibbon and Ponte, 2004; Ponte and Gibbon, 2005).

In economics literature, quality characteristics are identified as the vertical differentiation of products. In the literature on trade and industrial organization, product differentiation may be classified into two categories: vertical or horizontal. Given that the two variants of a product are identically priced, if a few consumers purchase one variant and others purchase the other variant, then this implies that these two variants are different in the horizontal sphere. On the other hand, given that the two variants of a product are identically priced, if all consumers purchase the same variant, then this implies that the two variants possess quality differences. In summary, the former product category is horizontally differentiated and the latter is vertically differentiated (see Thisse, 1979).

The aspect of product quality first emerged in the 1970s and instantly captured the attention of scholars, see Spence (1975), Sheshinski (1976), Gabszewicz and Thisse (1979), etc. They investigated subjects such as the relationship between price and quality in a monopoly, relationship between quality and income distribution, and the impact of regulations on product quality, etc.

Ever since, numerous scholars including Gabszewicz and Thisse (1986), Choi and Shin (1992), Motta (1993), Aoki and Prusa (1996), Aoki (2003) have been focusing on the product quality. Their studies immensely enhanced our understanding regarding the role of quality in business. They discussed certain issues such as the impact of time of investment or mode of competition on product quality levels.

The impact of minimum quality standards (MQSs) on product quality has been studied by Das and Donnenfeld (1989), Ecchia and Lambertini (1997), Valletti (2000), Herguera *et al.* (2002), Toshimitsu (2003), Kuhn (2007) among others. Quality standards are important considerations for producers as they may be required to make additional investments for upgrading their product quality. Theoretically, an increase in the MQS may decrease the degree of product differentiation in the market. Moreover, the introduction of an MQS may reduce social welfare.

According to Giovannucci and Ponte (2005), coffee was one of the first internationally traded products for which collective efforts were made for developing



standards addressing socio-economic and environmental concerns. Quality standards and quality control procedures are vital aspects for coffee transactions in producing countries (see Daviron and Ponte, 2005). On one hand, quality standards operate as entry barriers for new entrants in the market and present new challenges for existing suppliers. On the other hand, the challenge of increasing standards provide opportunities to selected suppliers for adding value, improving their products, and developing new methods for enhancing cooperation in a particular industry or country (Jaffee, 2004).

Organic, Shade, and Fair Trade coffees—collectively known as sustainable coffees—are some of the prominent standards in coffee nowadays. These products tend to meet the standards and are deemed as sustainable coffees because they attempt to expand or specialize in markets in which consumers are conscious of the environmental and social impact of products.

## **1.2. Motivation**

The organic sector is the fastest growing sector in crop trading, with substantial growth rates globally. According to the International Trade Center, despite the global slowdown as a result of the latest financial crisis, the trade in organic products continued to grow in 2008 and 2009. In addition, the rising interest in the environmental protection attributes of quality products, such as products that do not increase artificial pollution, waste disposal problems, or cause illnesses, have contributed to the growth of trade in organic products. These environmental concerns facilitate the trend that consumers, especially those located in developed countries, prefer the consumption of those crops that are produced without chemical inputs, are free of chemical additives, and pay special attention to environmental protection aspects.

The worldwide sales of organic products reached US\$ 41 and US\$ 47 thousand million in 2007 and 2008, respectively. The sales for 2009 is estimated at US\$ 53 thousand million, considering an annual growth rate of approximately 14% (see Table 3). Most of the certified organic production is sold to countries that are members of the Organization for Economic Cooperation and Development (OECD). Europe, the United States, and Japan account for approximately 63%, 30%, and 4% of these sales, respectively (see Figure 5).

According to the 2008 FiBL-IFOAM Report, the regimes for the import of organic products in markets such as the EU, the US, and Japan are rather strict and products may be imported only on the condition that the certifying agency has been

approved by the respective competent authorities. Moreover, technical requirements for achieving such recognition are difficult to meet, and the associated costs are high. Maintaining recognition and/or the necessary accreditation requires the certification agency to possess substantial financial capacity as well as personnel.

Worldwide, approximately 130 countries, out of which over 90 are developing countries, produce commercial quantities of certified organic products (Kortbech-Olesen, 2000). 43.5% of the worldwide organic producers are located in Africa; this makes it the geographical location with the largest number of organic producers in the world. Asia occupies the second place with 19.2%, followed by Latin America and Europe with 18.3% and 17.5%, respectively. North America and Oceania have the least number of organic producers worldwide (see Figure 6).

### **1.2.1. The local context of organic products: Peru**

The Agriculture in Peru is mainly performed by small-scale producers, who are unable to use chemicals or pesticides owing to their low income; this makes it easier to meet the basic requirements irrespective of whether or not they want to produce their goods for the organic market. Primarily, Peru's traditional agricultural products include indigenous chicken meat, paddy rice, potatoes, plantains, whole and fresh cow milk, indigenous cattle meat, asparagus, hen eggs, corn, and sugar cane (Commission for Exports and Tourism in Peru- PromPeru, 2009).

In addition, Peru was formerly one of the world's single largest sources of coca leaves and accounted for approximately two-thirds of the total cocaine production in the world (UNODC). Coca cultivation is a centuries-old tradition practiced by the ancient Andean Inca Empire. The Incas used coca for religious and medicinal purposes. However, today, the age-old tradition of coca cultivation poses potential threats to the national securities of several nations in the Western Hemisphere. The production of coca is associated with organized crime, guerilla insurgency movements, and drug addiction. For these reasons, the United States Government focused on combating coca production in Peru. According to the United Nations Office on Drugs and Crime (UNODC), cultivation of coca in Peru was substantially reduced from 115,000 hectares in the mid-1990s to 46,232 hectares in the 2000s; coffee is one of the most important alternative crops to coca production in Peru.

Over the recent years, the interest in Peruvian conventional smallholders involved in the production of organic products has been growing. According to Willer and



Kilcher (2009), Peru has approximately 33,500 smallholders who produce organic products and ranks 7<sup>th</sup> in the world in this respect. This trend was encouraged by a previous decision that was taken by the regional governments in Peru to ban genetically modified crops and promote organic growing instead.

Peru maintains a growth rate of 45% annually in organic production. In 2008 and 2009, the Peruvian exports of organic products were valued at US\$ 194.22 and US\$ 240 million, respectively (see Figure 7). The production of organic agriculture is being promoted in the country through various activities such as trade fairs, ecological product booths in supermarkets, and diffusion through media. The organic products that are exported from Peru include Coffee, cacao, cotton, and mango. Coffee is the primary organic export product in the country and constitutes 58.68% of the total exports of organic products (see Figure 8).

The USDA-FAS Peru annual report (2010) reveals that coffee producers face two major constraints. First, farmers are unable to obtain credit from private banks, because they still do not accept the farmers' often-untitled land as collateral for loans. A majority of the farmers obtain their loans from coffee buyers or informal lenders with high interest rates and a sale contract on the coffee price. Second, during the land reform of the 1970s, land was divided into small plots, making it extremely difficult for the producers to efficiently produce, harvest, and process coffee.

According to Giovannucci (2003), the process of obtaining organic certification, which includes various steps such as learning and preparation, conversion time and certification, are expensive and sometimes difficult especially for producers in developing countries. Currently, each producer has 23 hectares of coffee under production and a majority of the small scale farmers have formed associations or agrarian cooperatives, which enable them to obtain better prices, improve post-harvest handling of production, and access quality certifications (USDA-FAS Peru Report, 2010). The organic coffee from Peru is mainly exported to Germany and United States, which accounts for 54% of the total sales (see Table 4).

### **1.3. Purpose of the Research**

This study attempts to discover the influence of standards on market access of coffee producers from developing economies to specialized markets located in developed countries. By using subgame perfect equilibrium via a vertically differentiated model, we intend to find whether producers and/or consumers benefit from the introduction of minimum quality standards under three scenarios, in the first scenario under a closed economy where the minimum quality standards are regulated by the domestic government, in the second scenario we deal with an open economy and the minimum quality standards will be set by the foreign importer government and in the third scenario those standards are imposed through an initiative process in a democratic regime in the importer country, and we shall compare the results derived under all the scenarios.

We first examine the impact of the minimum quality standards that are formulated by the domestic government, and then we shall investigate the alternative scenario that standards are determined in the importer country.

### **1.4. Scope of the Research**

This research will focus on the adoption of minimum quality standards by Peruvian coffee producers who export their product to specialized markets located in developed countries. We analyze the equilibrium under price competition through Bertrand model instead of using quantity competition and it is because the coffee is a commodity product and therefore its price fluctuate too much , then , it is better for farmers to concentrate in a high quality, not in the most quantity because the highest quality coffee creates a separated specialty market that is somehow immune from the commodity prices because consumers pay according to the quality and farmers don't have to worry about price fluctuation.

## **1.5. Structure of this study**

The organization of this study is divided into five chapters and structured as follow:

Chapter one contains an introduction of the research background and motivations, purpose, scope and structure of this study.

Chapter two presents a review of the basic concepts such as vertical differentiation, minimum quality standards and social welfare, ecolabeling and investment, and democratic society.

Chapter three introduces the subgame perfect equilibrium as the research methodology used in this study. It will begin with the definition of some basic concepts in the game theory field before to introduce the notion of a subgame perfect equilibrium.

Chapter four present and analyze a duopoly model of vertical product differentiation in the coffee industry, and deal with the cases of closed and open economy by analyzing the equilibrium under price competition through Bertrand model. In addition we derive the MQS which maximize the social welfare. In addition , we present and analyze a duopoly model of vertical product differentiation with initiative democracy.

Chapter five contains conclusions of this study including discussion and limitations of this issue. Also, suggestions will be made for future research.

# **CHAPTER TWO**

## **LITERATURE REVIEW**

This section presents a review of the basic concepts that we shall deal with along this study, such as vertical differentiation, minimum quality standards and social welfare, certification, ecolabeling and investment, and democratic society. This section aims to contribute to a profound understanding of each concept.

### **2.1. Vertical Differentiation**

Vertical Differentiation together with horizontal differentiation constitutes the two streams in the field of product differentiation (Waterson, 1989). According to Cremer and Thisse (1986) the characteristic of vertical product differentiation is that all consumers have the same ranking of the variants of a product. For instance, if the prices of two products are identical, all consumers buy the same variant, then we say that those products possess vertical differentiation.

This issue was raised in the 1970s, and one of the pioneers in this topic such as Sheshinski (1976), developed a model of the socially optimum levels of quality and quantity and uses this model to demonstrate how quality and quantity levels are simultaneously chosen by a monopoly firm, besides he analyze in what direction the monopoly equilibrium deviates from the social optimum. Gabszewicz and Thisse (1979) characterized the demand structure and the non cooperative market solution, they analyzed the quality parameters and described the quality component as an important factor in many economic decisions where its choice bears as much on the outcome of the choice as its quantity component and sometimes happens that only the quality component plays a role in the buying behavior of a consumer.

There are two types of competitions between firms in the market; the literature refers to Bertrand and Cournot competition where firms compete on prices and on quantities respectively. Motta (1993) presented a basic vertical differentiation model with the aim of compare equilibrium qualities under price and quantity competition and has found that firms always choose to offer distinct qualities at equilibrium,



independently of the hypotheses on cost and on price contrasted with quantity competition. In addition he has found that under the hypothesis of price competition firms will differentiate their products specifications more than under quantity competition and the reason is that in Bertrand competition firms have a higher incentive to choose more distant specifications of the good, due to the fiercer competition at the marketing stage of the game at the first stage of the game which pushes firms to choose more differentiated products than under Cournot competition.

The timing of investment also has grasped the attention of scholars. Aoki (1996) compared the subgame perfect Nash equilibrium of a game with simultaneous quality choice and a game with sequential quality choice, he refers that the timing of quality choice not only has implications for the quality of products available but also has important consequences for measures of welfare, such as producer, consumer and social surplus, in addition he has reported that a game with sequential quality choice induces firms to make smaller quality investments than they would in a game with simultaneous quality choice. Aoki (2003) found that the consumer surplus is greater and producer surplus is smaller with simultaneous choice than sequential choice when there is Bertrand competition in the sales stage.

Nowadays, the literature in this field also include social responsibility, for instance, Garcia-Gallego and Georgantzis (2009) explained the firm's corporate social responsibility as a vertical differentiation strategy, they argue that increases in the consumers' social awareness entail to higher profits to socially conscientious firms and may lead to higher levels of social welfare, provided that the market structure is left unchanged, nevertheless, when an increase in the consumer's social consciousness changes the market structure, welfare may fall, while the duopolists' profits rise. Nishijima (2009) developed a model of mixed duopoly in which the service is vertically differentiated, he described a scenario of a public service, which is affordable and besides has high quality, such service has to be restricted due to the low capacity of supplying, in this context he has demonstrated that whether there is a decrement in the supply of a public service, it will reduce total surplus except that the price of the public service is too low and its quality is too high.

Boswell and Moore (2009) discussed the topic of service provision and concluded that if managers compete in markets they should differentiate their products to increase profitability. Nevertheless, if they can not afford a product differentiation,

then they should establish whether demand for their product is affected by the level of service associated with the product being offered.

## **2.2. Minimum Quality Standards and Social Welfare**

Ronnen (1991) and Crampes & Hollander (1995) argue that the adoption of standards entails in a reduction of product differentiation in the market and in an asymmetric change in firm's profits. According to Ecchia and Lambertini (1997) the willingness of consumers to pay higher prices for higher qualities has made the use of minimum quality standards more and more common in various industries, those standards aim at increasing social welfare through a reduction of the price or quality ratio preponderating in the market.

They have developed a model to derive the minimum quality standards which maximizes the social welfare and their results coincide with Ronnen, Crampes & Hollander findings showing that the imposition of the standard diminish the degree of differentiation in the market, reduces the market share of the high quality firm to the advantage of the low quality firm, besides their model also increase the social welfare in a way that the gains for the low quality firm and low consumers outbalance the losses suffered by the high quality firm and high income consumers.

Valletti (2000) has shown that the behavior of the MQS shall depend on the form of competition that firms deal with, he has demonstrated that a MQS is not welfare enhancing when firms interact as Cournot competitors, therefore a MQS adoption is not suitable in such market.

## **2.3. Certification, Ecolabeling and Investment**

According to De Freitas and Bottega (2009) certification is a procedure by which a product, process or service is reviewed by a third party to corroborate that a set of criteria or standards are being reached. Because the quality of a product is a appreciated attribute that consumers cannot directly observe either before or after purchase and use, the need for regulation in this internationally context is important, and one the solutions to solve this information problem is to rely on third party certification (Cason and Gangadharan, 2002). Once the product meets environmental criteria or

standards, a “seal-of-approval” or ecolabel may be affixed to the product (Wessels *et al*, 2001).

Amacher *et al.* (2004) point out that ecolabels are virtually important strategic variables for firms, which serve to differentiate a firm’s product from those produced by firms that don’t make the necessary green investment. They argued that, any firm, wishing to supply high enough environmental quality to secure an ecolabel, is forced to make investments to increase quality and therefore reduce the costs of quality production. In addition they have developed a model extending the usual duopoly model of vertical product differentiation with variable costs by including an initial technology investment stage which allow them to compare socially optimal levels of investment and environmental qualities with those that result from profit maximization, with this research they have showed that firms’ incentives to invest in technologies and therefore obtain the ecolabels depend mainly on the differences in cost structures between firms.

De Freitas and Bottega (2009) depicted the international economy scenario between two countries which deal with standards and labeling under two systems such as Autarky and International Trade and found that standards harmonization is welfare enhancing compared to the Autarky scenario and that the imposition of a national label in one of the countries does not lead to a Pareto efficiency in the country competitor.

Ibanez and Stenger (2000) studied the information impacts of eco-labels within a vertical differentiation model in three different information situations: complete, imperfect, and partial. The aim was to determine if information on food safety is consistent with a higher level of environmental quality of agriculture. The authors showed, on the one hand, that labeling could be efficient from an environmental point of view depending on the proportion of high environmental quality products in the market. On the other hand, they showed that labeling policy can decrease consumer surplus.

### **2.3.1. Price as a Signal of Quality**

Daughety and Reinganum (1995) worked out a model in which quality can be interpreted as safety. They have shown that higher prices signal safer products when consumers support a sufficiently high portion of the loss.

Mahenc (2008) studied prices as signals of environmental performances for polluting products. He showed that high environmental performance can be signaled either through a high or a low price depending on the link between environmental

performance and competitiveness. The author used price as a signal for environmental performance but did not consider the problem of asymmetric information or presence of more than one label for the same product.

### **2.3.2. Information Value of Eco-labels**

The International Standardization Organization (ISO) distinguishes between three different types of ecolabels. Type I eco-labels are those based on a voluntary multi-criteria product life cycle assessment of environmental effects with verification by a third party. Type II eco-labels are based on environmental claims by producers, importers, and retailers. Type III eco-labels provide quantitative product information according to pre-set indices similar to consumer information on product packaging.

Bougherara, et al. (2005) studied the general impact of the consumption of two different goods on the environment when labeling schemes are introduced. The authors have shown that the net effect on the environment is worse than without labeling schemes.

Heyes and Maxwell (2004) compare the environmental implications and social welfare of the World Environmental Organization (WEO) labeling and the Non-Governmental labeling. They analyze the interaction between these two approaches when WEO is subject to pressure from firms. They have shown that if the two approaches are not interdependent, then the presence of the NGO induces a resistance toward the WEO and may reduce social welfare. If the two approaches run in parallel then they may reduce the resistance of producers towards the WEO labeling which increases welfare.

### **2.3.3. Effect of eco-labeling on competition between firms**

O'Brien and Teisl (2004) studied environmental certification and labeling for forest products. Their results show that changes in eco-labeling policies affect consumer's willingness to pay. As an extension of their work, one may expect that the presence of a second eco-label may impact consumer's willingness to pay also.

Arora and Gangopadhyay (1994) developed a model of over-compliance in a two stage game. Assuming consumers can value the environmental quality of a product, the model shows that the market becomes segmented and that the firm with the lower cost always over-complies.



Nilson et al. (2004) analyzed the credibility of an increased number of ecolabels in the food industry. They conclude that a great number of consumers remain uninformed due to the presence of several eco-labels. Youssef and Abderrazak (2007) extended this line of work by studying the willingness to cheat by producers using eco-labels. They ask if the presence of several eco-labels in the industry induces producers to cheat and to produce products with lower environmental quality than is claimed through the eco-label. They found that when there is multiplicity of eco-labels, the incentive of each firm is to diminish their respective environmental qualities, and the consumer will not take into account the label in her decision to buy the product.

Van Amstel et al. (2008) compare the informational content of five eco-labels in the food industry. Their findings suggest that eco-labels fail to convey to consumers the message of the environmental impacts of products.

#### **2.3.4. Certified Organic Coffee and environmental protection**

According to Giovannucci and Ponte (2005), coffee is one of the first internationally traded products where collective efforts were undertaken to develop standards on processes that address socio-economic and environmental concerns.

Quality standards and quality control procedures are key aspects of the domestic coffee trade in producing countries (see Daviron and Ponte, 2005).

Sedjo and Swalow (2002) argued that International environmental organizations propose voluntary ecolabeling as a market incentive to promote industry to operate in an ecologically sustainable and environmentally friendly manner.

According to Willer and Kilcher (2008), the most important import markets for organic products are the European Union, the US and Japan, and thus their regulations having a significant impact on global trade and the development of standards in other regions. For instance, the EU regulation on organic production came into force on January 1, 2009. Many European States that are not members of the EU will begin adapting their regulations to the EU Regulation.

#### **2.3.5. Agricultural Cooperatives and Quality Provision**

Yu (2008) analyzed the competition of coop and private firm in setting quality standard and related payment to attract the participation of farmers. In doing so, he developed a product differentiation model, allowing farmers to be heterogeneous in their efficiency to provide quality. He argued that because coop is owned by farmers. Its

objective is to maximize the total welfare of farmer members. Therefore, it cares more about the participation of farmers than the market premium associated with quality of final products. His results showed that a coop tends to set a higher quality standard and attract more farmers as compared to a rival private firm.

The debates on coops versus private firms have attracted much attention in recent years. Coops, as a vertically integrated organization, enjoy various advantage compared to the private firms. For example, Sexton (1986) stated that marketing coop has pro- competitive effect in mixed oligopsony market. Albeak and Schultz (1998) indicated that the members in a coop often over produced, which gives the coop a credible commitment to produce large quantity when it competes a la Cournot with the private firms.

Bontems and Fulton(2005) showed that in absence of perfect information, coop benefit from a information cost advantage because its objective is in consistent with that of farmers. Giannakas and Fulton (2001, 2005) also argue advantages of coop in respect to the member commitment and competition in innovation, respectively.

## **2.4. Democratic Society**

In a democratic society there are interactions between citizens, political representatives and administrative machinery providing a special view of citizens' opportunities to influence and participate in policy-making and related processes (Malkia, Anttiroiko and Savolainen, 2004). In Europe we can find a clear example of this scenario through the treaty of Lisbon, which ratify the basic principles of democratic governance in Europe such as democratic equality, representative democracy and a participatory democracy.

As regards imports of organic products from third countries, to import products into the European Union, the products must have been certified by an inspection body or authority recognized by the European Commission. This fact is seeing as a way from EU to protect their citizens.

In the literature of representative democracy, Besley and Coate (1997) developed a basic model to represent a democratic society where people are entitled to vote for their government representatives who shall be charge of making lows, besides this democratic scenario allow to answer several questions about the behave of a typical

population society. Rohini (2003) deal with the fact that policies promulgated by a government usually are unsuccessful in order to help solving the needs of disfavoured minorities located in Indian states. He concluded that there is an increment of small groups that benefit from the mandate, which suggest that a complete policy commitment may be absent in such democracies.

Besley and Coate (2003) discuss the interaction of the provisions centralized and decentralized for the case of local public goods where the fact of sharing costs in a centralized system will cause a dispute between citizens in different jurisdictions comparing to the fact when spending decisions are made by the elected representatives through the local legislation. They found that the behavior of the legislation have narrow relationship with either the excessive public spending or allocations of public goods and therefore the dispute between across jurisdictions.

When regulators are elected, regulatory policy becomes bundled with other policy issues the current politicians are responsible for. Because voters have only one vote to cast and regulatory issues are not salient for most voters, there are electoral incentives to respond to stakeholder interests. Whether regulators are elected, their stance on regulation is the only salient issue so that the electoral incentive is to run a pro-consumer candidate, (Besley and Coate 2003). Moreover, the authors use panel data on regulatory outcomes from United States and found new evidence in favor of the idea that elected states are more pro-consumer in their regulatory policies.

Armstrong and Sappington (2006) argued that in many countries throughout the world, regulators are struggling to find out whether and how to introduce competition into regulated industries. In this paper the authors examine the complexities involved in the liberalization process. This work also differentiated liberalization policies that generally are in favor of competitiveness from corresponding anticompetitive liberalization policies.

Lemos and Agrawal (2006) refer to the environmental current problem as urgent and complex problems which entails that either the government or market actors behave leading the situation. Besides, there are emerging hybrid modes of governance across the state-market community divisions such as co-management, public-private partnerships and social-private partnerships. This paper studies the promise that those modes of governance hold to improve the current environmental situation, and also

investigate some of the critical problems to which hybrid forms of environmental governance are also subject.

Padovano and Ricciuti (2008 ) deal with political competition and economic performance in OECD countries and in Italian Regions , the interaction of those topics generate a dilemma insofar as data tend to support the theory at the lower levels of government. The authors search to solve the dilemma through the larger set of policy instruments that reduces the tax price of votes at the national level compared to the subnational ones, therefore relaxing a binding constraint on national politicians' incentives to use altered redistributive policies to win contested elections, besides, constitutions typically reserve competencies with a high ideological potential to the national government, which further obfuscates swing voters' responsiveness to the economic performance of the central government.

Armijo and Gervasoni (2010) studied the competition and the participation as two dimensions of democracy, where they assumed that a increasing in democratic competition cause policy gradualism therefore generating fewer deep crises. At the same time if the democratic participation increases should increase the influence of relatively poor electors, who have a differentially strong aversion to deep growth crises. In addition, they concluded questioning the concept of formulating economic policy institutions that are intentionally insulated from the democratic context.



# **CHAPTER THREE**

## **RESEARCH METHODOLOGY**

This study is going to use the subgame perfect equilibrium in game theory to discover the influence of standards on market access of coffee producers from developing economies to specialized markets located in developed countries and to find whether producers and/or consumers benefit from the introduction of minimum quality standards under some scenarios. This chapter will begin with a brief introduction of some basic concepts in the game theory field before to introduce the notion of a subgame perfect equilibrium. Then, the concepts of backward induction and game tree will be explained.

### **3.1. Game theory**

Game theory provides taxonomy for economic contexts and situations, based on the strategic form (Kreps, 1990). It is the interaction among individual decision maker, all of whom are behaving purposefully, and whose decisions have implications for other people that make strategic decisions different from other decisions (Romp, 1997).

### **3.2. Extensive Games with Perfect Information**

According to Osborne and Rubinstein (1994), an extensive game is an explicit description of the sequential structure of the decision problems encountered by the players in a strategic situation. The model allows us to study solutions in which each player is assumed to consider his plan of action not only at the beginning of the game but also at any point of time at which he has to make a decision. By contrast, in strategic game we could talk about a plan covering unlimited contingencies, but the timing structure is “lost” and the model does not allow us to talk about a player reconsidering his strategy after some events in the game have unfolded.

A game is with perfect information if each player, when making any decision, is perfectly informed of all the events that have previously occurred.

### 3.3. Nash Equilibrium

The Nash equilibrium for a game is a strategy profile in which every player's strategy is optimal given that the other players use their equilibrium strategies. Change the strategy of any single player and the proposed strategies of the other players will often become suboptimal (Scott and Fernandez, 1998).

### 3.4. Subgame Perfect Equilibrium

A Nash equilibrium is subgame perfect if the players' strategies constitute a Nash equilibrium in every subgame (Selten, 1965). The notion of subgame perfect equilibrium eliminates Nash equilibria in which the players' threats are not credible (Osborne and Rubinstein, 1994).

In a game with perfect information, a subgame consists of a subset of the nodes and branches of the original game that, when taken together, constitute a game in themselves (Scott and Fernandez, 1998).

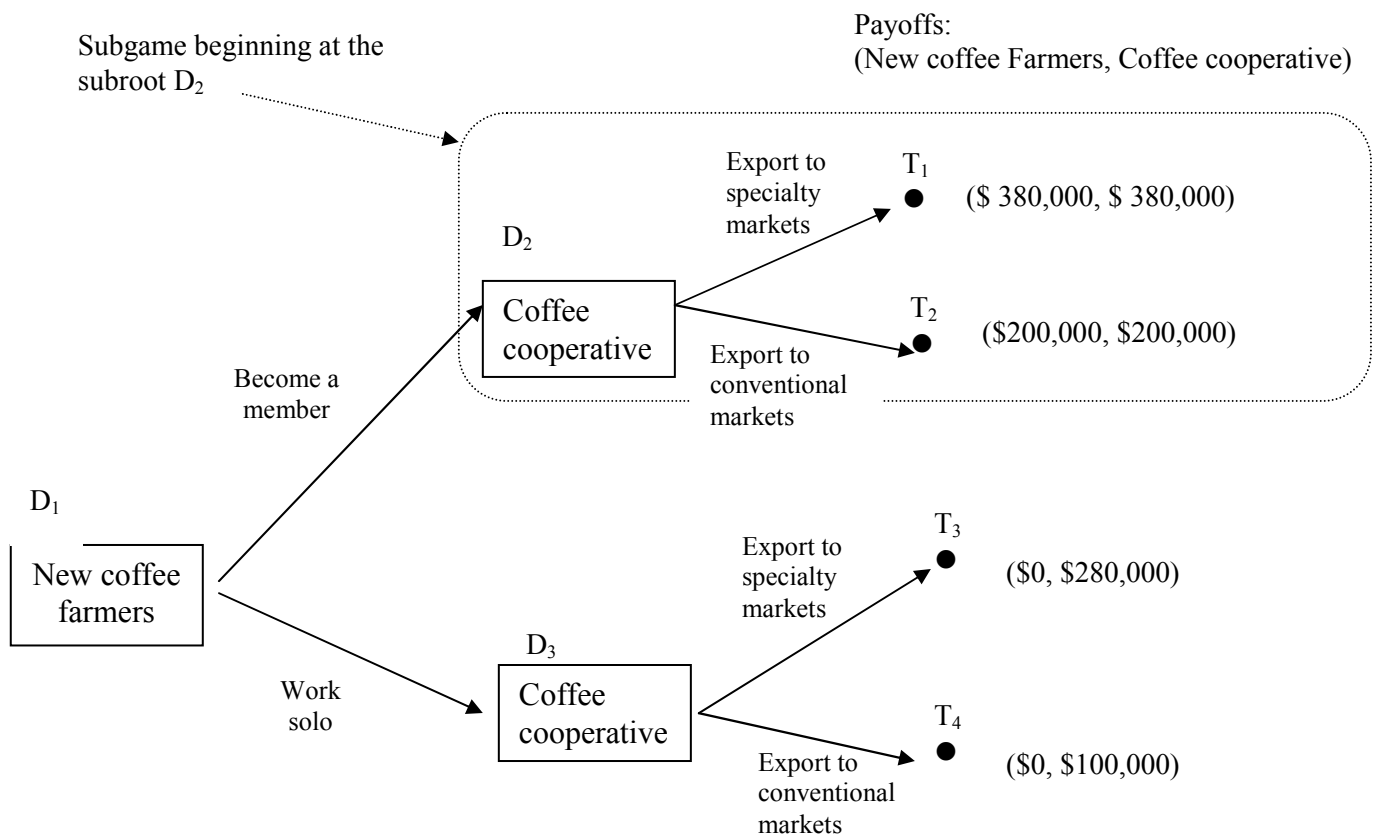


Figure 1. Coffee game and one of its two proper subgames.

Considering the figure above. It is a subgame that begins at  $D_2$ . This subgame has only one Nash Equilibrium, at this equilibrium the coffee cooperative chooses *export to specialty Markets*. But the Nash Equilibrium strategy profile {Work solo,(export to conventional markets, export to conventional markets)} requires Coffee Cooperative to choose enter at  $D_2$ . The nonoptimality of this strategy profile in the subgame makes the threat incredible. Coffee Cooperative's incredible threat is eliminated in equilibrium once we demand that Nash Equilibrium strategies remain Nash Equilibrium when applied to any subgame. A Nash with this property is said to be *subgame perfect* (Scott and Fernandez, 1998).

### 3.4.1. Game Tree

According to Scott and Fernandez (1998) a game tree is a powerful way to organize the information in order to determine the set of strategies for either firm. The game tree is a picture composed of nodes and branches. Each node in the game tree represents a decision point for one of the players and is said to belong to the players that moves at that point. To build a game tree we have to follow four rules:

Game tree rule 1: Every node is immediately preceded by at most one other node.

Game tree rule 2: No path in a tree connects a decision node to itself.

Game tree rule 3: Every node is the successor of a unique initial node.

Game tree rule 4: Every tree has exactly one initial node.

### 3.4.2. Backward induction

According to Scott and Fernandez (1998) the subgame perfect Nash equilibrium is normally deduced by "backward induction" from the various ultimate outcomes of the game, eliminating branches which would involve any player making a move that is not credible from that node.

Scott and Fernandez (1998) argued that the backward induction procedure has six steps, shown as follow:

Step 1: Start at the terminal nodes of the game and trace each one to its immediate predecessor, which will be a decision node for some player. These decision

nodes are either “trivial”, “basic” or “complex”. A decision node is basic if each of its branches leads to exactly one terminal node. A basic node with only one branch is trivial. A decision node is complex if it is not basic.

Step 2: Find the optimal move at each basic decision node reached in step 1 by comparing the payoffs the player obtains at each terminal node reached from this decision node.

Step 3: Erase all the nonoptimal branches that originate from each of the basic decision nodes you examined in step 2. Each of these basic decision nodes becomes trivial.

Step 4: Now we have a new game tree that is simpler than the original one. If in step 1 we arrived at the root of the tree, then it is now done.

Step 5: If we haven’t reached the root, then we have to go back to step 1 and start all over again. In this way we have to work our way step by step toward the root.

Step 6: For each player, collect together the optimal decisions at each of the player’s decision nodes. This collection of decisions constitutes that player’s optimal strategy in the game.

# CHAPTER FOUR

## THE MODEL

In this section we develop and analyze a duopoly model of vertical product differentiation, we shall use the basic model *a la* Motta (1993) and the model *a la* Ecchia and Lambertini (1997) to derive the MQS which maximize the social welfare.

We consider a duopolistic market for vertically differentiated coffee, where certified organic coffee represent a high quality product and conventional coffee represent the low quality product.

We depict the gradual scenario that usually face coffee producers from developing countries, starting since they work solo producing conventional coffee and selling their product to the local market, later those farmers decide to get together in micro, small, and medium-sized enterprises or cooperatives which aims to produce certified organic coffee for the local market under the national organic regulation, which in this paper represent the MQS under social welfare maximization set by the local government, then, those farmer associations proceed to reach their main goal which is to export their products to niche markets in developed countries where they are forced to achieve the organic regulations set by the importer country , it is worth to notice that in this research we will focus only in organic market as that specialized market or niche market.

In section 4.1 we analyze the case of closed economy, which comprise two scenarios, in the first one the coffee producers are working without standards, and in the second one we derive an optimal minimum quality standard under social welfare maximization. In section 4.2 we deal directly with the organic coffee trade between the exporter developing country and the importer developed country, where we assume that the developed country introduce an optimal minimum quality standard set under social welfare maximization. We shall use backward induction to derive the subgame perfect Nash equilibrium. Proceed to the next step



## 4.1. Closed Economy

In this section we start analyzing a basic duopoly model with vertical product differentiation under a scenario without standards. In the following scenario we derive an optimal minimum quality standard under social welfare maximization.

### 4.1.1. Two Producers without Standards

The following model is based on Motta (1993). Assume there are only two coffee firms working in the industry, firm 1 and 2, producing two vertically differentiated products. Firm 1, who produces the coffee with higher quality or good 1, will be called high-quality firm and firm 2 who produces the coffee with lower quality or good 2 will be called low-quality firm.

The game in this model consists of two stages. In the first stage each firm chooses the quality level of its product, the respective qualities are denoted as  $q_1$  and  $q_2$ , with  $q_1 > q_2$ . The quality upgrading cost is assumed to be  $kq_i^2/2$ ,  $i=1,2$ . This setting is a standard setting, see Aoki (2003). In the second stage we analyze the case of price competition through Bertrand model.

There is a unit mass of consumers located in the local market, uniformly distributed on  $[0,1]$  that differ in their tastes described by the parameter  $\theta$ . Consumers close to 1 represent consumers with a high taste for quality product as long as they get close to 0 represent to costumers with a low taste for quality product. Each consumer makes a single unit purchase at price  $p$ . Higher the quality of the acquired good and higher will be the utility  $\mathcal{U}$  reached by the consumers and equal to  $\mathcal{U} = \theta q - p$ . The indifferent consumer that find the good 1 and 2 equivalent and the marginal consumer who is indifferent between purchasing the good 1 and making not purchase are equal to  $\bar{\theta} = (p_1 - p_2)/(q_1 - q_2)$  and  $\underline{\theta} = p_2/q_2$  respectively. For the latter, the purchase of the good with quality 2 will imply zero utility level.  $\theta$  has a direct connection to consumers' income (i.e. only consumers with a higher  $\theta$  will be willing to pay for the higher quality good). It is assumed that there are fixed costs of quality equal to  $kq_i^2/2$ .

In the second stage of the game, firms set prices. At this stage, costs of quality development have been already sunk, without loss of generality we take this cost to be zero. Quantities demanded to the high and low quality firm are defined by  $x_1 = 1 - (p_1 - p_2)/(q_1 - q_2)$  and  $x_2 = (p_1 - p_2)/(q_1 - q_2) - (p_2/q_2)$  respectively.

Accordingly, the profit function of the two firms can be specified as follow

$$\pi_1 = p_1 x_1 - \frac{k}{2} q_1^2, \quad (1a)$$

$$\pi_2 = p_2 x_2 - \frac{k}{2} q_2^2. \quad (1b)$$

Using backward induction we first have to derive the equilibrium for the price setting sub-game, subject to their previous choices of quality provided for the product, obtaining the following first-order conditions:

$$\frac{\partial \pi_i}{\partial p_i} = \frac{p_i \partial x_i}{\partial p_i} + x_i = 0, \quad i = 1, 2. \quad (2)$$

Solving (2) yields the equilibrium prices as,

$$p_1 = \frac{2q_1(q_1 - q_2)}{4q_1 - q_2}, \quad (3a)$$

$$p_2 = \frac{q_2(q_1 - q_2)}{4q_1 - q_2}. \quad (3b)$$

Substituting the prices into the marginal consumer preferences, we have:

$$\bar{\theta} = \frac{2q_1 - q_2}{4q_1 - q_2}, \quad (4a)$$

$$\underline{\theta} = \frac{q_1 - q_2}{4q_1 - q_2}. \quad (4b)$$

Having the value of the marginal consumer preferences, we calculate the quantities demanded to the high and low quality firm as follow:

$$x_1 = \frac{2q_1}{4q_1 - q_2}, \quad (5a)$$

$$x_2 = \frac{q_1}{4q_1 - q_2}. \quad (5b)$$

We now look for solutions of the quality game. Firms will choose their quality specification to maximize their profits,  $\pi_i = p_i x_i - k/2 q_i^2$  for  $(i = 1, 2)$ , the first order conditions of this problem are:

$$\frac{\partial \pi_1}{\partial q_1} = \frac{4q_1(4q_1^2 - 3q_1q_2 + 2q_2^2)}{(4q_1 - q_2)^3} - kq_1 = 0, \quad (6a)$$

$$\frac{\partial \pi_2}{\partial q_2} = \frac{q_1^2(4q_1 - 7q_2)}{(4q_1 - q_2)^3} - kq_2 = 0. \quad (6b)$$

Now, rewrite (6a) and (6b) by bringing  $q_1$  and  $q_2$  on the right hand side of their respective equalities. After substituting and re-arranging, one obtains:

$$4q_1^3 - 23q_1^2q_2 + 12q_1q_2 - 8q_2^3 = 0. \quad (7)$$

Set  $q_1 = Aq_2$ , with  $A \geq 1$  (recall that  $u_1$  is the higher quality, which allows us to do this transformation), so that (6) can be rewritten as:

$$4A^3 - 23A^2 + 12A - 8 = 0. \quad (8)$$

The only solution (in the real numbers and greater than one) is  $A = 5.2512$ .

Replacing this value back into the first-order conditions and using the relationship  $q_1 = Aq_2$ , we obtain the equilibrium qualities as follow:

$$q_1 = \frac{0.2533}{k}, \quad q_2 = \frac{0.0482}{k}. \quad (9)$$

This result is similar from the one found by Motta (1993) after setting  $k = 1$  (See table 1 on page 122 of Motta, 1993). In addition, the use of the model *a la* Motta (1993) allows for a quality differences between firms, hence relaxing the price competition on the market. We also confirm the results found by Aoki (1996) whose findings showed that in a vertically differentiated duopoly where firms choose first qualities simultaneously and compete in prices and are not forced to meet any quality standard, the firm supplying the high quality product earns higher profit and therefore higher market sales, meanwhile the low quality firm earns a lower profit.

### 4.1.2. Minimum quality standards (MQS) and social welfare maximization

In this section, the model is based on Ecchia and Lambertini (1997). In this scenario the producers work and sell their products to the local market and are regulated by the national organic regulation. We present the organic regulation as MQS which is set by the local government in pursuit of domestic social welfare maximization. When products are bounded by MQS, we depict the situation in a 3-stage game.

In the first stage, the domestic governments determine the MQS in order to pursue social welfare maximization. In the second stage, the producers set their product quality under the regulation of MQS. In the last stage, the producers compete in a Bertrand fashion in the market. We use backward induction to derive the subgame perfect Nash equilibrium. The equilibrium obtained through Bertrand competition in this stage is the same as that derived in (2) and shall not be repeated here.

As in the prior scenario the firm 1 represent the high quality firm 1 and firm 2 represent the low quality firm. With an MQS set by the government, both firms are forced to set the quality level above the MQS. In most of cases is the low quality firm which is obligated to increase its quality level to meet the standard and it is not necessary to force the high quality firm because it is already above the standard. Then, because we assume this is the case during the whole analysis, the low-quality firm has to comply with the MQS, i.e.  $q_2 = \underline{q}$ , therefore, the profit functions of the two firms in the second stage are, respectively:

$$\pi_1 = p_1 x_1 - \frac{k}{2} q_1^2, \quad (10a)$$

$$\pi_2 = p_2 x_2 - \frac{k}{2} \underline{q}^2. \quad (10b)$$

The high-quality firm determines its quality level by solving the first-order condition for profit maximization of (10a), which is:

$$\frac{d\pi_1}{dq_1} = \frac{4q_1(4q_1^2 - 3q_1\underline{q} + 2\underline{q}^2)}{(4q_1 - \underline{q})^3} - kq_1 = 0. \quad (11)$$

Besides, fully differentiating (11) and rearranging terms, we obtain:

$$\frac{dq_1}{d\underline{q}} = -\frac{\pi_{1q_1\underline{q}}}{\pi_{1q_1q_1}} > 0, \quad (12)$$

where  $\pi_{1q_1q_1} = -8\underline{q}^2(5q_1 + \underline{q}) / (4q_1 - \underline{q})^4 - k < 0$  and  $\pi_{1q_1\underline{q}} = 8q_1\underline{q}(5q_1 + \underline{q}) / (4q_1 - \underline{q})^4 > 0$ .

The expression in (12) indicates the impact of the MQS on the quality level of the high-quality firm, and shows that it will increase with a more stringent MQS.

Now, we move to the first-stage game. Suppose in this stage that the local government sets an MQS to maximize social welfare  $W$ , which is composed of consumer surplus and producer surplus, and is expressed through the following social welfare function:

$$SW^s = \int_{p_2/\underline{q}}^{(p_1-p_2)/(q_1-\underline{q})} (\theta\underline{q} - p_2) d\theta + \int_{(p_1-p_2)/(q_1-\underline{q})}^1 (\theta q_1 - p_1) d\theta + \pi_1 + \pi_2, \quad (13)$$

where, the two definite integrals in the right-hand side of the welfare function represent the consumer surplus generated from the low and the high quality products respectively. The superscript  $s$  refers to the variables under a scenario of a closed economy with standards.

The welfare-maximizing MQS is derived by maximizing the social welfare function with respect to  $\underline{q}$  as follows:

$$\frac{dW}{d\underline{q}} = \frac{\partial W}{\partial q_1} \frac{dq_1}{d\underline{q}} + \frac{\partial W}{\partial \underline{q}} = 0. \quad (14)$$

Utilizing (11) and (12) to solve (14), we obtain the welfare-maximizing MQS as follows:

$$\underline{q}^s = 0.170216 / k. \quad (15a)$$

Given the welfare-maximizing MQS (15a) and substituting it into (11) yields the optimal quality of the high-quality firm as follows:

$$q_1^s = 0.293324 / k. \quad (15b)$$

By simple comparison with Motta (1993), we obtain the following proposition.

**Proposition 1.** *In a closed economy, the profit of the firms with MQS is smaller than that without MQS. In addition, the MQS is effective.*

When firms operate without the regulation of MQS, their profit is positive ( $\pi_1 = 0.0244 / k$ ,  $\pi_2 = 0.0015 / k$ ) and greater than that regulated by MQS ( $\pi_1 = -0.0009 / k$ ,  $\pi_2 = -0.0084 / k$ ).

The reason of this result is that when governments take the social welfare into consideration, they not only care for the profit of firms, but also for the surplus of consumers. When more consumers are served, the social welfare becomes higher. A higher quality standard raises market size. The market size is larger with a higher MQS. Thus MQS is been pushed up to exceed the low quality level.

These findings coincide with Crampes and Hollander (1995) who consider a duopolistic market with single-product firms and show that the introduction of the MQS causes the reduction of product differentiation in the market. However, we differ with their results that show that the introduction of a MQS enlarges the profit of the low quality firm while the profit of the high quality firm is reduced.

In addition, we showed that the standards create a higher entry barrier for new entrants in a value chain and represent a challenge for the firms that exist in the market because the profits of the firms are lower after the government set an MQS in order to maximize the social welfare. However, the government might subsidize both firms in order to keep them in the market at the level that firm 1 and 2 make at least zero profit. We show and compare these results in the following table:

Table 1. Comparison of the Social Welfare under the scenarios without standards, with standards and subsidy scenario

| Scenario without standards             |                       |                       |
|--|-----------------------|-----------------------|
| $SW = 0.0691 / k$                      | $\pi_1 = 0.0244 / k$  | $\pi_2 = 0.0015 / k$  |
| Scenario with standards                |                       |                       |
| $SW = 0.0772 / k$                      | $\pi_1 = -0.0009 / k$ | $\pi_2 = -0.0084 / k$ |
| The government subsidizes firm 1 and 2 |                       |                       |
| $SW = 0.0772 / k$                      | $\pi_1 = 0$           | $\pi_2 = 0$           |

We can see in table 1 that if the government set the standards and subsidizes firm 1 and 2 in order to keep them in the market, the social welfare is not altered. Hence, we infer that the government will agree on setting the standards and subsidizing both firms.



## 4.2. Open Economy

In this section, we move to the scenario where the coffee firms proceed to reach their main goal which is to export their products to the market in developed countries. In order to export to the developed country, these coffee firms are forced to achieve the organic regulations set by the importing country.

### 4.2.1. Minimum Quality Standard and Social Welfare Maximization

In this scenario we analyze the influence of the introduction of an MQS in a developed country. We imagine that the importing country sets an MQS to regulate the entrance of organic products in the country; this MQS is set in pursuit of social welfare maximization. This standard is supposed to be higher than the quality level of the low quality firm and lower than the quality level of the high quality firm. This fact binds the low quality firm to comply with the MQS, i.e.  $q_2 = \underline{q}$ .

As in the prior scenario, this game consists of three stages. In the first stage the developed country sets an MQS in pursuit of maximum social welfare; in the second stage, subject to the MQS, firms decide on the level of their product quality; finally in the third stage, the two firms compete in Bertrand fashion. We use backward induction to derive the subgame perfect equilibrium. Because the equilibrium of the third and second stage are the same as those prevailing in (2) and (11), we need only to calculate the MQS in the first stage.

The social welfare is composed by the consumer surplus generated from the low ( $CS_1$ ) and the high quality ( $CS_2$ ) products only.

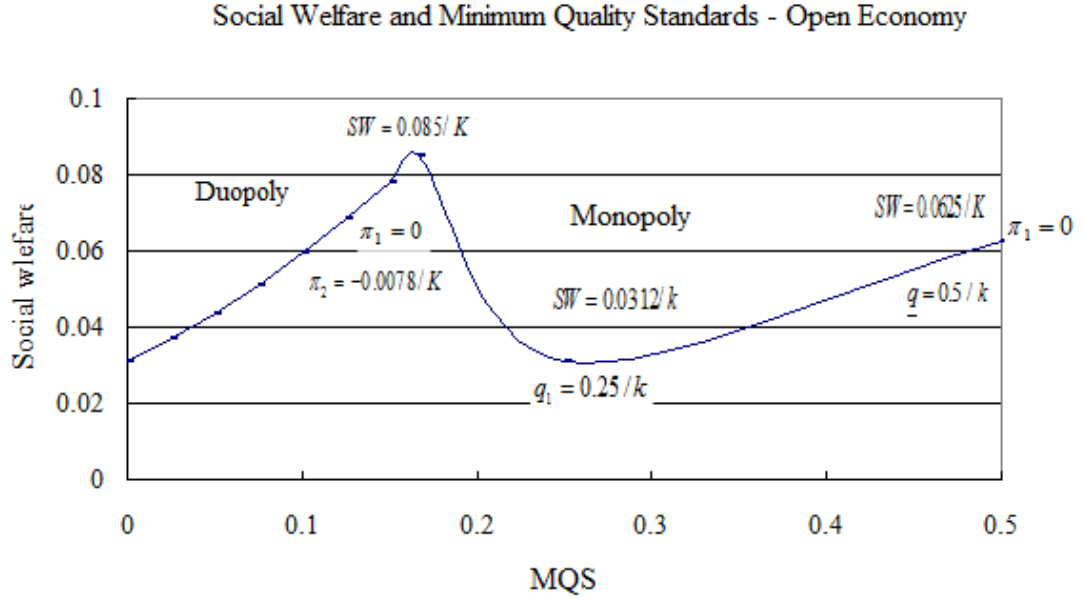


Figure 2. Behavior of Social Welfare with Respect to MQS - Open Economy

In figure 3 we can see that the social welfare is increasing with a higher MQS. The highest level the MQS can reach is set by the zero-profit condition of the high quality firm. The result of table 2 reveals that if the importing country imposes an MQS so that the high quality firm supplies in the market making zero profit, the social welfare is the largest.

As the MQS increases, the low quality firm no longer finds it profitable to stay in the market for a MQS equal to  $\underline{q}^o = 0.1666/k$  it generates negative profit (see table 2).

Substituting the MQS value into equation (11) yields the optimal quality standard of the high quality firm as follows:  $q_1^o = 0.2916/k$ . At the same time the maximizing social welfare under MQS is equal to  $SW^o = 0.0850/k$ . The superscript  $o$  refers to the variables under an open economy.

There is another possibility that the low quality firm exit the industry, the domestic market starts to be supplied by a foreign monopoly, in this case the social welfare is composed by the consumer surplus generated from the high quality good only and behaves increasing in the MQS and reaches its maximum at a quality level of  $\underline{q}^M = 0.5/k$ . The superscript  $M$  refers to the variables under foreign monopoly. It is

worthy to recall that at this point the foreign monopolist makes zero profits. These results are summarized in the following proposition.

**Proposition 2** *The highest MQS social welfare maximizing blocks the entry of the low quality exporter firm and the market becomes a monopoly controlled by the high quality exporter firm. In addition, the MQS social welfare maximizing in an open economy is smaller ( $0.1666 / k$ ) than that of a closed economy ( $0.1702 / k$ ).*

Besides, in an open economy the social welfare under the MQS social welfare maximizing is greater (  $SW^o = 0.0850 / k$  ) than that in a closed economy (  $SW^{ws} = 0.0691 / k$  ,  $SW^s = 0.0772 / k$  ) and greater under a monopoly case (  $SW^M = 0.0312 / k$  ) as well.

We can see how the choice of the MQS alters social welfare for the importing country. Because the SW is much larger if both companies stay in the market, the importing country might subsidize to the low quality firm through development programs in developing countries to increase the market access in order to allow both of them stay in the market and avoid a monopoly case.

Comparing the scenarios without and with standards in a closed economy case we found that like Ecchia and Lambertini (1997) since the minimum quality standards are higher than the lower quality previously offered in the market in absence of regulation the quality levels produced in the market tend to increase. In the open economy scenario we see that when firms engage under prices competition the highest minimum quality standards will give rise to the highest social welfare, meanwhile the benefit of both companies will decrease, and the firm 2 is making loss. These latter results reversed the findings of Valletti (2000) who engaged in Cournot competition and has shown that when quantity setting behavior is assumed overall welfare is decreasing with the implication that a MQS should not be adopted in such market.

### 4.2.2. Minimum Quality Standard under Initiative Democracy

In this section, we shall derive the optimal MQS under an initiative process depicting the European Union society in the context of the treaty of Lisbon.

Following the Lisbon treaty that introduced the citizens' initiative, a particular policy proposal can be request to bring forward to the European commission by one million EU citizens'. Once the signatures from citizens have been collected, the petition will be registered with the commission and a decision made on whether the initiative falls within the scope of its powers.

In our model the citizens want to obtain the appropriated MQS with the objective to maximize their utility  $V^i$ . Hence, the citizens will try to initiate the MQS if they are aware that it raises their wealth.

This democratic scenario has three stages. At the first stage, citizens choose for the appropriated MQS to regulate the market of products and maximize their utility  $V^i = \theta^i q_i - p_i$ ; in the second stage, subject to the MQS the exporter firms determine simultaneously their quality levels; in the last stage the firms compete in prices.

Because the equilibrium of the third and second stage are the same as those prevailing in (2) and (11), we need only to deal with the MQS in the first stage.

We proceed to analyze the effect of the MQS on the individual utility of the high and low quality consumers, as follow:

$$\frac{dV_1^i}{d\underline{q}} = \theta_1^i \frac{dq_1}{d\underline{q}} - \left( \frac{\partial p_1}{\partial q_1} \frac{dq_1}{d\underline{q}} + \frac{\partial p_1}{\partial \underline{q}} \right), \quad (16a)$$

$$\frac{dV_2^i}{d\underline{q}} = \theta_2^i - \left( \frac{\partial p_2}{\partial q_2} \frac{dq_1}{d\underline{q}} + \frac{\partial p_2}{\partial q_1} \right). \quad (16b)$$

Using equation (10), in appendix D we show that the increment of MQS raises the utility of both the high and the low quality consumers. Therefore, we can infer that there will be a high expectation of the citizens to initiate a highest MQS.

However, as we have demonstrated in the scenario of MQS under social welfare maximization, the MQS will reach its maximum level when only the high quality firm

stay in the market and is making zero profit, at this point the utility of the high quality consumers is  $V_1^i = (0.5\theta_1^i - 0.25)/k$ , which compared to the utility acquired by consuming the products from a duopoly market that is  $V_1^i = (0.2916\theta_1^i - 0.0729)/k$ , we can see that the individual utility is larger under a monopoly. This leads to proposition 3.

**Proposition 3** *If a high MQS offers a high utility to both types of consumers, then, all of them will prefer initiate a more demanding standard which might force company 2 to drop the market ,and it will start to be served by a foreign monopoly.*

Hence, we conclude that the initiative process work as an entry barrier against the market access of firms from developing countries to developed markets, because the citizens will try to initiate such policy to increase their wealth, therefore a very demanding MQS in the importing country become this market less attractive for any exporter firm. In this way farmers association from developing countries are forced to search for new export markets where the set standards don't prejudice their profits.

# **CHAPTER FIVE**

## **CONCLUSIONS AND SUGGESTIONS**

The major of this study is to discover the influence of standards on market access of coffee producers from developing economies to specialized markets located in developed countries. Based on the results, several conclusions can be drawn. The research findings will be presented at the first and the managerial will be given later. Suggestion for future also will be provided in this chapter.

### **5.1. Research Findings**

In this context, we demonstrated that the introduction of the optimal MQS limits firms' access to markets. We confirmed that although the introduction of the highest MQSs maximizes social welfare, there is a reduction in the profits of the high-quality firm and the low-quality firm bears losses. This fact gives rise to the possibility that the importing market is monopolistic. Besides, we have noticed that if the low-quality firm exits the scenario and a monopolistic firm begins supplying to the market, the importing country's social welfare will decrease dramatically.

The gradual scenario represented the real case of coffee producers from developing countries, organized into micro, small, and medium-size enterprises or cooperatives, which first begin working in the local economy and subsequently seek opportunities to export their products to niche markets in developed countries like the organic market.

Furthermore, this study has shown that because the coffee belongs to a commodity market where the price goes up and down which means that if prices drop very much it could be very hard for the farmers, hence it is important for farmers to concentrate in a high quality, not in the most quantity because the highest quality coffee creates a separated specialty market that is somehow immune from the commodity prices because consumers pay according to the quality and farmers don't have to worry about price fluctuation.



## **5.2. Implications**

This paper implies that such farmers first need to organize themselves into cooperatives or associations in order to gain access to information, financial credit, technology, and build capacity, which would facilitate increased access to specialty markets such as the organic market. In addition, nowadays we can find social enterprise models which cares to build strong supply chains, investing in the overall health of the specialty coffee industry, support farmers and roasters, and use innovative technologies to make sure that farmers and roasters are communicating, learning, and developing transparent, long-term relationships that aid in the health of the sustainable coffee market.

## **5.3. Limitations**

The limitations of the research are discussed in order to focus attention when applying research result. In this study the representation of the organic standards as MQS is hypothetical. Thus, the application of high quality standards is needed for better justification of the proposed model.

The addition of other relevant factors in this context such as the technology investment, certification costs, and the fierce competition between the small farmer cooperatives and associations with the big coffee firms are also needed for more convincing results.

## **5.4. Research Suggestions**

This study would recommend that future researchers need to use more variables such as the technology investment, certification costs, to study the impact of the standards on the market access from developing economies to specialized markets. Besides, the setting used in this research could be improved to fill the existing wage gap of worker.

The results of the model can also be reinforced with data collection from the

whole coffee supply chain and contrasted with the results produced by subgame perfect equilibrium.

Finally, this type of research should be duplicated using different types of the existing environmental ecolabels and adding the respective social implications to those surveys. A comparison of differences among those surveys would be interesting.

Table 2. Equilibrium Values, under a Closed and an Open Economy

| I. Closed Economy Case |                           |                |                    |             |            |                      |                   |
|------------------------|---------------------------|----------------|--------------------|-------------|------------|----------------------|-------------------|
|                        | MQS: $\underline{q}$      | $q_1$          | $\pi_1$            | $\pi_2$     | $SW$       | $\underline{\theta}$ | $X_1$ $X_2$       |
| Without Standards      | $0.0482/k^*$              | $0.2533/k$     | $0.0244/k$         | $0.0015/k$  | $0.0691/k$ | $0.2125$             | $0.5250$ $0.2625$ |
| With Standards         | $0.1702/k$                | $0.2933/k$     | $-0.0009/k$        | $-0.0084/k$ | $0.0772/k$ | $0.1227$             | $0.5848$ $0.2924$ |
| II. Open Economy Case  |                           |                |                    |             |            |                      |                   |
|                        | MQS: $\underline{q}$      | $q_1$          | $\pi_1$            | $\pi_2$     | $SW$       | $\underline{\theta}$ | $X_1$ $X_2$       |
| duopoly                | $0.1666/k$                | $0.2916/k$     | $0$                | $-0.0078/k$ | $0.0850/k$ | $0.1250$             | $0.5833$ $0.2916$ |
| Monopoly**             | $\underline{q}^M = 0.5/k$ | $q^M = 0.25/k$ | $\pi^M = 0.0312/k$ | -----       | $0.0312/k$ | ---                  | $x^M = 0.5$ ----  |

Legend: MQS = Minimum quality Standards; SW = Social Welfare. See text for other notations.

\* corresponds to  $q_2$  i.e., the equilibrium quality of the low-quality firm.

\*\* The superscript  $M$  denotes the values of the high-quality firm under the monopoly case.

## **APPENDIX**

## Appendix A. Closed Economy. MQS and social welfare maximization. Procedure to obtain the welfare-maximizing MQS

In a closed economy, welfare comprises consumers' surplus and producers' surplus, which is represented in the following manner:

$$W = \int_{p_2/\underline{q}}^{(p_1-p_2)/(q_1-\underline{q})} (\theta \underline{q} - p_2) d\theta + \int_{(p_1-p_2)/(q_1-\underline{q})}^1 (\theta q_1 - p_1) d\theta + \pi_1 + \pi_2 \quad (\text{A.1})$$

Solving (A.1), we obtain the following equation:

$$W = \frac{q_1(12q_1^2 - q_1q_2 - 2q_2^2)}{2(-4q_1 + q_2)^2} - \frac{k}{2}q_1^2 - \frac{k}{2}q_2^2. \quad (\text{A.2})$$

In order to derive the optimal MQS, we differentiate (A.2) with respect to  $\underline{q}$  using the following welfare maximizing function:

$$\frac{dW}{d\underline{q}} = \frac{\partial W}{\partial q_1} \frac{dq_1}{d\underline{q}} + \frac{\partial W}{\partial \underline{q}}. \quad (\text{A.3})$$

In order to facilitate the process of deriving the optimal MQS (A.3), we establish that  $A = q_1 / \underline{q}$ , where  $A \geq 1$ .

Now, solving each of the values in order to deal with (A.3), originally we have

$$\frac{\partial W}{\partial \underline{q}} = \frac{20q_1^3 - 17q_1^2 \underline{q}}{2(4q_1 - \underline{q})^3} - \underline{q}k, \quad (\text{A.4})$$

$$\frac{\partial W}{\partial q_1} = \frac{24q_1^3 - 18q_1^2 \underline{q} + 5q_1 \underline{q}^2 + \underline{q}^3}{(4q_1 - \underline{q})^3} - q_1k. \quad (\text{A.5})$$

We are required to deal with  $\underline{q}$  and  $q_1$  in (A.4) and (A.5), respectively and subsequently, use equation (11) in order to convert the data into  $A$ , which yields

$$q_1 = \frac{16A^3 - 12A^2 + 8A}{(4A - 1)^3 k}. \quad (\text{A.6})$$

Dividing both sides of (A.6) by  $\underline{q}$  yields the value of  $\underline{q}$  in terms of  $A$ , which is represented by the following equation:

$$\underline{q} = \frac{16A^2 - 12A + 8}{(4A - 1)^3 k}. \quad (\text{A.7})$$

Substituting (A.6) and (A.7) into (A.4) and (A.5), respectively and converting the other terms of the expression into  $A$ , we obtain the following equations:

$$\frac{\partial W}{\partial \underline{q}} = \frac{20A^3 - 49A^2 + 24A - 16}{2(4A - 1)^3}, \quad (\text{A.8})$$

$$\frac{\partial W}{\partial q_1} = \frac{8A^3 - 6A^2 - 3A + 1}{(4A - 1)^3}. \quad (\text{A.9})$$

Simultaneously, we work on an equation in order to analyze the impact of the MQS on the quality level of the high-quality firm (such a result is obtained by totally differentiating the profit of the high-quality firm, i.e.,  $\pi_1 q_1 \underline{q} d\underline{q} + \pi_1 q_1 q_1 dq_1 = 0$ ), in the following manner:

$$\frac{dq_1}{d\underline{q}} = -\frac{\pi_{1q_1 \underline{q}}}{\pi_{1q_1 q_1}} > 0. \quad (\text{A.10})$$

Solving (A.10) yields

$$\frac{dq_1}{d\underline{q}} = \frac{-40q_1^2 \underline{q} - 8q_1 \underline{q}^2}{-40q_1 \underline{q}^2 - 8\underline{q}^3 - k(4q_1 - \underline{q})^4}. \quad (\text{A.11})$$

We convert the terms of equation (A.11) to  $A$ ; however, we are first required to ascertain the value of  $k$  in the function of  $q_1$  and  $\underline{q}$ . We use equation (11) in order to obtain the value of  $k$  and obtain the following equation:

$$\frac{dq_1}{d\underline{q}} = \frac{-40A^2 - 8A}{-64A^3 + 64A^2 - 84A} > 0. \quad (\text{A.12})$$

Substituting (A.8), (A.9), and (A.12) into (A.3), the only solution (in real numbers and greater than one) is  $A = 1.72325$ . By re-substituting this value into the first order conditions and using the relationship  $A = q_1 / \underline{q}$ , we obtain the welfare maximizing MQS and the optimal quality of a high-quality firm.

## **Appendix B. Open Economy. MQS and social welfare maximization. Procedure to obtain the welfare-maximizing MQS**

In order to determine the impact of the MQS on  $SW$  in an open economy, we differentiate the social welfare function with respect to  $\underline{q}$ , which yields

$$\frac{dSW}{d\underline{q}} = \frac{dCS_1}{d\underline{q}} + \frac{dCS_2}{d\underline{q}}, \quad (\text{B.1})$$



where the impact of the MQS on  $CS_1$  and  $CS_2$  is

$$\frac{dCS_1}{dq} = \frac{\partial CS_1}{\partial q_1} \frac{dq_1}{dq} + \frac{\partial CS_1}{\partial q} = \frac{q_1^2(64q_1^4 - 48q_1^3 q + 68q_1^2 q^2 + q_1 q^3 - 4q^4)}{2(4q_1 - q)^3(16q_1^3 + 21q_1 q^2 - 16q_1^2 q)} > 0, \quad (B.2)$$

$$\frac{dCS_2}{dq} = \frac{\partial CS_2}{\partial q_1} \frac{dq_1}{dq} + \frac{\partial CS_2}{\partial q} = \frac{2q_1^2(96q_1^4 - 40q_1^3 q + 88q_1^2 q^2 - 5q_1 q^3 - 4q^4)}{(4q_1 - q)^3(16q_1^3 + 21q_1 q^2 - 16q_1^2 q)} > 0, \quad (B.3)$$

In order to identify the behavior of social welfare with respect to the MQS, we replace (B.2) and (B.3) for analyzing the sign of the equation through the following factoring process,

$$\begin{aligned} \frac{dSW}{dq} &= \frac{q_1^2(112q_1^3 - 24q_1^2 q + 99q_1 q^2 + 20q^3)}{2(4q_1 - q)^2(16q_1^3 + 21q_1 q^2 - 16q_1^2 q)} = \frac{q_1^2(88q_1^3 + 24q_1 q_1^2 - 24q_1^2 q + 99q_1 q^2 + 20q^3)}{2(4q_1 - q)^2(21q_1 q^2 + 16q_1^2 q_1 - 16q_1^2 q)} \\ \frac{dSW}{dq} &= \frac{q_1^2(88q_1^3 + 24q_1^2(q_1 - q) + 99q_1 q^2 + 20q^3)}{2(4q_1 - q)^2(21q_1 q^2 + 16q^2(q_1 - q))} \end{aligned} \quad (B.4)$$

Since  $q_1 > q$  and the predominant sign of the equation outside the parentheses ( $q_1 q$ ) is positive, the sign of the entire equation is positive, which implies that the social welfare increases with the introduction of the MQS.

In order to determine the value of the welfare-maximizing MQS, we demonstrate that the MQS established by the importing country permits only the high-quality firm to supply to the market while making zero profits.

$$\pi_1 = p_1 x_1 - \frac{k}{2} q_1^2 = 0. \quad (B.5)$$

In order to support (B.5), we use the reaction function for firm 1 in the following manner:

$$\frac{d\pi_1}{dq_1} = \frac{4q_1(4q_1^2 - 3q_1 q + 2q^2)}{(4q_1 - q)^3} - kq_1 = 0. \quad (B.6)$$

Now, solving (B5) and (B6) simultaneously, we obtain the welfare maximizing MQS as  $q^o = 0.1666/k$  and the optimal quality of the high-quality firm as  $q_1^o = 0.2916/k$ .

### Appendix C. Open Economy. Analysis in the case of a monopoly

In a monopoly, the profit of the single firm that exists in the market is represented as

$$\pi^M = p_1 x_1 - \frac{k}{2} q_1^2. \quad (C.1)$$

First, maximizing with respect to  $p_1$  and subsequently, with respect to  $q_1$ , we obtain  $x^M = 0.5$ ,  $q^M = 0.25/k$ , and  $\pi^M = 0.0312/k$ . The superscript  $M$  denotes the value of the high-quality firm in the case of a monopoly.

In a monopoly, the social welfare function is equal to the consumer surplus of the only firm supplying in the market and is represented in the following manner:

$$SW^M = CS_1 = \int_{(p_1 - p_2)/(q_1 - \underline{q})}^1 (\theta q_1 - p_1) d\theta, \quad (C.2)$$

Solving the social welfare equation yields  $SW^M = 0.0312/k$ .

In order to determine the value of the welfare-maximizing MQS, we will proceed in the same manner as in appendix (B.4), where the high-quality firm supplies to the market while making zero profits.

$$\pi^M = p_1 x_1 - \frac{k}{2} q_1^2 = 0. \quad (C.3)$$

Solving (C.3), we obtain the limit of the high-quality firm i.e., the only supplier in the market, as  $q^{Mmq} = 0.5/k$ .

#### **Appendix D. Determining MQS using an initiative process under a democratic regime. Identifying the impact of MQS on high- and low-quality consumers.**

Individual utility may be re-expressed in the following manner:

$$V^i = \theta^i q_i - p_i. \quad (D.1)$$

From (D.1), we derive the impact of the MQS on the individual utility of high- and low-quality of consumers, which is represented as

$$\frac{dV_1^i}{dq} = \theta_1^i \frac{dq_1}{dq} - \left( \frac{\partial p_1}{\partial q_1} \frac{dq_1}{dq} + \frac{\partial p_1}{\partial q} \right), \quad (D.2)$$

$$\frac{dV_2^i}{dq} = \theta_2^i - \left( \frac{\partial p_2}{\partial q_1} \frac{dq_1}{dq} + \frac{\partial p_2}{\partial q} \right). \quad (D.3)$$

In order to identify the consumers who enjoy an optimal MQS, equating (D2) and (D3) to zero and solving them yields the following equations:

$$\theta_1^* = \left( \frac{\partial p_1}{\partial q_1} \frac{dq_1}{dq} + \frac{\partial p_1}{\partial q} \right) / \frac{dq_1}{dq} \quad (D.4)$$

$$\theta_2^* = \left( \frac{\partial p_2}{\partial q_1} \frac{dq_1}{d\underline{q}} + \frac{\partial p_2}{\partial \underline{q}} \right). \quad (\text{D.5})$$

Applying equation (3) in order to solve (D.4) and (D.5) yields

$$\frac{\partial p_1}{\partial q_1} = \frac{8q_1^2 - 4q_1\underline{q} + 2\underline{q}^2}{(4q_1 - \underline{q})^2}, \quad \frac{\partial p_1}{\partial \underline{q}} = \frac{-6q_1^2}{(4q_1 - \underline{q})^2}; \quad (\text{D.6})$$

$$\frac{\partial p_2}{\partial q_2} = \frac{4q_1^2 - 8q_1\underline{q} + \underline{q}^2}{(4q_1 - \underline{q})^2}, \quad \frac{\partial p_2}{\partial q_1} = \frac{3q_1^2}{(4q_1 - \underline{q})^2}. \quad (\text{D.7})$$

Replacing the values from (D.6), (D.7) and equation (7) into (D.4) and (D.5)

respectively, solving we have:

$$\theta_1^* = \frac{8q_1^2 - 4q_1\underline{q} + 2\underline{q}^2}{(4q_1 - \underline{q})^2} + \frac{-6q_1^2(8\underline{q}^2(5q_1 + \underline{q}) + (4q_1 - \underline{q})^4 k)}{(4q_1 - \underline{q})^2 8q_1\underline{q}(5q_1 + \underline{q})}, \quad (\text{D.8})$$

$$\theta_2^* = \frac{3q_2^2}{(4q_1 - \underline{q})^2} \frac{8q_1\underline{q}(5q_1 + \underline{q})}{(8\underline{q}^2(5q_1 + \underline{q}) + (4q_1 - \underline{q})^4 k)} + \frac{4q_1^2 - 8q_1\underline{q} + \underline{q}^2}{(4q_1 - \underline{q})^2}. \quad (\text{D.9})$$

Comparing (D.8) and equation (4a), which represents the taste parameters of high-quality consumers, yields the following:

$$\theta_1^* - \bar{\theta} = -\frac{\underline{q}}{4q_1 - \underline{q}} - \frac{3q_1 k (4q_1 - \underline{q})^2}{4\underline{q}(5q_1 + \underline{q})} < 0. \quad (\text{D.10})$$

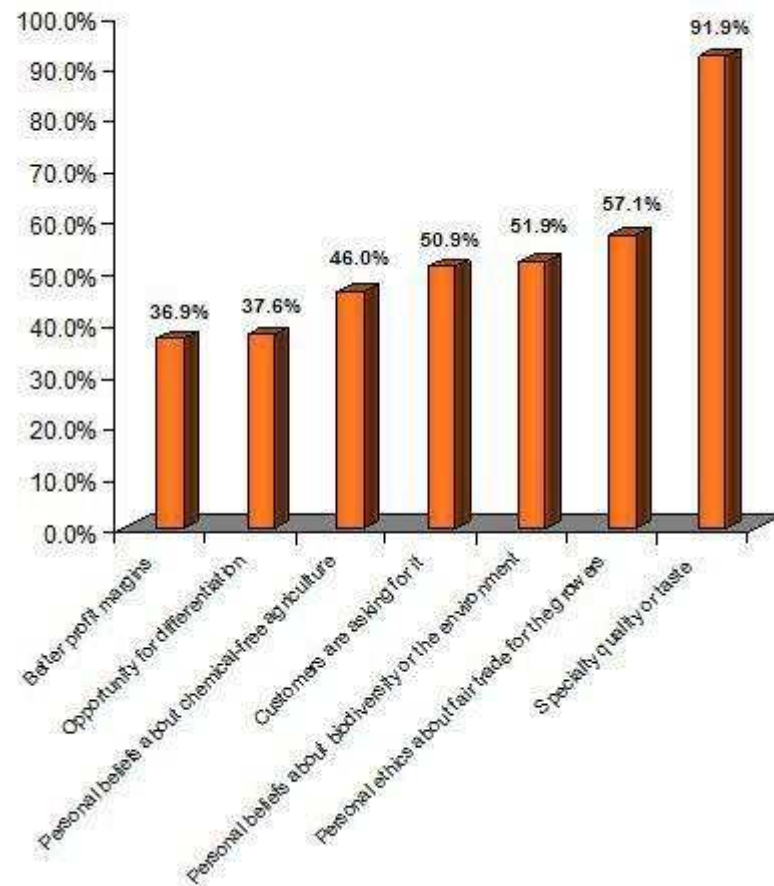
(D.10) is negative, which indicates that  $\bar{\theta} > \theta^*$ . This implies that the MQS compliments the wealth of all high-quality consumers.

Comparing (D.9) and equation (4b), which represents the taste parameters of low-quality consumers, yields the following equation:

$$\theta_1^* - \underline{\theta} = -\frac{3kq_1q_2(4q_1 - \underline{q})^2}{8\underline{q}^2(5q_1 + \underline{q}) + k(4q_1 - \underline{q})^4} < 0. \quad (\text{D.11})$$

(D.11) is negative, which indicates that  $\underline{\theta} > \theta^*$ . This implies that low-quality consumers prefer a rather rigorous MQS because it provides them with a windfall gain.

## FIGURES AND TABLES



**Source:** Sustainable Coffee Survey of the North American Specialty Coffee Industry, Giovannucci (2001).

**Figure 3.** Factors Considered "very important" in Making Sustainable Coffee Valuable to Businesses

**Table 3.** Worldwide Sales of Organic Products

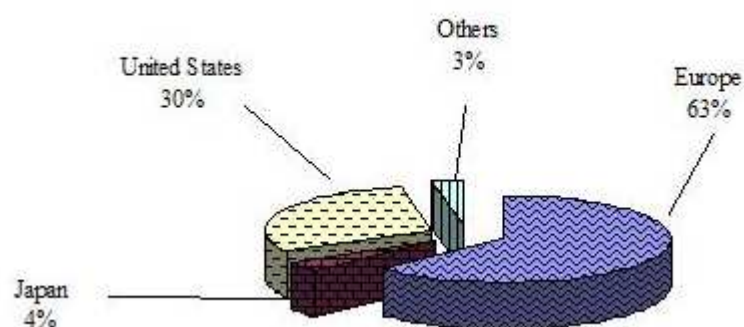
| Year     | Sales Thousand<br>millions US\$ | Growth rate |
|----------|---------------------------------|-------------|
| 2009 (*) | 53                              | 12.77%      |
| 2008     | 47                              | 14.63%      |
| 2007     | 41                              | 17.14%      |
| 2006     | 35                              | 16.67%      |
| 2005     | 30                              | 11.11%      |
| 2004     | 27                              | 10.20%      |
| 2003     | 24.5                            |             |

**Source:** International Trade Center—ICT, Organic Monitor

**Made by:** Commission for the Promotion of Peruvian Exports and Tourism (PromPeru), Ministry of Foreign Commerce and Tourism of Peru

\* The 2009 values have been estimated

**Original Version:** Spanish

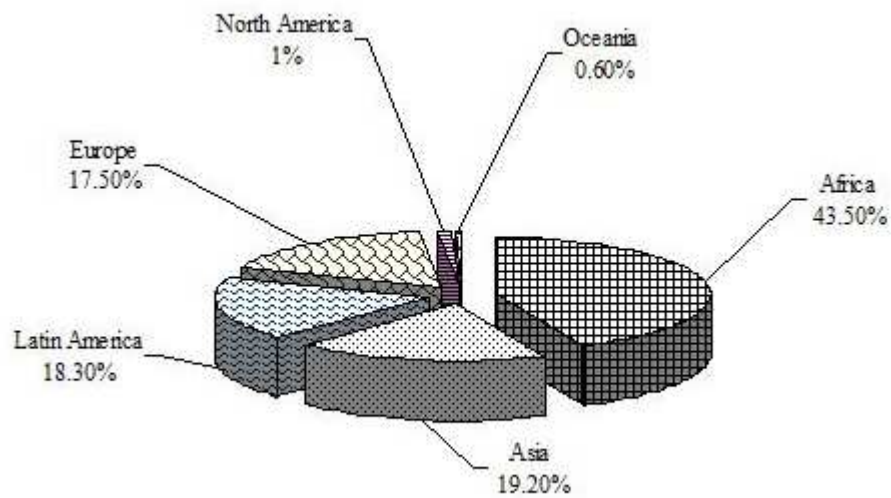


**Source:** International Trade Center—ICT, Organic Monitor

**Made by:** Commission for the Promotion of Peruvian Exports and Tourism (PromPeru), Ministry of Foreign Commerce and Tourism of Peru

\*This graph has been regenerated by the author.

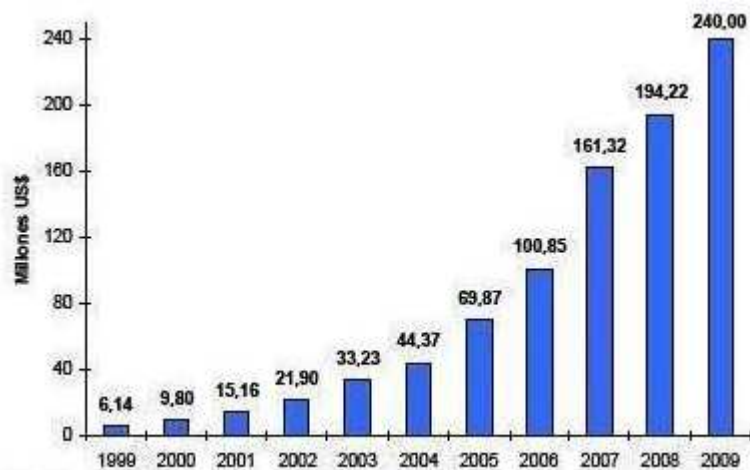
**Figure 4.** Main Markets for Organics Products - 2008



**Source:** FiBL & IFOAM 2009

\*This graph has been regenerated by the author.

**Figure 5.** Organic Producers by Geographical Regions



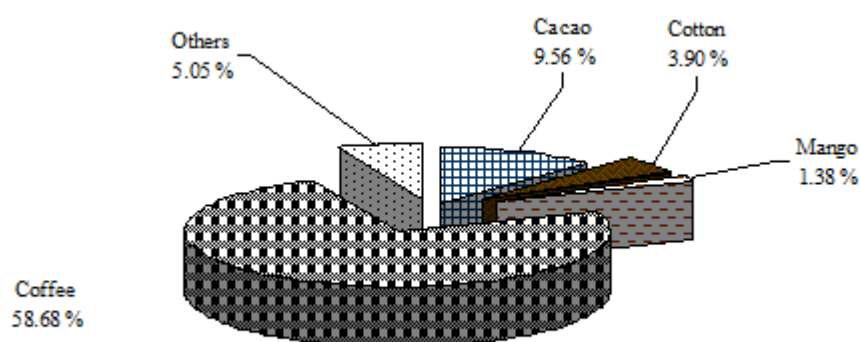
Source: Peru National Customs Service—ADUANAS

Made by: Commission for the Promotion of Peruvian Exports and Tourism (PromPeru), Ministry of Foreign Commerce and Tourism of Peru

This chart is based on estimated values

Original Version: Spanish

**Figure 6.** Peru - FOB Value of Organic Products



Source: Peru National Customs Service—ADUANAS

Made by: Commission for the Promotion of Peruvian Exports and Tourism (PromPeru), Ministry of Foreign Commerce and Tourism of Peru

This graph is based on estimated values and includes derived products.

\*This graph has been regenerated by the author (Original Version: Spanish).

**Figure 7.** Peru: Export by Organic Products

2008

**Table 4.** Peru: Exports of Organic Coffee by Market

2008

| Country       | %      |
|---------------|--------|
| United States | 27.06% |
| Germany       | 26.88% |
| Belgium       | 12.02% |
| Sweden        | 11.31% |
| Canada        | 6.05%  |
| Others        | 16.69% |

**Source:** Peru National Customs Service—ADUANAS

**Prepared by:** Commission for the Promotion of Peruvian Exports and Tourism (PromPeru), Ministry of Foreign Commerce and Tourism (Peru)



## REFERENCES

### JOURNALS

- Arora, S., and S. Gangopadhyay, 1994, "Toward a Theoretical Model of Voluntary Overcompliance," Discussion Paper 94-11, Washington, D.C.: Resources for the Future.
- Amacher, G., E. Koskela and M. Ollikainen, 2004, "Environmental Quality Competition and Eco-labeling," *Journal of Environmental Economics and Management* 47, 284-306.
- Armijo, L. and C. Gervasoni, 2010, "Two dimensions of *democracy* and the economy," *Democratization* 17 (1), 143-174.
- Armstrong, M. and D. Sappington, 2006, "Regulation, Competition and Liberalization," *Journal of Economic Literature* 44(2), 325–366.
- Aoki, R. and T. Prusa, 1996, "Sequential versus Simultaneous Choice with Endogenous Quality," *International Journal of Industrial Organization* 15, 103-121.
- Aoki, R., 2003, "Effect of Credible Quality Investment with Bertrand and Cournot Competition," *Economic Theory* 21, 653-672.
- Besley, T. and S. Coate, 1997, "An Economic Model of Representative Democracy," *The Quarterly Journal of Economics*, 86-114.
- Besley, T. and S. Coate, 2003, "Centralized versus decentralized provision of local public goods: a political economy approach," *Journal of Public Economics* 87(12), 2611-2637.

- Besley, T. and S. Coate, 2003, "Elected Versus Appointed Regulators: Theory and Evidence," *Journal of the European Economic Association* 1 (5), 1176-1206.
- Bontems and Fulton, 2008, "Organizational Structure, Redistribution and the Endogeneity of Cost: Cooperatives, For-Profit Firms and the Cost of Procurement," *Journal of Economic Behavior and Organization*.
- Boswell, J. and E. Moore, 2009, "Service Provision and Product Differentiation: A Comment to A Note on the Strategic Use of Service," *Journal of Business Strategies* 26, 186-193.
- Bougherara, D., G. Grolleau, and L. Tjiébaut, 2005, "Can Labeling Schemes Do More Harm Than Good? An Analysis Applied to Environmental Labeling Schemes," *Journal of Law and Economics* 19, 5-16.
- Brander, J., 1981, "Intra-industry trade in identical commodities," *Journal of International Economics* 11, 1-14.
- Cason, T., and L. Gangadharan, 2002, "Environmental Labeling and Incomplete Consumer Information in Laboratory Markets," *Journal of Environmental Economics and Management* 43, 113-134.
- Choi, C. and H. Shin, 1992, "A Comment on a Model of Vertical Product Differentiation," *Journal of Industrial Economics* 40, 229-231.
- Cremer, H. and J. Thisse, 1991, "Location Models of Horizontal Differentiation: A Especial Case of Vertical Differentiation Models," *The Journal of Industrial Economics*, XXXIX (4), 384-390.
- Crampes, C. and A. Hollander, 1995, "Duopoly and Quality Standards," *European Economic Review* 39, 71-82.

- Das, S. and S. Donnenfeld, 1989, "Oligopolistic Competition and International Trade: Quantity and Quality Restrictions," *Journal of International Economics* 27, 299-318.
- Daughety, A., and J. Reinganum, 1995, "Product Safety: Liability, R & D and Signaling," *American Economic Review* 85, 1187-1206.
- Ecchia, G. and L. Lambertini, 1997, "Minimum Quality Standards and Collusion," *Journal of Industrial Economics* 45, 101-113.
- De Freitas, J. and L. Bottega, 2009, Standards, "Voluntary Labels, and International Trade," *Journal of Agricultural & Food Industrial Organization* 7, 1-24.
- Gabszewicz, J. and J. Thisse, 1979, "Price Competition, Quality, and Income Disparities," *Journal of Economic Theory* 20, 340-359.
- Gabszewicz, J. and J. Thisse, 1986, "On the nature of competition with differentiated products," *Economic Journal*, 96,160-172.
- Garcia-Gallego, A. and N. Georgantzis, 2009, "Market effects of changes in consumers' social Responsibility," *Journal of Economics & Management Strategy* 18, 235-262.
- Fulton, M and K. Giannakas, 2000, "Organizational Commitment in a Mixed Oligopoly: Agricultural Cooperatives and Investor-Owned Firms," *American Journal of Agricultural Economics*, 83(5), 1258-1265
- Fulton, M and K. Giannakas, 2005, "Process innovation activity in a mixed oligopoly: the role of cooperatives," *American Journal of Agricultural Economics*, 87(2), 406-422

- Giovannucci, D. and S. Ponte, 2005, "Standards as a new form of social contract? Sustainability initiatives in the coffee industry," *Food Policy* 30,284–301.
- Herguera, I., P. Kujal and E. Petrakis, 2002, "Tariffs, Quality Reversals and Exit in Vertically Differentiated Industries," *Journal of International Economics* 58, 467-492.
- Heyes, A., and J. Maxwell, 2004, "Private vs Public Regulation: Political Economy of the International Environment," *Journal of Environmental Economics and Management* 48, 978-996.
- Ibanez L., and A. Stenger, 2000, "Environment and Food Safety in Agriculture: are Label Efficient?," *Australian Economic Papers* 39, 452-464.
- Kuhn, M., 2007, "Minimum Quality Standards and Market Dominance in Vertically Differentiated Duopoly," *International Journal of Industrial Organization* 25, 275-290.
- Lemos, M. and A. Agrawal, 2006, "Environmental Governance," *Annual Review of Environment and Resources* Vol. 31: 297-325.
- Mahenc, P., 2008, "Signalling the Environmental Performance of Polluting Products," *International Journal of Industrial Organization* 26,59-68.
- Motta, M., 1993, "Endogenous Quality Choice: Price vs. Quality Competition," *Journal of Industrial Economics* 41, 113-131.
- Nilsson, H., B.Tunçer and A.Thidell., 2004, "The Use of Eco-labeling like Initiatives on Food Products to Promote Quality Assurance-Is There Enough Credibility?," *Journal of Cleaner Production* 12,517- 526.
- Nishijima, M., 2009, "Quality and Welfare in Mixed Duopoly: Effects of Capacity Reduction," *The Japanese Economic Review* 60, No. 1.

- O'Brien, K.A., and M.F. Teisl, 2004, "Eco-information and its Effect on Consumer Values for Environmentally Certified Forest Products," *Journal of Forest Economics* 10, 75-96.
- Padovano, F. and R. Ricciuti, 2008, "The Political Competition-Economic Performance Puzzle: Evidence from the OECD Countries and the Italian Regions," CESifo Working Paper No. 2411.
- Pande, R., 2003, "Can Mandated Political Representation Increase Policy Influence for Disadvantaged Minorities? Theory and Evidence from India," *The American Economic Review* 93, 1132-1151.
- Ponte, S. and P. Gibbon, 2005, "Quality standards, conventions and the governance of global value chains," *Economy and Society* 34 (1): 1-31.
- Ronnen, U., 1991, "Minimum Quality Standards, Fixed Costs, and Competition," *Rand Journal of Economic* 22, 490-504.
- Spence, M., 1975, "Monopoly, Quality and Regulation," *Bell Journal of Economics* 6, 417-429.
- Sedjo, R., and Swallow S., 2002, "Voluntary Eco-labeling and the Price Premium," *Land Economics* 78 (2), 272-284.
- Sexton R., 1990, "Imperfect Competition in Agricultural Markets and the Role of Cooperatives: A Spatial Analysis," *American Journal of Agricultural Economics*, 72(3) 709-20
- Sheshinski, M., 1976, "Price Quality and Quantity Regulation in Monopoly Situation," *Economica* 43, 127-137.

- Toshimitsu, T., 2003, "Optimal R&D Policy and Endogenous Quality Choice,' *International Journal of Industrial Organization* 21, 1159-1178.
- Valleti, T., 2000, "Minimum Quality Standards Under Cournot Competition," *Journal of Regulatory Economics* 18, 235-245.
- Van Amstel, M., P. Driessen and P. Glasbergen, 2008, 'Eco-Labeling and Information Asymmetry: a Comparison of Five Eco-labels in the Netherlands,' *Journal of Cleaner Production* 16, 263-276.
- Waterson, M., 1989, "Models of Product Differentiation," *Bulletin of Economic Research* 41, 1-27.

## **BOOKS**

- Greenberg, R. and R. Rice, 2000, "Shade-Grown Coffee and Biodiversity in Peru," Smithsonian Migratory Bird Center, Washington, DC.
- Kreps, D., 1990, "Game Theory and Economic Modelling," Oxford: Oxford Univ. Press.
- Daviron, B. and S. Ponte, 2005, "The Coffee Paradox: Global Markets, Commodity Trade and the Elusive Promise of Development," Zed Books, London and New York.
- Gibbon, P. and S. Ponte, 2004, "Trading Down: Africa, Value Chains and the Global Economy," Temple University Press, Philadelphia, PA.
- Giovannucci, D., 2003, "Emerging issues in the marketing and trade of organic products, In: Organic Agriculture: Sustainability, Markets and Policies," Organization for Economic Cooperation and Development, Paris, and CABI Publishing, Wallingford, UK. 187-197.

Malkia, M., A. Anttiroiko, and R. Savolainen, eds., 2004, “eTransformation in Governance. New Directions in Government and Politics,” Idea Group.

Osborne, M. and A. Rubinstein, 1994. “A course in game theory,” The MIT Press.

Scott, H. and L. Fernandez, 1998, “Game Theory with economic applications,” 2nd ed., Addison-Wesley Publishing Company, Inc.

## **ELECTRONICS ARTICLE**

Agrobanco, 2007, “Coffee's crop production, Publication of the Agrarian Bank of Peru,” Original version in Spanish. Available on <http://www.agrobanco.com.pe/EstudiosXProductos.htm>

Commission for Exports and Tourism in Peru - PromPeru, 2009, “International Trade of organic products,” Original version in Spanish. Available on <http://www.promperu.gob.pe/>

Giovannucci, D., 2001, Sustainable Coffee Survey of the North American Specialty Coffee Industry, Specialty Coffee Association of America, Long Beach, CA., Available on [http://www.ccc.org/Storage/42/3481\\_CoffeeSurvey\\_EN.pdf](http://www.ccc.org/Storage/42/3481_CoffeeSurvey_EN.pdf)

Nadvi, K. and F. Waltring, 2002, “Making Sense of Global Standards,” INEF Report 58/2002. INEF-University of Duisburg, Duisburg. Available on <http://inef.uni-due.de/page/documents/Report58.pdf>

United Nations Office on Drugs and Crime – UNODC, “Peru Programme: Situation Analysis.” Available on [http://www.unodc.org/pdf/peru\\_programme.pdf](http://www.unodc.org/pdf/peru_programme.pdf)

United States Department of Agriculture (USDA) - Foreign Agricultural Service (FAS) , 2010, “Peru Coffee Annual Report.” Available on <http://gain.fas.usda.gov>

## **ORGANIZATION'S TECHNICAL PAPERS**

Jaffee, S., 2003, "From challenge to opportunity: transforming Kenyan fresh vegetable trade in the context of emerging food safety and other standards," Agricultural and Rural Development Discussion Paper, The World Bank, Washington, DC.

Wessels C, and K. Cochrane et al, 2001, "Ecolabelling and international trade law implications. Product certification and ecolabelling for fisheries sustainability." Rome, FAO Fisheries Technical paper 422.

Willer, H. and L. Kilcher (Eds.), 2008, "The World of Organic Agriculture. Statistics and Emerging Trends 2008," FiBL-IFOAM Report. IFOAM, Bonn; FiBL, Frick; ITC, Geneva.

Willer, H. and L. Kilcher (Eds.), 2009, "The World of Organic Agriculture. Statistics and Emerging Trends 2009," FiBL-IFOAM Report. IFOAM, Bonn; FiBL, Frick; ITC, Geneva.

Wilson, J.S. and V.O. Abiola, (Eds.), 2003, "Standards and Global Trade: A Voice for Africa," The World Bank, Washington, DC.

## **CONFERENCE PROCEEDINGS**

Kortbech-Olesen, R., 2000,"Export Opportunities of Organic Food from Developing Countries." Presentation made at World Organics 2000. London, United Kingdom.



