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THE ECONOMIC ANALYSIS OF THE INTERNATIONAL ESPRESSO COFFEE MARKET

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Abstract

0.1 English version

This research is the result of a PhD project "Eureka", a special doctoral program promoted by Regione Marche in order to combine applied research projects capable of creating synergies between the University and local businesses.

This research, specifically created with the intention of combining the research methodologies in the field of economic policy used in the University of Macerata with the need to study coffee market by the marketing department of Nuova Simonelli S.p.A..

In particular, the company taking part in this research project deals with the production and marketing of professional espresso coffee machines. Hence the need to understand the role of espresso coffee in international markets.

The present work aims to investigate the operation of the coffee supply chain and, in it, the role of professional espresso coffee machines.

So the thesis consists in a study divided in three different parts: first an analysis of the HoReCa (hotel-restaurant-cafe) sector (the end market), it continues with an analysis of the coffee supply chain with a study on price transmission of the commodity within the same industry, lastly there is the analysis of goods export characterizing the Made in Italy, particularly deepening the export of professional espresso coffee machines.

The three parts of the thesis are autonomous in itself but, at the same time, if taken together, help to give a better and more complete view of the economic sector under study.

Initially it is developed an analysis of the espresso coffee end market, i.e. the HoReCa sector.

In the absence of a literature that gives an overview of the world market in this sector, taking into account the role of the spread of Italian espresso machines, it was decided to fill this gap.

It has therefore identified the development of the HoReCa sector in relation to the spread of espresso. This is an exploratory analysis of the global market

in which the relationships between the various actors operating in this sector have been identified.

In order to identify the strategic relationship between the various players is taken as a reference the theoretical framework of Porter's five forces. Secondary data from scientific literature, market analysis and sectoral magazines' articles have been used to identify the roles of the various economic agents operating in this market.

The result is a framework that highlights the relationships between the various players underlining the opportunities for manufacturers of coffee machines, supplying an expanding market. On the other side it is emphasized as the HoReCa players are related with a wide range of suppliers such as the production of coffee machines it is an important element for their product but they are secondary in cost functions.

If the economic crisis has affected the beginning of the millennium in the HoReCa sector, it has mostly done through the transformation of the sector. In general, the restaurant, holding up well to the shock of 2008, has resumed a growth path despite consumers preferred to divert consumption towards cheaper forms of coffee. In this growth of the different types of retail outlets they have assumed more and more hybrid characteristics, so that also in the bar is resized the role of the coffee, which has instead acquired space in other types of services. In this context, large international chains have taken an important role in the spread of Western consumption patterns. With these changes in the market, the role of traditional machines, Italian excellence, may suffer from the foreign competition of superautomatic machines.

Then the entire coffee chain is analysed. The differences between the part of the supply chain that develops in the producing countries and that which takes place in the consumer countries are analysed. It is also taken into account the liberalization of the market following the collapse of the International Coffee Agreement regime.

It then proceeds with a review of the literature on price transmission in the supply chain described. The vector autoregression technique is identify as a way to study the coffee price transmission.

A series of regressions based on the International Coffee Organization and the U.S. Bureau of Labor Statistics data were used to verify previous studies with updated data. In particular, it was verified the effect of the coffee market liberalization.

The assumptions of greater fluctuations in prices during the period following the liberalization of the market have been confirmed. It remains important to the role of international trade that acts as a link between the markets of production and the consumption of coffee, from the point of view of prices creates a break in the transmission of the same, showing clearly a vertical distinction of the supply chain in two sections from different behaviours.

The analysis concludes with a study of the areas of excellence in Made in Italy exports. They are considered some of the areas of excellence of Made in Italy in relation to the Balassa index, and suggestions for improvement of the index itself, found in literature. It is then considered in more depth the export of professional espresso coffee machines.

This allows you to see the behavior of a key sector of the study in relation to other Italian excellences.

In addition, a series of regressions was developed in order to deepen the export behavior of espresso machines in relation to socio-economic variables of the target countries, as well as the comparison with monetary variables.

It showed an export of coffee professional machines linked to urban development and to Western lifestyles, confirming the hypotheses found in the literature on coffee consumption.

As for the monetary aspect it rather shows how the euro entry has a greater role in international trade of this good than the lira had. What emerges is a picture of the sectors of Made in Italy related to the world of coffee that also other excellences of Italian productions and exports, knows establish itself in the international markets, especially with regard to the production of professional espresso coffee machines. Professional espresso machines of traditional type, typical of Made in Italy, and in any case the result of continuous innovation, are able to exploit a booming business and a positive moment of the whole of the coffee consumer market. Competitiveness challenges are given by foreign technologies but also by the coffee market for at home consumption.

0.2 Italian version

La presente ricerca è frutto di un progetto di Dottorato "Eureka", un particolare percorso dottorale promosso da Regione Marche al fine di coniugare progetti di ricerca applicata in grado di creare sinergie tra le Università e le imprese del territorio.

Questa ricerca in particolare nasce con l'intenzione di coniugare le metodologie di ricerca nell'ambito della politica economica che vengono utilizzate nell'Università degli Studi di Macerata con le necessità di studio dei mercati dell'area marketing della Nuova Simonelli S.p.A..

In particolare l'azienda che ha preso parte a questo progetto di ricerca si occupa della produzione e commercializzazione di macchine professionali per il caffè espresso. Di qui la necessità di comprendere il ruolo del caffè espresso nei mercati internazionali.

Con il presente lavoro si vuole indagare il funzionamento della filiera del caffè ed in essa il ruolo svolto dalle macchine professionali per caffè espresso.

Si procederà dunque ad uno studio che si compone di tre diverse parti: dapprima con un'analisi del settore di sbocco del bene, si proseguirà un'analisi della filiera del caffè con uno studio sulla trasmissione dei prezzi della commodity all'interno della stessa supply chain, infine si andrà ad analizzare i mercati esteri caratterizzanti il Made in Italy approfondendo in particolar modo l'export delle macchine professionali per caffè espresso.

Le tre parti della tesi sono in sé autonome ma allo stesso tempo, se prese insieme, contribuiscono a dare una migliore visione del settore economico oggetto di studio.

Inizialmente viene sviluppata un'analisi del settore di sbocco del caffè espresso, ossia quello denominato HoReCa (hotel-restaurant-cafè).

In mancanza di una letteratura che dia una visione generale del mercato mondiale di questo settore tenendo in considerazione il ruolo della diffusione delle macchine italiane per il caffè espresso,

Si va quindi ad individuare lo sviluppo del settore HoReCa in relazione alla diffusione del caffè espresso. Questa è un'analisi esplorativa del mercato globale nella quale si individuano le relazioni tra i vari attori che operano in questa filiera.

Al fine di individuare le relazioni strategiche tra i vari attori viene preso come riferimento il framework teorico delle cinque forze di Porter. Vengono utilizzati quindi dati secondari da testi scientifici, analisi di mercato ed articolo di riviste specializzate per individuare i ruoli dei diversi agenti economici che operano in questo mercato.

Ne viene fuori un quadro di riferimento che evidenzia le relazioni tra i vari player sottolineando le opportunità del produttore di macchine da caffè in un mercato di sbocco in espansione. Dall'altro lato viene sottolineato come il mercato HoReCa faccia riferimento ad un'ampia serie di fornitori dei quali la produzione di macchine da caffè ne è solo un elemento importante per il prodotto ma secondario a livello di costo.

Se la crisi economica di inizio millennio ha influito nel settore HoReCa lo ha fatto soprattutto attraverso la trasformazione del settore. In generale la ristorazione, resistendo bene allo shock del 2008, ha ripreso un percorso di crescita nonostante parte dei consumatori abbiano preferito deviare i consumi verso forme più economiche di caffè. In questa crescita le differenti tipologie di punti vendita hanno assunto caratteristiche sempre più ibride, così che anche nei bar è ridimensionato il ruolo del caffè, che invece ha acquisito spazio in altre tipologie di servizio. In questo contesto le grandi catene internazionali hanno assunto un ruolo importante nella diffusione di stili di consumo occidentali. Con questi cambiamenti del mercato, il ruolo delle macchine tradizionali, eccellenza italiana potrebbero soffrire della concorrenza estera delle superautomatiche.

Viene poi analizzata l'intera filiera del caffè. Vengono sottolineate le differenze tra la parte di filiera che si sviluppa nei paesi produttori e quella che ha luogo nei paesi consumatori. Viene presa in considerazione la liberalizzazione del mercato in seguito alla caduta del regime dell'International Coffee Agreement.

Si procede poi con una revisione della letteratura sulla trasmissione dei prezzi all'interno della filiera descritta. Dalla revisione si individua la tecnica della autoregressione vettoriale come modalità di studio della trasmissione dei prezzi.

Una serie di regressioni basate sui dati dell'International Coffee Organization e dello U.S. Bureau of Labor Statistics sono stati utilizzati per verificare gli studi precedenti con dati aggiornati. SI è potuto così verificare come la trasmissione dei prezzi sia stata modificata dalla liberalizzazione del mercato.

Sono state confermate le ipotesi di maggiore fluttuazione dei prezzi in periodo nel periodo successivo alla liberalizzazione del mercato. Resta importante il ruolo del commercio internazionale che fa da legame tra il mercato della produzione e quello del consumo del caffè, dal punto di vista dei prezzi crea una cesura nella trasmissione degli stessi rendendo evidente la distinzione verticale della filiera in due sezioni dai comportamenti differenti.

L'analisi si conclude con uno studio dei settori d'eccellenza dell'export Made in Italy. Vengono considerati alcuni dei settori d'eccellenza del Made in Italy in relazione all'indice di Balassa, ed a proposte di miglioramento dell'indice stesso, reperibili in letteratura. Viene poi considerato in modo più approfondito l'esportazione delle macchine professionali per il caffè espresso.

Questo permette di vedere il comportamento di un settore fondamentale dello studio in relazione con le altre eccellenze italiane.

Inoltre una serie di regressioni è stata sviluppata per poter approfondire il comportamento dell'export delle macchine da caffè espresso in relazione a variabili socio-economiche dei paesi target, oltre che il confronto con variabili monetarie.

Se ne evidenzia un export delle macchine professionali da caffè legato allo sviluppo urbano ed agli stili di vita occidentali, confermando quanto la letteratura sui consumi di caffè lasciava presumere.

Per quanto riguarda l'aspetto monetario se ne evidenzia invece come l'ingresso dell'Euro abbia un ruolo maggiore negli scambi internazionali di questo bene rispetto a quanto accadeva con la Lira.

Ne viene fuori un quadro dei settori del Made in Italy legati al mondo del caffè che, parimenti alle altre eccellenze delle produzioni ed export italiani, sanno imporsi nei mercati internazionali, soprattutto per quanto riguarda la produzione di macchine professionali per il caffè espresso. Le macchine professionali per espresso di tipo tradizionale, tipiche del Made in Italy, e comunque frutto di continua innovazione, riescono a sfruttare un settore in espansione ed un momento positivo di tutto il mercato del consumo del caffè. Sfide di competitività sono date da tecnologie estere per la preparazione di bevande calde nel settore HoReCa, ma anche dal mercato del caffè per il consumo domestico.

Introduction

The market for *Made in Italy* products is gaining much interest. A good that certainly stands out for its Italianity is the espresso coffee. Since coffee is one of the most traded commodity but not produced in Italy, the *Made in Italy* characteristic of the espresso as an hot drink is very peculiar. The *Made in Italy* is represented by a drinking culture placed at the very end of a complex international supply chain. This Italian drinking culture is not only represented by the agri-food sector, but also by the mechanical products necessary for the espresso preparation: the coffee espresso machines.

This study is in fact developed under the *Eureka* PhD Courses. Eureka Doctorates are an initiative of the Marche Region to develop applied research projects between local Universities and regionally established businesses. In particular, this study was developed jointly by the University of Macerata and Nuova Simonelli S.p.A.. The firm is one of the leading company in the production of professional espresso coffee machines.

In this research, then, there is a study of the international coffee supply chain, taking into account the role of professional espresso coffee machine in interacting with this supply chain.

In Figure 1 is possible to see a representation of the complexity of the coffee supply chain. On the right side of the scheme there is the steps of the coffee itself, while on the left it is possible to find the productions of professional coffee machines and its relations with the coffee supply chain. As it is possible to see the production of coffee machines have relations with the final part of the coffee supply chain.

In the research will be analyzed all the supply chain presented in Figure 1. Different parts of the supply chain will be studied in different chapters. In the first one there is broad a study of the coffee supply chain. In the following chapter there is a deepen study on the last part of this supply chain. At the end, the coffee machine production is examined.

The results of the chapters are then connected to have a validation of the research. In fact the thesis chapters, using different methods, give some results

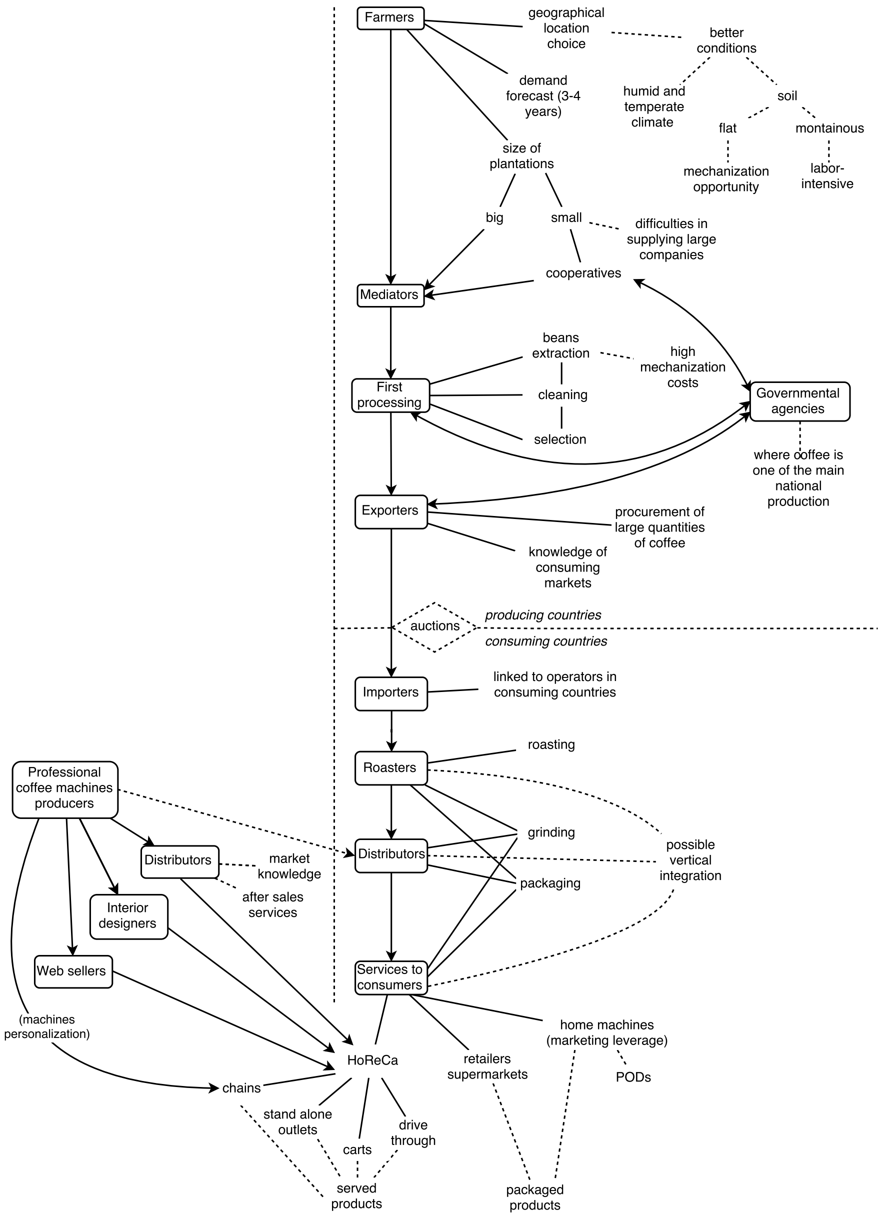

Figure 1: Coffee supply chain and its links with professional coffee machines producers. Own elaboration from Ponte (2002), Pascucci (2009) and sectoral periodicals.

that compared are useful to suggest appropriate conclusions. This happens because methodological triangulation is one method to improve the findings (Olsen, 2004). Triangulation methods are, in fact, useful to validate the findings when there is a convergence between results from different research. It is also useful when there is contrasts or inconsistencies in the results because the comparison of different results could suggest the basis for further researches in the same field (Mathison, 1988; Guion et al., 2011).

Chapter 1

Porter's Five Forces Analysis of HoReCa industry

1.1 Introduction

In the daily debate, especially during the world economic crisis, it has often been pointed out that companies with a strong inclination towards internationalization have better performances than those operating on a local market (Riontino, 2012; Saccomani, 2012). This common belief is often borne out by the facts, and especially from the evidence that exporters and internationalized firms are less tied to internal market dynamics Quattrociocchi (2012). On the other hand one can not say that openness to foreign markets could be the panacea of all evil. There is indeed a strong downside in addressing the economic policies in target countries, as well as the culture and preferences of foreign consumers(Accetturo and Giunta, 2012).

To understand whether the typical productions of the Made in Italy follow this law of internationalization advantage, widespread in the common sense, it is necessary to do a study on the condition of typical Italian industry productions that have a strong export performances. In particular we want to dwell on one peculiar good: espresso coffee (and the other espresso based beverages). It has been chosen this product because it has to do with the spread of Italian food culture and lifestyle. It has been chosen this product also because of the connection with several industries along the supply chain: from the agri-food industries to the HoReCa(Hotel-Restaurant-Café) sector, from the commodities markets and the roasting processing to the production of the mechanical appliances for the preparation and service of the hot drink.

The focus on espresso coffee product is important to be able to see the market reaction to a Made in Italy production. Espresso is a very peculiar product to be considered as Made in Italy: it is a good whose Italian identity is not so much in primary production, but in the preparation method. The coffee, in fact, as a food product, is grown in tropical countries in the southern hemisphere, certainly not in Italy. Coffee consumption takes place in the north of the world through the transformation of the grain in hot drink. The hot drink production methods are different and the espresso it is only one of many.

The first espresso machine was designed in Turin in 1884 by Moriondo (1884). One can therefore say that this method, though marginal in the global landscape, is typical of the Italian production. Today espresso machines are spread all over the world, especially in the world of cafés and restaurants. In the domestic consumption, in fact, it is second to alternative methods even in Italy, such as the mocha and, thinking to the future the growing importance of coffee capsules. These elements allow to better define the environment of reference in the study of the five forces, letting to focus on the HoReCasector and its supply chain.

From the viewpoint of the international market, the supply chain of coffee is undoubtedly a chain able to interconnect very distant countries and different levels of development, economic structure and cultural background. Suffice to say that in 2014 the trade of coffee recorded an export of nearly $ 20 billion: the first exporting countries are Brazil, Vietnam, Colombia and Ethiopia, for a direct product mainly to the United States, Germany and Italy. This means ca connect almost every country in the world with a propensity for production in developing countries and a transformation and consumption that take place mainly in developed countries.

It therefore follows that the consumption of espresso coffee in the world is a key element of the dissemination of Italian culture abroad (Morris, 2005), as it was already done after migrations (Morris, 2005; Jolliffe, 2010).

We have seen that the world of coffee connect different countries with different levels of development, operating along the same chain. Within this supply chain, the spread of espresso is the spread of Italian culture, not just in brewing, but also in the way of consuming coffee itself and benefit from the services of the bar more in general. Besides this there is the important role of the, largely Italian, producers of professional espresso coffee machines, highlighting the connection between the Italian culture and the businesses connected with espresso based beverages.

The purpose of this research is to illustrate the espresso based beverages industry to identify the economic and symbolic value and the inter-linkages between sectors of the supply chain. Exploring these dynamics allows us to understand how the much discussed and craved Made in Italy sector depends on many stakeholders, whose interests and needs have to be considered at the policy level.

For this reason, research is developed within the theoretical framework of Porter's Five Competitive Forces (Porter, 1979, 2008).

Since several variables must be considered, to understand comprehensively the competitiveness within the industry, it was decided to collect secondary data through a systematic review of market studies, trade magazines for professionals and food processing operators of the industrial machineries and HoReCasectors. Data, analysis and extracts from interviews with key informants published on these sources have been included in Porter's model, illustrating the connections.

In the next section it is presented the theoretical model through a brief review of the literature; subsequently it is defined the competitive environment, namely the HoReCasector connected with the espresso based beverages. From the definition of the sector it is developed then the analysis of other competitive forces according to Porter's scheme, emphasizing the possible analogies with the sectors related features. In the final section there is the discussion of the results.

1.2 The Theoretic Framework: Porter's Five Competitive Forces

The Five Competitive Forces model was introduced by Michael E. Porter in his article of 1979 "How competitive forces shape strategy" in which were assumed for the first time those that according to the author are the determinants of competitiveness that any industry have to face.

Here it is used the model of Porter's Five Forces because it is the best-known theory on the market applied to management practice (O'Brien et al., 2004); it is therefore a suitable scheme not only to the academic reader but also to the business manager.

The forces described by Porter are the internal rivalries to the sector, central to this theoretical framework, the threats coming from new entrants and possible substitutes, as well as the bargaining power of suppliers and customers. The analysis of the five competitive forces proves to be a useful tool for companies to define the competitiveness of an industrial sector and therefore the industry's level of profitability. A scheme of the forces could be found in Figure 1.1.

Porter (1979), in the definition of the forces, it also presents some elements that only in his 2008 article "The Five Competitive Forces That Shape Strategy" have better clarified calling them factors. The factors are those elements that do

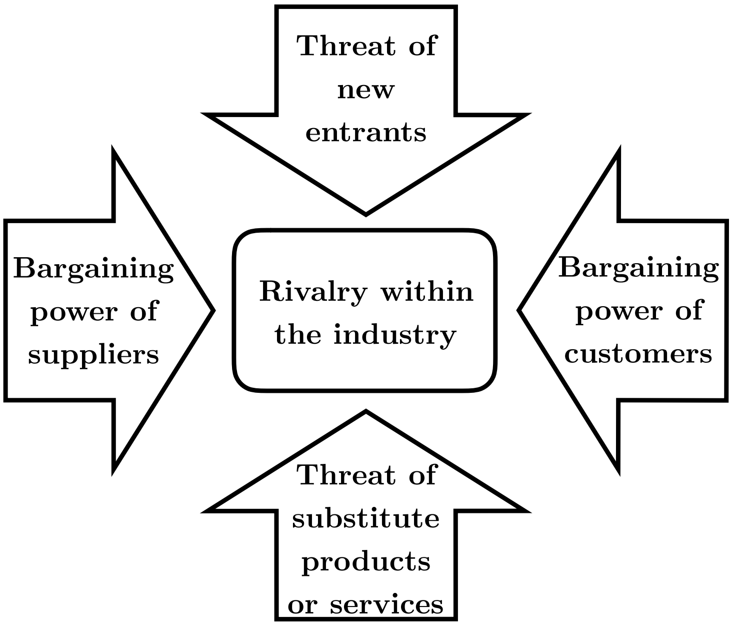

Figure 1.1: Porter's Five Forces Scheme. Re-elaborated version from Porter (1979)

not represent competitive forces but act on them, going to change them. Factors are: the growth rate of industry, technology and innovations, government and finally complementary products and services. In defining the forces that operate on the competitive environment, it must be careful to not put these factors among the forces. The factors, anyway, need to be carefully taken into account because they affect the five forces and through them they change the competitive environment.

The analysis of five competitive forces is commonly used in various business fields. Recent examples may be those of Perdana et al. (2012), using this type of analysis to study the environment in which they operate small landowners who produce teak wood. The analysis is directed to the understanding of the difficulties faced by small producers in a market where the largest manufacturers and institutionalized have more market access routes and the possibility of exploiting competitive advantages. The five forces thus become a strategic tool for businesses (also small) to cope with the difficulties that the market puts in front of operators in the competitive environment center.

Indiatsy et al. (2014) use the same tool to study the banking system in Kenya, particularly with respect to those operators who operate within a cooperative system.

Beyond cases of study of static competitive environments, the analysis of the five forces can also be used to investigate competitive areas that are undergoing important transformations, to it to identify managerial paths for the enterprise development. En example is the study of Scupola (2002) who, through the Porter's analysis, emphasizes the strategies of scientific publishers in dealing with the spread of online publications, thus having to face a new fast changing world.

The just presented cases, though far from the object of analysis of this study, have an important point in common: the use of secondary data. This consideration confirms the validity of the methodology used.

1.2.1 Five Forces Framework Application in Agri-food Sector

Models developed by Porter are widely used in strategic and business studies. This also happens in the agribusiness sector. The Five Forces Model is often used in the study of value chains creation and development.

Interestingly it appears to be the use that is made of the model in Olson et al. (2010a). In the text, in fact, the methodology is used to study two different value chains that converge on one single process at end of the production chain. In the text in fact there are two chains upstream of the value chain, one which refers to animal production and another that refers to the production of plants. The two chains are then brought together in one when the stage of the retail trade, and consumption. This is similar to the environment of our interest, which sees a food chain, the one of coffee, and another, the one of industrial productions, which merge at the end in a single market: the hot drink retail.

In Olson et al. (2010b) there is an example of the five forces model applied at the firsts phases of a supply chain, in which, however, is highlighted the role of internationalization in a very dynamic competitive environment. Identifying, moreover, the necessary answers to the socio-economic and environmental questions that the developments of the supply chain suggest.

These studies are also useful to see how competitive environments may develop after a modification of the technology in use. In fact, this factor is fundamental and its insertion in the productive world is paramount. This is especially true in the agri-food sector, where the expansion of cultivated areas could be a response not just to the growing demand for agricultural product (Bechdol et al., 2010).

In agri-food sector, the five forces analysis has been useful in bringing to conclusions such as the need for greater coordination in agricultural production (Boland et al., 2010), or even to emphasize the need for consolidation of enterprises in order to meet the ever more stringent regulations in the agricultural sector (Cook, 2011). In Lawrence et al. (2011) similar situations are deepened, taking into account the cattle market.

1.3 Five Forces Analysis

In this section will be described the competitive environment and the forces acting on it.

1.3.1 Definition of the Competitive Environment

According to the article by Porter (2008) on the five competitive forces, it is necessary to identify the industry that is going to study. The frame of reference is that of the HoReCa chains. The aim is to emphasize the role played by coffee whitih this sector. Talking about coffee the reference is especially on espresso coffee and anyway all types of hot drinks that are prepared with professional machines preparation of espresso, the so called espresso based beverages, the most known of which is cappuccino. The espresso based beverages are the Italian way to drink coffee out of home.

To define the industry we must still take into account two fundamental dimensions identified by Porter (2008) useful to delimit the industry borders: the production or service scope and the geographical scope. Both dimensions must be clearly defined so as not to run into, on the one hand, an excessive vagueness, and, on the other hand, in a too narrow definition of the field, as it would exclude key elements.

Respect to the first issue, there could be an error in the study of coffee in itself, and not considering the solely espresso coffee. That broader consideration of the entire coffee sector could be excessively beyond the scope of espresso, remember, in fact, that the main focus must remain still in b2b connections between the professional machines for production espresso and users of that product. Considering the competitive environment the one of the entire HoReCa sector that uses indiscriminately coffee, without any reference to espresso based beverages, would be just to deprive the study of that fundamental relationship between coffee and its way to be drunk in Italy, then the Italian production related to coffee and the spreading of the italian culture.

The opposite could be reduce the study only to espresso production. It would have the effect to help to define the boundaries of the study, but relegating it to the Italian case, therefore, losing the feature of internationalization which should characterize the present work. Considering only the espresso consumption would be a too small market niche taking into account markets outside of Italian borders. Going to consider the key industry in this research, namely the sector of espresso coffee machines production, we must consider that them products are also used for the production of other hot drinks: the espresso based beverages, as the cappuccino. Precisely the cappucino can be taken as the main example of foreign consumption of drinks prepared with espresso machines. The British case could be an example, in fact, the cappuccino, probably because of the combination of a familiar product to the British (the use of milk in an hot drink) with an exotic preparation (the milk foam in the hot drink) may have been the success factor in affirming the use of coffee machines for espresso overseas in the fifties, the period of first broadcast of this instrumentation on British soil (Morris, 2005).

The competitive environment is defined, with respect to the product / service, as the one limited by the *operators of the HoReCasector that serve drinks prepared with professional espresso coffee machines.*

It is considered necessary to emphasize some specifications of the existing differences within the industry, as it has been just defined. A first subdivision within the HoReCa sector can be seen among the structured operators, that is chains, and unstructured operators, that is who operates with individual outlets. Operators will therefore develop on two models, the first American-inspired model, whose most important example could be represented by Starbucks, and the second widespread in Italy, with few bars arranged in chains (unless you consider the sector of services related to transport and then service stations).

A second differentiation could arise immediately when you consider the one hand the existence of bar or coffeehouse (or coffee shop) and on the other the other residual HoReCa operators. The first are commercial establishments are the ones whose main production is that of hot drinks based on coffee, or who are in these productions a major share of its sales. The latter are, however, operators in the sector that are not part of these categories but who possess and use the same equipment for the production of espresso coffee. This situation might make to consider the existence of two different categories of players within this area, namely the presence of two different sectors. This paper will therefore focus if the two categories as described by this last differentiation can be well described by a single industry, or whether there may be significant differences between the two categories, especially in the relationship with the manufacturers of coffee machines professional. If significant differences are identified, the model will have to take account. Each specific environment, in fact, could include in itself factors ranging from politics to economics to the local culture that could deeply differentiate the competitive environment of reference. This kind of attention is also useful in defining the possible need to revise the model, in fact, Porter (2008, p.91) writes: *"A rule of thumb is that where the differences in any one* *force are large, and where the differences involve more than one force, distinct industries may well be present."*

For what concern the geographical scope, for the moment there is a defined area of reference. This choice is due to the exploitative kind of analysis to understand the Made in Italy spreading in the international markets. For the geographical scope it is anyway necessary to consider the two different types of development, the aforementioned Italian and American models. These the two models may have precise geographical diffusion in which the two models might not overlap.

Lacking a study on the industry as it has been described above, it is necessary to consider researches done in related areas and partly overlapped with that object which they seek. The fast food industry represents one of the possible sectors whose structure is in part overlapping to the industry as defined in this paper. Specialist coffee shops, fast foods and other spreading kind of HoReCa industry typologies should have to take into account with major highlighting to understand the diffusion of western culture in the whole world, and also Italian culture to drink coffee. These are frequently organized in chains. Chains are important in the western culture spreading because of their standardization, able to penetrate local culinary culture.

The culture, then, for its peculiar characteristics, is a factor of primary importance because, unlike the others that can also be modified in a relatively short time, tends to remain for a long time, and its modifications can occur only in the long term. Considering therefore essential to evaluate cultural differences, especially in the competitive environment study under observation, we have to contemplate the two alternative strategies of standardization and localization. Internationalized brands could use both the strategies but it is necessary to emphasize that the second strategy, which provides for an adaptation to the market and culture local, is a strategy considered more successful in this industry Castillo (2013). It could be interesting to understand how a specific product as the express, typically Italian, would fit within localization strategies.

Considering the food industry in the EU, we can see how it is one of the biggest manufacturing sectors as well as it is covering large areas of production in which they have an important part also areas closely related to the industry investigated in this research, such as those related to bakery or the production of beverages. The food industry in the EU is then characterized by intense competition, highly saturated markets and a strong concentration in the retail sector, in spite of this we can see a profits persistence in the industry. The theory predicts that the persistence of the profits in the food industry is favored by significant market shares, at least when the market is highly concentrated and growth is moderate. On the contrary if the market share give an indication of the market diversification, then it is to consider a large market share as a factor that could decreases the profitability in the sector. Moreover, younger companies tend to have higher profits of older ones, but if the company has a constant growth over time this represents a profitability factor (Hirsch and Gschwandtner, 2013).

It should be considered the important element of the price-based competition as the dominant strategy in the food industry. This has important implications as it reduces the range of companies size operating successfully in the industry, since, on the one hand it is possible to see diseconomies of scale for very large enterprises, on the other hand too small businesses could not take advantage of adequate economies of scale to have competitive prices that allow to stay in the market. It should be added that in developed markets such as those in the EU there are a number of laws, from food safety to packaging labeling and others, involving administrative burden, this factor also, though affecting both the small and the great companies raises questions about proper sizing. The concept of enterprise size is important because larger companies have more leverage to counter the bargaining power of buyers and suppliers (Hirsch and Gschwandtner, 2013).

This factor is important even in the coffee market where it has been a shift of power in the period following the fall of the International Coffee Agreement. After the liberalization, the market power has shifted from coffee producing countries to coffee consuming countries, in particular, looking at the upstream part of the production chain, the power has shifted from coffee growers to coffee roasters, who, working in conditions of competitive advantage, as they operate in an environment very concentrated, they are uninterested in vertical integration strategies(Ponte, 2002). Analogous situation is possible to notice in the relations between food manufacturers and HoReCasectior, where happened a general shift of power from the distribution channels to the retail sector players (Wrigley and Lowe, 2010), in particular considering the retailers organized in chains. These considerations on the concentration of an industry should therefore include not only within the analysis in the competitive sector, but also through the supply chain. Higher concentrations in a sector lead to more intense competition then lower profits (Hirsch and Gschwandtner, 2013). But it is also necessary to consider the relative concentrations in the light of the relationships with suppliers and customers, since concentration changes in one of these areas will lead to the modification of relations with other competitive forces.

The research results of (Hirsch and Gschwandtner, 2013) show that the diversification in the food sector bring benefits if happen within the same environment, not the same happens if the diversification takes place in different sectors.

The market share affects differently in different environments. Age is a factor that weakens the company, as expected from theory. Larger companies not only better resist to administrative costs but also to the greater bargaining power suffered in the retail industry. For the remainder, the results are in accordance with the theory, except the notable exception that investment in research and development for the food industry achieve negative results in terms of profits. Regarding the retail industry, beyond the national brands, private labels are gaining market shares, often divided into two groups with different approaches: one oriented to the price and the other to the quality (Senauer et al., 2010). This could happen even in chains for food and drink consumption out of home. For the consumption in the HoReCa industry, the economic crisis has caused a reduction in the full service dining sales, while the fast-food ones grew. The restaurants have changed their menus to make them cheaper bu it is still growing the home consumption, anyway, the take-away has been less affected by the crisis than the out of home consumption (Senauer et al., 2010).

The retail industry has changed in recent decades: an industry in which there were small businesses has become, through a process of concentration, an industry in which they operate some of the largest businesses nationwide. The retail processes has become more and more the segment to guide the entire supply chain in which it operates. The same supply chain, before driven by the offer, has become progressively more demand driven. The use of lean retailing processes has also contributed (Wrigley and Lowe, 2010).

Globally, some operators in OECD countries were the first to move and export mainly capital and knowledge in the late '90s. They were facilitated by several factors: the opening up of emerging markets to foreign direct investment, mature and increasingly regulated domestic markets, availability of financial resources and access to credit, attempt to take advantage of the first-mover benefits, and exploitation of ICT technologies. Among these major players, the ones who play the main role operate in the food industry. Retailers often operate as input channels in the markets in which they invest to export the products of their favorite suppliers. The bigger player have assumed a tendency to operate in a limited number of countries in which they try to reach an adequate size to exploit leadership positions, sometimes shared with few big competitors. On the contrary, as regards those who occupy lower positions in the ranking of the largest chains of transnational retail, thay tend to expand their scope across multiple countries to increase revenues, being not able to exploit any leadership position. The entry of new national markets is in fact not as simple as it could appear. New entrants suffer the strong resistance of local players that have greater knowledge of the regional competitive environment. This information asymmetry means that local players can anticipate transnational player, often creating appropriate size structures in the national market to have a market position which ensures resistance to competition from large corporations. In many emerging markets, besides the resistance of the local operators just described, it is added that of the informal markets. As concern the informal markets, however, often the entry of international players going to change the entire supply chain. International players foster the appearance of new intermediaries, local players need to reach bigger firm size to be able to remain in the market, but also the growth of formal or quasi-formal contracts (Wrigley and Lowe, 2010).

The major players have to face the problem of profitability in remaining in a foreign market, this is important to occupy leadership positions. Often appropriate market positions cannot be reached, and companies are forced to exit the market. An alternative strategy to exit from a market is that the exchange of positions, that is, two players mutually agree to exchange outlets to work with larger dimensions in a smaller number of states (Wrigley and Lowe, 2010).

1.3.2 The suppliers' bargaining power

The industry of our interest has a large number of suppliers. They will study the relationships with different suppliers, focusing particularly on those related to coffee. Among them we can include both those from the agri-food supply chain, especially the roasters, and those relating to the industrial production of espresso coffee machines.

Considering the suppliers of the broader industry related to tourism and the food, we can say that their bargaining power varies depending on the sector. It is possible, however, to consider that the most important result to be still within the following list: real estate owners and other related work including interior design, food ingredient suppliers, consultants in the management, training and marketing areas, ICT suppliers (Marketline, 2012b).

For the sectors most linked to food is obviously important the relationship with food suppliers. It is essential to maintain a network of reliable suppliers offering of merchantable quality foods. This is particularly critical in areas such as the fast food industry, where it is also necessary to maintain low food costs. It becomes necessary to select those suppliers that work with large volumes and low margins but who manage to maintain a good quality of food provided (Marketline, 2012a).

In the HoReCa sector, suppliers are generally stronger than the industry players over two important elements. On the one hand the fact that a significant part of operative costs are spent on wages, as this industry is labor-intensive. The fact that wages are high, even for the existence of minimum wages laws present in many states, will lead the company to want to reduce other costs, those of food in the first place, but without decreasing the quality of the food offered. Having quality products at low cost means that HoReCa operators are closely linked to their suppliers, who are not generally so tied up on the other side. Then on the other hand players suffer for the high transition costs in finding new suppliers, while supplier does not suffer the loss of a customer (Marketline, 2012c). The relationships are reversed when we think of the bargaining power of players organized in chains.

To consider the important role of the real estate activities than the HoReCa operators, the Financial Times columnist Tim Harford (2006) about the major players in the coffeehouse. The author argues that mark-ups on the price of coffee are around 150%, so there is someone who earns a lot about coffee. The fact that some of the major chains can charge so much the price of coffee depends on the fact that there is no one nearby able to offer the same product at a lower price. The prices are so high and lacks direct competition depends on favorable locations. Starbucks, for instance, chooses positions suited to meet the coffee needs of commuters. So, even though there may be other competitors interested in opening a bar nearby and through competitive mechanisms to lower the price of coffee, this is not possible due to lack of venues in strategic positions. The result is then that property owners have the opportunity to make high profits that the coffeeshops unload on their customers through higher markups on coffee.

Moreover, a significant part of the active management of costs is due to manpower. As regards the retail industry, manpower can be a critical factor in several aspects such as selection, training or experience. On the other hand, the standardization of internal processes and the concentration of companies make these firms to acquire bargaining power vis-à-vis employees (Senauer et al., 2010).

1.3.3 The buyers' bargaining power

Let us see how they act the customers or potential customers of the sector. In this case we have to understand how to operate the (espresso) coffee consumers, actual or potential. This is a category for which we expect a low bargaining power. In the relationship between buyers and sellers we are in fact in an industry in which a seller, a bartender, have many customers who individually make purchases for values representing a minimum percentage of sales. Also the fact that the purchase of coffee represents a very small share of income suggests that price sensitivity is very low for consumers. The demand for non-durable goods, in fact, is assumed to be dependent on the income and on the prices of the good itself and its substitutes, but our case seems to be one of the exceptions. In fact, we are describing a saturated market, in which every consumer can purchase the desired amount of product. The direct relationship between income and demand is, therefore, not working (Durevall, 2005).

The consumption of coffee, in fact, does not appear to be linearly related to income. In high-income countries the consumption of coffee may have reached the optimal level for consumers, so increases in income should not to affect consumption, as well as income decreases may have mainly effect on savings rates, do not interfering on coffee consumption . In low-income countries, however, that coffee consumers could quickly converge on the optimal consumption levels during income increases. This gives evidence of a lowering income elasticity of demand when income increases. For level of income over US $ 14,000 per year, consumers can afford all the coffee they wont (Galindo, 2011).

To understand the consumption linked to of local culture and how drinks typical of distant cultures can penetrate specific markets, important clues may be provided by the study of younger consumers (Habib et al., 2011). Young people may be more disconnected from the existing culture and to be that of long-term change agent within the internationalization strategies of a product. In fact, age differences can show in particular products of consumption preferences differences, among which coffee is an example.

Throughout the world of retail there may be strong opportunities by considering the economic development of countries that are seeing strong cultural and demographic changes. An example might be Indian case, with an increasing number of nuclear families, women workers and more generally with the growth of the middle class that has led to the development of the entire retail sector. This growing middle class and the resulting developing retail sector have brought positive performances also in the food industry. The growing demand for the entire retail sector could lead to entry and the development of increasingly more structured companies and international corporations within the Indian industry (Bahuguna, 2012)), which is expected in particular in the area related to food (Bajpai and Imtiaz, 2013). What is happening in India could be the case of many other nations that are at the same level of economic development, especially for the growing middle class.

Even for the case of China, the expansion of the middle class has led to changes in the market. Here it should also be pointed out that the introduction of a market economy has been a driver of the market transformation, increasingly linked to recognizable brands in the food sector. As just stated, it is primarily linked to that age range, entered into employment market during the economic boom, that has already brought to the brand culture as both status and quality. In this market, moreover, it is forecast a sharp reduction in the number of companies related to the food, with a market consolidation . Companies able to demonstrate efficiency and quality of the product will remain in the marketplace, the brands will be the way to communicate these features. On the other side, regarding the importance of the brand, one challenge is related with its falsifiability, especially in emerging markets like China. In these markets there may be cases in which many brands on the market are fake, then the consumer prefers to refer the seller to certify the authenticity of the brand. The seller often could be a big western chain of retail that with its know-how also has the ability to educate Chinese manufacturers of food products on the quality and use of the brand in order to transmit information to consumers on the quality itself (McLoughlin et al., 2012).

If in the Chinese case just described (McLoughlin et al., 2012) was especially emphasized the retail linked to consumption at home, this could also be true for consumption outside the home. The catering chains, and among them the coffeeshops, may take for example one of the big distribution organized and have competitive advantages in being a means of product quality communication to consumers.

As for the consumption of food in general, the recession has led consumers to economize on spending, which could also have implications for the long term (Senauer et al., 2010).

The consumers of the HoReCa sector are the individual customers, which are many for each company and operating individually have little bargaining power. It is possible to emphasizes the exception of high-price ranges outlets, not made up of chains and pointing to low volume of sales with high sales margins. In general, customers do not suffer transition costs. The companies have been active in building brand especially for the lower-middle price ranges, leading to brand loyalty for consumers, as indicating that the sector is much more than just a source of food (Marketline, 2012c).

1.3.4 The threat of substitutes

Among the substitutes we can make a first division into two parts, on the one hand those still linked to the consumption of espresso coffee, the other ones that do not provide for the espresso coffee. As defined by Porter (2008, p.31): “[a] substitute performs the same or a similar function as an industry’s product by a different means.” (Porter, 2008, p. 31) Then we can imagine that there are ways to drink espresso different from the one served at the bar, which can be similarly away from home but with unserved mode, such as through vending machines that offer the good for lower prices, or it could be the shift of consumption at home (“to do it yourself (bring the service or product in house)."(Porter, 2008, p.31)). The espresso coffee consumption at home is a very active nowadays, principally for the coffee capsules segment ("pods are driving sales in North America, the world's biggest coffee machine market and also the most dynamic." (Della Santa, 2012)).

As for the comparison of consumption out of home and consumption at home it is possible to observe two opposite movements of consumers. The consumption of coffee capsules is somehow a possible indication that this mode of hot drink preparation will lead to a shift in consumption from outside the home to the in house in developed countries that have suffered the effects of the economic crisis. In less developed countries but which are experiencing economic growth, it is possible to observe the opposite effect.

Developing countries, in fact, show that the growth of income declines the share of expenditure for food consumption (among other things by following the law of Engel) and that there is a variation between the proportion spent on consumption in the home and the for consumption away from home, with an increase of the second. In the Turkish example, the just described factors of this change in consumption, appears to be linked to a general Westernization of trade, particularly with the spread of shopping centers and a shift of purchases from small shops to those of mass consumption which offer a more a wide selection of quality products. These dynamics are coupled with a strong dynamism of the fast food industry.

The Westernization factor or at least more closely linked to globalization can also be noticed by the fact that consumption outside the home is strongest in the cities than in rural areas. This is evident from the study of Bozoglu et al. (2013), who takes as a proxy of wealth and membership in global markets ease of access to food, the car ownership or availability of Internet access at home.

The espresso coffee consumer does not drink espresso exclusively for the good in itself, but it could just be part of an approach to a different need, such as to socialize. Referring to what happened in the UK, in fact, the success in the first publication of such espresso and cappuccino systems was also due to the fact that the time needed to consume was suffcient to start a conversation (Morris, 2005). The cappuccino therefore responded not only to the drinking needs or to savor a peculiar taste but mainly to entertain social relations. The function to compensate for the need to maintain social relationships may also fall into other HoReCa services that offer other alternative products such as tea, wine, beer and other. These might remain in other market niches than the espresso, and should be considered as substitutes. It may also be possible to consider them as complementary goods, internal to the sector under study, if these, together with espresso, go to be part of a wider service to the customer, within the same menu. These options are two sides of the same coin that depend on the specific situation, having consequences on the competitive environment.

In this context, it might be interesting to make an observation with regard to new lifestyles, in particular we can consider how the growth of fast food is influenced by a more committed life (Habib et al., 2011), and this influences the consumption of coffee. Indeed, we can imagine that consumption can become more tied to a pleasure to quickly consumed as a corollary of a quick meal, or can go to better occupy the satisfaction of a gustatory pleasure and the development of opportunities for socialization. This second hypothesis could be corroborated by increased growth of coffeeshops in developed countries. A significant example is that of the Costa brand within the Whitbread group, as it is proving to be the brand that drives the growth of the entire company operating the many areas of the HoReCa sector under different brand names (Datamonitor, 2012).

The threat of substitutes is considered moderate. Transition costs reside fundamentally in the time spent and the effort to cook at home; from this point of view healthful lifestyle may have preference for consumption at home. Formal meals outside the home decreases with the style grow faster life. For those who eat away from home as a recreational There are of course alternatives that do not involve food but still meet the recreational needs (Marketline, 2012c).

1.3.5 The threat of new entrants

The new entrants that could threaten the competitive environment we can make two basic distinctions, on the one hand those already in the HoReCa sector, on the other hand it is possible to consider players external to this industry. Among the first there are some players who operate within the coffee sector but who are not using professional espresso machines, offering customers other types of drink then espresso based beverages. Besides these there may be some of the HoReCa industry players that do not serve coffee . These would be interesting to understand why the former have decided to serve the good only in alternative forms to those of espresso and derivatives, from second would be interesting to understand why they decided not to serve drinks derived from coffee, and if you might be interested in entering the sector or if they have well-defined choices excluding an entry into the sector. Among those who are not present in the HoReCa industry, there are obviously those totally external player that could decide to enter this market. It is difficult to understand if there are areas in which new players could enter the market. The five forces study is a useful to for possible new players and incumbents to understand the existence of these spaces in which it could be possible to play a competitive role in the industry. It might be interesting, to understand what are the chances that a player external to the sector as described but connected to it can enter the industry. Particularly through vertical integration strategies that can go over what has already been traced by other companies in the supply chain, such as Lavazza, which with its three chains (Espression, Il Caffè di Roma and Barista) has vertically integrated itself, entering solidly to make part of the industry that is the competitive environment that we have taken as a reference. There is to be seen whether this integration is seen as an opportunity by those who could do it and what do you think those who already is integrated. Compared to what just mentioned, we must consider that in the industry described, these new entrants could have coffee as the main offered good, or secondary as well.

In the retail sector it is playing an important role in the large retail chains, where selling food is not the only activity but it is often used as leverage to increase the frequency of consumer attendance (Senauer et al., 2010). In the HoReCa industry, the coffee role could be considered analogous, on the one hand, a lever to increase the input of customers in bars and coffeehouses, on the other hand, as a product that can be consumed by customers of other types of HoReCa outlets, increasing the revenues.

When big retailers going to enter new markets encounter barriers of different kinds. The barriers can be institutional, cultural, organizational or legal. The corporation must have the ability to adapt to environmental culture in which decides to enter. To entering a new market there are three possible strategies to overcome these barriers: transfer strategies that is to act an exact copying the corporate structure without adaptation to the environment, joining strategies creating new skills by recombining existing skills in the home country with the ones from other countries where the company start to operates, finally imitation strategies through which a company enters a country by imitating the best practices implemented in that country from its competitors. Other issues is the protection of knowledge, in the overcoming of legal / institutional barriers and relations especially with potential funders little stimulated by the risk of internationalization. In case of entry into mature market, moreover, the need to find the right niche market to stand as alternative to established competitors. Barriers to foreign direct investments may always be present, by imposing restrictions on corporate shares held by foreign capital or special requests for foreign investors. The liberalization of foreign direct investment at the end of the 90s is opposed to tendencies to regulate them, during the next decade (Wrigley and Lowe, 2010).

It is thought that in markets like this there may be a high probability of having new entrants. Although it must take into account the presence of strong chains and a very regulated market also for issues related to hygiene as well as wage rules, new entrants can still take advantage of low-skilled labor force and often disposed to part time. What favors more access in this market, despite the barriers described is the prospect of a growing market, both in the recent crisis, both as a prediction about the future period (Marketline, 2012c).

Chapter 2

Coffee supply chain - price analysis

2.1 Introduction

2.1.1 International coffee trade: evidences of a north-south trade dynamic

Coffee is one of the most traded commodity in the world. Considering global trade data from United Nations, coffee exports represented more than 0,17% of all the international traded flows for the year 2014 (considered in value). Taking into account the code 0901 of the "Harmonized Commodity Description and Coding System (HS)"as representative of the international coffee trade, such commerce reached a value of over 31 billion US$ in 2014, while the whole amount of trade reached almost 18 trillion worth for the same period[1].

Furthermore, coffee is a commodity strongly related with the north-south dynamics of the international trade. The coffee consumption take place largely in the north, while approximately the 90% of the world coffee production come from the south (Daviron and Ponte, 2005).

Taking into account the previous two considerations is possible to understand the importance of the production and commerce of this bean in an optic of

[1]Data come from UN Comtrade database (available on-line at the url `http://comtrade.un.org/data/`). The considered percentage is the ratio between the sum of value of all the traded goods under the HS code 0901 and the total sum of all goods traded in 2014. The description of the code HS 0901 is *"Coffee; whether or not roasted or decaffeinated; coffee husks and skins; coffee substitutes containing coffee in any proportion"* and represents all the trade relating to coffee. The value of the total exports of HS code 0901 is 31.276.352.067 US$, while all the export flow amount to 17.940.598.454.575 US$. In the calculation of the percentage are considered only the export flows to avoid double counting. Data have been downloaded on 26th January 2016. More updated data are not available with the necessary completeness.

developing studies.

The International Coffee Organization (ICO) could give us some informations to better understand the coffee trade dynamics. This organization is the most important intergovernmental association putting together nations involved in coffee trade[2]. The same ICO says between its member are placed the 98% of world coffee production and the 83% of world coffee consumption[3].

To have a first understanding of the north-south dynamics in coffee production and trade is possible to understand the ICO member's roles. ICO members are divided in two types: exporters and importers. Exporters are 42 members[4]. Importers are 8 members[5], one of which is European Union, including 28 member states.

In Figure 2.1 is possible to have a representation of the members disposition in the world map. As it is shown, there is a clear separation between coffee production in the south ad coffee consumption in the north of the world.

Figure 2.1: ICO members: striped area represents importing members, dark area represents exporting ones (Source: ICO).

From an economic point of view, it is probably better not to talk about a north-south difference but about a center-periphery relations. This concept was defined for the very first time by Prebisch (1950) and afterwards developed by

[2]Cf. `http://www.ico.org/mission07_e.asp?section=About_Us`
[3]Cf. `http://www.ico.org/members_e.asp?section=About_Us`
[4]As at December 2015
[5]Ibidem

Wallerstein (1974). The center-periphery differentiation is studied in development economics. This theory is used to describe the economic world after the born of the world system with the discovery of the Americas, the development of the colonial powers and the growth of international commerce between North-West Europe as the center and the rest of the world as the periphery. Today we could consider all the developed world as the center.

If the center of the world became gradually more rich, the periphery have a subordinate role with a stagnant wealth. This difference is reflected in the wealth of the nations participating the international coffee trade. In the role of nations living in the center of the economy, coffee consuming countries are richer than nations where take place coffee farming.

Table 2.1 shows the different wealth of ICO members. In particular there are the first twenty ICO member with higher wealth. Wealth is considered from the gross domestic product per capita, calculated at purchasing power parity (GDP($ PPP)/p.c.) using the current international dollar for the year 2014. Considering the population is important to define the real level of development of a nation. The use of a single currency is necessary in the international comparisons, moreover purchasing power parity help to take into account not only tradable goods but also not tradable ones (Volpi, 2003). Data came from International Monetary Fund, World Economic Outlook Database, October 2015. Data are available for all ICO members with the exception of Cuba. Most of the importing countries are placed at the very first positions of this particular ranking. All the importing countries are listed in Table 2.1. All the thirty members not listed in Table 2.1 are exporting members.

The ranking in Table 2.1 demonstrate how the coffee consumption take place in advanced countries, while the production take place in countries generally less developed than the firsts.

2.1.2 The value of the coffee traded in the international market

In the international market the coffee is traded in various forms. Differences depends substantially on the different levels of processing. Most valuable data to investigate this issue could be the United Nations statistics on international trade. Another source of data could be the statistics from International Coffee Organization. Having already mentioned the two sources before in this work, is necessary to understand how they works. In particular is important to note the existence of some differences in data collected. For the moment, the first big difference is in the definition of exporter status: we have seen that between the ICO members there are a differentiation between importing and exporting

Member	Role	GDP($ PPP)/p.c.
Norway	Importer	67.165,704
Switzerland	Importer	58.148,746
United States of America	Importer	54.369,826
Japan	Importer	37.518,750
European Union	Importer	36.868,814
Russian Federation	Importer	24.448,671
Gabon	Exporter	20.756,504
Turkey	Importer	19.698,302
Panama	Exporter	19.545,5312
Mexico	Exporter	17.950,007
Brazil	Exporter	16.155,338
Thailand	Exporter	15.578,557
Costa Rica	Exporter	14.919,108
Colombia	Exporter	13.479,697
Peru	Exporter	111.859,988
Tunisia	Importer	11.341,370
Ecuador	Exporter	11.302,681
Indonesia	Exporter	10.651,340
Paraguay	Exporter	8.476,492
El Salvador	Exporter	8.059,803

Table 2.1: First twenty ICO members ranked by GDP per capita at Purchasing Power Parity.

HS Code	Description
090111	coffee, not roasted, not decaffeinated
090112	coffee, not roasted, decaffeinated
090121	coffee, roasted, not decaffeinated
090122	coffee, roasted, decaffeinated
090140	coffee substitutes containing coffee
090190	coffee husks and skins

Table 2.2: HS 6-digits codes describing different kinds of coffee internationally traded.

countries, this differentiation reflects in the import-export data. There are also the re-export category in which the ICO include coffee exported by importing members. In the UN data re-export include the good, before imported, and exported without be processed, furthermore re-export data is a part of the total export data. This way, in the UN data, all the nation could be exporter if they act some process to the goods or not. Then, considering the UN data, also coffee importing countries could be between the most important international coffee exporter. Later on the underlined differences could be use to understand how to use data.

Starting from UN Comtrade database, and HS coding system, it have been already mentioned the 4-digit code 0901 as the one representing all the coffee trade in the international market. There are some 6-digit codes describing coffee traded in its various forms. This coded are described in Table 2.2[6].

Studying the 6-digit codes could give a deepening understanding of the coffee kinds traded by every nation, but to have a first understand is possible to investigate the unit price of the coffee trade in the code 0901.

The first step is to calculate the average unit price of coffee traded in the international market. The lower such price is, the less processed should be the goods.

Starting this study with the ten biggest coffee traders, considering the classification by weight in Table 2.3 ad by value in Table 2.4.

The line in the middle of the table shows a clear separation in the coffee unit price traded by producing countries and the one traded by not coffee producers. Difference in unit price in producing countries depends on the bean quality. Countries producing little or no amount of robustas[7] have higher unit price than the countries basing their production on robustas. Not too much difference there

[6] There is also the code 090130 with the same description of the code 090190. This code is not considered in the Table 2.2 because there are no data recorded for the years under investigation.

[7] in comparison to arabicas

Country	Netweight (kg)	Unit Price (US$/kg)
Uganda	212.107.998	1,93
Vietnam	1.646.310.766	2,01
Indonesia	384.827.677	2,70
India	197.329.076	2,74
Brazil	1.988.095.552	3,04
Honduras	242.082.500	3,24
Colombia	623.367.975	4,04
Ethiopia	238.689.764	4,29
Belgium	218.204.130	4,56
Germany	542.484.644	4,59

Table 2.3: First 10 exporter country by weight, ranked by crescent unit price.

is in unit price between Ethiopia and Belgium or Germany. Ethiopia is a producer of Arabica species of coffee, with high price. Belgium and Germany are importer of every kind of coffee, but in particular of the kind more similar to the raw agricultural material, say the commodity marked with HS code 090111. It represent 90% in weight of all Belgian coffee imports and 93% of German ones[8]. Belgian coffee exports are mainly of the same kind of coffee imports, placed in category 090111. There is a little added value in the 090111 export in respect to the imports of the same code (3,17 vs 3,10 US$/kg). Considering the value of exported roasted coffee, HS code 090121 reach a level similar to previously discussed one, with a higher value added (medium unit price of 8,35 US$/kg). In Germany the situation is quite different, exports in non decaffeinated roasted coffee (HS code 090121) is the main value, with a price of 6,21 US$/kg. German exports in not roasted coffee, not decaffeinated (HScode 090111) plus decaffeinated (HS code 09012), reached similar level to most exported one, but with lower unit prices (respectively 3,29 and 3,81 US$/kg, little higher than the 2,97 US$/kg paid for the imported not roasted not decaffeinated coffee).

Considering the firsts exporters by value, is possible to see how increase the number of the non producing countries, meaning that, in this areas, are sold highly priced coffee, mainly because of the processes occurred downstream the supply chain.

[8]Elaboration from data downloaded for Belgium and Germany, year 2014, from UN Comtrade database on 28^{th} January 2016

Country	Value (US$)	Unit Price (US$/kg)
Vietnam	3.311.395.619	2,01
Indonesia	1.039.609.487	2,70
Brazil	6.052.718.907	3,04
Colombia	2.516.694.333	4,04
Ethiopia	1.023.864.852	4,29
Belgium	995.204.889	4,56
Germany	2.487.575.910	4,59
USA	958.674.259	6,45
Italy	1.503.155.558	8,61
Switzerland	2.211.247.782	37,93

Table 2.4: First 10 exporter country by value, ranked by crescent unit price.

2.1.3 A supply chain analysis

Previous studies of the supply chain shows what is sustained in the previous paragraph: the coffee supply chain starts with production in the south and ends with consumption in the north. Brazil is an exception to the norm. Brazil is the biggest coffee producer but also one of the most coffee consuming country. From ICO data, Brazil is the second consuming country, after US. Even though Brazil consume less than a half of its production, due to the huge amount of the production itself it could be assessed as a big consumer. From the crop year 1990/91 to the crop year 2015/2016 the ratio of Brazilian domestic consumption over its production are in the range 0,257 - 0,493, with the exception for the crop year 1995/1996 when the ratio was 0,559 due to the 1994 frost[9]. Only some producer countries consume more coffee than their production, from ICO data, only five producing members have insufficient production for internal consumption, at the same time five members consume the same quantity of their production[10].

Starting with some considerations about the coffee supply chain: taking into account the second postwar period we have to underline a main difference between a first period in which a quota system ruled the international coffee market and the present liberalized period. The quota system is developed under the aegis of ICO with the agreement called International Coffee Agreement (ICA). The ICA was signed for the first time in 1962 and become law in October 1963. Quota system contributed to maintain coffee prices high and stable. Today the ICA is still ruling the international coffee commerce. In 2007 was signed the 7th ICA agreement. In the end of '80s the rules on international coffee market was

[9]Elaboration from ICO annual data downloaded on 16th February 2016.
[10]Elaboration from ICO annual data downloaded on 16th February 2016.

deeply changed. In 1989 ICO members did not reached an agreement for the ICA quota system, and this system ended.

With the end of quota system the players strength in respect of others changed. In particular changed the related strength of players from producing countries and from consuming ones. In the regulated period, coffee market was characterized by low price elasticity from both sides, demand and supply. Coffee prices turned out to be generally high and stable. This stability existed because of the existence of the quotas. Without any market regulation the elasticity would be low in the short period and higher in the long period. Differences in elasticities depends mainly on the biological characteristics of the plants: coffee plants needs three years to become product and a further period to reach the maximum productivity (Ponte, 2002), usually achieved between the ages of five and eight year and maintained until the fifteenth year, after a loss in productivity is registered (Licciardo, 2008).

Differently from prices stability, the production fluctuated. Quotas maintained prices artificially high, and their end brought a significant fall in coffee prices. The price fluctuation was softened, at least in the first year after the end of quota system, because of the introduction in the market of coffee previously stocked (selling that coffee amount was forbidden with quotas). Effects to reduce the fall was brought by drought in Brazil and the resulting minor production than the average (Akiyama and Varangis, 1990).

End of quota system have caused a fall in coffee prices. A consequence of the fall of coffee prices has been a lowering in the producers incomes. These effects touched not only the enterprises but also the public sector of producing countries and the earnings linked to export (Akiyama and Varangis, 1990).

From the demand side, there was a weakening of the players. On the other side of the medal, players in consuming countries strengthen their position. If the producing countries lost from the end of quota system, consuming countries, in particular US and European countries won. There was a strange game the one played by consuming countries in the previous period. ICA quota system operated in favor of producing countries but was decided jointly by producing and consuming countries. The system has resisted for so long time probably because of political interests (Akiyama and Varangis, 1990). In fact, after the second world war, US had political interests on Latin America and Europe maintained interest on Africa.

With this change in the balance of power, using the framework developed by Gereffi (1999), is possible to observe a transition from a "producer-driven" global supply chain to a "buyer-driven" one.

The first type of supply chain are the ones in which big producers with a strong international presence could lead the productive network. Producer-driven supply chains are typical of capital-intensive and high-tech industries. Coffee related industry not seems to be naturally of this kind. When quotas are fixed on coffee export the regulations, due to a limitation in the export, had created the premises to strengthen producers powers and artificially create a producer-driven supply chain.

With the market deregulation the supply chain move to a more natural (for this market) buyer-driven type. This kind of supply chain is typical in productions where retailers, dealers or strong-brand owner have the leadership. This supply chain is typical of labor-intensive industries. Coffee supply chain is a good representation of this kind of supply chain because it is highly fragmented. Many producers in developing countries do their work following specifications from retailers from developed countries. There is also the figure of the exporter, who manage the trade between production and consumption.

A complete representation of this supply chain was developed by Ponte (2002). The representation of the supply chain is in Figure 2.2. In this representation is possible to underline the exporter and the marketing board roles and linkages in the supply chain, during the quota regulation and after that period.

The marketing board was some public authority with the task to assure a minimum selling price to producers. In the liberalized coffee market, the marketing board role is no longer request (Licciardo, 2008). The dashed lines represents the linkages no longer existing in the liberalized coffee market.

End of ICA quota system meant the end of minimum prices control authorities but, more important, a concentration of the player in the middle of the supply chain. The market seen a selection of the most competitive traders. Most competitive traders are the ones who better dealt with price fall and instability. Less competitive players left the market or was acquired by others. Payers used merger and acquisition strategies to improve their role in the market. Not only traders but also roasters followed the same strategies to compete. In many cases traders entered in the roasters market and vice versa to better tackle the fall of the prices. This situation increase the internal competitiveness, and in the market took place a selection of the best enterprises(Licciardo, 2008).

2.1.4 A supply chain analysis: review of the literature

Coffee output decisions. Coffee supply chain have some peculiarities, in the previous section it was shown the division of the supply chain along a north-south relation. In this section will been shown another peculiarity in coffee cultivation and harvesting. Research on perennial plantings profitability started with the study of Nerlove et al. (1958).

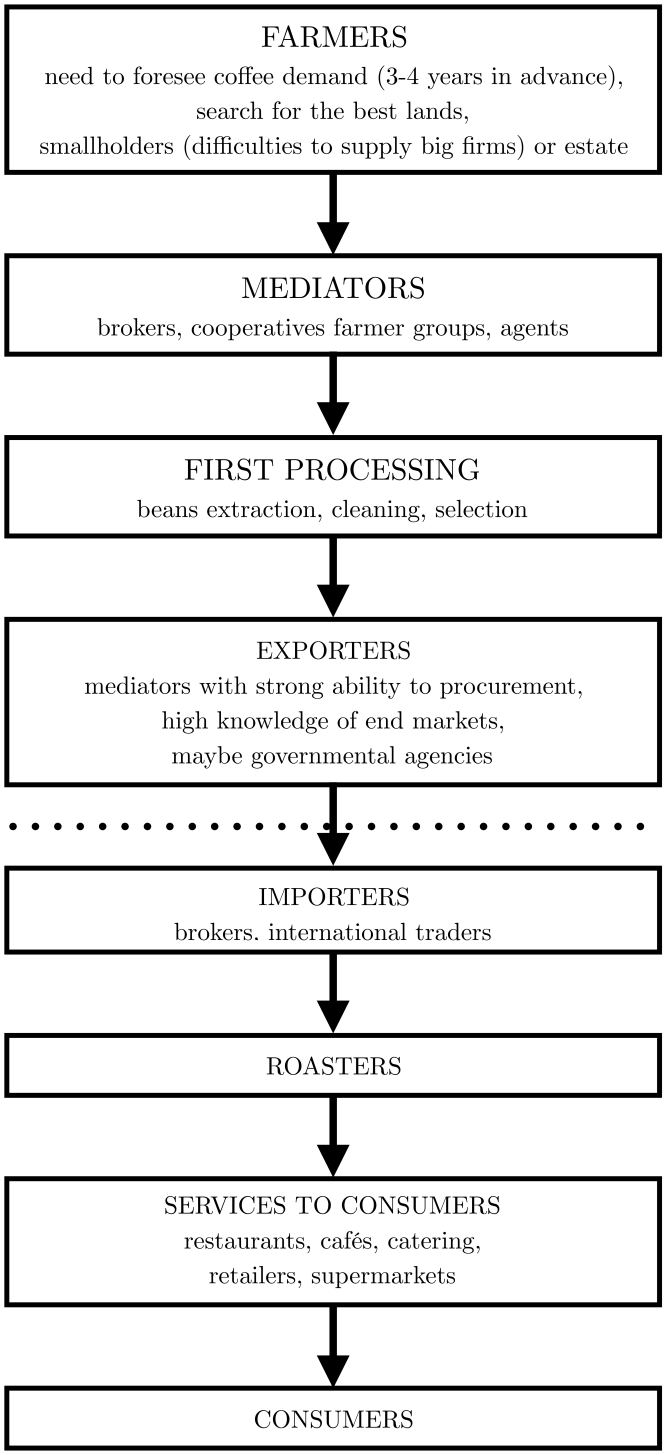

Figure 2.2: Coffee supply chain. Own elaboration starting from Ponte (2002) and Fiorani et al. (2016). Dotted line represents the passage from producing to consuming countries.

A complete treatment of the analysis of coffee supply from the point of view of the producers has offered by Akiyama and Trivedi (1987). The authors started their analysis from a literature review showing the development of model that taking into account the problem of a lag between the decision to plant and the moment in which full productivity of the plantation is reached (also considering a period at the end of plant life, when its productivity decrease). From Bateman (1965) to Wickens and Greenfield (1973), passing through Behrman (1968), Ady (1968), Stern et al. (1965) and French and Matthews (1971), there is an evolution in the thinking the maximization problem in perennial crop supply. These studies are focused not only on coffee but also on others perennial corps, however could be used in the coffee case. This research line start from the idea that farmers take their decision to maximize the present value of expected profits with respect to planted acreage (Bateman, 1965) or desired acreage (Behrman, 1968). Not so different from the previous is the article by Ady (1968) that adds some exogenous indexes to the regression, but the structure remain the same of the two previous articles. In general is possible to say that, to this moment, the updated research scheme is the Nerlovian model (Nerlove and Addison, 1958; Braulke, 1982). A step forward was reached by Stern et al. (1965), even though the advance was in the estimation of the output that uses not only lagged prices as in the past but also current prices. An actual advancement in the research was brought by French and Matthews (1971) and after by Wickens and Greenfield (1973). These authors investigated on investment and harvest decisions as separate components of the output decisions. Due to the fact that Akiyama and Trivedi (1987) find several problems in the development of this approach, they try to overcome them and determine an output equation, reaching to describe the so called *vintage supply function*:

$$\begin{aligned}\ln Q(t) = \ln A + \ln[\beta(0)e^{\lambda_1 t}\{\textstyle\sum \bar{\delta}(t-v)N^{+}(t-v) + e^{\lambda_2 t}Q(0)\}] \\ + (\beta_0) + \theta \ln P(t) - \theta \ln P^{e}(t) \\ + \textstyle\sum_{i=1}^{m} \beta_i \ln P(t-i) + u(t) \quad (2.1)\end{aligned}$$

This way is represented a model describing the output decisions in perennial crops planting taking into account

Commodity trade in international markets. In the international markets, coffee is sold in financial markets on spot or derivative bases. Every importing port have its spot market, the most important are in New York for the North American market or in Bremen and Hamburg for the European one. In New York, coffee is also contracted in the Intercontinental Exchange, that is the most important market for Arabicas. An important market for the Robusta is in the London's NYSE-Euronext. In this nowadays competitive market, these commodity exchanges cover the functions connected with the price determination and give to marketers the instruments to assure themselves against the risks connected with coffee trading (Tamvakis, 2015).

The possibility to sell commodities in the futures market is linked with The possibility to store and preserve commodity productions productions broughts some relations between cash and future prices. Prices creates a system of incentives and disincentives to store productions or brought them to the market, making an intertemporal connection between the two prices based on the net cost of carrying stocks(Working, 1948, 1949; Garcia and Leuthold, 2004). This relation seems not to be present in non-storable productions (Garcia and Leuthold, 2004). Coffee could be considered a storable production. US Department of Agriculture said World coffee stocks are growing, due to the recent increased production in Brazil and slow in Vietnamese export.USDA (2015) But in the previous times are noted a decrease in the coffee stocks, because during the International Coffee Agreement period the stocks were artificially high (Akiyama and Varangis, 1990; Bohman and Jarvis, 1999).

Storage of commodities is a fundamental aspect of the supply chain, then is not possible to understand commodity prices unless having taking into account the storage dynamics. An important aspect of storage is its stabilizing impact on prices, as suggested by the theory of competitive storage (Mitra and Boussard, 2012). This effect is due to the speculative approach of the inventory holder. Inventories exists for secure the supply but also are used in speculative approaches. Inventory holders try to buy goods at low prices and sell them at higher prices, then the stabilizer effect is simple to explain, low prices lead to stock increasings, when the prices are high the increase is in the goods supply, then the effects on prices are stabilizing movements, as said by the theory of competitive storage (Gustafson, 1958; Deaton and Laroque, 1992, 1996; Scheinkman and Schechtman, 1983; Cafiero et al., 2006, 2011; Ahti, 2009; Funke et al., 2011)

The futures coffee price dynamics resulted to be non-linear (Decoster et al., 1992) but at the same time not chaotic (Adrangi and Chatrath, 2003).

Hedging in agricultural commodities brought some benefits in reducing risks connected with prices (Garcia and Leuthold, 2004).

Commodity futures markets nowadays are more responsive to bubbles signals, returning faster to a new equilibrium than in the past (Etienne et al., 2014)

There were no extensive changes in commodity prices volatility during the financial crisis apart from some particular cases in which changes in volatility were commodity specific, understandable by the study of factors specific to that particular commodity; the financial crisis period could be assimilate to other period with high volatility (Vivian and Wohar, 2012).

The financial markets have experienced a greater liquidity than in the past, due to the enhancement of people participating at financial market activity due to hedging and speculative operations (Mensi et al., 2013).

The shocks and volatility transmission between different commodity markets are due to liberalization and cointegration occurred between them, and it is also possible to highlight a significant correlation between commodity and equity markets (Mensi et al., 2013).

Adding commodity to the financial portfolio is a strategy to improve the risk-adjusted return performance (Mensi et al., 2013), following this indication the correlation between commodities or between commodities and other financial products will increase.

At the beginning of the 21^{th} century commodities markets access was expanded and at same time trading costs declined, attracting new investors and increasing the number (Irwin and Sanders, 2012).

trading cost fell mainly because of the new trading mechanisms connected with the use of electronic devices, this nw way to match demand and supply improves the information transmission too (Irwin and Sanders, 2012).

During the period 2004-2011 three main structural changes occurred in the futures markets: 1) the shift to an electronic order matching platform with its influence on market performances, trading costs and informations transmission, 2) new financial instruments developed by investment banks and 3) the participation of new investors in the financial activities. These innovation, in particular the last, have decreased the risk premiums in the commodity markets, then it has lowered the cost of hedging and reduced the volatility of a market better integrated with the financial one (Irwin and Sanders, 2012).

From the point of view of the real economy two main factors are accounted for the agricultural commodities price growing in the financial crisis period: on one side the increased demand of goods from the emerging economies that faced a stagnant supply, on the other side for the increased demand for biofuels in the developed economies (Cheng and Xiong, 2013).

In the past there were two major classes of investors in the commodity futures markets: hedgers and noncommercial traders. After the firsts years of the new millennium a third class of participants are largely involved in market operations: the so-called commodity index traders. This last class are the speculator's one (Cheng and Xiong, 2013).

The futures market could impact the commodity prices through three principal economic mechanisms:

1. standard theory of storage;
2. risk sharing;
3. information discovery.

The theory of storage refers to a convenience yield in holding the commodity to have an higher price. This convenience yield is related with a future basis (the futures price minus the spot one) that is connected with the cost of storing the commodity. The risk sharing, or the trying to have a better sharing of commodity price risk, is one of the reasons to develop the commodity futures markets. At last the centralized markets have the role to aggregate information about supply and demand otherwise scattered in every place the commerce take place (Cheng and Xiong, 2013).

Volatility and raising of food prices are related to the increase of biofuel production. Biofuel policies demonstrate a direct impact on sugar price, and this price is influencing most of others agricultural commodity prices. In general ethanol production could influence short-run agricultural commodity prices (Zhang et al., 2010).

The income growth in developing countries increased the demand for meet, then the one of feed grains used for animal nutrition and meet production (Schnepf, 2008).

Biofuel policies in US, EU and in other countries increased the demand for some coarse grain and oilseeds (Schnepf, 2008).

Agricultural futures markets are highly interrelated and in this connected world the leading role is represented by US markets Hernandez et al. (2014).

Variability on agricultural commodity prices depends on the low production and consumption elasticities, this low elasticities could brought high fluctuation of commodity prices even with little market shocks (Dehn et al., 2005).

In agricultural commodities markets shocks to supply are the predominant cause of price volatility. It depends mainly on the lag between production decision, based on expected prices, and the real demand level and realized price on the marketplace (Dehn et al., 2005).

"I argue that the rise in food prices over 2007 and the first half of 2008 should be seen as part of the wider commodity boom which is largely the result of rapid economic growth in China and throughout Asia in a context of loose money and in which, because of previous low investment, supply was inelastic. The demand for grains and oilseeds as biofuel feedstocks was the main cause of the price rise but macroeconomic and financial factors explain its extent. The futures market may be an important monetary transmission mechanism, but it is commodity investors, not speculators, who, by investing in commodities as an asset class, may have generalized prices rises across markets." (Gilbert, 2010) "current 1st generation biofuels production are corn, wheat, sugarcane, soybean, rapeseed and sunflowers" "In recent years the share of bioenergy-based fuels has increased moderately, but continuously, and so did feedstock production, as well as yields. So far, no significant impact of biofuels production on feedstock prices can be observed. Hence, a co-existence of biofuel and food production seems possible" Ajanovic (2011).

With the attractiveness of biofuel production, the correlation between agricultural and energy markets will became more stronger. These linkages connected the world oil prices with the agricultural commodity prices, but have little or no effects on local agricultural markets (Nazlioglu and Soytas, 2012)

A positive effects for investments in agricultural commodity markets could be seen when the oil price increases and the dollar weakens, as during the period 2006-2008 (Nazlioglu and Soytas, 2012).

In the period from 2006 to mid-2008 international prices of agricultural commodities registered an upward trend not seen for about forty years. This trend could be explained at lest by four reasons related to demand-driven changes:

1. rising world food demand, mostly from BRICs and other states that have reached higher levels of economic wellbeing;
2. increasing biofuel production;
3. increasing activity in futures market, included speculation activities;
4. the US expansionary monetary policy.

On the supply side there are other explanations, as:

1. low rate of agricultural investments and research and development activities;
2. higher oil prices;
3. weather-related shocks .

(Cooke et al., 2009).

It is not sure that during the food crisis bubbles in some agricultural commodities derived from financial speculation (Gutierrez, 2013).

Agricultural commodities prices in the past were determined by supply and demand, nowadays financial investors have their role in defining these prices (Baldi et al., 2016).

Existence of a causal nexus between US policies and agricultural commodities prices, in particular biofuel policies have elevated this prices in the world market (Rausser and De Gorter, 2014).

After the crisis there is the possibilities of risk transmission between different energy and agricultural markets. Linkages for these relation could be the use of oil as a production cost, the connection of the two markets with biofuel related activities and the use of agricultural commodities as a way ti invest. Apart from this possible linkages, the real causal link between the two markets is not yet known, but there is the possibility that other financial factors could playing their role in the agricultural commodity market (Nazlioglu et al., 2013).

Volatility transmission between agricultural commodities futures market is a short-run phenomenon (Beckmann and Czudaj, 2014).

Fluctuation in the oil prices could be used by investors to predict agricultural commodity prices (Nazlioglu, 2011).

A global supply chain model. After having shown international coffee market macro-data and a review on different areas of the coffee global supply chain, there is a necessity to find a model that could represent the whole supply chain. An interesting framework is the Costinot et al. (2013) one. In this study, in fact, there is a clear and formal representation of a global supply chain in which the specialization processes brought to a differentiation creating a north-south dynamics as the one found in the coffee supply chain. Costinot et al. (2013) start from studying a possible model of international supply chain with the following characteristics: an arbitrary number of nations, one factor of production, a continuous of intermediate goods that became the end product after a series of transformations prone to errors.

In the development of that model, the authors followed Sobel (1992) and Kremer (1993) instructions about models with sequential production and presence of errors. Sobel (1992) studied processes prone to errors, that can be divided into different operations, with the aim to find an efficient subdivision. Kremer (1993) developed a production function for a transformation process prone to errors that is coherent with differences in national wealths (and small firms prevalence in less developed countries) and salary differences within the firms.

In this model (Costinot et al., 2013) the production of the final good necessitate of one unit of the intermediate good at the previous stage ad one unit of labor at every stage. Some errors take place along the supply chain, at every error the intermediate good unit subjected to the error will be lost. Errors come up along the supply chain with a constant poissonian rate, this rate represent the exogenous technological characteristic of the nation in which the intermediate process take pace. This model is useful for the representation of the coffee supply chain because in a free market equilibrium shows a kind of vertical specialization in which developed countries are specialized in the final parts of the production and developing ones are specialized in the initial phases of the same production. This kind of specialization come from absolute differences in national productivity, these differences become comparative advantage source Costinot et al. (2013).

This framework there is mathematically described as follow. There is only one producing factor, the labor L_c, with its salary w_c . Work is employed for the transformation of an intermediate good in the consecutive intermediate good in a continuuom of stages $s \in \mathcal{S} \equiv (0, S])$ taking place in different countries $c \in \mathcal{C} \equiv \{1, \ldots, C\}$. The characteristic element of the model is the possibility that errors take place along the supply chain. Errors take place according to a Poisson distribution with λ_c. The subscript in λ_c means that every country have a different distribution, in fact this distribution is an exogenous characteristic of every country. In this model, then, nations have a role in the supply chain organized according to strictly decreasing λ_c.

The output of the intermediate production is given by:

$$q(s + ds) = (1 - \lambda_c ds)q(s) \tag{2.2}$$

The equation (2.11), considered the derivative definition,could be rewrited as $\frac{q'(s)}{q(s)} = -\lambda_c$, with λ_c the constant rate at which intermediate goods will be irreparably damaged.

The model find the equilibrium of perfect competition, particularly, if a good is produced in country $c \in \mathcal{C}$ than

$$p(s + ds) = (1 - \lambda_c ds)p(s) + w_c ds \tag{2.3}$$

will represent the profit maximization. For reaching the market clearing conditions in goods and labor markets are needed:

$$\sum_{c=1}^{C} Q_c(s_2) - \sum_{c=1}^{C} Q_c(s_1) = -\int_{s_1}^{s_2} \sum_{c=1}^{C} \lambda_c Q_c(s) ds, \forall s_1 \leq s_2, \tag{2.4}$$

$$\int_0^S Q_c(s) ds = L_c, \forall c \in \mathcal{C}. \tag{2.5}$$

To complete the theoretical framework in Costinot et al. (2013) there are the results on the vertical specialization and the wage distribution Vertical specialization follows the rules:

$$S_c = S_{c-1} - (\frac{1}{\lambda_c}) \ln(1 - \frac{\lambda_c L_c}{Q_{c-1}}), \forall c \in \mathcal{C} \tag{2.6}$$

$$Q_c = e^{-\lambda_c (S_c - S_{c-1})} Q_{c-1}, \forall c \in \mathcal{C}, \tag{2.7}$$

with linit conditions $S_0 = 0$ e $S_C = S$.

International wage distribution, instead, is given by

$$w_{c+1} = w_c + (\lambda_c - \lambda_{c-1})p_c, \forall c \in \mathcal{C} \tag{2.8}$$

$$p_c = e^{\lambda_c N_c} p_{c-1} + (e^{\lambda_c N_c} - 1)(\frac{w_c}{\lambda_c}), \forall c \in \mathcal{C} \tag{2.9}$$

with limit conditions $p_0 = 0$ e $p_C = 1$.

Having said that this model could be useful for the representation of the coffee supply chain, with a characteristic North-South dynamic as shown in Paragraph 2.1.1, we could see that a possible problem come up against the assumption that this model could represent the supply chain that is taken in account: nothing is already said about possible damages to the coffee along the supply chain.

In fact is more simple to show how the North-South dynamic, in this case, is better represented not by exogenous technological levels, but by the intrinsic natural characteristics of coffee plants, at least for the production of the row agricultural material. Coffee plants, in facts, grow up in tropical and subtropical areas. This kind of plants necessitate of a temperature that remain near twenty Celsius degree and rain in abundance Licciardo (2008). It is possible to find these natural characteristics in the developing areas and not in the developed ones. On these side it is possible to suggest that some comparative advantages exists but from an environmental point of view.

On the other side, for the consumption, is possible to show it si referred more on cultural characteristics than on economical one such as final good price or wages and wealth. This idea is supported by the research of Durevall (2005) on the Swedish market. In that case, is shown how the main determinant of coffee consumption in Sweden (one of the most important consuming country) are inter-generational preferences. It was proved, in fact, that coffee consumption has changed depending on factors related to age and not on factors related to economy. This have an important consequence in the fact that cultural aspects are the determinant of coffee consumption and not economic aspects, at least in the situation on Sweden. Economic aspects could have their relevance under some threshold of prices and/or income, but, since the coffee cup price is so low and the Sweden is a rich country it seems to be very far from that threshold Durevall (2005), different situations could be possible in poorer countries.

Recalling the Costinot et al. (2013) model, apart from the aspects just mentioned, it seems to be useful for the representation of the coffee supply chain. First, there is a North-South relation and this model brought to its description. Second, the idea of errors and destruction of goods units seems to be coherent. Even thought there are not reliable data on coffee lost along the supply chain, it seems to be natural that an agricultural good could have some problems during the transformation processes; it is possible that some amounts of coffee could be lost during the transportation, or that some intermediate processes results not to be successful and the resultant product will be unusable fo human consumption. Then could be a loss of coffee in every phase of its transformation, from production to consumption. For the data, it is possible to consider that, at least for products involved in the international trade is possible to have a source of wasted goods in the re-export and re-import data. These kind on data present in the Un Comtrade database refers to good exported from a country and re-imported in the same country due to different motives, one of which is the goods defectiveness[11]. An example is US coffee re-export that reached over 38mln kg in 2014[12], since seems not to be plausible that the motives are in general of other nature than defective goods, due to US economic conditions (for other motives *cf.* Nota 11)

Costinot et al. (2013) model have some peculiarities useful to adapt the model at the coffee case. One is the possibility to use the model to represent a supply chain in which more parts are assembled in an end product. The reason behind this concept is in the fact that poorer countries tend to be specialized in assembling products. Instead, developed countries usually are specialized in the productions taking place at the end of the productive supply chain, where are built the most complex and technological advanced components. This idea could be useful in the study of the coffee supply chain because, considering the coffee as an hot drink, the production of the final good necessitate the use of coffee machines. Since coffee machines are fundamentally traditional productions but could reach an high level of technological development in some kind of professional coffee machines or in super-automatic ones, them are produced mainly in Western Europe or North America.

[11]In the Un Comtrade Glossary is possible to find: *"Re-exports are exports of foreign goods in the same state as previously imported; they are to be included in the country exports. They are also recommended to be recorded separately for analytical purposes, which may require the use of supplementary sources of information in order to determine the origin of re-exports, i.e., to determine that the goods in question are indeed re-exports rather than the export of goods that have acquired domestic origin through processing."* source: `http://comtrade.un.org/db/mr/rfGlossaryList.aspx`. Analogous definition from the other side of the trade is possible to find for re-imports. Moreover in the same website at URL `http://unstats.un.org/unsd/tradekb/Knowledgebase/Reexports-and-Reimports` is possible to read: *"There are several reasons why an exported good might return to the country of origin. The exported good might be defective, the importer might have defaulted on payments or canceled the order, the authorities might have imposed an import barrier, or demand or prices in the country of origin might have made it worthwhile to bring the good back."*.

[12]Data from Comtrade, HS code 0901, downloaded on 19 May 2016. Data are generally lower than of previous years, then is possible that are incomplete and necessitate to be updated, but are sufficient for the aim of this paragraph.

2.2 Literature Review on Models Useful to Describe Coffee Supply Chain

In this section there is the discussion of different models, found in the literature, that are able to describe different area of the supply chain. In the next paragraph it is proposed the model of coffee beans output. Then there is a description of the north-south relation along the supply chain. At the end the study of price transmission along the same supply chain.

2.2.1 Coffee Beans Production

Given the peculiarities of the production of coffee, in particular the timing of plantations production, it has developed a line of research that began with Nerlove et al. (1958), which has focused on the profitability of the offer by perennial plantations. Full analysis of the theme was offered by Akiyama and Trivedi (1987). The author retraces in particular studies of Bateman (1965), Behrman (1968), Ady (1968), Stern et al. (1965), French and Matthews (1971) and Wickens and Greenfield (1973) to provide its production function. Although the just mentioned studies focus on different types of products, which only partly touches the coffee, actually they deepen the understanding of the production of types of crops following the same timing model: a waiting time before the plant becomes full productive and, at a certain point of the development, a productivity decay.

Akiyama and Trivedi (1987) he wants to overcome the critical points of previous studies, emphasizing the need to develop a model that encompasses within itself four characteristics: *a*) the existence of a post sowing period in which plants are unproductive, *b*) the dependence of the actual production, among other things, also from previous production levels, *c*) the existence of significant adjustment costs for what concerns both the planting and the removal of plantations, *d*) constraints related to the adjustment processes as well as those linked to past decisions.

These studies allow us to identify the expected output, and the best strategies to plant or replace the plants with a production that can be defined as perennial. Furthermore, they also define the output of the plantation through the *vintage supply function*:

$$\ln Q(t) = \ln A + \ln[\beta(0)e^{\lambda_1 t}\{\sum \overline{\delta}(t-v)N^{+}(t-v) + e^{\lambda_2 t}Q(0)\}] \\ + (\beta_0) + \theta \ln P(t) - \theta \ln P^{e}(t) \\ + \sum_{i=1}^{m} \beta_i \ln P(t-i) + u(t) \quad (2.10)$$

2.2.2 A global supply chain model

Let us see a supply chain model useful for the examination of the international coffee market. An interesting framework seems to be the one of Costinot et al. (2013).

In the cited article there is a model with a clear representation of a global supply chain that develops with a north-south specialization dynamics. Thus it appears to be generally similar to what has been described for the coffee supply chain. The article (Costinot et al., 2013), in fact, develops a theory about a global supply chain operation with certain characteristics comparable to those of our case study. The considered characteristics of this supply chain are: an arbitrary number of nations, a factor of production, a continuous intermediate goods produced in sequence which lead to the final product after a series of transformations subject to error.

In developing the model, the authors have followed the guidelines in Sobel (1992) and Kremer (1993) about sequential productions subject to errors. Sobel (1992) has studied, in fact, the transactions subject to errors that can be divided into several parts, in order to identify an efficient subdivision. Kremer (1993) develops, instead, a production function subject to errors which is consistent with differences in wealth between different nations and wages differences within companies. Firtermore, this production function assumes the prevalence of small businesses in less developed nations.

In the model, the production of the final good requires the use of a unit of work and a unit of the intermediate good produced in the previous stage. The errors occur in the supply chain according to a Poisson constant rate that is the exogenous technological feature typical of the country in which the intermediate processing occurs. Every mistake cause the lost of the intermediate good units that were been processed at the time. This model is useful as a starting point for our representation because in a free market equilibrium shows a vertical specialization in which the most developed countries are specialized in the final stages of production, while the least developed countries, on the contrary, are specialized in the early stages. This specialization comes from the absolute differences in productivity between nations that becomes a source of comparative advantage (Costinot et al., 2013).

The supply chain of coffee is distributed according to this route that goes from the south to the north, acquiring added value. The foregoing is a point in favor of the model for the representation of the international coffee market, in fact, as we have seen, the coffee is generally produced in the south of the world and consumed in the north. The question mark on the use of this model comes from the reason for the placement of different countries along the supply chain. In the model the most developed countries are positioned at the end of the supply chain because there is greater risk of losing the added value which added to the raw material in the previous steps. In the case of coffee, in a different way, the north-south arrangement is derived mainly from the environmental advantages of cultivation of the plant in tropical areas and for cultural characteristics as regards the consumption.

The coffee plant, in fact, grows in tropical and sub-tropical areas since it requires temperatures that deviate little from twenty degrees Celsius and heavy rains (Licciardo, 2008). The consumption of coffee, on the other hand, may also result from different factors, such as, for example, in the study on the Swedish case it is shown that the consumption of coffee, in that particular case, depends primarily on the intergenerational preferences and not by the price or income (Durevall, 2005).

The fact is that this development of the sector on the route from south to north exists. The fundamental idea that mistakes could be made in every steps is relevant. The coffee can in fact be lost, ruined in the processing stages, there may be inventories that remain, even in error, in stock, etc.. so there may be a loss in any stage of processing. Data on the re-export, for example, represent the fact that once imported goods are sent back to their home countries, among these there may be goods that did not arrive undamaged at the port of arrival, so they are sent back to the country of departure.

The model in Costinot et al. (2013) anyway allows deviations from the linear supply chain. One of these deviations is represented by the production of more parts which are then assembled. The rationale behind this concept is that the poorest countries tend to specialize in the assembly, while the richer ones in the final stages of production of the most complex parts of the product. The case of coffee can be represented in this last case. Although coffee has a simple production, it follows a pattern in which the intermediate steps are implemented in the richest countries, often because they are also the product of the consumer countries. If we consider coffee as a hot drink, its final production takes place in the consuming location. For the estraction of the hot drink are used machines built in developed countries, particularly in countries of Western Europe and North America, that are the technological appliances used in the supply chain.

In the considere framework (Costinot et al., 2013) there is, in addition to the good that is transformed, only one factor of production, work L_c, paid with wage w_c . The work is employed for the transformation of an intermediate good in the subsequent intermediate one, in a continuous of steps $s \in \mathcal{S} \equiv (0, S]$ taking place in different nations $c \in \mathcal{C} \equiv \{1, \dots, C\}$. The main feature of the model is the probability of the error distributed according to a Poisson distribution λ_c, indicating the exogenous characteristic of the nation c. For the model, then, nations are listed according to their λ_c, strictly decreasing. The output of the intermediate good is defined by:

$$q(s + ds) = (1 - \lambda_c ds)q(s) \tag{2.11}$$

The Equation (2.11), considering the definition of the derivative, could be write also as $\frac{q'(s)}{q(s)} = -\lambda_c$ considering thee λ_c as te index of the constant tax at which intermediate goods are destroyed. The model goes on to identify the equilibrium of perfect competition, and in particular, whether a good is produced in a country $c \in \mathcal{C}$ then

$$p(s + ds) = (1 - \lambda_c ds)p(s) + w_c ds \tag{2.12}$$

will represent profit maximization. As for the condition of market clearing of the goods market and that of labor, will also have

$$\sum_{c=1}^{C} Q_c(s_2) - \sum_{c=1}^{C} Q_c(s_1) = -\int_{s_1}^{s_2} \sum_{c=1}^{C} \lambda_c Q_c(s) ds, \forall s_1 \leq s_2, \tag{2.13}$$

$$\int_0^S Q_c(s) ds = L_c, \forall c \in \mathcal{C}. \tag{2.14}$$

To complete the theoretic framework of Costinot et al. (2013) there are the results on vertical specialization and income distribution. The vertical specialization take place according to:

$$S_c = S_{c-1} - (\frac{1}{\lambda_c}) \ln(1 - \frac{\lambda_c L_c}{Q_{c-1}}), \forall c \in \mathcal{C} \tag{2.15}$$

$$Q_c = e^{-\lambda_c (S_c - S_{c-1})} Q_{c-1}, \forall c \in \mathcal{C}, \tag{2.16}$$

with limit conditions $S_0 = 0$ e $S_C = S$. International income distribution is given by:

$$w_{c+1} = w_c + (\lambda_c - \lambda_{c-1}) p_c, \forall c \in \mathcal{C} \tag{2.17}$$

$$p_c = e^{\lambda_c N_c} p_{c-1} + (e^{\lambda_c N_c} - 1)(\frac{w_c}{\lambda_c}), \forall c \in \mathcal{C} \tag{2.18}$$

with limit conditions $p_0 = 0$ e $p_C = 1$.

2.2.3 Review of the Literature on Coffee Price Analysis

This section will present some works in order to understand the different researches developed on the coffee price related questions.

A first example of coffee price related research could be the one of Durevall (2005). The author explores in his text the dynamics of prices of roasted coffee. It is studied over a long period of time, from 1968 to 2002, but only for the Swedish market. This study take into account only the b2c commerce of the supply chain, is thus lacking, in this survey, an investigation of the relationships with other coffee prices we can find along the supply chain.

The research was then carried out on a country traditionally coffee consumer. It turns out that coffee consumption is not linked to the price, at least for a demand from consumers with an income in line with the standards of developed nations. Other factors, however, can affect coffee consumption, as the generational change and the consequent cultural changes.

Li and Saghaian (2013), on the other side, went to investigate in the upstream supply chain of coffee, from production to the international market.

The purpose of the text was to identify the bargaining power of farmers working in the world of coffee. The authors set off by the idea of the existence of a oligopsony. In particular, they wanted to study social issues and economic development of farmers operating in a market with excess supply and asymmetric price transmission.

The main result of the article is the identification of a greater bargaining power of Colombian farmers compared to the Vietnamese ones. In Colombia the most important production is that of Arabica coffee, with higher quality than the Robusta, of which Vietnam is the biggest producer. This differential quality represents a leverage and Colombian farmers use it to have a most favourable price for their production.

Bettendorf and Verboven (2000) have studied the changes in the Dutch market during the freeze took place in Brazil in 1994. They have studied data limited to the Netherlands, in a very limited period of time, ranging from 1992 to 1996. The authors noted a highly competitive market, where little of price stabilization was carried out thanks to the lowering of the mark-up. Given the internal competitiveness to the market, in fact, the mark up was already low and therefore did not give many possibilities of action on it. Another important result, which also will find again later, it is that in the final price of the coffee served there are many different elements, other than coffee bean price.

La trasmissione del prezzo del caffè To go deeper into the supply chain of coffee, it is possible to study how prices change along different steps in the commodity transformation and commercialization. Along the supply chain, the coffee bean will undergo transformations until arriving into the cup, each transformation will match an increase in the price of the good. The increase in the price of the asset will be a consequence of the interaction of coffee with another factor of production (transormations or commercialization). Depending on the contribution of the other factor of production will vary the price and there will be an indication that we are facing a new intermediate good.

At this point it is possbile to consider as example the model proposed by Mehta and Chavas (2008) . The model is useful because shows a differentiation into three prices, within the econometric analysis. It is considered, in fact, a coffee producer price p_t^F, an intermediate price, we can call it the wholesale price p_t^W in addition to what they see final consumers p_t^R. There will therefore be that the price p_t is actually a vector formed of three elements as specified:

$$p_t = \begin{bmatrix} p_t^F \\ p_t^W \\ p_t^R \end{bmatrix} = \begin{bmatrix} f(p_{t-1}, p_{t-2}, \dots p_{t-n}, x_t, x_{t-1}) \\ g(p_{t-1}, p_{t-2}, \dots p_{t-n}, x_t, x_{t-1}, \dots x_{t-n}) \\ h(p_{t-1}, p_{t-2}, \dots, p_{t-n}, x_t, x_{t-1}) \end{bmatrix} + \begin{bmatrix} e_t^F \\ e_t^W \\ e_t^R \end{bmatrix}. \tag{2.19}$$

The price system is structured according to the specific characteristics of the sector and considering the price transmission from one production step to another. This is further specified by the following equations:

$$\begin{aligned} p_t^F &= k_0^F + k_t^F t + k_{quota}^F d_{t-1} + k_Q^F \prime Q_t \\ &\quad + \sum_{S=F,W} \left\{ k_S^F p_{t-1}^S + \sum_{k=1}^{n-1} (k_{S,k}^F) + (k_{S,k}^{F+} D_{S,t-k}^{+}) \Delta p_{t-k}^S \right\} \end{aligned} \tag{2.20}$$

Representing the price of coffee that comes from production and comes at an intermediary (wholesale) stage.

The phase of trade between intermediaries and final production is described by the price:

$$\begin{aligned} p_t^W &= \beta p_{t-12}^W + \text{effetti di breve termine} \\ &+ \left(b_0 + \sum_{T=\text{I,II,III}} [(b_T + b_T^A ICA_{t-T}) P_{t-T}] + (b_{\text{II}}^{+} + b_{\text{II}}^{A+} ICA_{t-v\text{II}}) D_{t-\text{II}}^{+} P_{\text{II}} \right) \\ &\times \left(1 + \sum_{T=\text{IV,V}} (\varphi_T + \varphi_T^A ICA_{t-T} + \varphi_T^{+} D_{t-T}^{+} + \varphi_T^{A+} ICA_{t-T} D_{t-T}^{+}) P_{t-T} \right). \end{aligned} \tag{2.21}$$

That comes from the equation:

$$p_t^w = \beta p_{t-12}^w + (a_t - \beta a_{t-12}) + c(\Delta I_t - \beta \Delta_{t-12}) - c b_t \varphi_t \tag{2.22}$$

where ΔI_t, b_t e φ_t are defined by:

$$\Delta I_t = k_0^W + k_{quota}^W d_{t-1} + \sum_{S=F,W,R} \left\{ k_s^W p_(t-1)^S + \sum_{k=1}^{r-1} k_{S,k}^{W+} D_{S,t-k}^+) \Delta p_{t-k}^S \right\} \tag{2.23}$$

$$b_t = \left(b_0 + \sum_{T=\text{I,II,III}} [(b_T + b_T^A ICA_{t-T}) P_{t-T}] + (b_{\text{II}}^+ + b_{\text{II}}^{A+} ICA_{t-v\text{II}}) D_{t-\text{II}}^+ P_{\text{II}} \right) \tag{2.24}$$

$$\varphi_t = \left(\varphi_0 + \sum_{T=\text{IV,V}} (\varphi_T) + \varphi_T^A ICA_{t-T} + \varphi_T^+ D_{t-T}^+ + \varphi_T^{A+} ICA_{t-T} D_{t-T}^+) P_{t-T} \right). \tag{2.25}$$

The price of the final good is instead described by the equation:

$$p_t^R = k_0^R + k_t^R t + k_{quota}^R d_{t-1} + k_Q^R \prime Q_t + \sum_{S=F,W} \left\{ k_S^R p_{t-1}^S + \sum_{k=1}^{l-1} (k_{S,k}^R) + (k_{S,k}^{R+} D_{S,t-k}^+) \Delta p_{t-k}^S \right\} \tag{2.26}$$

The vector of errors depends, instead, on the price in addition to the dry conditions or frost plantations that have occurred over the years, or by the presence of the quota system in the previous year than the one under study.

Obviously today we are far from the end of the ICA, so we can assume that there are no repercussions of the quota system on today's prices. Following this hypothesis we can go to simplify the equations describing prices in the coffee sector. In particular, they are erased all those terms that are multiplied by dummy variables that take the value 0 in the absence of the quota system. The hypothesis is, moreover, already supported by the original model for all those values that refer to a period of at least five years higher than that of the end of the quota system. Whereas the quota system was suspended July 4, 1989 and was never resumed, the model without the part relating to quota system it is valid at least from July 4, 1994, that is, has validity in a study of the system in the last twenty years. The equations thus become:

$$p_t^F = k_0^F + k_t^F t + k_{Q'}^F Q_t + \sum_{S=F,W} \left\{ k_S^F p_{t-1}^S + \sum_{k=1}^{n-1} (k_{S,k}^F + k_{S,k}^{F+} D_{S,t-k}^+) \Delta p_{t-k}^S \right\} \tag{2.27}$$

$$\begin{aligned} p_t^W &= \beta p_{t-12}^W + (a_t - \beta a_{t-12}) + c(\Delta I_t - \beta \Delta I_{t-12}) \\ &+ \left(b_0 + \sum_{T=\text{I,II,III}} (b_T P_{t-T}) + b_{\text{II}}^+ D_{t-\text{II}}^+ P_{\text{II}} \right) \\ &\times \left(1 + \sum_{T=\text{IV,V}} (\varphi_T + \varphi_T^+ D_{t-T}^+) P_{t-T} \right) \end{aligned} \tag{2.28}$$

$$p_t^R = k_0^R + k_t^R t + k_{Q'}^R Q_t + \sum_{S=W,R} \left\{ k_S^R p_{t-1}^S + \sum_{k=1}^{l-1} (k_{S,k}^R + k_{S,k}^{R+} D_{S,t-k}^+) \Delta p_{t-k}^S \right\} \tag{2.29}$$

2.3 Elaborazione dei dati

Iniziando uno studio dei dati recenti, prendiamo quelli forniti dall'ICO per quanto riguarda il caffè. I dati disponibili per i prezzi sono a cadenza annuale per quanto riguardano i prezzi per i beni finale ed i prezzi pagati al produttore. Si può far riferimento invece ai prezzi mensili per quanto riguarda il prezzo intermedio del caffè.

La prima problematica, quindi, è quella di definire degli intervalli temporali congrui per poter avviare una regressione. Prendiamo come riferimento i dati annuali e le medie annuali del costo del caffè, al fine di poter avere dei dati omogenei per quanto riguarda la cadenza temporale.

La seconda problematica riguarda la supply chain. Il dati riguardanti i prezzi al produttore ed i prezzi finali sono riferiti rispettivamente alla nazione di origine e di consumo. Il dato del prezzo intermedio viene invece riferito alla qualità del caffè commerciato. Risulta quindi fondamentale andare a distinguere una supply chain che sia consistente rispetto alla realtà del mercato. Considerando che uno dei maggiori produttori di caffè è il Brasile, partiamo da quel dato per andare a recuperare il prezzo del bene al produttore. Per il prezzo intermedio andremo quindi a verde quello della qualità maggiormente prodotta in Brasile, ovvero il Brazilian Naturals. Questa è una qualità di arabica, tali qualità vengono commerciate principalmente nel mercato delle commodity di New York. Andremo dunque a confrontare il prezzo finale andando a prenderlo dal mercato statunitense, immaginando che vi siano meno elementi che turbino il prezzo in un mercato direttamente adiacente quello della commodity.

I dati possono essere riassumibili nella seguente tabella:

Anno	p^F	p^W	p^R
1990	54,32	82,97	296,63
1991	43,99	72,91	280,87
1992	45,20	56,49	257,78
1993	52,88	66,58	247,16
1994	114,57	143,24	340,13
1995	115,52	145,95	403,79
1996	96,35	119,77	343,03
1997	145,41	166,80	411,08
1998	105,25	121,81	376,50
1999	74,07	88,84	342,73
2000	65,98	79,86	344,98
2001	37,05	50,70	309,26
2002	30,91	45,23	292,38
2003	42,82	50,31	291,63
2004	56,33	68,97	284,94
2005	87,09	102,29	326,25
2006	87,02	103,92	320,32
2007	98,30	111,79	346,89
2008	109,26	126,59	
2009	100,80	115,33	366,90
2010	134,00	153,68	390,57
2011	224,26	247,62	519,08
2012	152,29	174,97	567,60
2013	102,14	122,23	545,28
2014	134,65	171,59	498,96

Table 2.5: Prezzi del caffè secondo dati ICO (valori in centesimi di US$ per libbra). Il dato relativo al prezzo finale dell'anno 2008 è un dato mancante

2.3.1 Primi controlli dei dati

Iniziamo il controllo dei dati con la metodologia seguita da Mehta and Chavas (2008). SI utilizzerà quindi il criterio di Schwartz (o Bayesian Information Criterion BIC, Schwarz et al. (1978)) al fine di scegliere il corretto numero di ritardi per procedere con una VAR (Sims, 1980) onde calcolare i coefficienti delle funzioni di trasmissioni dei prezzi da un settore all'altro. Verrà utilizzato il pacchetto di Gretl per selezionare il corretto numero di ritardi. Non potendo utilizzare la serie p^R poiché contiene un valore mancante all'interno della stessa, si andrà a vedere come agiscono le altre due serie. Si considererà dunque la funzione che utilizza la serie del prezzo pagato ai produttori in quanto la stessa utilizza come variabili esogene solo la serie dei prezzi intermedi, escludendo dunque la serie con il dato mancante.

Con la funzione di scelta dei ritardi di Gretl, utilizzando il criterio di informazione di Schwarz, il criterio sceglie un solo ritardo qualora se ne scelgano fino ad un massimo di cinque.

Ritardi	*BIC*
1	6,494150
2	6,566974
3	6,616052
4	6,728692
5	6,865271

Quando si sceglie la possibilità di avere fino a sei ritardi si avrà la scelta migliore con tre ritardi.

Ritardi	*BIC*
1	6,322563
2	6,235331
3	6,196849
4	6,320163
5	6,472226
6	6,617522

Oltre si avrà l'indicazione di scegliere il massimo numero di ritardi (o quello immediatamente precedente). Ciò dipenderà dal fatto che, maggiore è il numero di ritardi che verrà considerato e minore saranno le diverse posizioni della serie che si possono utilizzare. Ossia, andrà sottratto al numero di dati della serie il numero massimo di ritardi sui quali si sta ricercando e ciò porterà ad un minor numero di dati qui quali operare che potrebbero dare degli errori nella scelta.

In definitiva possiamo immaginare che, al fine di sviluppare una VAR, sia sufficiente prendere solo un ritardo. Questo è confacente col fatto che la maggior parte delle regressioni per quanto riguarda il caffè facciano riferimento solamente agli effetti di breve periodo che sono considerati quelli riferibili all'ultima annualità.

Il prezzo all'origine. Vediamo ora come agisce la VAR nel caso in cui consideriamo il prezzo all'origine, con il ritardo di un periodo e l'utilizzo del prezzo internazionale del caffè arabica brasiliano come prezzo intermedio.

Sistema VAR, ordine ritardi 1
Stime OLS usando le osservazioni 1991–2014 ($T = 24$)

Log-verosimiglianza = −72,9700
Determinante della matrice di covarianza = 25,6094

AIC $= 6,4142$
BIC $= 6,6105$
HQC $= 6,4663$
Test portmanteau: LB(6) = 2,56692, df = 5 [0,7664]

Equazione 1: pF

	Coefficiente	Errore Std.	rapporto t	p-value
const	−10,6121	3,12687	−3,3938	0,0029
pF_{t-1}	0,00534940	0,0362701	0,1475	0,8842
pW	0,888660	0,0326054	27,2550	2,74e–17
time	0,287565	0,190641	1,5084	0,1471

Media var. dipendente	94,00583	SQM var. dipendente	45,08790
Somma quadr. residui	614,6257	E.S. della regressione	5,543580
R^2	0,986855	R^2 corretto	0,984883
$F(3,20)$	500,4945	P-value(F)	5,67e–19
$\hat{\rho}$	0,214954	Durbin–Watson	1,163676

Test F per zero vincoli

Tutti i ritardi di pF	$F(1,20) = 0,0217526$	[0,8842]

In questo risultato, la significatività del p-value mostra che la nostra funzione prezzo ha un forte legame con il prezzo del bene intermedio, ma anche con il valore costante.

Se facciamo ritardare di un periodo anche la variabile esogena allora avremo delle piccole differenze. Come si può vedere di seguito, dall'analisi dei p-value si può notare che la significatività della costante viene persa, a favore di quella delle variabili ritardate. Non si può però considerare tali variabili come fortemente significative, in quanto il p-value indica che non è possibile rifiutare l'ipotesi nulla se si vuole una probabilità d'errore inferiore al 5% come è usuale.

Sistema VAR, ordine ritardi 1
Stime OLS usando le osservazioni 1991–2014 ($T = 24$)

Log-verosimiglianza = −71,0729
Determinante della matrice di covarianza = 21,8646
AIC $= 6,3394$
BIC $= 6,5848$
HQC $= 6,4045$
Test portmanteau: LB(6) = 2,45747, df = 5 [0,7829]

Equazione 1: pF

	Coefficiente	Errore Std.	rapporto t	p-value
const	−3,51372	4,92653	−0,7132	0,4844
pF_{t-1}	0,480290	0,265516	1,8089	0,0863
pW	0,896014	0,0311777	28,7389	4,02e–17
pW_{t-1}	−0,436368	0,241898	−1,8039	0,0871
time	0,0379678	0,227611	0,1668	0,8693

Media var. dipendente	94,00583	SQM var. dipendente	45,08790
Somma quadr. residui	524,7503	E.S. della regressione	5,255325
R^2	0,988777	R^2 corretto	0,986414
$F(4, 19)$	418,4921	P-value(F)	3,11e–18
$\hat{\rho}$	−0,063804	Durbin–Watson	1,689560

Test F per zero vincoli

Tutti i ritardi di pF $F(1, 19) = 3,27209$ [0,0863]

Il valore mancante nella serie. Da questo punto abbiamo il problema di considerare il valore mancante di p^R per l'anno 2008. I dati ICO provengono dallo US Bureau of Labor Statistics, e fanno riferimento alla serie Consumer Price Index - Average Price Data (Series id: APU0000717311) che presenta valori mancanti per gli anni 2007 e 2009, oltre, a quanto appena detto, ovvero la totale mancanza per i dati del 2008.

Si decide quindi di riempire quel valore utilizzando una comparazione della serie storica presa in come in Tabella 2.5 con i dati dell'indice dei prezzi del caffè al consumo dello US Bureau of Labor Statistics.

Le serie di dati alternative disponibili dalla stessa fonte statunitense appena citata sono le seguenti:

1. Producer Price Index - Commodities Roasted Coffee (Series id: WPU02630104)

2. Consumer Price Index - All Urban Consumers Coffee (Series id: CUUR0000SEFP01)

3. Consumer Price Index - All Urban Consumers Roasted Coffee (Series id: CUUR0000SS17031)

le tre serie si possono vedere in rappresentazione grafica nella Figura 2.3 insieme alla serie dei prezzi che dobbiamo andare a completare. Le tre serie sono state indicizzate equiparando il valore dell'anno 1992, il primo disponibile per tutte e quattro le serie. Questa indicizzazione potrebbe creare un'allargamento delle linee nella parte destra del grafico.

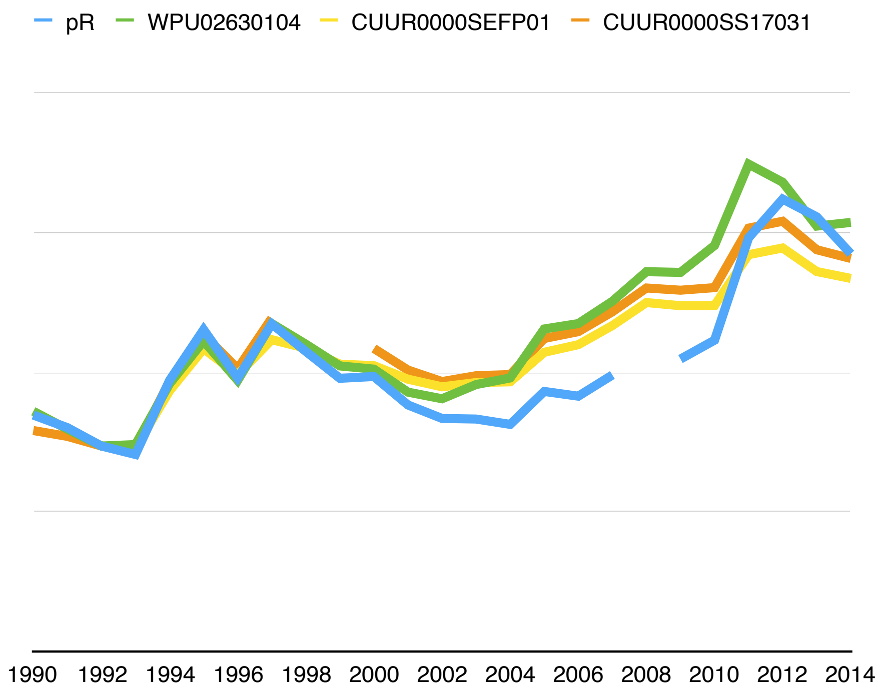

Figure 2.3: Serie di prezzi, la variabile p^R di riferimetno con le serie di prezzi disponibili presso lo US Bureau of Labor Statistics

Anche se dal grafico si può notare che l'andamento delle serie sia affine, benché proprio nel punto col dato mancante la serie p^R sia un più bassa, la serie WPU0263010 appare più affine a meno di quella discrepanza dovuta all'indicizzazione ad un periodo iniziale delle serie stesse.

Per vedere se vi sia effettivamente una maggiore similitudine tr le due serie appena citate si andranno a calcolare i coefficienti di correlazione.

Coefficienti di correlazione, usando le osservazioni 1992–2014
(i valori mancanti sono stati saltati)
Valore critico al 5% (due code) = 0,4132 per n = 23

pR	WPU02630104	CUUR0000SEFP01	CUUR0000SS17031	
1,0000	0,9072	0,9133	0,9181	pR
	1,0000	0,9842	0,9831	WPU02630104
		1,0000	0,9990	CUUR0000SEFP01
			1,0000	CUUR0000SS17031

Quelli che ci interessano in particolar modo sono gli ultimi tre della prima riga. QUesti descrivono infatti la correlazione tra la serie che dobbiamo completare e le altre serie dalle quali scegliere la più adatta al nostro scopo. I coefficienti sono molto significativi, in quanto mostrano una correlazione diretta molto forte, superiore allo 0,9 in ogni caso. A differenza di quanto ipotizzato da un primo sguardo dei grafici, e benché le differenze siano minime, appare che la serie CUUR0000SS1703 abbia una correlazione maggiore con p^R. Utilizzeremo quindi quest'ultima per calcolare il dato mancante attraverso l'utilizzo dei minimi quadrati ordinari.

Viene sviluppata quindi una la funzione

$$\widehat{\text{pR}} = \underset{(40{,}203)}{-24,7557} + \underset{(0{,}24039)}{2,37075}\,\text{CUUR0000SS17031}$$

$$T = 22 \quad \bar{R}^2 = 0,8209 \quad F(1,20) = 97,261 \quad \hat{\sigma} = 39,404$$

(errori standard tra parentesi)

la quale ha dei coefficienti abbastanza robusti, infatti si può notare subito, dall'elaborazione dei dati che gli p-value garantiscono una percentuale d'errore solo nel caso della costante di poco superiore al 5%.

Modello 1: OLS, usando le osservazioni 1990–2014 ($T = 22$)
Sono state scartate osservazioni mancanti o incomplete: 3
Variabile dipendente: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	−24,7557	40,2030	−0,6158	0,5450
CUUR0000SS17031	2,37075	0,240389	9,8621	3,99e–09

Media var. dipendente	362,9777	SQM var. dipendente	93,11155
Somma quadr. residui	31052,88	E.S. della regressione	39,40360
R^2	0,829441	R^2 corretto	0,820913
$F(1,20)$	97,26127	P-value(F)	3,99e–09
Log-verosimiglianza	−110,9931	Criterio di Akaike	225,9862
Criterio di Schwarz	228,1683	Hannan–Quinn	226,5002

In questo caso vediamo come vi sia un p-value che indica un coefficiente dell'altra serie molto robusto. Lo stesso non si può dire riguardo la costante. Dato che le serie sono indicatori dello stesso prezzo, benché derivate da due enti differenti che raccolgono i dati in maniera non necessariamente identica, si potrebbe considerare che esistano delle discrepanze nei valori ma queste, in linea generale, sono difformi più per un calcolo dei dati ricevuti che non per una costante che farebbe solo spostare le curve lungo l'asse delle ordinate. Dato che il p-value per la costante è eccessivamente alto, si può immaginare di ripetere la regressione senza l'utilizzo della costante stessa. SI avrà quindi, come risultato, una funzione con un coefficiente che ha un p-value estremamente basso, con un alto grado di veridicità.

Modello 2: OLS, usando le osservazioni 1990–2014 ($T = 22$)
Sono state scartate osservazioni mancanti o incomplete: 3
Variabile dipendente: pR

	Coefficiente	Errore Std.	rapporto t	p-value
CUUR0000SS17031	2,22599	0,0494840	44,9840	2,29e–22

Media var. dipendente	362,9777	SQM var. dipendente	93,11155
Somma quadr. residui	31641,59	E.S. della regressione	38,81678
R^2	0,989729	R^2 corretto	0,989729
$F(1,21)$	2023,561	P-value(F)	2,29e–22
Log-verosimiglianza	−111,1997	Criterio di Akaike	224,3994
Criterio di Schwarz	225,4904	Hannan–Quinn	224,6564

La funzione che dobbiamo rendere in considerazione diventa dunque:

$$\widehat{\text{pR}} = \underset{(0{,}049484)}{2,22599}\ \text{CUUR0000SS17031} \tag{2.30}$$

$$T = 22 \quad \bar{R}^2 = 0,9897 \quad F(1,21) = 2023,6 \quad \hat{\sigma} = 38,817$$

(errori standard tra parentesi)

Sostituendo alla funzione il valore dell'indice per l'anno 2008 avremo il valore da sostituire a quello mancante nella serie storica. Essendo 188,0 il valore dell'indice per l'anno 2008, inserendolo nella funzione avremo un valore $p^R_{t=2008} = 418,49$ (arrotondato al secondo decimale).

Il valore appare alto rispetto quelli adiacenti, ciò si può notare dal grafico delle stime presente in Figura 2.4. Ua strategia più semplice per inserire un valore mancante potrebbe essere quella di inserire un valore intermedio. In questo caso si è scelto di non preferire un valore intermedio in quanto tutte le serie che coprono quel'anno, e che come abbiamo visto sono fortemente correlate con la serie di partenza, presentano dei picchi, benché a volte non troppo sensibili, proprio per l'anno 2008. Si è preferito, quindi, adoperare il valore risultante dalla regressione come nell'equazione 2.30 per completare la serie storica dalla quale siamo partiti.

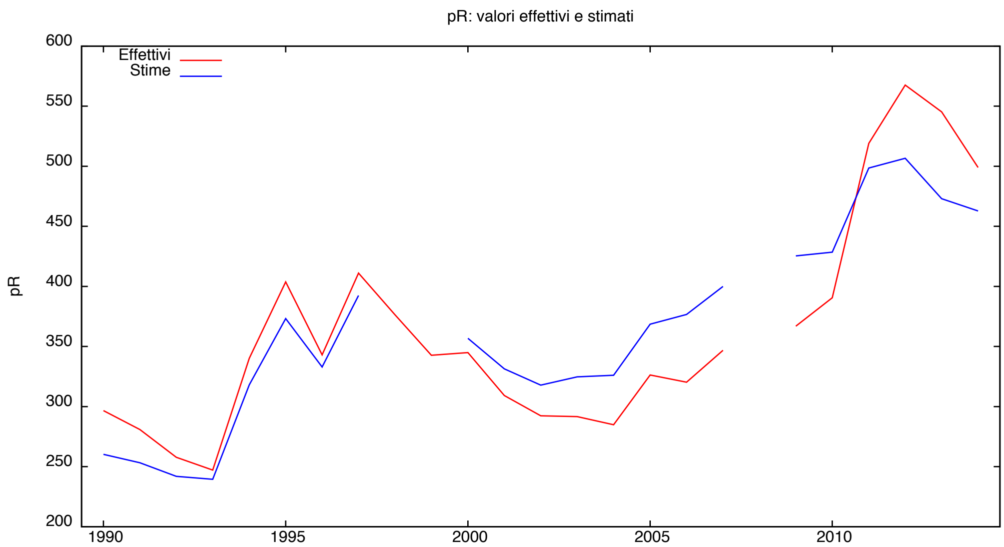

Figure 2.4: Stime secondo la simulazione senza costante

Il prezzo intermedio. Consideriamo qui il prezzo del bene intermedio, sempre con lo stesso ritardo di un periodo. In questo caso tratteremo ambo gli altri prezzi come esogeni. Nel caso cui non si considerino ritardi dei valori esogeni avremo i seguenti coefficienti:

Sistema VAR, ordine ritardi 1
Stime OLS usando le osservazioni 1991–2014 ($T = 24$)

Log-verosimiglianza = −72,1255
Determinante della matrice di covarianza = 23,8691
AIC $= 6,4271$
BIC $= 6,6726$
HQC $= 6,4922$
Test portmanteau: LB(6) = 3,35097, df = 5 [0,6460]

Equazione 1: pW

	Coefficiente	Errore Std.	rapporto t	p-value
const	−2,12996	6,65377	−0,3201	0,7524
pW_{t-1}	−0,0635726	0,0468573	−1,3567	0,1908
pF	1,03299	0,0429993	24,0234	1,11e–15
pR	0,0917012	0,0377121	2,4316	0,0251
time	−0,663281	0,243543	−2,7235	0,0135

Media var. dipendente	112,8113	SQM var. dipendente	49,13234
Somma quadr. residui	572,8575	E.S. della regressione	5,490938
R^2	0,989682	R^2 corretto	0,987510
$F(4, 19)$	455,6229	P-value(F)	1,40e–18
$\hat{\rho}$	−0,157411	Durbin–Watson	1,722977

Test F per zero vincoli

Tutti i ritardi di pW $F(1, 19) = 1,84071$ [0,1908]

In questo caso si nota un forte legame con il prezzo di produzione e legami statisticamente sensibili con il prezzo finale e con la serie temporale, mentre poco significativa la costante e la variabile al periodo antecedente. Nel caso invece si considerino ritardi anche per i prezzi presi come esogeni avremo:

Sistema VAR, ordine ritardi 1
Stime OLS usando le osservazioni 1991–2014 ($T = 24$)

Log-verosimiglianza = −69,4707
Determinante della matrice di covarianza = 19,1317
AIC = $6,3726$
BIC = $6,7162$
HQC = $6,4637$
Test portmanteau: LB(6) = 3,23849, df = 5 [0,6633]

Equazione 1: pW

	Coefficiente	Errore Std.	rapporto t	p-value
const	−8,47844	7,04990	−1,2026	0,2456
pW_{t-1}	0,159457	0,278343	0,5729	0,5742
pR	0,0489041	0,0433246	1,1288	0,2747
pR_{t-1}	0,0491823	0,0366925	1,3404	0,1978
pF	1,08588	0,0531326	20,4372	2,10e–13
pF_{t-1}	−0,282496	0,285530	−0,9894	0,3364
time	−0,610187	0,328780	−1,8559	0,0809

Media var. dipendente	112,8113	SQM var. dipendente	49,13234
Somma quadr. residui	459,1615	E.S. della regressione	5,197066
R^2	0,991730	R^2 corretto	0,988811
$F(6, 17)$	339,7727	P-value(F)	9,78e–17
$\hat{\rho}$	−0,229348	Durbin–Watson	2,129289

Test F per zero vincoli

Tutti i ritardi di pW $F(1, 17) = 0,328193$ [0,5742]

con un sistema che mostra una forte significatività principalmente per quanto riguarda il legame col prezzo finale, mentre non ci sono altre variabili che abbiano probabilità d'errore inferiore al 5%.

Il prezzo finale Per quanto riguarda il prezzo finale verranno eseguite le stesse operazioni. Qui il caso è speculare a quello del prezzo all'origine. Avremo dunque

Sistema VAR, ordine ritardi 1
Stime OLS usando le osservazioni 1991–2014 ($T = 24$)

Log-verosimiglianza = −111,223
Determinante della matrice di covarianza = 620,616
AIC $= 9,6019$
BIC $= 9,7983$
HQC $= 9,6540$
Test portmanteau: LB(6) = 7,09504, df = 5 [0,2137]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	54,0163	25,6127	2,1090	0,0478
pR_{t-1}	0,531357	0,0923084	5,7563	1,24e–05
pW	0,903301	0,135935	6,6451	1,80e–06
time	1,54933	1,08722	1,4250	0,1696

Media var. dipendente	367,7750	SQM var. dipendente	88,65788
Somma quadr. residui	14894,77	E.S. della regressione	27,28990
R^2	0,917611	R^2 corretto	0,905252
$F(3, 20)$	74,24989	P-value(F)	5,13e–11
$\hat{\rho}$	−0,121558	Durbin–Watson	2,119240

Test F per zero vincoli

Tutti i ritardi di pR $F(1, 20) = 33,1353$ [0,0000]

Oppure, con i ritardi delle variabili esogene:

Sistema VAR, ordine ritardi 1
Stime OLS usando le osservazioni 1991–2014 ($T = 24$)

Log-verosimiglianza = −110,181
Determinante della matrice di covarianza = 568,994
AIC $= 9,5984$

BIC $= 9,8438$
HQC $= 9,6635$
Test portmanteau: LB(6) = 4,77811, df = 5 [0,4436]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	75,9820	30,2160	2,5146	0,0211
pR_{t-1}	0,389493	0,141062	2,7611	0,0124
pW	0,771249	0,167180	4,6133	0,0002
pW_{t-1}	0,326370	0,248582	1,3129	0,2048
time	2,16386	1,16613	1,8556	0,0791

Media var. dipendente	367,7750	SQM var. dipendente	88,65788
Somma quadr. residui	13655,85	E.S. della regressione	26,80912
R^2	0,924464	R^2 corretto	0,908561
$F(4,19)$	58,13361	P-value(F)	2,15e–10
$\hat{\rho}$	−0,088887	Durbin–Watson	2,156213

Test F per zero vincoli

Tutti i ritardi di pR $F(1,19) = 7,62395$ [0,0124]

Ciò mostra un forte legame tra il prezzo finale del bene e quello intermedio, almeno per quanto riguarda quello riferibile allo stesso periodo.

2.3.2 Un'autoregressione vettoriale

Riprendiamo il modello visto in precedenza, per lo studio delle relazioni tra i prezzi del caffè lungo la supply chain. Il modello va adattato ai dati a disposizione, tenendo in considerazione che, almeno per quanto riguardano i prezzi al produttore, essi sono disponibili in forma annuale.

I prezzi annuali al produttore sono un dato da ritenersi significativo, infatti la raccolta avviene una volta l'anno in ogni nazione, in situazioni favorevoli e considerando anche differenze qualitative (es. arabica vs robusta) possono avvenire al massimo due volte in nazioni con condizioni climatiche particolarmente favorevoli. Ne risulta quindi che per i coltivatori i prezzi annuali sono un dato di sufficiente valore per poter costruire una regressione che abbia valore.

In questo studio sono state utilizzate le VAR per due motivi: da un lato poiché si poteva far riferimento ad un lavoro precedente, utilizzandone la stessa metodologia con dati aggiornati, benché il modello andasse adattato ai dati annuali dei prezzi al produttore. Dall'altro lato abbiamo visto come la supply chain del caffè sia molto complicata e nei passaggi fondamentali ci siano dinamiche molto differenti tra loro, quindi l'autoregressione vettoriale ne risulta uno strumento che meglio può garantire uno studio della trasmissione dei prezzi che seguono dinamiche così diverse al fine di individuare se le dinamiche previste una volta finito l'agreement si siano effettivamente verificate.

Va preso in considerazione il fatto che il modello debba tener conto della fine del regime di quote. Si deve quindi considerare che il modello debba controllare il fatto che la dinamica successiva alla fine delle quote possa avere un suo percorso proprio. Si vuole quindi andare a vedere in particolare questo periodo temporale, l'anno 1990 potrebbe dunque essere adeguato come anno di partenza. Secondo il modello considerato infatti, nel 1990 dovrebbero essere pressoché esauriti gli effetti docuti al regime delle quote

Il modello presentava una serie di caratteristiche, alcune delle quali sono state utilizzate per gli studi precedenti:

1. l'esistenza di tre prezzi: quello di produzione (p^F), quello intermedio, utilizzato nelle contrattazioni internazionali (p^W) ed infine quello finale alla rivendita (p^R),

2. la funzione che descrive lo stato di un prezzo è data dai suoi precedenti,

3. il ruolo dei prezzi (e gli eventuali precedenti) del caffè nelle fasi immediatamente adiacenti della supply chain nella definizione dei prezzi finali,

ed altre caratteristiche invece non sono state finora considerate:

4 le differenze tra i valori dei prezzi in tempi differenti (finora abbiamo considerato solamente i prezzi in valore assoluto),

5 la frizione che si crea nel diminuire i prezzi una volta che questi sono stati aumentati,

6 il ruolo delle scorte,

7 il ruolo della ripiantumazione.

Per ora non consideriamo il ruolo delle scorte, in parte assorbito dalle dinamiche di prezzo. Il fatto che le scorte vengano non prese in considerazione è legato allo sviluppo del mercato nel periodo posteriore al sistema di quote. Mentre era in vigore l'International Coffee Agreement, infatti, vi era stato un forte accumulo di scorte di caffè nei paesi produttori. Questo era dovuto proprio al fatto che le quote vigenti non permettevano di commerciare l'intera quantità prodotta. La gelata avvenuta in Brasile immediatamente dopo la fine del sistema di quote è stato un motivo di utilizzo delle scorte stesse. Proprio grazie alla gelata si è potuto utilizzare le scorte per supplire alla mancanza di raccolto, da un altro punto di vista si può dire che la mancanza di raccolto non ha permesso un eccesso d'offerta proprio nel momento in cui questo si sarebbe potuto verificare. Se poi consideriamo che andremo a prendere un periodo vicino alla fine degli effetti delle quote nei prezzi successivi, possiamo immaginare che l'eccesso d'inventario, presente nel periodo di quote, stia, in quel momento, andando ad esaurire i suoi effetti.

Gli effetti della piantumazione sono invece inseriti all'interno degli effetti di medio periodo per quanto riguarda il prezzo intermedio (p^W), con l'inserimento delle frizioni di prezzo per i soli prezzi di due anni precedenti quello considerato, in quanto in quel periodo sarebbe avvenuta la piantumazione che nel periodo di riferimento sarebbe diventata produttiva.

Ora andremo a vedere il ruolo delle differenze dei prezzi e della frizione nel diminuire gli stessi. Rispetto a quanto considerato finora andremo dunque a considerare il differente ruolo della variazione dei prezzi precedenti rispetto quelli successivi. In questo caso l'idea dietro questi è che, una volta che i prezzi sono aumentati, essi avranno più difficoltà a diminuire rispetto alla situazione inversa. Un diminuzione dei prezzi avrà invece effetti inferiori sui prezzi futuri, che saranno più liberi di aumentare.

Il prezzo all'origine. Iniziamo con il vedere come si comporta il prezzo al produttore. Ad un primo passo vediamo come reagisce considerando un solo ritardo, così come nei test precedenti.

Sistema VAR, ordine ritardi 1
Stime OLS usando le osservazioni 1991–2013 ($T = 23$)

Log-verosimiglianza = −53,3361
Determinante della matrice di covarianza = 6,04993
AIC = $5,3336$
BIC = $5,7285$
HQC = $5,4329$
Test portmanteau: LB(5) = 15,2566, df = 4 [0,0042]

Equazione 1: pF

	Coefficiente	Errore Std.	rapporto t	p-value
const	−8,18604	2,08509	−3,9260	0,0013
pF_{t-1}	−0,0292673	0,0218099	−1,3419	0,1996
pFΔ1	0,0994746	0,161294	0,6167	0,5467
pFΔ1DΔ1	0,710735	0,265898	2,6730	0,0174
pW	0,885966	0,0232393	38,1237	2,39e–16
PWΔ1	−0,108930	0,145276	−0,7498	0,4650
pWΔ1DΔ1W	−0,550081	0,260068	−2,1151	0,0516
time	0,333237	0,128021	2,6030	0,0200

Media var. dipendente	92,23870	SQM var. dipendente	45,24347
Somma quadr. residui	139,1484	E.S. della regressione	3,045744
R^2	0,996910	R^2 corretto	0,995468
$F(7,15)$	691,3619	P-value(F)	1,16e–17
$\hat{\rho}$	0,428356	Durbin–Watson	1,127361

Test F per zero vincoli

Tutti i ritardi di pF $F(1,15) = 1,80076$ [0,1996]

Andare a prendere numeri molto grandi di ritardi

Il numero più alto di ritardi che da risultati di valore è con tre differenze temporali (oltre il campione non è sufficientemente significativo, anche se aggiungendo un ulteriore ritardo risulterebbe comunque computabile). Il risultato della regressione diventa:

Sistema VAR, ordine ritardi 1
Stime OLS usando le osservazioni 1991–2011 ($T = 21$)

Log-verosimiglianza = −10,0603
Determinante della matrice di covarianza = 0,152627
AIC $= 2,4819$
BIC $= 3,2778$
HQC $= 2,6546$
Test portmanteau: LB(5) = 11,8639, df = 4 [0,0184]

Equazione 1: pF

	Coefficiente	Errore Std.	rapporto t	p-value
const	−13,6394	0,980342	−13,9129	3,45e–05
pF_{t-1}	0,00905325	0,0153267	0,5907	0,5804
pFΔ1	0,213019	0,0874851	2,4349	0,0590
pFΔ1DΔ1	0,211600	0,154016	1,3739	0,2279
pW	0,877024	0,0102827	85,2915	4,20e–09
PWΔ1	−0,180971	0,0793096	−2,2818	0,0714
pWΔ1DΔ1W	−0,243536	0,120502	−2,0210	0,0992
pFΔ2	0,232075	0,0919103	2,5250	0,0529
pFΔ2DΔ2	−0,550935	0,299846	−1,8374	0,1256
pFΔ3	0,349054	0,0902060	3,8695	0,0118
pFΔ3DΔ3	−0,422399	0,148332	−2,8477	0,0359
pWΔ2	−0,201931	0,0854390	−2,3634	0,0645
pWΔ2DΔ2W	0,532910	0,289880	1,8384	0,1254
pWΔ3	−0,337160	0,0845148	−3,9894	0,0104
pWΔ3DΔ3W	0,469866	0,118654	3,9600	0,0107
time	0,618833	0,0578559	10,6961	0,0001

Media var. dipendente	88,90762	SQM var. dipendente	45,32999
Somma quadr. residui	3,205169	E.S. della regressione	0,800646
R^2	0,999922	R^2 corretto	0,999688
$F(15,5)$	4273,613	P-value(F)	3,13e–09
$\hat{\rho}$	0,246219	Durbin–Watson	1,504031

Test F per zero vincoli

Tutti i ritardi di pF $F(1,5) = 0,348907$ [0,5804]

Questo, come facile notare, non da valori significativi a meno del valore del prezzo intermedio. Questo dimostra che in regressione complesse per questo prodotto vi è un eccesso di variabili che non aggiungono significatività al risultato finale.

Il prezzo intermedio. Per quanto riguarda il prezzo intermedio avremo il seguente modello:

Sistema VAR, ordine ritardi 1
Stime OLS usando le osservazioni 1991–2013 ($T = 23$)

Log-verosimiglianza = −46,2954
Determinante della matrice di covarianza = 3,27990
AIC = $4,9822$

BIC $= 5,5253$
HQC $= 5,1188$
Test portmanteau: LB(5) = 6,16947, df = 4 [0,1868]

Equazione 1: pW

	Coefficiente	Errore Std.	rapporto t	p-value
const	−7,68211	4,65297	−1,6510	0,1246
pW_{t-1}	−0,0356383	0,0252660	−1,4105	0,1838
pF	1,02694	0,0347735	29,5322	1,42e–12
pFΔ1	−0,348909	0,158973	−2,1948	0,0486
pFΔ1DΔ1	−0,486041	0,260959	−1,8625	0,0872
PWΔ1	0,369129	0,138782	2,6598	0,0208
pWΔ1DΔ1W	0,308307	0,248969	1,2383	0,2393
pR	0,101843	0,0265478	3,8362	0,0024
PRΔ1	−0,0568765	0,0366881	−1,5503	0,1470
pRΔ1DΔ1R	0,0309665	0,0673293	0,4599	0,6538
time	−0,695294	0,153464	−4,5307	0,0007

Media var. dipendente	110,2557	SQM var. dipendente	48,57822
Somma quadr. residui	75,43765	E.S. della regressione	2,507284
R^2	0,998547	R^2 corretto	0,997336
$F(10,12)$	824,6457	P-value(F)	1,97e–15
$\hat{\rho}$	−0,015611	Durbin–Watson	2,027366

Test F per zero vincoli

Tutti i ritardi di pW $F(1,12) = 1,98958$ [0,1838]

Il prezzo finale Per quanto riguarda il prezzo al retail avremo:

Sistema VAR, ordine ritardi 1
Stime OLS usando le osservazioni 1991–2013 ($T = 23$)

Log-verosimiglianza = −97,3677
Determinante della matrice di covarianza = 278,350
AIC $= 9,1624$
BIC $= 9,5574$
HQC $= 9,2617$
Test portmanteau: LB(5) = 8,59643, df = 4 [0,0720]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	59,0572	25,9557	2,2753	0,0380
pR_{t-1}	0,473798	0,100435	4,7174	0,0003
pW	0,808365	0,205009	3,9431	0,0013
PWΔ1	0,222788	0,377458	0,5902	0,5638
pWΔ1DΔ1W	−0,0596033	0,580230	−0,1027	0,9195
PRΔ1	−0,0157327	0,328420	−0,0479	0,9624
pRΔ1DΔ1R	0,807671	0,567086	1,4242	0,1748
time	2,83007	0,903160	3,1335	0,0068

Media var. dipendente	362,0713	SQM var. dipendente	86,03047
Somma quadr. residui	6402,051	E.S. della regressione	20,65922
R^2	0,960682	R^2 corretto	0,942334
$F(7,15)$	52,35775	P-value(F)	2,05e–09
$\hat{\rho}$	0,314091	Durbin–Watson	1,332985

Test F per zero vincoli

Tutti i ritardi di pR $F(1,15) = 22,2543$ [0,0003]

2.3.3 Autoregressioni senza variabili esogene

Senza variabili esogene avremo i seguenti risultati:

Il prezzo all'origine.

Sistema VAR, ordine ritardi 1
Stime OLS usando le osservazioni 1991–2014 ($T = 24$)

Log-verosimiglianza = −116,666
Determinante della matrice di covarianza = 976,785
AIC = $9,9721$
BIC = $10,1194$
HQC = $10,0112$
Test portmanteau: LB(6) = 3,92006, df = 5 [0,5610]

Equazione 1: pF

	Coefficiente	Errore Std.	rapporto t	p-value
const	23,1854	17,3005	1,3402	0,1945
pF_{t-1}	0,584031	0,177232	3,2953	0,0034
time	1,32393	1,12591	1,1759	0,2528

Media var. dipendente	94,00583	SQM var. dipendente	45,08790
Somma quadr. residui	23442,84	E.S. della regressione	33,41146
R^2	0,498625	R^2 corretto	0,450875
$F(2, 21)$	10,44242	P-value(F)	0,000711
$\hat{\rho}$	0,104935	Durbin–Watson	1,770474

Test F per zero vincoli

Tutti i ritardi di pF $F(1, 21) = 10,8589$ [0,0034]

Il prezzo intermedio.

Sistema VAR, ordine ritardi 1
Stime OLS usando le osservazioni 1991–2014 ($T = 24$)

Log-verosimiglianza = −119,009
Determinante della matrice di covarianza = 1187,39
AIC = $10,1674$
BIC = $10,3146$
HQC = $10,2065$
Test portmanteau: LB(6) = 4,89974, df = 5 [0,4282]

Equazione 1: pW

	Coefficiente	Errore Std.	rapporto t	p-value
const	27,6858	20,7084	1,3369	0,1955
pW_{t-1}	0,596994	0,176759	3,3774	0,0028
time	1,48017	1,19577	1,2378	0,2294

Media var. dipendente	112,8113	SQM var. dipendente	49,13234
Somma quadr. residui	28497,25	E.S. della regressione	36,83765
R^2	0,486737	R^2 corretto	0,437854
$F(2, 21)$	9,957335	P-value(F)	0,000909
$\hat{\rho}$	0,105128	Durbin–Watson	1,755987

Test F per zero vincoli

Tutti i ritardi di pW $F(1, 21) = 11,4072$ [0,0028]

Il prezzo finale

Sistema VAR, ordine ritardi 1
Stime OLS usando le osservazioni 1991–2014 ($T = 24$)

Log-verosimiglianza = −125,210
Determinante della matrice di covarianza = 1990,85
AIC = $10,6842$
BIC = $10,8315$
HQC = $10,7233$
Test portmanteau: LB(6) = 2,57856, df = 5 [0,7646]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	72,4550	44,5047	1,6280	0,1184
pR_{t-1}	0,708641	0,154459	4,5879	0,0002
time	3,01286	1,86094	1,6190	0,1204

Media var. dipendente	367,7750	SQM var. dipendente	88,65788
Somma quadr. residui	47780,48	E.S. della regressione	47,69970
R^2	0,735706	R^2 corretto	0,710535
$F(2,21)$	29,22842	P-value(F)	8,55e–07
$\hat{\rho}$	0,124447	Durbin–Watson	1,730323

Test F per zero vincoli

Tutti i ritardi di pR $F(1,21) = 21,0487$ [0,0002]

Correlazione dei dati I coefficienti di correlazione per le tre serie sono quindi:

Coefficienti di correlazione, usando le osservazioni 1990–2014
Valore critico al 5% (due code) = 0,3961 per n = 25

pF	pW	pR	
1,0000	0,9912	0,8075	pF
	1,0000	0,8118	pW
		1,0000	pR

I coefficienti di correlazione mostrano una buona correlazione per i tre differenti livelli di prezzo presi sulle medie annuali.

Va notata comunque una maggiore correlazione tra i prezzi in cima alla supply chain (p^F e p^W) rispetto a quello più a valle (p^R con gli altri due prezzi). Da qui si può immaginare che il prezzo al retail abbia una sua funzione meno legata alle altre due serie.

Se andiamo ad evidenziare i p-value delle relazioni tra variabili troviamo che hanno una bassa probabilità d'errore nel definire le altre, quelle variabili presenti secondo gli schemi in Figura 2.5 ed in Figura 2.6. Nel primo caso sono evidenziate le relazioni senza considerare nelle regressione le asimmetrie che si creano al variare dei prezzi.

Possiamo vedere che nei due casi il prezzo finale ha comunque un collegamento coi prezzi intermedi oltre a risentire del proprio prezzo nell'anno precedente.

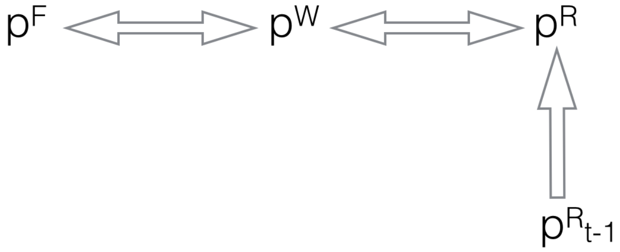

Figure 2.5: Le frecce indicano il verso di realzioni tra variabili nelle quali vi è una precisione della variabile superiore al 95%.

L'aggiunta delle asimmetrie nella trasmissione dei prezzi non va a modificare la situazione del prezzo al retail per quanto riguardano i ritardi della variabile endogena, né le variabili esogene. Questo accade mentre alcune variabili che indicano la presenza di asimmetrie vanno ad entrare nella definizione dei prezzi a monte della filiera con una buona significatività.

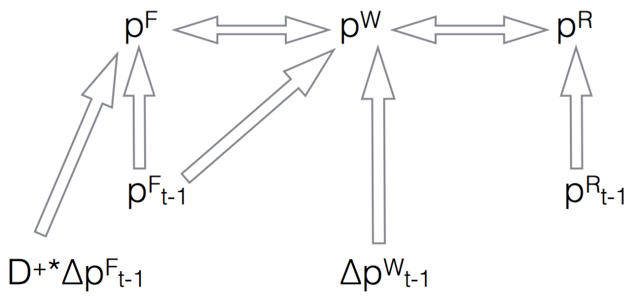

Figure 2.6: Le frecce indicano il verso di realzioni tra variabili nelle quali vi è una precisione della variabile superiore al 95%. Questo caso differisce da quello in Figura 2.5 perché in questo caso sono state considerate anche le asimmetrie nella trasmissione dei prezzi.

2.3.4 Elaborazione dei dati mensili

Completiamo i dati mancanti dalla serie Consumer Price Index - Average Price Data APU0000717311 dello US Bureau of Labor Statistics.

$$\widehat{\text{APU0000717311}} = \underset{(0,085239)}{0,368551} + \underset{(0,00064961)}{0,0255025}\,\text{IndexWPU02630104}$$

$$T = 299 \quad \bar{R}^2 = 0,8379 \quad F(1,297) = 1541,2 \quad \hat{\sigma} = 0,37302$$

(errori standard tra parentesi)

con dei p-value molto forti:

Modello 1: OLS, usando le osservazioni 1980:01–2015:09 ($T = 299$)
Sono state scartate osservazioni mancanti o incomplete: 130
Variabile dipendente: APU0000717311

	Coefficiente	Errore Std.	rapporto t	p-value
const	0,368551	0,0852392	4,3237	2,10e–05
IndexWPU02630104	0,0255025	0,000649612	39,2581	1,40e–119

Media var. dipendente	3,605943	SQM var. dipendente	0,926435
Somma quadr. residui	41,32483	E.S. della regressione	0,373016
R^2	0,838428	R^2 corretto	0,837884
$F(1,297)$	1541,195	P-value(F)	1,4e–119
Log-verosimiglianza	−128,4051	Criterio di Akaike	260,8102
Criterio di Schwarz	268,2111	Hannan–Quinn	263,7724

E si aggiunge alla serie i valori mancanti relativi al periodo 2007-2009. Il risultato visibile in figura sarà il seguente:

Considerata la correlazione tra questi dati ed il prezzo mensile del caffè Brazilian Naturals, per lo stesso periodo considerato nel caso annuale in precedenza, abbiamo un coefficiente di correlazione con un valore estremamente basso:

Coefficienti di correlazione, usando le osservazioni 1990:01–2013:10
Valore critico al 5% (due code) = 0,1160 per n = 286

pW	pR	
1,0000	0,5027	pW
	1,0000	pR

Questo coefficiente è molto più basso che nel caso studiato in precedenza. Ciò dimostra che nel caso mensile vi è molta più variabilità tra i due prezzi rispetto alla situazione nella quale venivano considerate le medie annuali.

Se andiamo a studiare l'andamento mensile del prezzo al retail andremo a scegliere, come fatto in precedenza, l'adeguato numero di ritardi da utilizzare nella regressione VAR. Nella scelta verrà considerato che la funzione segua un trend stagionale, oltre ad un trend temporale e l'adeguamento fatto con una

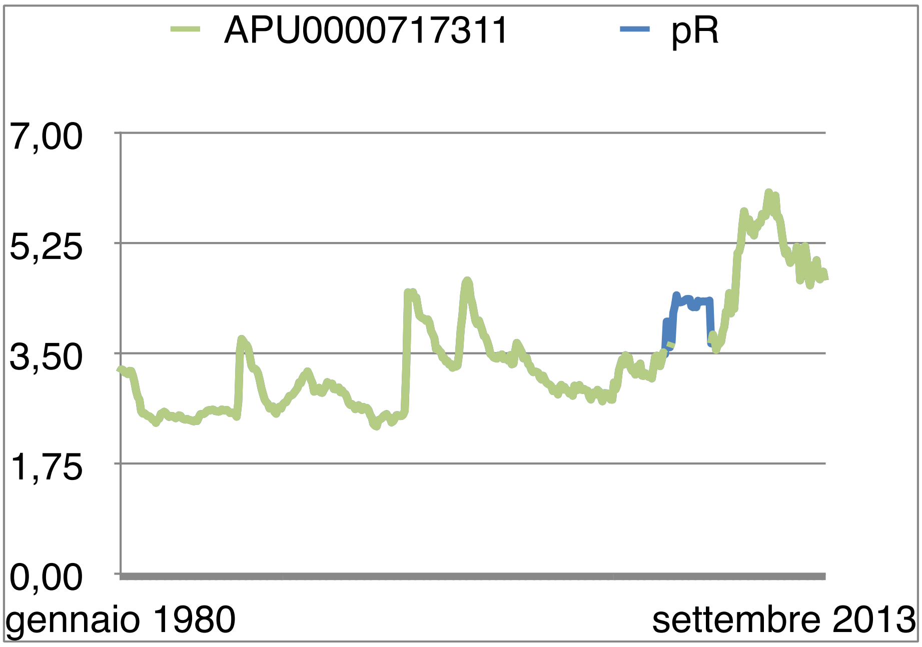

Figure 2.7: Dati p^R con aggiunta dei dati mensili mancanti evidenziati in blu

costante, come accadeva nel modello iniziale dal quale ci siamo mossi per tutta la discussione.

I risultati dei test mostrano che per la scelta ottimale si dovrebbero considerare due ritardi. Infatti questo è il risultato, sia che si considerino un massimo di 12 ritardi, sia che i tirardi massimi considerati salgano a 24 o 36, come visibile dai valori che minimizzano il BIC in Tabella 2.6:

Andando quindi ad eseguire la regressione con due ritardi avremo:

Sistema VAR, ordine ritardi 2
Stime OLS usando le osservazioni 1980:03–2015:09 ($T = 427$)

Log-verosimiglianza = 270,489
Determinante della matrice di covarianza = 0,0164932
AIC $= -1,1967$
BIC $= -1,0542$
HQC $= -1,1404$
Test portmanteau: LB(48) = 69,74, df = 46 [0,0135]

Equazione 1: pR

BIC per ritardi massimi :	12	24	36
1	$-1,005417$	$-0,979795$	$-0,947428$
2	$-1,027569$	$-1,000176$	$-0,967783$
3	$-1,017453$	$-0,989479$	$-0,956557$
4	$-1,006333$	$-0,977774$	$-0,944551$
5	$-0,998572$	$-0,969507$	$-0,935975$
6	$-0,984126$	$-0,954694$	$-0,920797$
7	$-0,970008$	$-0,940283$	$-0,906013$
8	$-0,955561$	$-0,925483$	$-0,890855$
9	$-0,941279$	$-0,910840$	$-0,875855$
10	$-1,069933$	$-0,896465$	$-0,861093$
11	$-0,913109$	$-0,881993$	$-0,846189$
12	$-0,898672$	$-0,867206$	$-0,831012$
13		$-0,854867$	$-0,818269$
14		$-0,854830$	$-0,817786$
15		$-0,845693$	$-0,808190$
16		$-0,843747$	$-0,805843$
17		$-0,836510$	$-0,798200$
18		$-0,827591$	$-0,789276$
19		$-0,813635$	$-0,774960$
20		$-0,799213$	$-0,760181$
21		$-0,769745$	$-0,745020$
22		$-0,769745$	$-0,729959$
23		$-0,755679$	$-0,715706$
24		$-0,747209$	$-0,706837$
25			$-0,691684$
26			$-0,676495$
27			$-0,661326$
28			$-0,650501$
29			$-0,637553$
30			$-0,622824$
31			$-0,607646$
32			$-0,593059$
33			$-0,596626$
34			$-0,596030$
35			$-0,581710$
36			$-0,566510$

Table 2.6: Criterio d'informazione bayesiano per la scelta dei ritardi in un modello di autoregressione vettoriale.

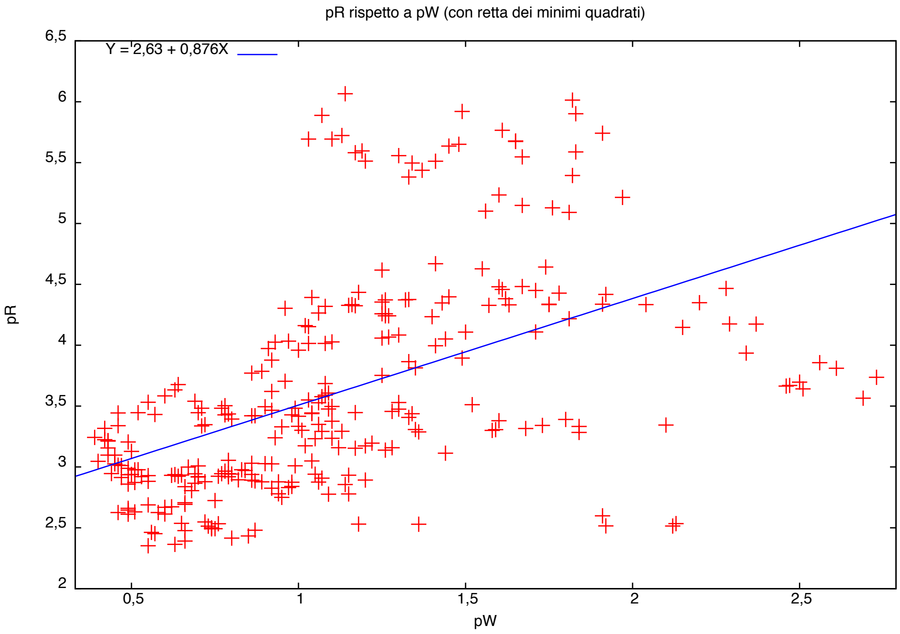

Figure 2.8: Correlazione p^W - p^R basata su dati mensili nel periodo gennaio 1990 - ottobre 2013

	Coefficiente	Errore Std.	rapporto t	p-value
const	0,00945226	0,0343759	0,2750	0,7835
pR_{t-1}	1,15967	0,0484044	23,9580	0,0000
pR_{t-2}	−0,190185	0,0482719	−3,9399	0,0001
S1	0,122861	0,0312725	3,9287	0,0001
S2	0,0570290	0,0316470	1,8020	0,0723
S3	0,0741620	0,0311675	2,3795	0,0178
S4	0,0777943	0,0311983	2,4935	0,0130
S5	0,0415161	0,0312217	1,3297	0,1843
S6	0,0420287	0,0310816	1,3522	0,1771
S7	0,114147	0,0310663	3,6743	0,0003
S8	0,0713173	0,0314081	2,2707	0,0237
S9	0,0365501	0,0312227	1,1706	0,2424
S10	0,0316902	0,0312986	1,0125	0,3119
S11	0,0169516	0,0312668	0,5422	0,5880
time	0,000190671	7,61872e–05	2,5027	0,0127

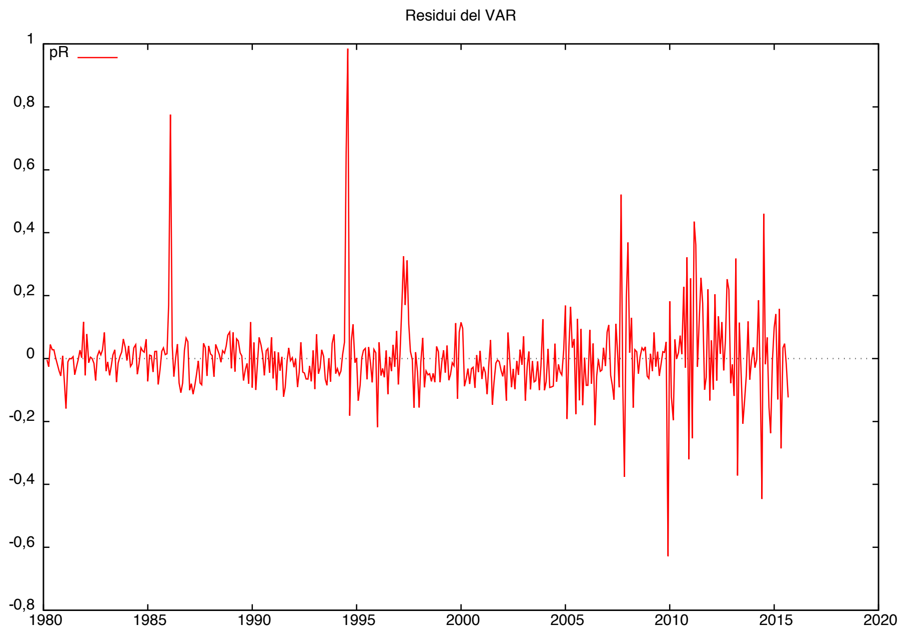

Figure 2.9: Residui dell'elaborazione su dati mensili di p^R

Media var. dipendente	3,456225	SQM var. dipendente	0,905348
Somma quadr. residui	7,042603	E.S. della regressione	0,130743
R^2	0,979831	R^2 corretto	0,979145
$F(14, 412)$	1429,643	P-value(F)	0,000000
$\hat{\rho}$	−0,012496	Durbin–Watson	2,022769

Test F per zero vincoli

Tutti i ritardi di pR	$F(2, 412) = 4382, 62$	[0,0000]
Tutte le variabili, ritardo 2	$F(1, 412) = 15, 5226$	[0,0001]

Per il sistema nel complesso —
Ipotesi nulla: il ritardo maggiore è 1
Ipotesi alternativa: il ritardo maggiore è 2
Test del rapporto di verosimiglianza: χ^2_1 = 15,792 [0,0001]

2.3.5 Prove di VAR con dati mensili modificando le dummy stagionali

Nella precedente VAR sono state evidenziate 11 dummy stagionali che indicavano i mesi da Gennaio a Novembre. In quel caso si è potuta notare un valore più forte dei coefficienti della prima e settima dummy, quindi di Gennaio e Luglio.

Figure 2.10: Previsioni per 24 mesi dell'elaborazione su dati mensili di p^R

I mesi in cui si raccoglie il caffè sono Aprile, Luglio ed Ottobre. Perciò rispetto alla raccolta sembra ci sia poco di relativo, in quanto le dummy significative si trovano durante un periodo di raccolta e nel punto intermedio (più lontano potremmo dire) dalle altre due date di raccolta.

Di seguito verranno elaborate regressioni variando le dummy mensili. Si potrà notare che i risultati sono generalmente peggiori di quello precedente. I valori dei coefficienti saranno infatti generalmente molto bassi e con p-value che spesso indicano alta probabilità d'errore.

Nel caso immediatamente successivo si evidenzia una significatività per le dummy di novembre e dicembre. Nell'ultimo caso preso in considerazione, invece, si evidenzia una significatività della dummy per gennaio.

Questo può indicare un'importanza nelle decisioni aziendali prese in vista del nuovo anno nel modificare i valori dei prezzi del caffè al consumo, più delle fluttuazioni secondo i cicli di raccolta degli stessi.

Dummy per il periodo Febbraio - DIcembre

Sistema VAR, ordine ritardi 2

Stime OLS usando le osservazioni 1980:03–2015:09 ($T = 427$)

Log-verosimiglianza = 270,489

Determinante della matrice di covarianza = 0,0164932

AIC = $-1,1967$
BIC = $-1,0542$
HQC = $-1,1404$
Test portmanteau: LB(48) = 69,74, df = 46 [0,0135]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	0,132313	0,0340458	3,8863	0,0001
pR_{t-1}	1,15967	0,0484044	23,9580	0,0000
pR_{t-2}	−0,190185	0,0482719	−3,9399	0,0001
dm2	−0,0658322	0,0317930	−2,0707	0,0390
dm3	−0,0486992	0,0312684	−1,5575	0,1201
dm4	−0,0450669	0,0313111	−1,4393	0,1508
dm5	−0,0813451	0,0313444	−2,5952	0,0098
dm6	−0,0808325	0,0311552	−2,5945	0,0098
dm7	−0,00871432	0,0311280	−0,2800	0,7797
dm8	−0,0515440	0,0315709	−1,6326	0,1033
dm9	−0,0863111	0,0313512	−2,7530	0,0062
dm10	−0,0911710	0,0313749	−2,9059	0,0039
dm11	−0,105910	0,0313171	−3,3818	0,0008
dm12	−0,122861	0,0312725	−3,9287	0,0001
time	0,000190671	7,61872e–05	2,5027	0,0127

Media var. dipendente	3,456225	SQM var. dipendente	0,905348
Somma quadr. residui	7,042603	E.S. della regressione	0,130743
R^2	0,979831	R^2 corretto	0,979145
$F(14, 412)$	1429,643	P-value(F)	0,000000
$\hat{\rho}$	−0,012496	Durbin–Watson	2,022769

Test F per zero vincoli

Tutti i ritardi di pR	$F(2, 412) = 4382,62$	[0,0000]
Tutte le variabili, ritardo 2	$F(1, 412) = 15,5226$	[0,0001]

Per il sistema nel complesso —

Ipotesi nulla: il ritardo maggiore è 1

Ipotesi alternativa: il ritardo maggiore è 2

Test del rapporto di verosimiglianza: $\chi^2_1 = 15{,}792$ [0,0001]

Dummy per il periodo Marzo - Gennaio

Sistema VAR, ordine ritardi 2

Stime OLS usando le osservazioni 1980:03–2015:09 ($T = 427$)

Log-verosimiglianza = 270,489

Determinante della matrice di covarianza = 0,0164932

AIC $= -1,1967$

BIC $= -1,0542$

HQC $= -1,1404$

Test portmanteau: LB(48) = 69,74, df = 46 [0,0135]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	0,0664813	0,0339940	1,9557	0,0512
pR_{t-1}	1,15967	0,0484044	23,9580	0,0000
pR_{t-2}	−0,190185	0,0482719	−3,9399	0,0001
dm3	0,0171330	0,0311118	0,5507	0,5821
dm4	0,0207652	0,0310951	0,6678	0,5046
dm5	−0,0155129	0,0310894	−0,4990	0,6181
dm6	−0,0150003	0,0312244	−0,4804	0,6312
dm7	0,0571179	0,0312504	1,8277	0,0683
dm8	0,0142882	0,0310519	0,4601	0,6457
dm9	−0,0204790	0,0311069	−0,6583	0,5107
dm10	−0,0253388	0,0314670	−0,8053	0,4211
dm11	−0,0400774	0,0315437	−1,2705	0,2046
dm12	−0,0570290	0,0316470	−1,8020	0,0723
dm1	0,0658322	0,0317930	2,0707	0,0390
time	0,000190671	7,61872e–05	2,5027	0,0127

Media var. dipendente	3,456225	SQM var. dipendente	0,905348
Somma quadr. residui	7,042603	E.S. della regressione	0,130743
R^2	0,979831	R^2 corretto	0,979145
$F(14, 412)$	1429,643	P-value(F)	0,000000
$\hat{\rho}$	−0,012496	Durbin–Watson	2,022769

Test F per zero vincoli

Tutti i ritardi di pR	$F(2, 412) = 4382,62$	[0,0000]
Tutte le variabili, ritardo 2	$F(1, 412) = 15,5226$	[0,0001]

Per il sistema nel complesso —

Ipotesi nulla: il ritardo maggiore è 1

Ipotesi alternativa: il ritardo maggiore è 2

Test del rapporto di verosimiglianza: $\chi^2_1 = 15{,}792$ [0,0001]

Dummy per il periodo Aprile - Febbraio

Sistema VAR, ordine ritardi 2

Stime OLS usando le osservazioni 1980:03–2015:09 ($T = 427$)

Log-verosimiglianza = 270,489

Determinante della matrice di covarianza = 0,0164932

AIC = $-1{,}1967$

BIC = $-1{,}0542$

HQC = $-1{,}1404$

Test portmanteau: LB(48) = 69,74, df = 46 [0,0135]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	0,0836143	0,0340300	2,4571	0,0144
pR_{t-1}	1,15967	0,0484044	23,9580	0,0000
pR_{t-2}	−0,190185	0,0482719	−3,9399	0,0001
dm4	0,00363225	0,0308184	0,1179	0,9062
dm5	−0,0326459	0,0308232	−1,0591	0,2902
dm6	−0,0321333	0,0308428	−1,0418	0,2981
dm7	0,0399849	0,0308539	1,2959	0,1957
dm8	−0,00284475	0,0308815	−0,0921	0,9266
dm9	−0,0376119	0,0308309	−1,2199	0,2232
dm10	−0,0424718	0,0310727	−1,3669	0,1724
dm11	−0,0572104	0,0311074	−1,8391	0,0666
dm12	−0,0741620	0,0311675	−2,3795	0,0178
dm1	0,0486992	0,0312684	1,5575	0,1201
dm2	−0,0171330	0,0311118	−0,5507	0,5821
time	0,000190671	7,61872e–05	2,5027	0,0127

Media var. dipendente	3,456225	SQM var. dipendente	0,905348
Somma quadr. residui	7,042603	E.S. della regressione	0,130743
R^2	0,979831	R^2 corretto	0,979145
$F(14, 412)$	1429,643	P-value(F)	0,000000
$\hat{\rho}$	−0,012496	Durbin–Watson	2,022769

Test F per zero vincoli

Tutti i ritardi di pR	$F(2, 412) = 4382,62$	[0,0000]
Tutte le variabili, ritardo 2	$F(1, 412) = 15,5226$	[0,0001]

Per il sistema nel complesso —

Ipotesi nulla: il ritardo maggiore è 1

Ipotesi alternativa: il ritardo maggiore è 2

Test del rapporto di verosimiglianza: $\chi_1^2 = 15{,}792$ [0,0001]

Dummy per il periodo Maggio - Marzo

Sistema VAR, ordine ritardi 2

Stime OLS usando le osservazioni 1980:03–2015:09 ($T = 427$)

Log-verosimiglianza = 270,489

Determinante della matrice di covarianza = 0,0164932

AIC = $-1,1967$

BIC = $-1,0542$

HQC = $-1,1404$

Test portmanteau: LB(48) = 69,74, df = 46 [0,0135]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	0,0872465	0,0341578	2,5542	0,0110
pR_{t-1}	1,15967	0,0484044	23,9580	0,0000
pR_{t-2}	−0,190185	0,0482719	−3,9399	0,0001
dm5	−0,0362781	0,0308178	−1,1772	0,2398
dm6	−0,0357655	0,0308552	−1,1591	0,2471
dm7	0,0363526	0,0308700	1,1776	0,2396
dm8	−0,00647700	0,0308611	−0,2099	0,8339
dm9	−0,0412442	0,0308238	−1,3381	0,1816
dm10	−0,0461040	0,0310848	−1,4832	0,1388
dm11	−0,0608426	0,0311281	−1,9546	0,0513
dm12	−0,0777943	0,0311983	−2,4935	0,0130
dm1	0,0450669	0,0313111	1,4393	0,1508
dm2	−0,0207652	0,0310951	−0,6678	0,5046
dm3	−0,00363225	0,0308184	−0,1179	0,9062
time	0,000190671	7,61872e–05	2,5027	0,0127

Media var. dipendente	3,456225	SQM var. dipendente	0,905348
Somma quadr. residui	7,042603	E.S. della regressione	0,130743
R^2	0,979831	R^2 corretto	0,979145
$F(14, 412)$	1429,643	P-value(F)	0,000000
$\hat{\rho}$	−0,012496	Durbin–Watson	2,022769

Test F per zero vincoli

Tutti i ritardi di pR	$F(2, 412) = 4382,62$	[0,0000]
Tutte le variabili, ritardo 2	$F(1, 412) = 15,5226$	[0,0001]

Per il sistema nel complesso —

Ipotesi nulla: il ritardo maggiore è 1

Ipotesi alternativa: il ritardo maggiore è 2

Test del rapporto di verosimiglianza: $\chi^2_1 = 15{,}792$ [0,0001]

Dummy per il periodo Giugno - Aprile

Sistema VAR, ordine ritardi 2

Stime OLS usando le osservazioni 1980:03–2015:09 ($T = 427$)

Log-verosimiglianza = 270,489

Determinante della matrice di covarianza = 0,0164932

AIC = $-1,1967$

BIC = $-1,0542$

HQC = $-1,1404$

Test portmanteau: LB(48) = 69,74, df = 46 [0,0135]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	0,0509684	0,0343252	1,4849	0,1383
pR_{t-1}	1,15967	0,0484044	23,9580	0,0000
pR_{t-2}	−0,190185	0,0482719	−3,9399	0,0001
dm6	0,000512605	0,0308653	0,0166	0,9868
dm7	0,0726308	0,0308832	2,3518	0,0192
dm8	0,0298011	0,0308495	0,9660	0,3346
dm9	−0,00496604	0,0308197	−0,1611	0,8721
dm10	−0,00982589	0,0310935	−0,3160	0,7522
dm11	−0,0245645	0,0311434	−0,7888	0,4307
dm12	−0,0415161	0,0312217	−1,3297	0,1843
dm1	0,0813451	0,0313444	2,5952	0,0098
dm2	0,0155129	0,0310894	0,4990	0,6181
dm3	0,0326459	0,0308232	1,0591	0,2902
dm4	0,0362781	0,0308178	1,1772	0,2398
time	0,000190671	7,61872e–05	2,5027	0,0127

Media var. dipendente	3,456225	SQM var. dipendente	0,905348
Somma quadr. residui	7,042603	E.S. della regressione	0,130743
R^2	0,979831	R^2 corretto	0,979145
$F(14, 412)$	1429,643	P-value(F)	0,000000
$\hat{\rho}$	−0,012496	Durbin–Watson	2,022769

Test F per zero vincoli

Tutti i ritardi di pR	$F(2, 412) = 4382,62$	[0,0000]
Tutte le variabili, ritardo 2	$F(1, 412) = 15,5226$	[0,0001]

Per il sistema nel complesso —

Ipotesi nulla: il ritardo maggiore è 1

Ipotesi alternativa: il ritardo maggiore è 2

Test del rapporto di verosimiglianza: $\chi^2_1 = 15{,}792$ [0,0001]

Dummy per il periodo Luglio - Maggio

Sistema VAR, ordine ritardi 2

Stime OLS usando le osservazioni 1980:03–2015:09 ($T = 427$)

Log-verosimiglianza = 270,489

Determinante della matrice di covarianza = 0,0164932

AIC $= -1,1967$

BIC $= -1,0542$

HQC $= -1,1404$

Test portmanteau: LB(48) = 69,74, df = 46 [0,0135]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	0,0514810	0,0343505	1,4987	0,1347
pR_{t-1}	1,15967	0,0484044	23,9580	0,0000
pR_{t-2}	−0,190185	0,0482719	−3,9399	0,0001
dm7	0,0721182	0,0308183	2,3401	0,0198
dm8	0,0292885	0,0309777	0,9455	0,3450
dm9	−0,00547865	0,0308647	−0,1775	0,8592
dm10	−0,0103385	0,0310380	−0,3331	0,7392
dm11	−0,0250771	0,0310475	−0,8077	0,4197
dm12	−0,0420287	0,0310816	−1,3522	0,1771
dm1	0,0808325	0,0311552	2,5945	0,0098
dm2	0,0150003	0,0312244	0,4804	0,6312
dm3	0,0321333	0,0308428	1,0418	0,2981
dm4	0,0357655	0,0308552	1,1591	0,2471
dm5	−0,000512605	0,0308653	−0,0166	0,9868
time	0,000190671	7,61872e–05	2,5027	0,0127

Media var. dipendente	3,456225	SQM var. dipendente	0,905348
Somma quadr. residui	7,042603	E.S. della regressione	0,130743
R^2	0,979831	R^2 corretto	0,979145
$F(14, 412)$	1429,643	P-value(F)	0,000000
$\hat{\rho}$	−0,012496	Durbin–Watson	2,022769

Test F per zero vincoli

Tutti i ritardi di pR	$F(2, 412) = 4382,62$	[0,0000]
Tutte le variabili, ritardo 2	$F(1, 412) = 15,5226$	[0,0001]

Per il sistema nel complesso —

Ipotesi nulla: il ritardo maggiore è 1

Ipotesi alternativa: il ritardo maggiore è 2

Test del rapporto di verosimiglianza: $\chi^2_1 = 15{,}792$ [0,0001]

Dummy per il periodo Agosto - Giugno

Sistema VAR, ordine ritardi 2

Stime OLS usando le osservazioni 1980:03–2015:09 ($T = 427$)

Log-verosimiglianza = 270,489

Determinante della matrice di covarianza = 0,0164932

AIC = $-1,1967$

BIC = $-1,0542$

HQC = $-1,1404$

Test portmanteau: LB(48) = 69,74, df = 46 [0,0135]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	0,0514810	0,0343505	1,4987	0,1347
pR_{t-1}	1,15967	0,0484044	23,9580	0,0000
pR_{t-2}	−0,190185	0,0482719	−3,9399	0,0001
dm7	0,0721182	0,0308183	2,3401	0,0198
dm8	0,0292885	0,0309777	0,9455	0,3450
dm9	−0,00547865	0,0308647	−0,1775	0,8592
dm10	−0,0103385	0,0310380	−0,3331	0,7392
dm11	−0,0250771	0,0310475	−0,8077	0,4197
dm12	−0,0420287	0,0310816	−1,3522	0,1771
dm1	0,0808325	0,0311552	2,5945	0,0098
dm2	0,0150003	0,0312244	0,4804	0,6312
dm3	0,0321333	0,0308428	1,0418	0,2981
dm4	0,0357655	0,0308552	1,1591	0,2471
dm5	−0,000512605	0,0308653	−0,0166	0,9868
time	0,000190671	7,61872e–05	2,5027	0,0127

Media var. dipendente	3,456225	SQM var. dipendente	0,905348
Somma quadr. residui	7,042603	E.S. della regressione	0,130743
R^2	0,979831	R^2 corretto	0,979145
$F(14, 412)$	1429,643	P-value(F)	0,000000
$\hat{\rho}$	−0,012496	Durbin–Watson	2,022769

Test F per zero vincoli

Tutti i ritardi di pR	$F(2, 412) = 4382,62$	[0,0000]
Tutte le variabili, ritardo 2	$F(1, 412) = 15,5226$	[0,0001]

Per il sistema nel complesso —

Ipotesi nulla: il ritardo maggiore è 1

Ipotesi alternativa: il ritardo maggiore è 2

Test del rapporto di verosimiglianza: $\chi^2_1 = 15{,}792$ [0,0001]

Dummy per il periodo Settembre - Luglio

Sistema VAR, ordine ritardi 2

Stime OLS usando le osservazioni 1980:03–2015:09 ($T = 427$)

Log-verosimiglianza = 270,489

Determinante della matrice di covarianza = 0,0164932

AIC = $-1,1967$

BIC = $-1,0542$

HQC = $-1,1404$

Test portmanteau: LB(48) = 69,74, df = 46 [0,0135]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	0,0807695	0,0344726	2,3430	0,0196
pR_{t-1}	1,15967	0,0484044	23,9580	0,0000
pR_{t-2}	−0,190185	0,0482719	−3,9399	0,0001
dm9	−0,0347672	0,0308540	−1,1268	0,2605
dm10	−0,0396270	0,0312109	−1,2697	0,2049
dm11	−0,0543656	0,0312937	−1,7373	0,0831
dm12	−0,0713173	0,0314081	−2,2707	0,0237
dm1	0,0515440	0,0315709	1,6326	0,1033
dm2	−0,0142882	0,0310519	−0,4601	0,6457
dm3	0,00284475	0,0308815	0,0921	0,9266
dm4	0,00647700	0,0308611	0,2099	0,8339
dm5	−0,0298011	0,0308495	−0,9660	0,3346
dm6	−0,0292885	0,0309777	−0,9455	0,3450
dm7	0,0428296	0,0310086	1,3812	0,1680
time	0,000190671	7,61872e–05	2,5027	0,0127

Media var. dipendente	3,456225	SQM var. dipendente	0,905348
Somma quadr. residui	7,042603	E.S. della regressione	0,130743
R^2	0,979831	R^2 corretto	0,979145
$F(14, 412)$	1429,643	P-value(F)	0,000000
$\hat{\rho}$	−0,012496	Durbin–Watson	2,022769

Test F per zero vincoli

Tutti i ritardi di pR	$F(2, 412) = 4382,62$	[0,0000]
Tutte le variabili, ritardo 2	$F(1, 412) = 15,5226$	[0,0001]

Per il sistema nel complesso —

Ipotesi nulla: il ritardo maggiore è 1

Ipotesi alternativa: il ritardo maggiore è 2

Test del rapporto di verosimiglianza: $\chi^2_1 = 15{,}792$ [0,0001]

Dummy per il periodo Ottobre - Agosto

Sistema VAR, ordine ritardi 2

Stime OLS usando le osservazioni 1980:03–2015:09 ($T = 427$)

Log-verosimiglianza = 270,489

Determinante della matrice di covarianza = 0,0164932

AIC = $-1,1967$

BIC = $-1,0542$

HQC = $-1,1404$

Test portmanteau: LB(48) = 69,74, df = 46 [0,0135]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	0,0460024	0,0346725	1,3268	0,1853
pR_{t-1}	1,15967	0,0484044	23,9580	0,0000
pR_{t-2}	−0,190185	0,0482719	−3,9399	0,0001
dm10	−0,00485984	0,0310891	−0,1563	0,8759
dm11	−0,0195984	0,0311407	−0,6294	0,5295
dm12	−0,0365501	0,0312227	−1,1706	0,2424
dm1	0,0863111	0,0313512	2,7530	0,0062
dm2	0,0204790	0,0311069	0,6583	0,5107
dm3	0,0376119	0,0308309	1,2199	0,2232
dm4	0,0412442	0,0308238	1,3381	0,1816
dm5	0,00496604	0,0308197	0,1611	0,8721
dm6	0,00547865	0,0308647	0,1775	0,8592
dm7	0,0775968	0,0308841	2,5125	0,0124
dm8	0,0347672	0,0308540	1,1268	0,2605
time	0,000190671	7,61872e–05	2,5027	0,0127

Media var. dipendente	3,456225	SQM var. dipendente	0,905348
Somma quadr. residui	7,042603	E.S. della regressione	0,130743
R^2	0,979831	R^2 corretto	0,979145
$F(14, 412)$	1429,643	P-value(F)	0,000000
$\hat{\rho}$	−0,012496	Durbin–Watson	2,022769

Test F per zero vincoli

Tutti i ritardi di pR	$F(2, 412) = 4382,62$	[0,0000]
Tutte le variabili, ritardo 2	$F(1, 412) = 15,5226$	[0,0001]

Per il sistema nel complesso —

Ipotesi nulla: il ritardo maggiore è 1

Ipotesi alternativa: il ritardo maggiore è 2

Test del rapporto di verosimiglianza: $\chi^2_1 = 15{,}792$ [0,0001]

Dummy per il periodo Novembre - Settembre

Sistema VAR, ordine ritardi 2

Stime OLS usando le osservazioni 1980:03–2015:09 ($T = 427$)

Log-verosimiglianza = 270,489

Determinante della matrice di covarianza = 0,0164932

AIC $= -1,1967$

BIC $= -1,0542$

HQC $= -1,1404$

Test portmanteau: LB(48) = 69,74, df = 46 [0,0135]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	0,0411425	0,0347543	1,1838	0,2372
pR_{t-1}	1,15967	0,0484044	23,9580	0,0000
pR_{t-2}	−0,190185	0,0482719	−3,9399	0,0001
dm11	−0,0147386	0,0312631	−0,4714	0,6376
dm12	−0,0316902	0,0312986	−1,0125	0,3119
dm1	0,0911710	0,0313749	2,9059	0,0039
dm2	0,0253388	0,0314670	0,8053	0,4211
dm3	0,0424718	0,0310727	1,3669	0,1724
dm4	0,0461040	0,0310848	1,4832	0,1388
dm5	0,00982589	0,0310935	0,3160	0,7522
dm6	0,0103385	0,0310380	0,3331	0,7392
dm7	0,0824567	0,0310409	2,6564	0,0082
dm8	0,0396270	0,0312109	1,2697	0,2049
dm9	0,00485984	0,0310891	0,1563	0,8759
time	0,000190671	7,61872e–05	2,5027	0,0127

Media var. dipendente	3,456225	SQM var. dipendente	0,905348
Somma quadr. residui	7,042603	E.S. della regressione	0,130743
R^2	0,979831	R^2 corretto	0,979145
$F(14, 412)$	1429,643	P-value(F)	0,000000
$\hat{\rho}$	−0,012496	Durbin–Watson	2,022769

Test F per zero vincoli

Tutti i ritardi di pR	$F(2, 412) = 4382,62$	[0,0000]
Tutte le variabili, ritardo 2	$F(1, 412) = 15,5226$	[0,0001]

Per il sistema nel complesso —

Ipotesi nulla: il ritardo maggiore è 1

Ipotesi alternativa: il ritardo maggiore è 2

Test del rapporto di verosimiglianza: $\chi^2_1 = 15{,}792$ [0,0001]

Dummy per il periodo Dicembre - Ottobre

Sistema VAR, ordine ritardi 2

Stime OLS usando le osservazioni 1980:03–2015:09 ($T = 427$)

Log-verosimiglianza = 270,489

Determinante della matrice di covarianza = 0,0164932

AIC = $-1,1967$

BIC = $-1,0542$

HQC = $-1,1404$

Test portmanteau: LB(48) = 69,74, df = 46 [0,0135]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	0,0264039	0,0346117	0,7629	0,4460
pR_{t-1}	1,15967	0,0484044	23,9580	0,0000
pR_{t-2}	−0,190185	0,0482719	−3,9399	0,0001
dm12	−0,0169516	0,0312668	−0,5422	0,5880
dm1	0,105910	0,0313171	3,3818	0,0008
dm2	0,0400774	0,0315437	1,2705	0,2046
dm3	0,0572104	0,0311074	1,8391	0,0666
dm4	0,0608426	0,0311281	1,9546	0,0513
dm5	0,0245645	0,0311434	0,7888	0,4307
dm6	0,0250771	0,0310475	0,8077	0,4197
dm7	0,0971953	0,0310421	3,1311	0,0019
dm8	0,0543656	0,0312937	1,7373	0,0831
dm9	0,0195984	0,0311407	0,6294	0,5295
dm10	0,0147386	0,0312631	0,4714	0,6376
time	0,000190671	7,61872e–05	2,5027	0,0127

Media var. dipendente	3,456225	SQM var. dipendente	0,905348
Somma quadr. residui	7,042603	E.S. della regressione	0,130743
R^2	0,979831	R^2 corretto	0,979145
$F(14, 412)$	1429,643	P-value(F)	0,000000
$\hat{\rho}$	−0,012496	Durbin–Watson	2,022769

Test F per zero vincoli

Tutti i ritardi di pR	$F(2, 412) = 4382,62$	[0,0000]
Tutte le variabili, ritardo 2	$F(1, 412) = 15,5226$	[0,0001]

Per il sistema nel complesso —

Ipotesi nulla: il ritardo maggiore è 1

Ipotesi alternativa: il ritardo maggiore è 2

Test del rapporto di verosimiglianza: $\chi^2_1 = 15{,}792$ [0,0001]

2.3.6 Eliminazione dei picchi visibili con i residui

In questa fase vengono elaborate delle regressioni nelle quali si eliminano i primi due picchi visibili dall'analisi dei residui della VAR per i prezzi al consumo mensili. I primi due picchi vengono individuati per il febbraio 1986 ed i mesi di luglio ed agosto 1994. Con buona probabilità possiamo individuare gli stessi come effetti di due eventi che sono accaduti a pochi mesi di distanza dallo realizzarsi dei picchi. Nel 1986 è venuto meno il sistema di quote che aveva regolato il mercato del caffè per lunghi anni. Nel momento del picco è possibile che vi sia stata una preoccupazione del mercato per la difficoltà o meglio la realizzazione dell'idea che le negoziazioni avrebbero portato alla fine di quel sistema di quote. Nel 1994 è avvenuta un'importante gelata in Brasile. Il picco potrebbe essere l'effetto della gelata, poi mitigato dall'utilizzo delle scorte accumulate durante il periodo nel quale le quote contingentavano le possibilità di immettere il prodotto nel mercato.

Vengono prese in considerazione questi due picchi e ci si ferma prima di quello successivo, infatti vi è un valore reale molto alto rispetto quelli previsti dalla regressione. Questo potrebbe essere dovuto al fatto che in quell'anno il prezzo del caffè raggiunse un massimo prima di una caduta come se la liberalizzazione del mercato avesse creato una bolla che poi è venuta meno. Parlare di bolla è forse troppo forte in questo caso, indubbiamente il residuo, benché significativo, è molto più basso dei due visti in precedenza. SI potrebbe dire che da quel momento di incertezza è iniziata comunque una forte variabilità dei prezzi,

Si va ora ad eliminare i due picchi attraverso l'inserimento di due variabili dummy. SI ripete l'esercizio fatto in precedenza, a partire da una nuova verifica dei criteri d'informazione, avendo sinora seguito quello di Schwartz, in questo casi il criterio suggerisce la scelta di un solo ritardo (così come quello di Hannan-Quinn) differentemente da quanto avrebbe fatto il criterio di Akaike suggerendo 5 ritardi.

Abbiamo quindi la seguente regressione:

Sistema VAR, ordine ritardi 1

Stime OLS usando le osservazioni 1980:02–2015:09 ($T = 428$)

Log-verosimiglianza = 345,198

Determinante della matrice di covarianza = 0,0116675

AIC $= -1,5383$
BIC $= -1,3866$
HQC $= -1,4784$
Test portmanteau: LB(48) = 90,3332, df = 47 [0,0001]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	−0,0224916	0,0286810	−0,7842	0,4334
pR_{t-1}	0,976752	0,00874304	111,7176	0,0000
PiccoPreFineQuote	0,833995	0,111825	7,4581	0,0000
GelataBrasile	0,921021	0,0790155	11,6562	0,0000
S1	0,119778	0,0263240	4,5501	0,0000
S2	0,0553866	0,0263176	2,1045	0,0359
S3	0,0853829	0,0261352	3,2670	0,0012
S4	0,0901169	0,0261367	3,4479	0,0006
S5	0,0544808	0,0261399	2,0842	0,0378
S6	0,0482002	0,0261375	1,8441	0,0659
S7	0,0937266	0,0262280	3,5735	0,0004
S8	0,0641135	0,0262377	2,4436	0,0150
S9	0,0488972	0,0261494	1,8699	0,0622
S10	0,0371941	0,0263269	1,4128	0,1585
S11	0,0197900	0,0263208	0,7519	0,4526
time	0,000185673	6,37375e–05	2,9131	0,0038

Media var. dipendente	3,455762	SQM var. dipendente	0,904338
Somma quadr. residui	4,993672	E.S. della regressione	0,110093
R^2	0,985700	R^2 corretto	0,985180
$F(15, 412)$	1893,303	P-value(F)	0,000000
$\hat{\rho}$	0,026156	Durbin–Watson	1,942646

Test F per zero vincoli

Tutti i ritardi di pR $F(1, 412) = 12480,8$ [0,0000]

In questo modo la regressione è molto più precisa. Eliminando inoltre le dummy stagionali si ha anche un miglioramento della qualità della costante, benché con una validità ancora relativamente non così forte come ci saremmo aspettati, comunque con un valore molto basso, così come il coefficiente temporale. Con il seguente risultato:

Sistema VAR, ordine ritardi 1
Stime OLS usando le osservazioni 1980:02–2015:09 ($T = 428$)

Log-verosimiglianza = 327,382
Determinante della matrice di covarianza = 0,0126804
AIC = $-1,5065$
BIC = $-1,4590$
HQC = $-1,4877$
Test portmanteau: LB(48) = 92,5787, df = 47 [0,0001]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	0,0404612	0,0233880	1,7300	0,0844
pR_{t-1}	0,975357	0,00897272	108,7024	0,0000
PiccoPreFineQuote	0,829669	0,113580	7,3047	0,0000
GelataBrasile	0,939757	0,0803392	11,6974	0,0000
time	0,000193504	6,54899e–05	2,9547	0,0033

Media var. dipendente	3,455762	SQM var. dipendente	0,904338
Somma quadr. residui	5,427191	E.S. della regressione	0,113271
R^2	0,984459	R^2 corretto	0,984312
$F(4,423)$	6698,724	P-value(F)	0,000000
$\hat{\rho}$	0,023561	Durbin–Watson	1,947803

Test F per zero vincoli

Tutti i ritardi di pR $F(1,423) = 11816,2$ [0,0000]

Nella Figura 2.11 si ripropongono dunque i picchi del 1997, che ora sono i primi picchi forti. In realtà vi sono anche dei segni dei due picchi precedenti, ma molto più deboli. Si nota ancora meglio come il 1997 sia un anno nel quale vi è stato un cambiamento che ha riportato verso un tentativo di stabilizzazione che non ha avuto successo. Nel tempo, infatti, vi è stata una più forte variabilità dei prezzi.

SI andrà quindi a vedere cosa accade negli ultimi 10 anni, che rappresentano un periodo nel quale vi è forte variabilità. I criteri d'informazione indicano la scelta per un solo ritardo.

Sistema VAR, ordine ritardi 1
Stime OLS usando le osservazioni 2005:11–2015:09 ($T = 119$)

Log-verosimiglianza = 50,4507
Determinante della matrice di covarianza = 0,0250774
AIC = $-0,6126$
BIC = $-0,2857$

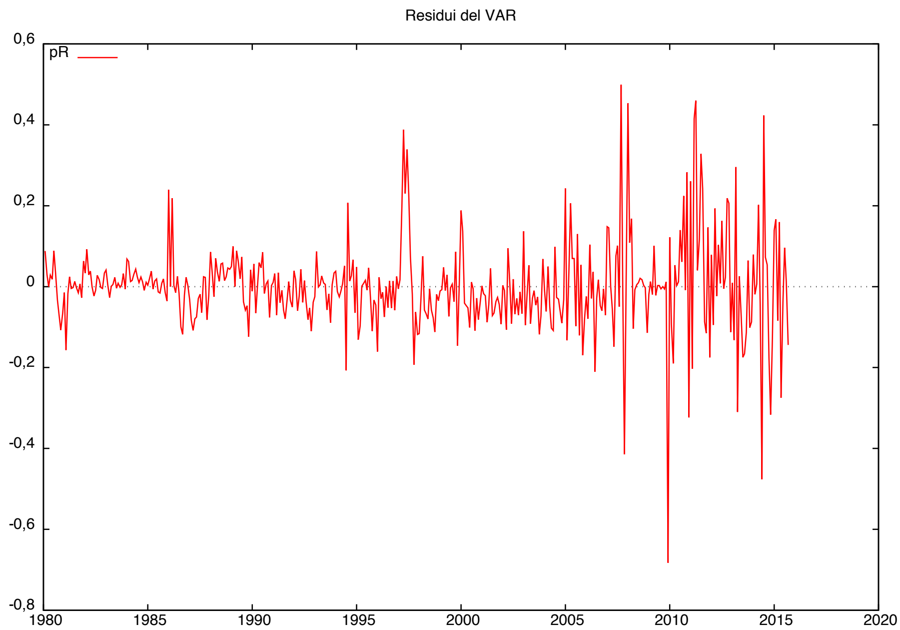

Figure 2.11: Residui dell'elaborazione tenendo conto delle dummy per il 1986 ed il 1994, escludendo le dummy temporali.

$\text{HQC} = -0,4799$
Test portmanteau: LB(29) = 30,6727, df = 28 [0,3318]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	−0,0418084	0,118079	−0,3541	0,7240
pR_{t-1}	0,969403	0,0304018	31,8863	0,0000
S1	0,294849	0,0756145	3,8994	0,0002
S2	0,152184	0,0754369	2,0174	0,0462
S3	0,259736	0,0754858	3,4409	0,0008
S4	0,216698	0,0754260	2,8730	0,0049
S5	0,142863	0,0754289	1,8940	0,0610
S6	0,114629	0,0754668	1,5189	0,1318
S7	0,277363	0,0755775	3,6699	0,0004
S8	0,192034	0,0754952	2,5437	0,0124
S9	0,214897	0,0755178	2,8456	0,0053
S10	0,162801	0,0775266	2,0999	0,0381
S11	0,134863	0,0754141	1,7883	0,0766
time	0,000152307	0,000744484	0,2046	0,8383

Media var. dipendente	4,507496	SQM var. dipendente	0,840452
Somma quadr. residui	2,984211	E.S. della regressione	0,168585
R^2	0,964197	R^2 corretto	0,959764
$F(13, 105)$	217,5155	P-value(F)	1,38e–69
$\hat{\rho}$	−0,038861	Durbin–Watson	2,058847

Test F per zero vincoli

Tutti i ritardi di pR $F(1, 105) = 1016,74$ [0,0000]

Senza dummy stagionali avremo

Sistema VAR, ordine ritardi 1
Stime OLS usando le osservazioni 2005:11–2015:09 ($T = 119$)

Log-verosimiglianza = 37,5647
Determinante della matrice di covarianza = 0,0311414
AIC = $-0,5809$
BIC = $-0,5109$
HQC = $-0,5525$
Test portmanteau: LB(29) = 36,1068, df = 28 [0,1399]

Equazione 1: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	0,181956	0,110794	1,6423	0,1032
pR_{t-1}	0,955093	0,0319000	29,9402	0,0000
time	0,000496214	0,000782243	0,6343	0,5271

Media var. dipendente	4,507496	SQM var. dipendente	0,840452
Somma quadr. residui	3,705827	E.S. della regressione	0,178737
R^2	0,955539	R^2 corretto	0,954773
$F(2, 116)$	1246,521	P-value(F)	3,83e–79
$\hat{\rho}$	−0,070109	Durbin–Watson	2,122928

Test F per zero vincoli

Tutti i ritardi di pR	$F(1, 116) = 896,415$	[0,0000]

In ogni caso c'è poca significatività del trend temporale, che ha comunque un coefficiente molto basso, come si ripetono i problemi per la costante. Prendendo i residui di quest'ultimo caso avremmo:

Figure 2.12: Residui dell'elaborazione dei valori degli ultimi dieci anni escludendo le dummy temporali.

Con dei valori che mostrano dunque una forte variabilità rispetto quelli predetti dalla regressione.

Con una previsione che anche in questo caso, comunque lascia presupporre un aumento dei prezzi nel breve periodo.

Figure 2.13: Previsione di p^R per 24 mesi dall'elaborazione dei valori degli ultimi dieci anni escludendo le dummy temporali.

2.3.7 Dati panel

Andando ad utilizzare i dati panel abbiamo la funzione:

$$\widehat{\text{pR}} = \underset{(0{,}11147)}{0,544797} + \underset{(0{,}020924)}{0,914732}\,\text{pR\_1}$$

$$T = 588 \quad \bar{R}^2 = 0,7737 \quad F(28,559) = 358,22 \quad \hat{\sigma} = 0,72583$$

(errori standard tra parentesi)

con i parametri:

Modello 1: Effetti fissi, usando 588 osservazioni
Incluse 28 unità cross section
Lunghezza serie storiche: minimo 12, massimo 24
Variabile dipendente: pR

	Coefficiente	Errore Std.	rapporto t	p-value
const	0,544797	0,111468	4,8875	0,0000
pR_1	0,914732	0,0209237	43,7176	0,0000

Media var. dipendente	5,238929	SQM var. dipendente	3,082814
Somma quadr. residui	294,4969	E.S. della regressione	0,725829
LSDV R^2	0,947210	R^2 intra-gruppi	0,773705
$F(28,559)$	358,2220	P-value(F)	0,000000
Log-verosimiglianza	−631,0471	Criterio di Akaike	1320,094
Criterio di Schwarz	1447,019	Hannan–Quinn	1369,548
$\hat{\rho}$	0,109923	Durbin–Watson	1,677151

Test congiunto sui regressori –
Statistica test: $F(1,559)$ = 1911,23
con p-value = $P(F(1,559) >$ 1911,23) = 1,6412e-182

Test per la differenza delle intercette di gruppo –
Ipotesi nulla: i gruppi hanno un'intercetta comune
Statistica test: $F(27,559)$ = 1,20164
con p-value = $P(F(27,559) >$ 1,20164) = 0,223436

Solo dati completi tranne UK: Ovvero i dati per quali si ha tutta la serie storica dal 1990 al 2014. Ai dati è stata tolta la serie storica del Regno Unito in quanto corrispondente ai prezzi del caffè solubile, quindi con valori di molto al di sopra degli altri.

Di seguito lo studio dei dati panel con effetti fissi:

$$\underset{(0,14061)}{\widehat{\text{pW}} = 0,406059} + \underset{(0,028904)}{0,928115}\,\text{pW\_1}$$

$$T = 312 \quad \bar{R}^2 = 0,7758 \quad F(13,298) = 245,84 \quad \hat{\sigma} = 0,69183$$

(errori standard tra parentesi)

con parametri:

Modello 1: Effetti fissi, usando 312 osservazioni
Incluse 13 unità cross section
Lunghezza serie storiche = 24
Variabile dipendente: pW

	Coefficiente	Errore Std.	rapporto t	p-value
const	0,406059	0,140614	2,8878	0,0042
pW_1	0,928115	0,0289043	32,1099	9,33e–99

Media var. dipendente	4,742468	SQM var. dipendente	2,318843
Somma quadr. residui	142,6307	E.S. della regressione	0,691828
LSDV R^2	0,914708	R^2 intra-gruppi	0,775779
$F(13,298)$	245,8358	P-value(F)	1,1e–150
Log-verosimiglianza	−320,6007	Criterio di Akaike	669,2014
Criterio di Schwarz	721,6035	Hannan–Quinn	690,1449
$\hat{\rho}$	0,089843	Durbin–Watson	1,762235

Test congiunto sui regressori –
Statistica test: $F(1,298) = 1031{,}05$
con p-value = $P(F(1,298) > 1031{,}05) = 9{,}3314\text{e-}99$

Test per la differenza delle intercette di gruppo –
Ipotesi nulla: i gruppi hanno un'intercetta comune
Statistica test: $F(12,298) = 0{,}420072$
con p-value = $P(F(12,298) > 0{,}420072) = 0{,}955179$

2.4 Considerazioni conclusive

Nel periodo dopo le chiusura del sistema di quote si è verificato quello che dalla letteratura sembrava emergere. Quell'allentamento della relazione tra i prezzi del caffè al consumo ed i prezzi dello stesso prodotto nei passaggi più a monte della filiera produttiva (Mehta and Chavas, 2008) sembra confermato da ogni elaborazione effettuata.

Si può notare, inoltre, che i prezzi al consumo dipendono soprattutto dai valori che gli stessi hanno assunto nell'anno precedente. Infatti le regressioni che utilizzano un ritardo della variabile endogena hanno alti livelli di significatività. La variabile temporale, invece, ha spesso dei coefficienti molto bassi che fanno presupporre uno scarso legame al passare del tempo.

All'interno delle dinamiche annuali, si può aggiungere che i mesi decisivi sono quelli a cavallo degli anni, in particolare da novembre a gennaio, con una più forte incidenza di quest'ultimo. Ciò sta ad indicare che le scelte aziendali hanno probabilmente una valenza maggiore, nella determinazione dei prezzi del caffè al consumo, rispetto alle dinamiche del mercato a internazionale del caffè.

Abbiamo visto che anche le dinamiche della raccolta influiscono poco, si è infatti riscontrato solo un picco istantaneo nei residui riferibile al mese della gelata in Brasile. Ciò può essere sintomo comunque di un'attenzione alle situazioni di crisi che si possono creare a monte della filiera, ma con un'incidenza molto relativa nelle dinamiche di prezzo a valle.

Si può comunque notare che la fine del contingentamento del mercato ha provocato comunque una sempre crescente variabilità dei prezzi, più difficili da prevedere.

Chapter 3

Made in Italy excellences

3.1 Introduction

Italy is one of the most rich country in the developed world. In the last year, Italy had the 7^{th} biggest GDP in the world. Considering the Per Capita GDP, Italy was raked lower but always between the most developed countries, respectively 27^{th} and 31^{st} for the GDP p.c. and the GDP p.c. at PPP[1]. Italian economy is considered one of the most developed, even though its most representative products are characterized by traditional productions.

Italy have made of its openness to other markets a necessity for growing, since the scarcity of natural resources give no possibility to a development without openness. The Italian geographical position, moreover, allows easy access to resources from other countries (Vasta, 2010).

Even if there is a not clear causality pattern, is possible to identify an historical situation in which the period of higher levels in openness are the ones of best economic performances (Vasta, 2010). Italy was historically, from the unification, an exporter of primary (agricultural) good. This pattern has been changed after the World War II and for the following quarter of a century. With the fall of primary products export and a new role of mechanical productions in serving overseas markets, took place a change within manufactured products export. In the last years has been possible to see a strong diversification in export patterns, due to an increasing capability to produce diversified goods and to follow a changed world demand. The Italian export is specialized in two kind of production: traditional sectors (e.g. textile and apparel or traditional manufacture such as ceramic or glass) and mechanical productions (e.g. electri-

[1] Data from World Bank for the year 2015. In the last five years, Italy was ranked between the 7^{th} anf the 8^{th} place for the GDP, between 26^{th} and 28^{th} place for the GDP p.c. (between the 30^{th} and 31^{st} considering the purchase power parity)

cal, industrial or agricultural machineries). Traditional sectors better represent the *Made in Italy* concept (Vasta, 2010).

The Italian export after the World War II are mainly in the resource based and low technology manufactures categories (and partially on medium technologies one) of the Lall (2000) categorization. Lall (2000) distinguished the exported goods according to process and technologies categories. In particular he highlighted how there are three main categories: primary products, manufactured goods and a residual category. The most important distinction in between the manufactured goods and depends from the different technologies used in the production. The subcategories are: resource based manufactures, low technology manufactures, medium technology manufactures and technology manufactures. The Italian specialization therefore is in processes with almost stable technologies, where the cost of labor is the most important element for the competitiveness. In this ind if low technology manufactures the competition in the market works through prices. To avoid price competition is important to differentiate in product quality, design and branding. For medium technology manufactures are required higher workers skills but the technologies are not yet fast changing. It is possible to say that Italy is specialized in sectors with a stable production process. In the last years little has changed: the most visible is shift in higher quality good within the already specialized sectors (Vasta, 2010).

Apart from high quality and luxury goods in traditional sectors, there are two new kind of products export, the first is the mechanical engineering productions, and the second are pharmaceuticals (Fortis, 2015).

Using data from Italian Ministry of Economic Development (Giorgio, 2016) we could see how Italy has been one of the countries most involved in international trade. In 2014, Italian share in international export was 2,8% in value. This quote put Italy in the 8^{th} position on the international export. Focusing on the imports, Italy is in the 12^{th} position on the international market, with a share of 2,4%.

Italian import and export data shows how its quotas, considering last ten years, has been decreasing. Italian imports decline from a share on 3,6 and from the 7^{th} position in 2005. Even though the exports share follow a similar path of the imports, Italian position have remained more or less the same, in fact we could observe little fluctuation of one position over and under the pivotal 8^{th} place.

Considering the absolute data in prices, the Italian import-export trade shows a growth in the last ten years. There was a significant fall in value traded in 2009 as the effect of the economic crisis in 2008. The last period (2012 - 2014) shows a slacken growth in export value, and a downturn in the imports.

About 2/3 of Italian exports goes to European countries, over a half to countries in the European Union (about 40% of the trade remain in the Euro area.) Considering the Italian products buyer countries, Germany is the biggest buyer, followed by France and the first extra UE country: the United State.

The most traded products (in value) are the machinery. The most traded products with traditional productions are clothing products with an export share of 3,9% in 2014. In the first 15 exported categories[2] we could notice other traditional production categories such as leather goods, shoes and furniture.

The austerity to reduce the Italian public debt and, consequently, the low internal demand are the causes of the slowed Italy's growth; while other countries performances are sustained by the growth of private debt exploded in the 2008 financial bubble (Fortis, 2015).

International markets, through technology and knowledge spillovers, stimulate a learning process improving the firms performances acting together with the exploitation of economies of scale. Learning activities, to increase the productivity necessitate the willingness to learn and the capacity to do it. Export activity is not determined by productivity growth, but determines it. Productivity growth is determined by the firm export intensity (Castellani, 2002).

3.1.1 Made in Italy products

Following the report by Symbola et al. (2015), Italian industry is one of the world excellence in manufacturing. *Made in Italy* is not only a sign of the production origin. The words *Made in Italy* recall in mind some typical aspects of the Italian manufacturing work, in particular the following characteristics are highlighted: attention to aesthetic, quality, raw material excellence, artisan expertise and creativity. These qualities of the *Made in Italy* products show how relevant are not only physical characteristics of the Italian productions, but intangible qualities are a value added in the *Made in Italy* productions. Industrial sectors typical of *Made in Italy* productions are clothing industry, agribusiness, furniture industry and car production.

In the cited report, the reaction of American and Chinese consumers to the expression "*Made in Italy*"are considered: about 4/5 of the consumers from the two markets have positive appeal to the Italian sounding products. They, furthermore, considers fashion industry, agribusiness and interior design typical Italian productions.

These considered sales markets are very important for the international economy in general and for Italian export in particular. US is the 3rd importer of Italian products, with a quota of 7,5% of Italian exports. China is the 8th im-

[2] Ateco 3-numbers codes

porter of Italian products, with a quota of 2,6% of Italian exports[3]. In potential terms these two markets are the most involved in international trade from both side: import and export. Considering Italian production, these two markets are potentially important end market because US is the biggest importer and China, since 2009, follows US in the international importers rank[4].

However, in Symbola et al. (2015) is underlined how some important sectors for the Italian export are not considered as typical *Made in Italy* sectors. Examples are mechanic, robotic and electronic industries, as well as renewable energy technologies.

What already said could brought to the idea that Italian exported products are of two kinds: one perceived from consumers as having a value added from being produced in Italy, an other type of products are not perceived as having this kind of value added.

3.1.2 International market indexes and Made in Italy exports

Starting to study the role of Italian exports and, in particular, the differences in *Made in Italy* Italian exports and exports not perceived as *Made in Italy* is necessary to approach to some indicators collecting all the information on different products trade.

One of the most used indicator useful to the scope is the Balassa Index (RCA) (Balassa, 1965, 1977; Balassa and Noland, 1989).

The RCA is used to study the revealed comparative advantages of a nation.

$$\text{RCA} = \frac{\frac{X_{ij}}{\sum_j X_{ij}}}{\frac{\sum_i X_{ij}}{\sum_{ij} X_{ij}}} \tag{3.1}$$

The Index is represented in equation (3.1) where the index i represent geographical areas and the index j represents industries. It is the ratio between the national export quota for a good and the same quota for a reference area. If the World is used as a reference area we have the possibility to understand the role of the Nation under investigation as a player in the international market, more precisely if there is or not a revealed comparative advantage. In the Balassa Index there is a threshold represented by the number one, in fact if $RCA = 1$ there are not any comparative advantage nor a comparative disadvantage. If the index is over the threshold then the Nation considered have a revealed com-

[3]data from UN Comtrade refers to year 2014. For the year 2015, in the disposable data at 25^{th} August 2016, US and China hare respectively a ranking of 3^{rd} and 9^{th} with quotas of 0,087 and 0,025

[4]Data from UN Comtrade

parative advantage for the considered production compared with the reference area Triulzi (1999).

The control variables that several research have highlighted as the ones could effect export intensity are: firm size, firm age, home location industrial environment and economic sectors (D'Angelo, 2012).

3.1.3 Italian export

To understand the role of Italy in the world export is possible to study in which commodities there are higher revealed comparative advantage. Firsts data to control are the total trade of Italy and the reference area: World. Data are downloaded from the UN Statistical Service[5]. Data considered are 2-digit HS codes.[6]. This data shows international trade at aggregated level but leaving a certain grade of differentiation such to not lose to much information.

After a study of Italian RCA indexes (see Appendix A) we could underline as 50/97 codes present a revealed comparative advantage (that is $RCA > 1$). Only sixteen codes correspond to an index over 2 and, among these, only seven have an index over 3 (up to almost 6). The highest specialization found is in textile relate products, but also ceramic, footwear and arms have an important index of specialization for the Italian export. This shows how Italy have a specialization in many commodities but for the majority this specialization is not so high compared to the world market dynamics.

During the nineties Italy performed a change in the market share of its export. If it had good performances in the first half of that period, then the performances worsening. The cause were mainly due to the kind of productions, with low level of market share in fast-growing markets or in markets of increasing international demand and some competitiveness concerns relate to monetary policy (monetary evaluation) and growing openness and importance of low labor cost emergence markets. This create a situation in which in developed countries remained the high added value processes and the others were outsourced in developing countries. As Foresti (2004) have shown, using the Constant Market Share Analisys (CMS)[7], the China's growing role in the international market

[5]UN Comtrade, data downloaded on 21st March 2016. Data are from 2013, if not explicitly expressed otherwise. Data for 2015 are not so complete to be representative of the World trade dynamics. Data disposable for 2014 are from 148 States, approximatively sufficient to have a wide view of the market dynamics, considered that for the previous years are respectively from 155, 160, 161 and 166 back to 2010. It is preferred to use 2013 data because the sum of total export is lower for 2014 then for 2013, and, after a period of export growing and in absence of sensible shocks in this period, data for 2013 could be the most complete between updated data.

[6]Data from UN have some minor statistical error. E.g. total Italian export differ if we consider the total given by the database ad the sum of all 2-digit HS codes, but, since the error, in this case, is of $7,72 \times 10^{-10}\%$ errors are considered negligible.

[7]The CMS method analyses the export performances starting from the assumption that a

created the main competitiveness concern for Italian productions.

After the Second World War, the Italian import-export activities has grown, most of all due to the growth in intra-industry trade (Pistoresi and Rinaldi, 2012).

With high rates of capital formation and an increasing internal demand, among other minor factors, the Italian growth was led also by imports and not only by exports (Pistoresi and Rinaldi, 2012).

From mid 70's Italian export became polarized in two categories, on one side the made in Italy products, on the other side specialized engineering products. The firsts are goods for personal use and for the house. The seconds are mostly machinery to make the firsts (Pistoresi and Rinaldi, 2012; Federico and Wolf, 2011; Vasta, 2010).

There have been an increasing diversification of Italian export over the years. Using the Herfindal index of product shares, Federico and Wolf (2011) shows how this index lowered from the unification to the mid 80's, and after shows a little rebound.

During the inter-war period Italy established its position in exporting medium technology products. After that period Italy defend its position in the world market. Since the declining in export in other developed countries in the recent period, Italian world market player's strategy became to sell its products to emerging markets (Federico and Wolf, 2011).

Italian export is in part similar to the patterns of developing export countries. It is better to say that manufactured export is the main export in developing countries (Santos-Paulino, 2010). A difference in export evolution between Italy and developing countries, in particular Eastern Asian countries is in the development of export and specialization. If Italian production became more and more high quality and luxury manufacture, Eastern Asian countries have improve the technological level of their production, exporting hi-tech goods (Santos-Paulino, 2010).

The introduction of the single currency and the Monetary Union have created a positive environment for the international goods exchange. The Euro have eliminated the costs related to the currency volatility and it have given more transparency to prices. It create the basis for an increase in the international commerce, both the ways. It have worked differently for different countries and different goods. The action of single currency introduction works on two different level: reduction of fixed costs and reduction of variable costs. Reduction of fixed costs brought an increase of exporting firms, alowing less productive firms to enter new markets. Reduction of variable costs increase the number

country's share should remain the same over time in the world market, if it do not happened it should be due to some competitive effects (Leamer and Stern, 1976).

of exporting firms. In the structure of export decisions there are two margins, on intensive, concerning price and quantity choices, the other extensive, concerning entering or not the market. Intensive margins depends on variable cost reduction. In the Italian case is possible to find a significance in the effects of the intensive margins and not a significance in the extensive one. These means a significance in the cut of variable costs and not in the fixed costs cut. The cut in fixed cost had no significant effects on Italian economy because, even though the structural characteristics of Italian firms such as low productivity, single productions and low average size should let consider some positive effects of the introduction of a single currency, the effects are too little to be significant at the national level (Vicarelli and Pappalardo, 2012).

Italian manufacturing firms have higher return from the international markets than from the internal one. An important methodology to reduce production costs and compete in the international markets for Italian firms is the process innovation. Non innovating firms could compete in the international markets when the currency exchange is favorable, large exchange rate shock allowed non innovative firms to export and them remain in the international market also when the exchange rate became less favorable (Basile, 2001). This kind of shocks have an important role before entering in the European Monetary Union.

3.1.4 Italian production: most important firms dynamics

Trade is more concentrated than employment and sales, import is more concentrated than export. The best preforming firms are the ones involved in import-export trade, better performing then only import and even more then only export firms. Firm not involved in the world market seems to be the worst performers. This differences could be referred to the presence of sunk costs selecting the most productive firms or because firms become more productive through learning or economies of scale effects (Castellani et al., 2010).

Differently from the theory of comparative advantages in international trade, the reality shows that in the same country only few firms are exporting many products in different countries, while the majority have market relation interesting only few products in few countries (Castellani et al., 2010).

As said in Melitz (2003), firms have different productivities (that is there in not a representative firm), and only the most productive firms[8] enter the international trade and the least productive ones have to leave the market. These happens due to sunk costs present in entering the local market and in entering the international one.

[8]In this model, firms knows their level of productivity after entering the local market.

Import are important because of the *learning-by-importing* hypothesis: with international transmission of knowledge and technologies there is an enhancement in importers productivity (Castellani et al., 2010).

A self-selection occurs between importing firms due to the fixed costs in establishing business relations. For enterprises importing goods at higher fixed cost, e.g. capital goods, this self-selection may be reinforced (Castellani et al., 2010).

Firms using newer and more complex ways of internationalization demonstrate to have better performances to the ones limiting their activities to the traditional way of exporting goods (Costa et al., 2015).

For what concerns food exports, Italy is considered one of the most important countries even though is not specialized, then imports exceeds exports. Italian food exported products are most of all internal productions, with low imported components. Italian export are of high quality products, higher than imported productions. Italian food producers are generally small firms, food exporters are at the average smaller than Italian exporters in other industries. Participation in value chains is important for small food producers to participate in the international market, otherwise high productivity levels are requested to have the capacity in competing in the international market (Giovannetti and Marvasi, 2016).

Italy demonstrate a specialization in the food industry, most of all in the beverage production. THe primary production, on the other side, is comparatively very weak in competing in the market (Platania et al., 2015).

3.2 Theory

The foundations of comparative advantages could be find in the works of Ricardo (1821). From the principle of comparative advantage is possible to explain the international trade an in particular the export as the expression of industries in which a particular area is more productive.

The work of Liesner (1958) has been the first to take into account comparative advantage to explain relative market power between countries. This work elaborate a study on comparative advantage in international trade considering the possibility to enter in a free trade agreement, underlining the use of data ad the limits in considering the export value not taking into account other variable such as the export growth rate, the mutual trade or other macroeconomic indexes such as the inflationary rate.

To have a formalization of the revealed comparative advantage there is the necessity to arrive to the work of Balassa (1965).

Due to the lack of theoretical foundations this assumption, remained one of the most important findings in the economics history, do not received adequate attention in empirical studies (Costinot et al., 2011).

Costinot et al. (2011) have developed an alternative to Balassa Index, theoretically grounded on Ricardian model. This model allow to understand the impact of productivity differences from the one of trade costs or demand differences.

The RCA Index is usually studied using data from national gross exports to compute the index. In reality it could be elaborated using different sources of data. The use of gross export is due to the ease to find that data in the national and international trade statistics. With the increasing of international trade and few international market barriers, but, most of all, with increasingly international supply chain is difficult to account the value of a traded good as a total value produced in the exporting country. For these reasons Brakman and Van Marrewijk (2016) suggest to analyze the RCA Index based on added value. The two measures, gross export RCA and value added RCA, suggested that different countries have different specialization patterns, but the suggest almost different results.

The RCA Index have some negative aspects. This index, as a competitive measure, could be distorted by different national economic policies, such as subsidies or trade limitation, as in the case of agricultural policies (Torok et al., 2012).

The RCA Index takes values between zero and plus infinity. This asymmetry could create some problems in comparing advantages and disadvantages. Dalum et al. (1998) suggested to modify the index in his Revealed Symetric Comparative Advantage Index (RSCA) defined as $\frac{RCA-1}{RCA+1}$. This way the values of the index could vary between -1 and $+1$, and the threshold for the revealed competitive advantage/disadvantage become zero. One of the motifs because this author prefers this transformation instead of the use of logarithms is because of the huge transformation for little differences in near zero RCA values; the other side of the medal could be that it is possible to say the opposite for positive numbers. An other motive is linked with the zero in logarithms, that could be the case in which are studying different sectors and no exports could ne fine for a determined country in a specific sector.

Juchniewicz and Lukiewska (2015) sow the competitiveness of European Union (EU) in the food sector, they used three different indexes, not only the RCA, but also Export Market Share (EMS) (the ratio of the export of a geographical area over the total world export in a determinate product) and the Trade Coverage (TC) (export over import ratio). In this study, since over the studied period seems that EU have reached the largest market share, it seems not to have a significant comparative advantage related to other countries.

In Bernatonyte (2015) there is the consideration of the Export Specialization Index (ES) as an index capable to correct the RCA. The ES differs from the RCA for the different denominator. The ES is referred to a particular market or sector, then the denominator will be the imports of a specific input in a specific market over the total imports of that market. It is suggested, furthermore, the use of Herfindal Index applied on exports.

An other index that could be used is the Trade Dissimilarity Index (Bernatonyte, 2015; Santos-Paulino, 2010) $A_j = 1/2 \sum_k |\frac{X_{jk}}{X_j} - \frac{X_k}{X}|$ wihere X represent the total export, k and j respectively the product and the country. This index vary from 0 to 1, and higher values represents higher dissimilarity. In other terms, lower values are better, meaning that the country is exporting diversified goods demanded by the world market, and the economy will be protected against trade shocks.

In the international trade, the flows of the same product usually have not only one direction from a country to another, usually have both the two directions, from one to the other and reverse. This fact is due to product differentiation in system of monopolistic competition (Lafay, 1992).

Following Lafay (1992), firms can differentiate their products and get advantage from this differentiation in various ways. Products could be differentiated by their nature or bay their quality. The first is the case of one-way trade. The second is when there are different levels of the same product, in this case there are two-ways trade. Comparative advantage fo the differentiated products can be acquired in different ways, working jointly or separately: favorable natural resources endowments, exploitation of relative cost advantages through macroeconomic factors (i.e. well-disposed factor of production endowments, following *Heckscher-Ohlin theorem*) or microeconomic factors (i.e. innovation in production processes), creation of new products and monopoly elements.

Two concepts are sometimes confused: competitiveness and comparative advantage. Competitiveness compares different countries in regard to a given products, on the other side comparative advantage are related to products. Comparative advantage is structural, differently form competitiveness that is subjected to macroeconomic variables, in particular to real exchange rates (Lafay, 1992). Then specialization patterns should be structural for every country (Santos-Paulino, 2010).

If Balassa considered only the export side because of the protectionism effects on the import side, with the time the effects of international trade policies lowered on the import side, but have been increased on the export one (e.g. export subsidies), the a different approach should be necessary. Seems useful to consider the symmetric of the RCA on the import side. Comparative advantage have a clear result if the two indexes are one major and the other minor of 1.

When both have the same dissimilarity compared to 1 then a different approach is necessary (Lafay, 1992).

To overcome these problems connected is necessary to consider the trade balance (Lafay, 1992; Balassa and Bauwens, 1988).

Trade balance could create some distortions arising from the minority flows dynamics, the macroeconomic situation and the relative weights of the products (Lafay, 1992). The minority flows are the minor between export and import for a specific trade. Minority flows determine the intra flows within a product group. The change of a minority flow in relation to the majority one could suggest the wrong interpretation in a change of the comparative advantage or disadvantage. This is a fact relative to all the formulas derived from the export/import ratio. Bias brought by this ratio is the reason for the relative weights of the products too. Macroeconomic variable give some conjunctural changes to the structural value of the comparative advantage.

Trade Performance Index (TPI) from International Trade Centre (UNCTAD/WTO agency) [9]

Other indexes could be used, for instance the Fortis-Corradini Index (FCI) could represents an example. The FCI shows how Italy is one of the most import exporter in every sector considering the trade balance(Fortis, 2015). Fortis (2015) have elaborate an index, called FCI, showing the position of different nations in surplus trade in different sectors (taking data from 6 digit HS data from Comtrade, Eurostat and Istat).

To better understand the dynamic changes in export patterns is better to introduce the Export Productivity Index (EXPY) (Santos-Paulino, 2010). The EXPY was introduced by Hausmann et al. (2007). It represents an income-productivity measure of a county export basket.

To calculate the EXPY it is necessary to introduce the Country'sProductivity Level (PRODY), that is firstly is necessary to find the associated income/productivity level for each good PRODY and then to calculate the export-weighted index of it EXPY:

$$PRODY_l = \sum_j \frac{\frac{x_{jl}}{X_j}}{\sum_j \frac{x_{jl}}{X_j}} Y_j$$

$$EXPY_j = \sum_l \frac{x_{jl}}{X_j} PRODY_l$$

The index j represents countries and goods are indexed by l. $X_j = \sum_l x_{jl}$ is the total export of the country j. Y_j is the country's j per-capita GDP.

[9]Italian TPI in `http://www.intracen.org/layouts/CountryTemplate.aspx?pageid=47244645034&id=47244654325`

$PRODY_l$ is the per-capita GDP weighted by the revealed comparative advantage of product l. $EXPY_j$ is an average of the PRODY weighted by the value share of different products in the country's total export (Hausmann et al., 2007).

These indexes come from the idea that specialization in different goods could bring to different economic growth patterns. These assumption have some consequences in economic policy. Goods are considered of two main kind, on one side the ones exported by developed countries, *"rich-country products"*, on the other side the *"poor-country goods"*. Countries specialized in the first kind of goods grow faster then the others. This differences is due to the situation in which countries are in the production frontier. To be in that situation the entrepreneurs overcome the cost uncertainty of the first production of a good in a specific country. This cost is one of the laissez-faire failures, and cause an ex ante under investment in new productions. A good policy is the one which create conditions to give the opportunity to internalize the positive externalities created ex post. The more the entrepreneurs are stimulate to invest in ex ante cost discovery, the more the country could be close to its productivity frontier (Hausmann and Rodrik, 2003; Hausmann et al., 2007).

3.3 Experimental

Data used to calculate the national comparative advantage, and more in general import and export data are from UN Comtrade repository.

Data of national statistics are from the World Bank.

For the data on import and export are considered two goods that are central in this research: roasted coffee and coffee machines. Others good considered are between the most important goods for Italian export policies. The choices goods for the comparison are choose between the most influent in the Fondazione Edison's reports (Reports particularly considered are the from the Fondazione Edison's Quaderni by Fortis (2006); Fortis and Corradini (2010); Fortis (2016b,a)).

Considering the structure of the Comtrade repository, some preliminary considerations are necessary. The goods are counted following the Standard International Trade Classification (SITC) and Harmonized System (Commodity Classification Code) (HS) indexes. The first classification are used in previous years and substituted by the other in the last years. Considering years from 1990 to 2015, it is necessary to consider the two different indexes; in doing it every double-counting problem are avoided. The possibility to have a non perfect correspondence between SITC and HS codes are avoided using the correspondence tables between codes of the two systems. The possibilities to have correspondence different from $1:1$ produce the necessity to consider also $n:1$

or 1 : n correspondences. Goods without data available for the entire period have not been considered[10].

The goods considered are listed in Table 3.1[11].

Goods	SITC	HS
Coffee Machines	74187	841981
Roasted Coffee	0712	090121
		090122
Pasta	0483	190211
		190219
Machine for the preparation of food and drinks	72722	8438
Sunglasses	88423	900410
Taps	7478	848180
Guns and Pistols	89114	930200
Leather apparel	84811	420310
Wine	11211	2204
	11215	
	11217	
Medicinals	542	3003
		3004
Yacht	79319	890399

Table 3.1: Goods and relative codes considered.

3.4 Calculation

Comparison of export trends with the other sectors considered.

In Figure 3.1 there is the comparison between coffee related sectors and the considered excellence of Italian agribusiness

Other Two important sector for the Italian export are the fashion business and the mechanics. Comparison between export in these sectors and the coffee related ones are showed respectively in Figure 3.2 and Figure 3.3

An important comparison is showed in Figure 3.4. Medicine related sector is not only important for the Italian export, but it shows the dynamic of a sector in which foreign direct investments are fundamental for the Italian production system.

[10] Tanned skins are an important production for the Italian export but are not taking into account because the data available start from year 2002

[11] The codes for coffee machines represents a broader sector but it is considered as a proxy of coffee machines sector since it is the deepest sector subdivision including professional coffee machines and coffee machines represent a significant part of the values counted in these codes

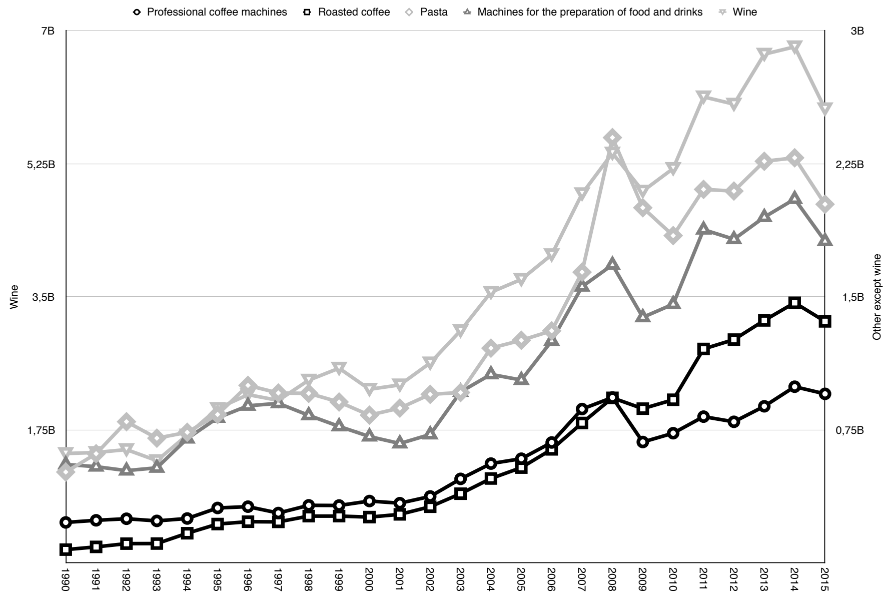

Figure 3.1: Italian export time series in selected good sectors of agribusiness and related machinery excellence.

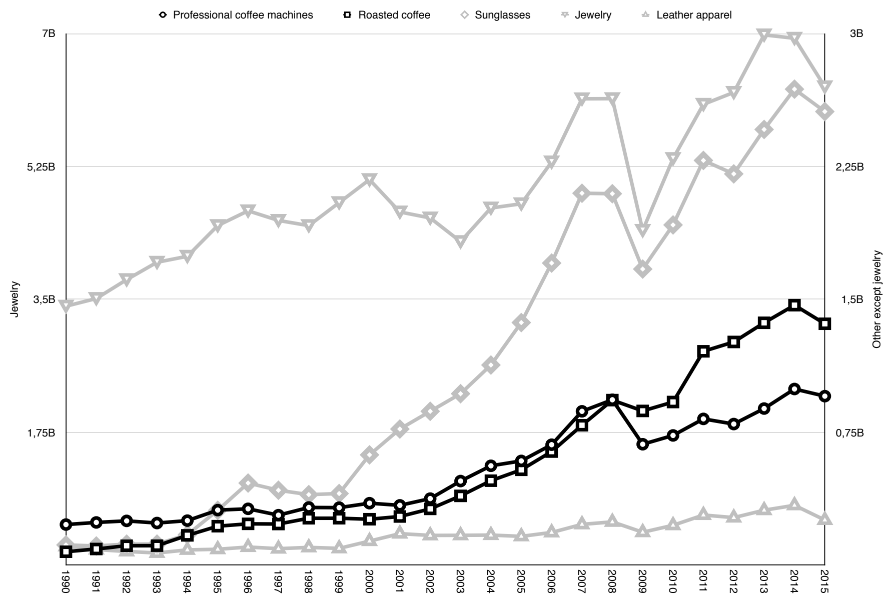

Figure 3.2: Italian export time series of coffee related production in comparison with selected good sectors of fashion business excellence.

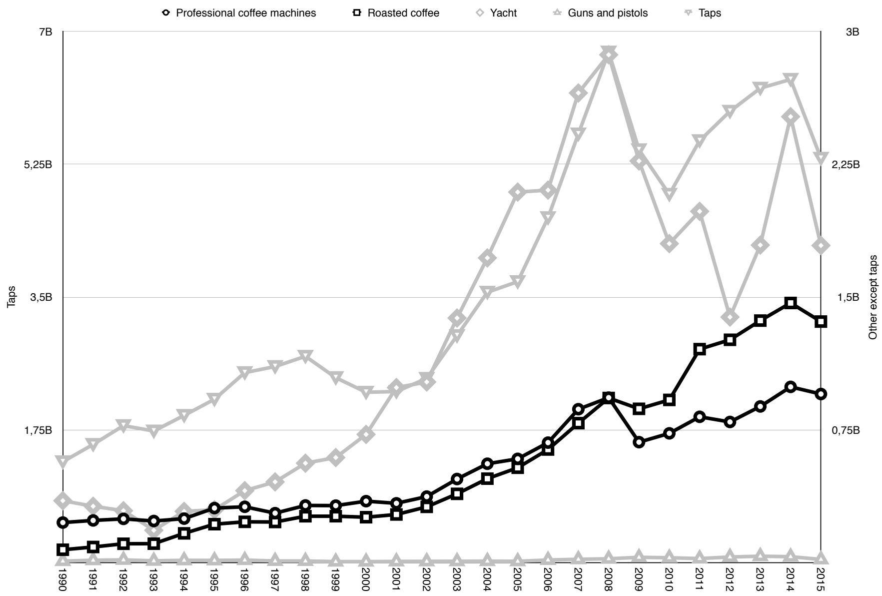

Figure 3.3: Italian export time series of coffee related production in comparison with selected good sectors of mechanic industry excellence.

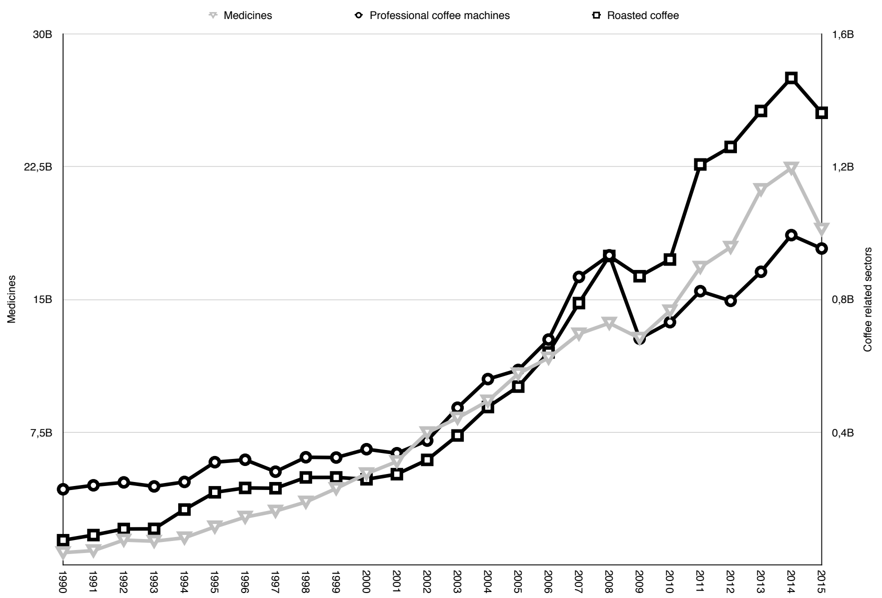

Figure 3.4: Italian export time series of coffee related production in comparison with selected good sectors of medicament industry.

3.5 Results

In Figure 3.5 is possible to understand at a very macro level the structure of Italian export.

It is evident the weakness of Italian export in primary productions. Vegetable and animal productions, stone, glass and mineral ones have weak performances in terms of revealed comparative advantages and in terms of export volume.

Similar results could be viewed for the tertiary sector. Service sector is the second weakest in terms of revealed comparative advantage, considered the aggregates as in Figure 3.5.

The machinery and electrical sector is the most important for export volume, but Italy seems not to be so specialized in this sector since the RCA is just over the unity. In reality, starting from this situation, we could understand that going deep in the subdivision of the sectors the situation could change, in fact, the mechanical sub-sector represented in HS code 84 is bigger than the electrical machinery export and Italy is more specialized in the first then is really unspecialized in the second one.

Showing good performances in the textile sector, the best are in sector related to textile, that is hides and fur productions on one side and footwear and headgear on the other side.

For the indexes taken into account, and for all the commodities considered, not too much differences could be showed by the different indexes. in particular, for those commodities considered important for the Italian export in the FCI rankings, also the RCA and derived indexes show a competitive advantage for Italian productions.

It is possible to find some differences in the comparison between the RCA and its symmetric on the import side. In particular for those commodities that are not perceived as typical of *Made in Italy* productions is possible to show a comparative disadvantage on the import side (see Table 3.2). This fact is the symptom of an important intra-commodity trade, as in te case of the leather apparel industry. Intra-commodity trade could be the reflection of important market dynamics in these sectors. In the medicinals sectors is underlined the role of foreign capitals in the growing comparative advantage of the sector. On the other side is possible to underline the role of acquisition of foreign competitors. The last is the case of the sunglasses, where the main Italian player bought the market leader brand from a foreign competitor, improving the competitive advantage of Italian production.

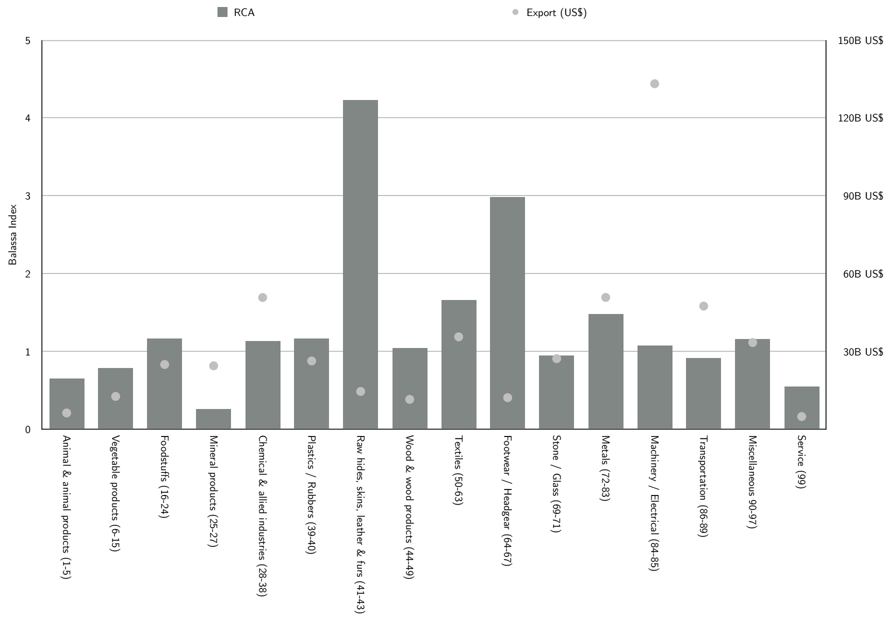

Figure 3.5: Aggregates of different Italian export product group, related to year 2013. HS codes ranges in brackets.

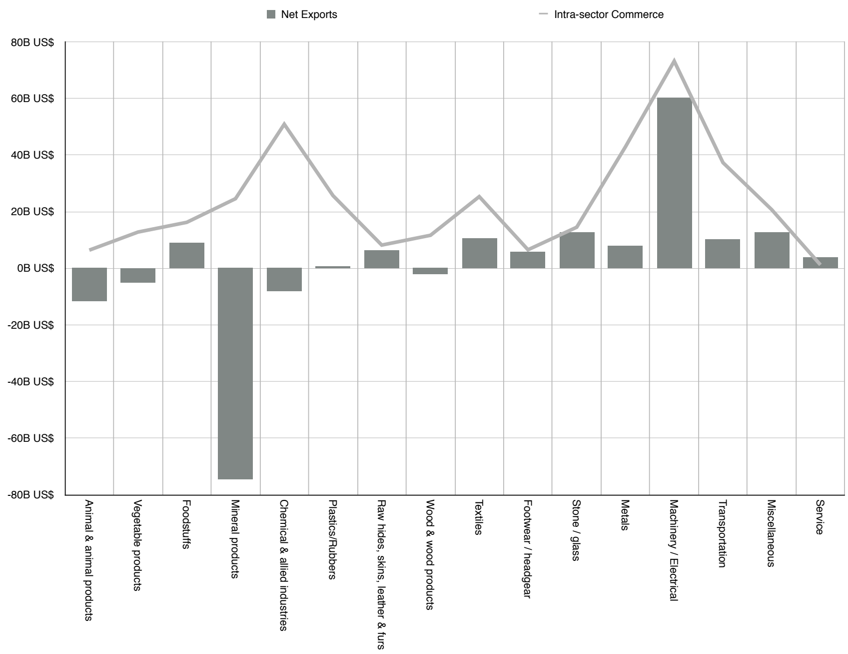

Figure 3.6: Net Italian exports and intra-trade commerce per product group, related to year 2013.

	Coffee Machines		Roasted Coffee		Sunglasses		Leather Apparel		Medicinals	
Year	XRCA	IRCD	XRCA	IRCD	XRCA	IRCD	XRCA	IRCD	XRCA	IRCD
1990	2,89	0,52	2,05	0,07	1,99	0,91	1,32	0,20	0,63	1,38
1991	2,70	0,62	2,41	0,09	1,88	1,00	1,26	0,31	0,67	1,26
1992	2,35	0,54	2,66	0,10	1,71	1,04	0,92	0,50	0,95	1,30
1993	2,72	0,51	2,85	0,13	1,78	0,98	0,93	0,59	0,92	1,34
1994	3,16	0,53	3,19	0,22	2,50	0,70	1,12	0,77	0,88	1,22
1995	3,11	0,54	3,29	0,36	3,46	0,69	1,19	1,17	1,01	1,15
1996	2,99	0,48	3,52	0,71	4,29	0,81	1,37	1,18	1,11	1,34
1997	3,73	0,61	3,58	0,70	4,28	1,03	1,34	1,18	1,26	1,32
1998	3,30	0,71	3,72	0,64	3,95	1,06	1,53	1,17	1,20	1,31
1999	3,65	0,78	4,07	0,63	4,14	1,33	1,68	1,02	1,38	1,39
2000	3,94	0,72	4,81	0,75	6,31	1,60	1,99	0,86	1,80	1,43
2001	3,51	0,68	5,24	0,69	6,66	1,16	2,32	1,06	1,49	1,36
2002	3,42	0,62	5,60	0,57	7,87	1,41	2,38	1,37	1,49	1,22
2003	3,80	0,62	5,56	0,60	7,81	1,27	2,03	1,45	1,36	1,19
2004	3,69	0,66	6,08	0,57	8,43	1,26	2,11	1,49	1,27	1,17
2005	3,54	0,59	5,60	0,54	9,51	1,30	2,11	1,53	1,43	1,16
2006	3,94	0,60	5,81	0,52	10,12	1,63	2,82	1,74	1,40	1,13
2007	3,87	0,60	5,28	0,62	9,80	1,71	3,37	1,87	1,29	1,11
2008	4,05	0,65	5,22	0,78	10,03	1,84	3,84	2,03	1,30	1,18
2009	4,55	0,77	4,91	0,75	9,39	1,76	3,72	2,03	1,25	1,30
2010	4,87	0,69	5,01	0,82	9,56	1,48	4,84	2,09	1,50	1,32
2011	5,10	0,64	4,74	0,84	10,12	1,46	5,59	2,26	1,70	1,49
2012	5,21	0,67	5,11	0,80	10,00	1,64	5,85	2,18	1,95	1,64
2013	5,13	0,67	5,17	0,85	10,13	1,83	6,21	2,25	2,24	1,73
2014	5,07	0,73	4,99	0,94	9,99	1,87	6,53	2,39	2,23	1,67
2015	4,77	0,72	4,51	0,85	9,18	1,95	5,73	2,34	1,84	1,57

Table 3.2: Export revealed comparative advantages and import revealed comparative disadvantages for selected commodities.

3.6 Professional Coffee Machine Export

In this section it will be discussed some regression series useful to the comprehension of coffee consumption. In particular it will be investigated the consumption of Italian coffee in the international HoReCa sector. Since the aim is to consider the Italian excellences in the coffee sector and the spread of espresso culture, two sectors could be taken into account: roasted coffee or coffee machine production.

To define the export of the Italian culture through the diffusion of the espresso coffee consumption the better variable between the two just enumerated is the coffee machine export. Then, the coffee machine export will be the dependent variable of this study.

Why this is the best choice: the two indexes, used as proxy of the espresso consumption have pros and cons.

Roasted coffee could be a good choice because different type of coffee (as an hot drink) require different levels of roasting and in Italy the roasted coffee are mainly for the espresso production and in part for the moka that is the most used in Italian domestic consumption but with little circulation abroad. Since this marginal use of moka abroad the Italian export of roasted coffee is possible to be considered as export of roasted coffee for espresso preparation. On the other side there could be a problem in the way roasted coffee is accounted in the international trade statistics: there is no differentiation between export for the home consumption and roasted coffee export for the out of home consumption. Moreover, the main problem with roasted coffee is in the convenience to roast coffee near the place of consumption. Roasted coffee for espresso is probably not bought from Italian firms. There are some Italian roasters between the major international players but the leader represents the major coffeehouse chain. The presence of micro-roasters are an other clue of the low importance of Italian roasted coffee for the preparation of espresso in the international Horeca sector.

Considering professional coffee machine could be a better way to define a proxy for the scope of this research. The cons is in the fact that the international trade statistics the sector is larger than the only coffee espresso machines but include other instruments to prepare hot drinks and to heat foods. This sector, on the other side, is differentiated between machineries for the domestic use and ones for professional use. This second kind: the professional ones, could be a correct proxy for the export of espresso based beverages consuming culture.

Firsts regressions are taken into account considering the model of gravity equation in international trade (Tinbergen, 1962; Anderson, 1979; Bergstrand, 1985; Feenstra et al., 2001). Regressions are performed using the plm package of the R software environment for statistical computing (Croissant et al., 2008). Regressions with panel data are performed using fixed effects due to its superiority respect random models when gravity approaches are studied (Egger, 2000). However Hausman test (Hausman, 1978) to confirm the best performance of the fixed effects than random effects have not been left out.

From the classical gravity equation (Equation 3.2), in this particular case it is possible to assume a simplification. Since we are discussing about Italian export only, the exporter data lost significance in the regression because it is always the same. In other words, operating on panel data, the Italian GDP remain the same and there is perfect collinearity in considering the variables marked with subscript "$_i$".

$$PX_{ij} = \beta_0 (Y_i)^{\beta_1} (Y_j)^{\beta_2} (D_{ij})^{\beta_3} (A_{ij})^{\beta_4} u_{ij} \tag{3.2}$$

In the Equation 3.2 PX_{ij} represents the value of export from country i to country j, the Ys representing the GDP, D_ij the distance and being inversely proportional to the export could be also written at the denominator, then there are the other possible factors and the error. With the simplification due to the fact that only the export from Italy are considered we could reduce the equation to the 3.3

$$PX_{ij} = \beta_0 (Y_j)^{\beta_1} (D_{ij})^{\beta_2} (A_{ij})^{\beta_3} u_{ij} \tag{3.3}$$

The GDP is considered at purchasing power parity to better compare data from different countries. To represent the distances are taken into account the unitary expenditure costs (€/ton) published by Bank of Italy (Banca d'Italia, 2014). Using this kind of data could be more useful than taking into account distances because transportations could be done with different means at different costs, and are connected with questions related to the simplicity or difficulties to commerce between different countries.

Additional regressions are, furthermore, developed to understand how different variables could interact with the Italian coffee machine export. These regressions are then developed in the form of

$$\text{Export} = f(\mathbf{x}) \tag{3.4}$$

where

$$\mathbf{x} = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_i \end{bmatrix}$$

it is the vector with one or more elements, depends on the different regression. This regressions are performed in a such way due to the high correlation between different independent variables, then it was deemed better to consider them in a separate way.

The data taken into account as x_i are enumerated in the data structure in Appendix B.1.

3.6.1 Calculations

We are starting to calculate the regressions about the gravity model using the GDP PPP of the importing countries and the distances. As it is possible to see in Table 3.3

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
log(GDPppp)	2.83911	0.16354	17.361	$< 2e - 16$***
log(Distance)	0.34652	0.14733	2.352	0.01923*

Table 3.3: For the complete summary of this regression see Appendix B.2

In this case, the use of fixed effects have resulted more efficient than the use of random effects (in Appendix B.3). It would be predicable from the literature (Egger, 2000). It has been also tested with the Hausman test (in Appendix B.4) to confirm the choice to use fixed effects.

The peculiarity is the result in the distance coefficient. Since it would have been predictably negative. This result of a positive coefficient, even though it is a low coefficient, seem to indicate that the distance favors the export. The reason of this result could be in the higher cost of transport to the United States or to the far east. China and US are the most important markets in the foodservice (from Euromonitor data have respectively 560 and 506 billion $ in 2014), also the third market is from the far east, i.e. Japan (206 billion $). Furthermore these are consolidated or fast growing markets, facilitating the attraction of foreign goods. Focusing on coffee, US is the second consumer after Brazil, with 977990,9 tons in 2014 (whole coffee consumption) and Japan in the sixth consumer (197034 tons in 2014). China on the contrary is not one of the most important consumer of coffee but it is one of the most fast growing in this market. Then it is possible that the growing rate of these markets have a major effect then the distance.

In fact, adding to the model the turnover of the Horeca sector, or the tonnes of coffee consumed in that sector (Table 3.4), the distance take the minus sign, as it should be following the gravity model. This fact is linked, on the other side, to a lost in significance of some indexes. This is particularly true when GDP and Turnover are considered due to the fact that these variables are highly correlated (0.9669719).

Since the just discussed high correlation, substituting the GDP with the turnover of the end market for that product seems to give a better result and concordant with the theory. As it is possible to see in Table 3.5.

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
log(GDPppp)	0.38975	0.40356	0.9658	0.335495
log(Distance)	−0.50566	0.18921	−2.6724	0.008250**
log(HorecaTurnover)	0.67198	0.21266	3.1599	0.001864**
log(GDPppp)	0.73767	0.33012	2.2345	0.0268599*
log(Distance)	−0.34453	0.21562	−1.5979	0.1120756
log(CoffeeFoodserviceTons)	0.53152	0.14709	3.6136	0.0004061***

Table 3.4: For the complete summary of these regressions see Appendices B.5 and B.7

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
log(HorecaTurnover)	0.83300	0.13198	6.3115	$2.222e-09$***
log(Distance)	−0.54537	0.18465	−2.9535	0.003577**

Table 3.5: For the complete summary of this regression see Appendices B.6

Inflation rate The inflation rates could have a role in the export. In the model used it seems not to be have a role.

Therefore, leaving the gravity model for a linear one, it is considered the GDP of importing countries and the interest rates of the same countries and Italy.

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
GDP	$5.0578e-06$	$3.4646e-07$	14.5984	$< 2.2e-16$***
i	$-4.7835e+03$	$4.8074e+03$	−0.9950	0.3202
i.ITA	$-1.6966e+06$	$2.0170e+05$	−8.4113	$4.762e-16$***

Table 3.6: For the complete summary of this regression see Appendix B.8

As it has already seen in the previous model, an increasing GDP in importing countries brought an increase in good imports then have a positive effect also for Italian production of professional coffee machines. The Italian inflation rate have an opposite effect. In fact growing the prices in a particular country it is obvious that its export will suffer of the increased prices.

Since the low significance of the importing countries inflation rate, it has tried to see what have happened removing that variable from the regression. The regression, with the less variable, improves significance. As it is possible to see in Table 3.7. There are not sensible differences in the coefficient estimations, when compared with the previous regression.

Similar result will appear if it is taken into account the difference between Italian and foreign inflation rate (Table 3.8).

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
GDP	$5.0775e-06$	$3.4598e-07$	14.676	$< 2.2e-16$***
i.ITA	$-1.6832e+06$	$1.9893e+05$	-8.461	$3.257e-16$***

Table 3.7: For the complete summary of this regression see Appendix B.9

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
GDP	$5.0617e-06$	$3.4643e-07$	14.6110	$< 2.2e-16$***
i.ITA-i	$-1.7110e+06$	$2.0118e+05$	-8.5047	$2.362e-16$***

Table 3.8: For the complete summary of this regression see Appendix B.10

Obvious differences appears in the estimations if only one independent variables are considered. As it is possible to see in Tables 3.9 and 3.10 the estimated coefficient are bigger then in the previous cases, but still consistent in sign and size. And is possible to note that a good significance remains.

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
GDP	$6.1875e-06$	$3.4291e-07$	18.044	$< 2.2e-16$***

Table 3.9: For the complete summary of this regression see Appendix B.11

In these regression, there are considered only panel dara with fixed effects. The idea behind this effects is that part of the error is justifiable by peculiar differences between different nations. Than it should be better to use the fixed effects then the random ones. It is also possible to test these differences to examine which are the better effects to apply in these regression, using the Hausman test. Running the Hausman test, the result is that using fixed effects is better in this research. (An example of the Hausman test is in Appendix B.13).

Coffee consumption as urban lifestyle. The aim of this paragraph is to test the hypothesis that consumption of coffee depends on western way of life. In particular, since the tea is the most common hot drink in the world but coffee, usually drunk in Italy and other Western countries, is spreading its popularity across the whole World, it is necessary to understand if this spreading of espresso is more linked to the dynamics related to part of the population more involved in the globalization dynamics. The dependent variables taken into account are consumer expenditure, disposable income and population. The regressions are run firstly considering the variables for the whole population (Table 3.11), then only for the urban one (Table 3.12).

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
i.ITA	-2790224	221466	-12.599	$< 2.2e-16$***

Table 3.10: For the complete summary of this regression see Appendix B.12

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
ConsExp	$2.1055e-05$	$4.0106e-06$	5.2498	$2.297e-07$***
DispInc	$-9.4670e-06$	$3.6024e-06$	-2.6280	0.008867**
TotPop	$6.9930e-02$	$3.7907e-02$	1.8448	0.065688.

Table 3.11: For the complete summary of this regression see Appendix B.14

Although in both cases we find the results with a good degree of significance, considering only the data related to the urban population there is a better estimate. Important to note the weight and the significance that the urban population have in defining the import of these productions. However, the fact that they have opposite signs suggests the possible existence of a force that opposes the perpetual growth of trade in those goods, to stop international trade when you get to a certain level of saturation of the market. Then there is the attempt to concentrate on these two variables to observe whether there is a non-linear behavior that would justify the hypothesis described above.

Considering the log of the disposable income this variable takes on significance (at the expense of the population variable, that anyway remain sufficiently significant). The variables related to disposable income and population change their signs (Table 3.13). Moreover, removing the variable relative to the population, there is a very significant regression (Table 3.14).

Group Regressions It has then proceeded to analyze the target markets do not in their entirety but according homogeneous groups than the development of exports of the considered code. The considered dependent variables are the GDP, expenditures for consumption, disposable income and population, for the last three variables have been considered only data relating to the urban area. Starting with a study on established markets (Table 3.15), namely those that longest importing professional espresso coffee machines. To select these markets you chose to consider the market share, i.e. these markets have the largest loss compared to the whole Italian export in this production. In fact, you can consider that older markets, although their import grows in absolute terms, they lose a percentage for the entry of new markets in the international arena. To enumerate, these markets are: France, Germany, Spain, Switzerland and Portugal.

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
UrbConsExp	$2.8765e-05$	$5.9500e-06$	4.8345	$1.804e-06$***
UrbDispInc	$-1.5974e-05$	$5.4290e-06$	-2.9424	0.0034157**
UrbPop	$8.9229e-02$	$2.3662e-02$	3.7709	0.0001831***

Table 3.12: For the complete summary of this regression see Appendix B.15

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
UrbConsExp	$7.9465e-06$	$6.5669e-07$	12.1009	$< 2e-16$***
log(UrbDispInc)	$1.2448e+07$	$7.7895e+05$	15.9810	$< 2e-16$***
UrbPop	$-3.7319e-02$	$1.1536e-02$	-3.2351	0.0013**

Table 3.13: For the complete summary of this regression see Appendix B.16

Then the study have proceeded to the newcomer markets. In this case have been considered different criteria to select the markets. In any case the above mentioned case represents the opposite of all these cases. Firstly the most grown markets are considered, i.e. Australia, China, Japan, South Korea and United States (Table 3.16).

Then the market considered are the ones with lowest share of Italian export at the beginning of the period, i.e. China, South Korea, Sweden, Thailand and United Arab Emirates (Table 3.17).

Finally the markets with bigger range in import quotas with a growing trend are considered (Table 3.18).

Although the representative end markets were selected in different ways, it can be seen that there is some repetition in the sign of the coefficients. This suggests that regardless of how the newcomer markets are chosen, there is a good significance of the independent variables selected, with the exception of the urban population. It is therefore possible to assume that the processes of urbanization not always have a direct relation with the westernization processes of costumes, at least as regards the consumption of coffee.

Instead, considering the established markets, the GDP is the independent variable which loses significance. This difference could be explained by the fact that in well-established markets there is enough wealth to buy all the good that consumers deem necessary. Conversely, in developing markets, the income is not always sufficient to fully meet the needs of consumers.

In Table 3.19 there is the same regression considering the end markets with more stable quotas of Italian export, said Belgium, Poland, Saudi Arabia, Sweden and Turkey.

To test the possibility that new lifestyles linked to Western way of life are connected with the growth of espresso consumption then to import of profes-

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
UrbConsExp	$7.4744e-06$	$6.4658e-07$	11.560	$< 2.2e-16$***
log(UrbDispInc)	$1.1510e+07$	$7.3004e+05$	15.766	$< 2.2e-16$***

Table 3.14: For the complete summary of this regression see Appendix B.17

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
GDP	$-1.0621e-05$	$1.2274e-05$	-0.8653	0.3886336
UrbConsExp	$2.6478e-04$	$5.4077e-05$	4.8964	$3.187e-06$***
UrbDispInc	$-1.4980e-04$	$4.3073e-05$	-3.4778	0.0007127***
UrbPop	$-2.1107e+00$	$5.9392e-01$	-3.5537	0.0005504***

Table 3.15: For the complete summary of this regression see Appendix B.18

sional espresso coffee machines, two independent variables have been considered: mobile possession and internet users. As it is possible to see in Table 3.20

Considered the internet and the spread of mobile phones as a modernity indexes, it would have expected a significant and positive correlation with the spread of espresso coffee from both the indexes. In reality this is not the case as regards the spread of mobile telephony. Probably one could consider that the effects of the two technological tools are different. With regard to mobile phones, nowadays it is an available instrumentation to most people, which is increasingly becoming a fundamental instrument in the daily lives of many people and mostly linked to one to one communications. With regard to the Internet connection, that is also widespread, it is possible to do two considerations: on the one hand there is the fact that is used especially by the younger generations, and also linked to widespread cultural changes; on the other side is a tool that can allow advertising related to Western lifestyles behaviors.

Monetary evidences Exchange rates are studied as they could influence the export of made in italy productions, in particular professional coffee machine export. Some prelimiary considerations are necessary. Data source used for monetary variables is the International Monetary Fund, then the international base currency, i.e. the US$, is used as a numerary. The Arab countries considered have their currency linked to the Dollar, with some adjustment in particular years but generally with fixed exchange rate. For the Russian currency there is a lack of data in the beginning of the considered period (from 1990 to 1992), due to the transition period from the Soviet Union. Russia then, for the same reason, suffered of an iper-inflation in the following years, i.e. from 1993 to 1999. For countries that have entered the Euro, for the previous years it has been made a correction on national currencies real data considering the official

Coefficients	Estimate	Std. Error	t-value	$Pr(>\|t\|)$
GDP	$1.6488e-05$	$3.9120e-06$	4.2148	$5.834e-05$***
UrbConsExp	$4.3943e-05$	$1.0307e-05$	4.2635	$4.867e-05$***
UrbDispInc	$-5.5185e-05$	$1.3569e-05$	-4.0668	0.0001004***
UrbPop	$1.9062e-02$	$3.1108e-02$	0.6128	0.5415386

Table 3.16: For the complete summary of this regression see Appendix B.19

Coefficients	Estimate	Std. Error	t-value	$Pr(>\|t\|)$
GDP	$2.5406e-05$	$9.5376e-06$	2.6637	0.008827**
UrbConsExp	$1.5302e-04$	$1.3375e-05$	11.4404	$< 2.2e-16$***
UrbDispInc	$-1.2790e-04$	$2.8102e-05$	-4.5512	$1.322e-05$***
UrbPop	$-8.7964e-03$	$2.0704e-02$	-0.4249	0.671713

Table 3.17: For the complete summary of this regression see Appendix B.20

exchange rate between the national currencies and the single currency.

In the first attempt, there is the intention to find out if, using panel data, it is better to use fixed effects or random effects. Since there is no sense to use random effects with actual exchange rate, indexes are built on them. The indexes are built considering 1999 as the base year, because it is the official year of Euro introduction.

Considering two regressions in which the index of Italian export of professional espresso coffee machines depending on the indexes of Italian and Foreign currencies, one using random effects (Appendix B.25) and the other using fixed effects (Appendix B.26), the Hausman test (Appendix B.27) suggests to use the first one, that is possible to see in the Table 3.21.

In this regression it is possible to see how the domestic monetary policy of the has a considerable effect on the export of the studied sector. But also the foreign monetary policies seems to be have a minor effect. Same results are visible in regression using indirect (quantity) exchange rate quotations, as is possible to see in Appendix B.33. In the latter case, since actual values are used, not indexes, fixed effects are preferred, as suggested by the Hausman test as in Appendix B.34.

In trying to understand the changes occurred with the introduction of the common currency in the EU, further regressions were estimated, taking into consideration subsections of the database. This kind of regressions have been performed using the data as in table 3.21, but also using indirect (quantity) quotation.

Considering only the period before the Euro introduction, there is a loss in the regressions significance (see Appendices B.28, B.29, B.30, B.35, B.36, B.37).

Coefficients	Estimate	Std. Error	t-value	Pr(> $|t|$)
GDP	$2.4172e-05$	$3.4409e-06$	7.0250	$1.564e-10$***
UrbConsExp	$6.2151e-05$	$9.3016e-06$	6.6818	$8.627e-10$***
UrbDispInc	$-8.1816e-05$	$1.1928e-05$	-6.8594	$3.578e-10$***
UrbPop	$7.7776e-03$	$3.0833e-02$	0.2522	0.8013

Table 3.18: For the complete summary of this regression see Appendix B.21

Coefficients	Estimate	Std. Error	t-value	Pr(> $|t|$)
GDP	$2.2976e-05$	$3.2250e-06$	7.1243	$9.485e-11$***
UrbConsExp	$-9.5050e-05$	$3.2006e-05$	-2.9697	0.0036231**
UrbDispInc	$1.0499e-04$	$3.2375e-05$	3.2430	0.0015448**
UrbPop	$-3.2457e-01$	$9.3245e-02$	-3.4808	0.0007054***

Table 3.19: For the complete summary of this regression see Appendix B.22

If the period after the Euro introduction is considered, there is a strong significance of the index of EUR/USD exchange rate. The same happens if the data of foreign currencies over Euro are considered (see Appendices B.31 and B.38 for regressions considering not Eurozone countries, and Appendices B.32 and B.39 in which Eurozone countries are included).

These elaborations could be the signal that the considered production follows could be helped by monetary devaluations due to the Euro monetary policies. The opposite could occurs if the Euro became stronger compared to foreign currencies. This dynamics linked to the monetary policies are not detected in the period before the Euro introduction.

Relations with HoReCa Sector Players In the Table 3.22 every line represents a different regression in which there are the connections between the professional coffee machines export and the different developments of the HoReCa sector and of parts of it.

At the first sight it is possible to note that generally at the growth of the sector will be a growth in the coffee machine export.

Opposite to the natural idea that a growth in the coffeehouse outlets will bring an increasing in the Italian export of coffee machine there is the opposite evidence. This fact could be due to the role played by the super-automatic coffee machines.

Coefficients	Estimate	Std. Error	t-value	$\Pr(>\|t\|)$
Mobile.Possession	-0.00014869	0.00027871	-0.5335	0.594
InternetUsers	0.10903815	0.02006161	5.4352	$9.212e-08$***
InternetUsers	0.0998146	0.0088906	11.227	$< 2.2e-16$***

Table 3.20: For the complete summary of this regression see Appendix B.23 and Appendix B.24

Coefficients	Estimate	Std. Error	t-value	$\Pr(>\|t\|)$
(Intercept)	9.90269	2.03597	4.8639	$1.550e-06$***
ExchRate.Index	1.67492	0.65926	2.5406	0.01137*
ExchRate.Ita.Index	-9.03813	2.07925	-4.3468	$1.678e-05$***

Table 3.21: For the complete summary of this regression see Appendix B.25

3.7 Discussion

The professional coffee machine export follows pattern typical of Italian production where compared advantages could be revealed, namely the ones took into account. Between these sectors the Balassa index and derived indexes say almost the same. Differences could be revealed if there is an important intra-market trade as in the leather apparel industry. Other kind of differences are revealed in market not typical of Made in Italy productions. The cases are the glasses and the one of pharmaceutical products. In the first case there is a change after the acquisition of a market leader from a national company. In the second case because of the fundamental role in foreign direct investments.

With the regressions developed it is possible to deepen the knowledge of professional espresso coffee machine export. More in general it could be possible to consider the professional coffee machine export as a proxy of the worldwide espresso coffee diffusion. This spreading is fostered by the development of occidental culture. The increasing of GDP is a symptom of economic growth. With the economic growth new areas follow the economic patterns of western countries. This imitation of economic culture is followed by some cultural elements and the coffee consumption could be one of these elements. Moreover the wellness in the cities are more significant than the one in the whole countries, as in the cities there is a more cosmopolitan way of life.

In the occidental countries, where the coffee culture has been already developed, the GDP is less important because of the already established coffee culture. It remain important the variables related to the cities' wellness. Due to the the hectic lifestyle that favors eating out.

The development of Internet connections favors the diffusion of occidental

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
Café Outlets	-206.555	89.164	-2.3166	0.02131*
Café Turnover	0.00139675	0.00027775	5.0289	$9.224e-07$***
Horeca Outlets	5.5457	1.6225	3.418	0.0007326***
Horeca Turnover	$9.8247e-05$	$1.7056e-05$	5.7603	$2.374e-08$***
Chained Outlets	463.874	51.641	8.9827	$< 2.2e-16$***
Chained Turnover	$6.0818e-04$	$6.5184e-05$	9.3301	$< 2.2e-16$***
Pizza Outlets	7197.8	1000.4	7.1947	$6.741e-12$***
Pizza Turnover	0.0086927	0.0008233	10.558	$< 2.2e-16$***

Table 3.22: For the complete summary of these regressions see from Appendix B.41 to Appendix B.48

way of life, while other technologies like mobile phone, dedicated to one to one connections do not have a relevance on the diffusion of espresso culture.

In the spreading of HoReCa sector worldwide, the coffee machines export receives a positive effect. The Italian export of coffee machines grows with the growth of different kinds of HoReCa outlets, and relative turnovers.

The idea to compare this kind of export with the pizza sector could be interesting because pizza is one of the most important Italian sounding alimentary good. On the other side the main players in the pizza sector are not Italian companies and it is unusual that pizzerias serve coffee. Even in this case there is a positive relation between pizza sector spreading and Italian professional coffee machine export. Than, the espresso could be favored by the diffusion of Italian culture and Italian sounding food.

Opposite to what it should be expected, the Italian coffee machines export is negatively affected by the growing of coffeeshop outlets. Intuitively more coffeeshops means more coffee machine demand. This fact could be the symptom of a more power of foreign producers. The main coffeehouse player, in fact, works with a Swiss supplier. Others players could prefer superautomatic machines, producer also by Italian makers but less identifiable with Italian typical productions.

Considering the monetary aspect, two factors have to be considered: the Euro role and the buying strategies of coffee machines. Since exchange rate relations have no significant effects on the export except from the ones concerning the Euro, it is possible to affirm that the common currency have, at least for the relevant industry, more influence than the national currency.

On the other side, generally, the purchase of coffee machines are not linked to monetary factors. The choice of purchase generally occurs in the contingent need moments (coffee machines last several years), or is linked to opening outlets choices. It is then more relevant the price at the moment, and in particular a comparison between different prices at the same time than waiting for the best time to buy.

Chapter 4

Conclusions

Different aspects of the problems linked to espresso coffee have been presented in the three chapters.

Espresso is only one kind of hot drink made by coffee. More in general we could talk about espresso based beverages to describe the set of hot drinks made with espresso coffee machines.

When discussing about espresso and coffee machines we are talking about coffee consumption, a very different question from the coffee production. The production and the consumption of coffee take place in different countries, representing substantially a north-south economic dynamic. In fact the coffee beans production take place in the south, mainly due to climatic need for cultivations. The consumption of hot drinks derived by coffee, on the contrary, is typical of developed countries.

In the past this north-south dynamic was important in the development economic because the regulated market created a link between production and consumption. The consumer countries used to use the market regulations to economically help and sustain the development of coffee producing countries. With the liberalization of the coffee market, new dynamics took place and the connection between production and consumption weakened.

Considering the HoReCa sector and the relation with its suppliers, seems clear that the bargaining power is not in the coffee related supplier's hands. On one side coffee machines represent a small part of the costs. On the other side there could be a bargaining power in the roasters. Agricultural and food suppliers have always a bargaining power in the quality of good thy are able to provide o their buyers. HoReCa players, in particular coffehouse operators have the possibility to adopt vertical integration strategies.

The export of professional coffee machines shows similarities with the export of other different productions recognizable as typical of the Made in Italy. Apart from this main tendency, studied from the point of view of the revealed comparative advantages, the professional coffee machine export recall some of the main mainstream macroeconomic dynamics: for instance the export increase with the GDP of the target countries. This is a confirm that the consuming countries are the richest, considered in the wide sense, including newcomer countries. The richness in urban area is a most important factor, symptom that the north-south dynamic represents a distinction between richer or enriching areas against others remaining outside occidental development patterns.

In general the other macroeconomic variables act as they are supposed to. The negative impact of Italian inflation means that a price increasing reduce the demand. The monetary variables have little power: the rate exchange influenced the market only after the Euro introduction.

The development of the HoReCa sector is in general positive to the export of professional coffee machine. There are sector with Italian sounding, like pizzerias, little connected with the service of coffee, but representing a positive index of the coffee machine export. This is the case where the Italian sounding have its influence on the HoReCa market. What could appear peculiar is the negative effect of coffeehose spreading. It could be related with the threat of superautomatic machines, less linked to Italian production, favored by many important chained players.

Appendix A

HS 2-digit codes

A.1 Italian HS 2-digit codes ranked per decreasing Balassa Index

HS Code	XRCA	Ita Exp Value (US$)
51	5,903	2.383.869.855
41	5,650	5.521.320.382
50	4,650	404.127.757
42	4,070	8.461.752.838
69	3,697	5.287.619.614
64	3,314	11.788.761.566
93	3,156	1.638.370.176
19	2,851	5.148.750.203
68	2,581	3.550.441.875
56	2,534	1.688.777.963
62	2,450	13.373.341.799
73	2,359	20.558.085.769
53	2,344	235.778.077
20	2,295	3.892.081.978
94	2,200	14.028.812.609
83	2,069	3.623.638.196
84	1,781	103.966.505.947
22	1,739	9.385.504.832
30	1,730	23.577.737.913
43	1,691	704.929.543

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HS Code	XRCA	Ita Exp Value (US$)
65	1,600	375.737.948
48	1,583	7.630.147.529
54	1,583	2.213.820.273
8	1,515	4.069.340.248
59	1,510	1.075.350.152
32	1,482	3.378.574.473
6	1,450	895.899.911
60	1,439	1.321.528.771
58	1,422	528.680.939
76	1,412	6.366.851.146
33	1,399	4.382.150.807
18	1,390	1.674.297.302
70	1,388	2.898.860.151
34	1,374	2.226.700.262
61	1,343	8.266.656.630
39	1,250	20.930.187.712
72	1,242	13.668.701.597
4	1,239	3.246.744.658
49	1,235	1.651.274.189
45	1,226	60.473.385
9	1,216	1.474.541.631
21	1,165	2.055.906.638
91	1,155	1.781.345.669
96	1,144	1.512.245.795
35	1,114	879.448.377
38	1,105	5.689.249.701
55	1,066	1.222.728.846
13	1,019	257.219.022
82	1,004	1.816.635.121
52	1,003	1.932.915.260
7	0,992	1.792.894.429
87	0,990	37.551.635.744
40	0,951	5.508.248.338
15	0,924	2.531.659.779
74	0,919	4.077.050.447
25	0,910	1.130.759.751
92	0,848	151.654.013

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HS Code	XRCA	Ita Exp Value (US$)
89	0,843	3.376.837.929
97	0,825	565.781.348
16	0,806	1.111.485.813
90	0,771	12.127.407.475
2	0,704	2.446.754.288
95	0,692	1.714.827.929
88	0,675	5.941.938.599
71	0,657	15.601.928.038
11	0,657	352.384.173
28	0,636	2.169.554.345
29	0,631	7.810.424.543
86	0,629	707.319.878
66	0,565	59.065.315
5	0,558	161.238.361
44	0,551	1.967.519.779
99	0,549	5.021.423.954
63	0,514	881.750.760
79	0,474	174.559.304
85	0,453	29.269.460.275
75	0,442	339.930.890
57	0,442	192.427.178
81	0,430	199.542.528
36	0,376	48.586.870
17	0,370	522.272.333
37	0,360	173.974.928
67	0,314	69.137.446
31	0,296	541.151.130
24	0,275	342.890.551
27	0,272	23.151.524.035
47	0,257	327.086.315
78	0,255	52.855.802
10	0,235	808.524.344
14	0,217	4.873.091
12	0,213	596.785.871
80	0,188	40.273.081
23	0,173	936.095.524
3	0,166	468.121.238

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HS Code	XRCA	Ita Exp Value (US$)
46	0,121	8.240.473
1	0,115	70.741.593
26	0,044	290.079.641

A.2 HS 2-digit codes description

Only codes in Italian export registered data are considered.

HS Code	Description
1	Live animals
2	Meat and edible meat offal
3	Fish and crustaceans; molluscs and other aquatic invertebrates
4	Dairy produce; birds' eggs; natural honey; edible products of animal origin; not elsewhere specified or included
5	Products of animal origin; not elsewhere specified or included
6	Live trees and other plants; bulbs; roots and the like; cut flowers and ornamental foliage
7	Edible vegetables and certain roots and tubers
8	Edible fruit and nuts
9	Coffee; tea; maté and spices
10	Cereals
11	Products of the milling industry
12	Oil seeds and oleaginous fruits; miscellaneous grains;seeds and fruit; industrial or medicinal plants; straw and fodder
13	Lac; gums; resins and other vegetable saps and extracts
14	Vegetable plaiting materials
15	Animal or vegetable fats and oils and their cleavage products
16	Preparations of meat; of fish or of crustaceans; molluscs or other aquatic invertebrates
17	Sugars and sugar confectionery
18	Cocoa and cocoa preparations
19	Preparations of cereals; flour; starch or milk; pastrycooks' products
20	Preparations of vegetables; fruit; nuts or other parts of plants
21	Miscellaneous edible preparations
22	Beverages; spirits and vinegar
23	Residues and waste from the food industries
24	Tobacco and manufactured tobacco substitutes

Continue in the next page

HS Code	Description
25	Salt; sulphur; earths and stone; plastering materials; lime and cement
26	Ores; slag and ash
27	Mineral fuels; mineral oils and products of their distillation; bituminous substances; mineral waxes
28	Inorganic chemicals; organic or inorganic compounds of precious metals; of rare-earth metals; of radioactive elements or of isotopes
29	Organic chemicals
30	Pharmaceutical products
31	Fertilisers
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations
34	Soap; organic surface-active agents; washing preparations; lubricating preparations; artificial waxes; prepared waxes; polishing or scouring preparations; candles and similar articles; modelling pastes; "dental waxes" and dental preparations with a basis of plaster
35	Albuminoidal substances
36	Explosives
37	Photographic or cinematographic goods
38	Miscellaneous chemical products
39	lastics and articles thereof
40	Rubber and articles thereof
41	Raw hides and skins (other than furskins) and leather
42	Articles of leather; saddlery and harness; travel goods; handbags and similar containers; articles of animal gut (other than silk-worm gut)
43	Furskins and artificial fur
44	Wood and articles of wood
45	Cork and articles of cork
46	Manufactures of straw; of esparto or of other plaiting materials; basketware and wickerwork 47Pulp of wood or of other fibrous cellulosic material
48	Paper and paperboard; articles of paper pulp; of paper or of paperboard

Continue in the next page

HS Code	Description
49	Printed books; newspapers; pictures and other products of the printing industry; manuscripts; typescripts and plans
50	Silk
51	Wool; fine or coarse animal hair; horsehair yarn and woven fabric
52	Cotton
53	Other vegetable textile fibres
54	Man-made filaments
55	Man-made staple fibres
56	Wadding; felt and nonwovens; special yarns; twine; cordage; ropes and cables and articles thereof
57	Carpets and other textile floor coverings
58	Special woven fabrics
59	Impregnated; coated; covered or laminated textile fabrics; textile articles of a kind suitable for industrial use
60	Knitted or crocheted fabrics
61	Articles of apparel and clothing accessories; knitted or crocheted
62	Articles of apparel and clothing accessories;not knitted or crocheted
63	Other made up textile articles
64	Footwear; gaiters and the like; parts of such articles
65	Headgear and parts thereof
66	Umbrellas; sun umbrellas; walking-sticks; seat-sticks; whips; riding-crops and parts thereof
67	Prepared feathers and down and articles made of feathers or of down
68	Articles of stone; plaster; cement; asbestos; mica or similar materials
69	Ceramic products
70	Glass and glassware
71	Natural or cultured pearls; precious or semi-precious stones; precious metals; metals clad with precious metal; and articles thereof; imitation jewellery; coin
72	Iron and steel
73	Articles of iron or steel
74	Copper and articles thereof
75	Nickel and articles thereof
76	Aluminium and articles thereof
78	Lead and articles thereof
79	Zinc and articles thereof
80	Tin and articles thereof

Continue in the next page

HS Code	Description
81	Other base metals
82	Tools; implements; cutlery; spoons and forks; of base metal; parts thereof of base metal
83	Miscellaneous articles of base metal
84	Nuclear reactors; boilers; machinery and mechanical appliances; parts thereof
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers; television image and sound recorders and reproducers; and parts and accessories of such articles
86	Railway or tramway locomotives; rolling-stock and parts thereof; railway or tramway track fixtures and fittings and parts thereof; mechanical (including electro-mechanical) traffic signalling equipment of all kinds
87	Vehicles other than railway or tramway rolling-stock; and parts and accessories thereof
88	Aircraft; spacecraft; and parts thereof
89	Ships; boats and floating structures
90	Optical; photographic; cinematographic; measuring; checking; precision; medical or surgical instruments and apparatus; parts and accessories thereof
91	Clocks and watches and parts thereof
92	Musical instruments
93	Arms and ammunition
94	Furniture; bedding; mattresses; mattress supports; cushions and similar stuffed furnishings; lamps and lighting fittings; not elsewhere specified or included; illuminated signs; illuminated name-plates and the like; prefabricated buildings
95	Toys; games and sports requisites; parts and accessories thereof
96	Miscellaneous manufactured articles
97	Works of art; collectors' pieces and antiques
99	Commodities not specified according to kind

Appendix B

Professional Coffee Machine Export Database and Regressions

B.1 Data Structure

data.frame': 500 obs. of 52 variabless:	
$ Country	: Factor w/ 20 levels "ARE","AUS","BEL",...
$ Year	: int 1990 1991 1992 1993 1994 1995 1996 1997 ...
$ Export	: int 11135336 12022801 16840860 20175244 ...
$ ExportRoastedCoffee	: int 4010897 5791904 6739745 7901213 ...
$ i	: num 3.7 3.33 2.28 2.38 2.13 ...
$ GDP	: num 5.98e+12 6.17e+12 6.54e+12 6.88e+12 ...
$ GDPpc	: num 23954 24405 25493 26465 27777 ...
$ i.ITA	: num 8.91 7.58 4.37 3.89 3.54 ...
$ GDP.ITA	: num 1.18e+12 1.24e+12 1.32e+12 1.06e+12 ...
$ GDPpc.ITA	: num 20757 21884 23167 18677 19274 ...
$ GDPppp	: num 9.25e+12 9.24e+12 9.57e+12 ...
$ GDPpcppp	: num 37062 36543 37321 ...
$ GDPpppIta	: num 1.74e+12 1.77e+12 1.78e+12 ...
$ GDPpcpppIta	: num 30734 31185 31424 ...
$ Distance	: num 67.8 65.2 49.8 ...
$ ConsExp	: num 3.76e+12 3.90e+12 4.15e+12 4.40e+12 ...
	Continue in the next page

$ DispInc	: num 4.30e+12 4.48e+12 4.77e+12 4.98e+12 ...
$ GrInc	: num 5.39e+12 5.63e+12 5.84e+12 6.10e+12 ...
$ Sav	: num 5.49e+11 6.02e+11 6.46e+11 5.95e+11 ...
$ UrbConsExp	: num 3.01e+12 3.15e+12 3.36e+12 3.57e+12 ...
$ UrbDispInc	: num 3.51e+12 3.64e+12 3.90e+12 4.08e+12 ...
$ AvgCaloriesPerCapitaPerDay	: num 3493 3522 3559 3605 3665 ...
$ ForeignCitizens	: int 14719400 15396600 16097500 16803500 ...
$ TotPop	: int 249622800 252980900 256514200 259918600 ...
$ UrbPop	: int 187966000 191504000 195191900 198793500 ...
$ EconomicallyActivePop	: int 125840000 126346000 128105000 129200000 ...
$ InternetUsers	: int 1810900 2719200 4086100 5456300 11833500 ...
$ MobilePossessionpHousehold	: Factor w/ 349 levels "-" 0 0.1 224 27 ...
$ Households	: int 93347000 94312000 95669000 96426000 ...
$ SilentGeneration	: int 48425500 48162700 48002700 47710700 ...
$ BabyBoomers	: int 76928800 77436400 77798300 78253200 ...
$ GenerationX	: int 54500000 54828100 55338900 55680100 ...
$ Millennials	: int NA NA NA NA 57802800 58345100 58937600 ...
$ GenerationZ	: int NA NA NA NA NA NA NA NA NA NA ...
$ ExchRate	: num 1 1 1 1 1 1 1 1 1 1 ...
$ ExchRate.Ita	: num 1198 1241 1232 1574 1612 ...
$ Euro	: int 0 0 0 0 0 0 0 0 0 0 ...
$ ExchRate.corr	: num 1 1 1 1 1 1 1 1 1 1 ...
$ ExchRate.Ita.corr	: num 0.619 0.641 0.636 0.813 0.833 ...
$ Export.Index	: num 0.506 0.546 0.765 0.917 1.082 ...
$ ExchRate.Index	: num 1 1 1 1 1 1 1 1 1 1 ...
$ ExchRate.Ita.Index	: num 0.659 0.683 0.678 0.866 0.887 ...
$ ExchRate.EuroLira	: num 1.62 1.56 1.57 1.23 1.2 ...
$ CafeTurnover	: num NA NA NA ...
$ ChainedTurnover	: num NA NA NA ...
$ HorecaTurnover	: num NA NA NA ...
$ PizzaTurnover	: num NA NA NA ...
$ CafeOutlet	: int NA NA NA ...
$ ChainedOutlet	: int NA NA NA ...
$ HorecaOutlet	: int NA NA NA ...
$ PizzaOutlet	: int NA NA NA ...
$ CoffeeFoodserviceTons	: num NA NA NA ...

B.2 Gravity model - fixed effects

Twoways effects Within Model

Call: plm(formula = log(Export) ∼ log(GDPppp) + log(Distance), data = aggiornati, effect = ”twoways”, model = ”within”, index = c(”Country”, ”Year”))

Balanced Panel: n=17, T=23, N=391

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−2.4900	−0.1950	0.0153	0.2140	2.1000	

Coefficients :

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
log(GDPppp)	2.83911	0.16354	17.361	$< 2e - 16$***
log(Distance)	0.34652	0.14733	2.352	0.01923*

— Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares: 139.37

Residual Sum of Squares: 74.885

R-Squared: 0.4627

Adj. R-Squared: 0.41418

F-statistic: 150.704 on 2 and 350 DF, p-value: < 2.22e-16

B.3 Gravity model - random effects

Twoways effects Random Effect Model (Swamy-Arora’s transformation)

Call: plm(formula = log(Export) ∼ log(GDPppp) + log(Distance), data = aggiornati, effect = ”twoways”, model = ”random”, index = c(”Country”, ”Year”))

Balanced Panel: n=17, T=23, N=391

		var	std.dev	share	
Effects:	idiosyncratic	0.213958	0.462556	0.257	theta : 0.8781 (id)
	individual	0.617079	0.785543	0.740	
	time	0.003038	0.055115	0.004	

0.1025 (time) 0.1022 (total)

Residuals :

Min.	1st Qu.	Median	3rd Qu.	Max.
−3.5900	−0.2750	0.0489	0.3530	1.8200

Coefficients :

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
(Intercept)	2.96291	-16.1985	$< 2e-16$***	
log(GDPppp)	2.25955	0.11050	20.4492	$< 2e-16$***
log(Distance)	0.26864	0.15217	1.7654	0.07829.

— Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: 276.49

Residual Sum of Squares: 123.45

R-Squared: 0.55351

Adj. R-Squared: 0.54926

F-statistic: 240.499 on 2 and 388 DF, p-value: < 2.22e-16

B.4 Gravity model - Hausman test

Hausman Test

data: log(Export) $\sim$ log(GDPppp) + log(Distance)

chisq = 13.356, df = 2, p-value = 0.001258

alternative hypothesis: one model is inconsistent

B.5 Gravity model with Horeca turnover

Twoways effects Within Model

Call: plm(formula = log(Export) $\sim$ log(GDPppp) + log(Distance) + log(HorecaTurnover), data = aggiornati, effect = "twoways", model = "within", index = c("Country", "Year"))

Balanced Panel: n=17, T=12, N=204

Residuals :

Min.	1st Qu.	Median	3rd Qu.	Max.
-0.64900	-0.13300	0.00361	0.14200	0.90700

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
log(GDPppp)	0.38975	0.40356	0.9658	0.335495
log(Distance)	-0.50566	0.18921	-2.6724	0.008250**
log(HorecaTurnover)	0.67198	0.21266	3.1599 0.001864**	

— Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: 20.466

Residual Sum of Squares: 14.922

R-Squared: 0.27091

Adj. R-Squared: 0.22975

F-statistic: 21.4279 on 3 and 173 DF, p-value: 7.5183e-12

B.6 Gravity model with Horeca turnover (2)

Twoways effects Within Model

Call: plm(formula = log(Export) ∼ log(Distance) + log(HorecaTurnover), data = aggiornati, effect = "twoways", model = "within", index = c("Country", "Year"))

Balanced Panel: n=17, T=12, N=204

Residuals :

Min.	1st Qu.	Median	3rd Qu.	Max.

$-0.64200 - 0.131000.005570.148000.92100$

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
log(Distance)	-0.54537	0.18465	-2.9535	0.003577 **
log(HorecaTurnover)	0.83300	0.13198	6.3115	2.222e-09***

— Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: 20.466

Residual Sum of Squares: 15.002

R-Squared: 0.26698

Adj. R-Squared: 0.22772

F-statistic: 31.6877 on 2 and 174 DF, p-value: 1.8403e-12

B.7 Gravity model with coffee consumption in Horeca sector

Twoways effects Within Model

Call: plm(formula = log(Export) ∼ log(GDPppp) + log(Distance) + log(CoffeeFoodserviceTons), data = aggiornati, effect = "twoways", model = "within", index = c("Country", "Year"))

Balanced Panel: n=17, T=11, N=187

Residuals :

Min.	1st Qu.	Median	3rd Qu.	Max.

$-0.6450 - 0.15100.01230.15100.9270$

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
log(GDPppp)	0.73767	0.33012	2.2345	0.0268599*
$log(Distance)$	-0.34453	0.21562	-1.5979	0.1120756
$log(CoffeeFoodserviceTons)$	0.53152	0.14709	3.6136	0.0004061***

— Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: 18.195

Residual Sum of Squares: 13.579

R-Squared: 0.2537

Adj. R-Squared: 0.213

F-statistic: 17.7901 on 3 and 157 DF, p-value: 5.4425e-10

B.8 Inflation

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ GDP + i + i.ITA, data = dati, model = "within", index = c("Country", "Year"))

Unbalanced Panel: n=20, T=24-25, N=499

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
-21800000	-4860000	-891000	0	4080000	28500000

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
GDP	$5.0578e-06$	$3.4646e-07$	14.5984	$< 2.2e-16$***
i	$-4.7835e+03$	$4.8074e+03$	-0.9950	0.3202
i.ITA	$-1.6966e+06$	$2.0170e+05$	-8.4113	$4.762e-16$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: $5.8161e+16$

Residual Sum of Squares: $3.0006e+16$

R-Squared: 0.48409

Adj. R-Squared: 0.46177

F-statistic: 148.878 on 3 and 476 DF, p-value: $< 2.22e-16$

B.9 Inflation 2

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ GDP + i.ITA, data = dati, model = "within", index = c("Country", "Year"))

Balanced Panel: n=20, T=25, N=500

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
-21900000	-4860000	-910000	0	4040000	28500000

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
GDP	$5.0775e-06$	$3.4598e-07$	14.676	$< 2.2e-16$***
i.ITA	$-1.6832e+06$	$1.9893e+05$	-8.461	$3.257e-16$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Total Sum of Squares: $5.8177e+16$
Residual Sum of Squares: $3.0124e+16$
R-Squared: 0.48221
Adj. R-Squared: 0.46099
F-statistic: 222.577 on 2 and 478 DF, p-value: $< 2.22e-16$

B.10 Inflation 3

Oneway (individual) effect Within Model

Call: plm(formula = Export ~ GDP + (i.ITA - i), data = dati, model = "within", index = c("Country", "Year"))

Unbalanced Panel: n=20, T=24-25, N=499

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
-21800000	-4850000	-904000	0	4080000	28400000

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
GDP	$5.0617e-06$	$3.4643e-07$	14.6110	$< 2.2e-16$***
i.ITA-i	$-1.7110e+06$	$2.0118e+05$	-8.5047	$2.362e-16$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Total Sum of Squares: $5.8161e+16$
Residual Sum of Squares: $3.0069e+16$
R-Squared: 0.48301
Adj. R-Squared: 0.46172
F-statistic: 222.827 on 2 and 477 DF, p-value: ¡ 2.22e-16

B.11 GDP

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ GDP, data = dati, model = "within", index = c("Country", "Year"))

Balanced Panel: n=20, T=25, N=500

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−25300000	−5300000	−1460000	0	4330000	31400000

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
GDP	$6.1875e-06$	$3.4291e-07$	18.044	$< 2.2e-16$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: $5.8177e+16$

Residual Sum of Squares: $3.4635e+16$

R-Squared: 0.40466

Adj. R-Squared: 0.38767

F-statistic: 325.583 on 1 and 479 DF, p-value: $< 2.22e-16$

B.12 Inflation 4

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ i.ITA, data = dati, model = "within", index = c("Country", "Year"))

Balanced Panel: n=20, T=25, N=500

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−19500000	−6060000	−1120000	0	4560000	42500000

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
i.ITA	−2790224	221466	−12.599	$< 2.2e-16$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: $5.8177e+16$

Residual Sum of Squares:$4.3697e+16$

R-Squared: 0.2489

Adj. R-Squared: 0.23845

F-statistic: 158.731on 1 and 479DF, p-value: $< 2.22e-16$

B.13 Hausman Test

data: Export ∼ GDP chisq = 13.893, df = 1, p-value = 0.0001936 alternative hypothesis: one model is inconsistent

B.14 Total Population

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ ConsExp + DispInc + TotPop, data = dati, model = "within", index = c("Country", "Year"))

Balanced Panel: n=20, T=25, N=500

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−24300000	−5510000	−1500000	0	3970000	32100000

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
ConsExp	$2.1055e-05$	$4.0106e-06$	5.2498	$2.297e-07$***
DispInc	$-9.4670e-06$	$3.6024e-06$	−2.6280	0.008867**
TotPop	$6.9930e-02$	$3.7907e-02$	1.8448	0.065688.

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: $5.8177e+16$

Residual Sum of Squares: $3.4656e+16$

R-Squared: 0.4043

Adj. R-Squared: 0.3857

F-statistic: 107.911 on 3 and 477 DF, p-value: $< 2.22e-16$

B.15 Urban Population

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ UrbConsExp + UrbDispInc + UrbPop, data = dati, model = "within", index = c("Country", "Year"))

Balanced Panel: n=20, T=25, N=500

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−21500000	−5490000	−1530000	0	4180000	32200000

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
UrbConsExp	$2.8765e-05$	$5.9500e-06$	4.8345	$1.804e-06$***
UrbDispInc	$-1.5974e-05$	$5.4290e-06$	-2.9424	0.0034157**
UrbPop	$8.9229e-02$	$2.3662e-02$	3.7709	0.0001831***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Total Sum of Squares: $5.8177e+16$
Residual Sum of Squares: $3.5086e+16$
R-Squared: 0.39691
Adj. R-Squared: 0.37865
F-statistic: 104.641 on 3 and 477 DF, p-value: $< 2.22e-16$

B.16 Urban Population (2)

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ UrbConsExp + log(UrbDispInc) + UrbPop, data = dati, model = "within", index = c("Country", "Year"))

Balanced Panel: n=20, T=25, N=500

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−21200000	−4170000	−520000	0	3540000	25600000

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
UrbConsExp	$7.9465e-06$	$6.5669e-07$	12.1009	$< 2e-16$***
log(UrbDispInc)	$1.2448e+07$	$7.7895e+05$	15.9810	$< 2e-16$***
UrbPop	$-3.7319e-02$	$1.1536e-02$	-3.2351	0.0013**

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Total Sum of Squares: $5.8177e+16$
Residual Sum of Squares:$2.3266e+16$
R-Squared: 0.60008
Adj. R-Squared:0.57248
F-statistic: 238.583 on 3 and 477 DF, p-value: $< 2.22e-16$

B.17 Urban Population (3)

Oneway (individual) effect Within Model

Call: plm(formula = Export ~ UrbConsExp + log(UrbDispInc), data = dati, model = "within", index = c("Country", "Year"))

Balanced Panel: n=20, T=25, N=500

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−20800000	−4010000	−268000	0	3530000	26200000

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
UrbConsExp	$7.4744e-06$	$6.4658e-07$	11.560	$< 2.2e-16$***
log(UrbDispInc)	$1.1510e+07$	$7.3004e+05$	15.766	$< 2.2e-16$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: $5.8177e+16$

Residual Sum of Squares: $2.3776e+16$

R-Squared: 0.59131

Adj. R-Squared: 0.56529

F-statistic: 345.794 on 2 and 478 DF, p-value: $< 2.22e-16$

B.18 Well-established markets

neway (individual) effect Within Model

Call: plm(formula = Export ~ GDP + UrbConsExp + UrbDispInc + UrbPop, data = mercati.consolidati, model = "within", index = c("Country", "Year"))

Balanced Panel: n=5, T=25, N=125

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−17400000	−3150000	117000	0	4110000	18500000

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
GDP	$-1.0621e-05$	$1.2274e-05$	−0.8653	0.3886336
UrbConsExp	$2.6478e-04$	$5.4077e-05$	4.8964	$3.187e-06$***
UrbDispInc	$-1.4980e-04$	$4.3073e-05$	−3.4778	0.0007127***
UrbPop	$-2.1107e+00$	$5.9392e-01$	−3.5537	0.0005504***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: $1.6591e + 16$

Residual Sum of Squares: $4.3029e + 15$

R-Squared: 0.74064

Adj. R-Squared: 0.68732

F-statistic: 82.8155 on 4 and 116 DF, p-value: $< 2.22e - 16$

B.19 New markets

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ GDP + UrbConsExp + UrbDispInc + UrbPop, data = mercati.cresciuti, model = "within", index = c("Country", "Year"))

Balanced Panel: n=4, T=25, N=100

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−16000000	−5700000	−1550000	0	7030000	28700000

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
GDP	$1.6488e - 05$	$3.9120e - 06$	4.2148	$5.834e - 05$***
UrbConsExp	$4.3943e - 05$	$1.0307e - 05$	4.2635	$4.867e - 05$***
UrbDispInc	$-5.5185e - 05$	$1.3569e - 05$	−4.0668	0.0001004***
UrbPop	$1.9062e - 02$	$3.1108e - 02$	0.6128	0.5415386

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: $2.211e + 16$

Residual Sum of Squares: $8.195e + 15$

R-Squared: 0.62935

Adj. R-Squared: 0.579

F-statistic: 39.0534 on 4 and 92 DF, p-value: $< 2.22e - 16$

B.20 New markets (2)

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ GDP + UrbConsExp + UrbDispInc + UrbPop, data = mercati.nuovi, model = "within", index = c("Country", "Year"))

Balanced Panel: n=5, T=25, N=125

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
-13900000	-2920000	-155000	0	2330000	16400000

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
GDP	$2.5406e-05$	$9.5376e-06$	2.6637	0.008827**
UrbConsExp	$1.5302e-04$	$1.3375e-05$	11.4404	$< 2.2e-16$***
UrbDispInc	$-1.2790e-04$	$2.8102e-05$	-4.5512	$1.322e-05$***
UrbPop	$-8.7964e-03$	$2.0704e-02$	-0.4249	0.671713

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: $9.8229e+15$

Residual Sum of Squares: $2.7592e+15$

R-Squared: 0.7191

Adj. R-Squared:0.66733

F-statistic: 74.2408 on 4 and 116 DF, p-value: $< 2.22e-16$

B.21 New markets (3)

Oneway (individual) effect Within Model

Call: plm(formula = Export ~ GDP + UrbConsExp + UrbDispInc + UrbPop, data = mercati.escursione, model = "within", index = c("Country", "Year"))

Balanced Panel: n=5, T=25, N=125

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
-19700000	-5840000	-1560000	0	7620000	26400000

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
GDP	$2.4172e-05$	$3.4409e-06$	7.0250	$1.564e-10$***
UrbConsExp	$6.2151e-05$	$9.3016e-06$	6.6818	$8.627e-10$***
UrbDispInc	$-8.1816e-05$	$1.1928e-05$	-6.8594	$3.578e-10$***
UrbPop	$7.7776e-03$	$3.0833e-02$	0.2522	0.8013

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: $2.9411e + 16$

Residual Sum of Squares: $1.0228e + 16$

R-Squared: 0.65224

Adj. R-Squared: 0.60528

F-statistic: 54.3911 on 4 and 116 DF, p-value: $< 2.22e - 16$

B.22 Stable markets

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ GDP + UrbConsExp + UrbDispInc + UrbPop, data = mercati.stabili, model = ”within”, index = c(”Country”, ”Year”))

Balanced Panel: n=5, T=25, N=125

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−6420000	−846000	101000	0	764000	7220000

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
GDP	$2.2976e - 05$	$3.2250e - 06$	7.1243	$9.485e - 11$***
UrbConsExp	$-9.5050e - 05$	$3.2006e - 05$	−2.9697	0.0036231**
UrbDispInc	$1.0499e - 04$	$3.2375e - 05$	3.2430	0.0015448**
UrbPop	$-3.2457e - 01$	$9.3245e - 02$	−3.4808	0.0007054***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: $2.8442e + 15$

Residual Sum of Squares: $5.0268e + 14$

R-Squared: 0.82326

Adj. R-Squared: 0.76398

F-statistic: 135.082 on 4 and 116 DF, p-value: $< 2.22e - 16$

B.23 Technology

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ Mobile.Possession + InternetUsers, data = dati, model = ”within”, index = c(”Country”, ”Year”))

Unbalanced Panel: n=19, T=20-25, N=449

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−28400000	−6510000	−1540000	0	5540000	39200000

Coefficients	Estimate	Std. Error	t-value	Pr(> $|t|$)
Mobile.Possession	-0.00014869	0.00027871	-0.5335	0.594
InternetUsers	0.10903815	0.02006161	5.4352	$9.212e-08$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Total Sum of Squares: $5.6099e+16$
Residual Sum of Squares: $4.3401e+16$
R-Squared: 0.22634
Adj. R-Squared: 0.21576
F-statistic: 62.6077 on 2 and 428 DF, p-value: $< 2.22e-16$

B.24 Technology (2)

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ InternetUsers, data = dati, model = "within", index = c("Country", "Year"))

Unbalanced Panel: n=19, T=20-25, N=454

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
-28300000	-6570000	-1700000	0	5470000	39200000

Coefficients	Estimate	Std. Error	t-value	Pr(> $|t|$)
InternetUsers	0.0998146	0.0088906	11.227	$< 2.2e-16$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Total Sum of Squares: $5.6728e+16$
Residual Sum of Squares: $4.3961e+16$
R-Squared: 0.22506
Adj. R-Squared: 0.21515
F-statistic: 126.046 on 1 and 434 DF, p-value: $< 2.22e-16$

B.25 Exchange Rate Indexes with Random Effects

Oneway (individual) effect Random Effect Model (Swamy-Arora's transformation)

Call: plm(formula = Export.Index ∼ ExchRate.Index + ExchRate.Ita.Index, data = dati, model = "random", index = c("Country", "Year"))

Unbalanced Panel: n=20, T=22-25, N=497

Effects:	var	std.dev	share
idiosyncratic	38.829	6.231	0.701
individual	16.557	4.069	0.299

theta :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.6896	0.7072	0.7072	0.7064	0.7072	0.7072

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−14.500	−1.850	−0.626	−0.003	0.583	70.100

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
(Intercept)	9.90269	2.03597	4.8639	$1.550e-06$***
ExchRate.Index	1.67492	0.65926	2.5406	0.01137*
ExchRate.Ita.Index	−9.03813	2.07925	−4.3468	$1.678e-05$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: 20024

Residual Sum of Squares: 19167

R-Squared: 0.042815

Adj. R-Squared: 0.042557

F-statistic: 11.0483 on 2 and 494 DF, p-value: $2.0231e-05$

B.26 Exchange Rate Indexes with Fixed Effects

Oneway (individual) effect Within Model

Call: plm(formula = Export.Index ∼ ExchRate.Index + ExchRate.Ita.Index, data = dati, model = "within", index = c("Country", "Year"))

Unbalanced Panel: n=20, T=22-25, N=497

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−18.6000	−1.5200	−0.0501	0.9760	66.0000	

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
ExchRate.Index	1.79432	0.67372	2.6633	0.008001**
ExchRate.Ita.Index	-9.13239	2.08182	-4.3867	$1.418e-05$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: 19326

Residual Sum of Squares: 18444

R-Squared: 0.045658

Adj. R-Squared: 0.043637

F-statistic: 11.3626 on 2 and 475 DF, p-value: $1.5125e-05$

B.27 Hausman Test on Exchange Rate Indexes

Hausman Test

data: Export.Index $\sim$ ExchRate.Index + ExchRate.Ita.Index chisq = 0.88056, df = 2, p-value = 0.6439

alternative hypothesis: one model is inconsistent

B.28 Exchange Rate Indexes - Pre-Euro Period

Oneway (individual) effect Random Effect Model (Swamy-Arora's transformation)

Call: plm(formula = Export.Index $\sim$ ExchRate.Index + ExchRate.Ita.Index, data = pre.euro, model = "random", index = c("Country", "Year"))

Unbalanced Panel: n=20, T=6-9, N=177

Effects:	var	std.dev	share
idiosyncratic	0.5316	0.7291	0.749
individual	0.1782	0.4222	0.251

theta :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.4238	0.5011	0.5011	0.4985	0.5011	0.5011

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
-1.4300	-0.2500	-0.0582	-0.0007	0.1090	7.7300

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
(Intercept)	0.73261	0.45586	1.6071	0.1098
ExchRate.Index	−0.53354	0.35114	−1.5194	0.1305
ExchRate.Ita.Index	0.81660	0.52129	1.5665	0.1191

Total Sum of Squares: 93.919

Residual Sum of Squares: 91.605

R-Squared: 0.024665

Adj. R-Squared: 0.024247

F-statistic: 2.19817 on 2 and 174 DF, p-value: 0.11408

B.29 Exchange Rate Indexes - Pre-Euro Period (Eurozone)

Oneway (individual) effect Random Effect Model (Swamy-Arora's transformation)

Call: plm(formula = Export.Index ∼ ExchRate.Index + ExchRate.Ita.Index, data = euro.pre.euro, model = "random", index = c("Country", "Year"))

Balanced Panel: n=6, T=9, N=54

Effects:	var	std.dev	share
idiosyncratic	0.01821	0.13494	0.456
individual	0.02173	0.14743	0.544

theta: 0.7082

Residuals :

Min.	1st Qu.	Median	3rd Qu.	Max.
−0.3480	−0.0782	−0.0158	0.0829	0.3500

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
(Intercept)	0.75786	0.24035	3.1532	0.002706**
ExchRate.Index	−0.18102	0.31294	−0.5784	0.565510
ExchRate.Ita.Index	0.32109	0.19854	1.6173	0.111992

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: 1.0239

Residual Sum of Squares: 0.97231

R-Squared: 0.050392

Adj. R-Squared: 0.047593

F-statistic: 1.3532 on 2 and 51DF, p-value: 0.26753

B.30 Exchange Rate Indexes - Pre-Euro Period (Not Eurozone)

Oneway (individual) effect Random Effect Model (Swamy-Arora's transformation)

Call: plm(formula = Export.Index ∼ ExchRate.Index + ExchRate.Ita.Index, data = non.euro.pre.euro, model = "random", index = c("Country", "Year"))

Unbalanced Panel: n=14, T=6-9, N=123

Effects:	var	std.dev	share
idiosyncratic	0.7609	0.8723	0.744
individual	0.2614	0.5112	0.256

theta :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.4284	0.5056	0.5056	0.5019	0.5056	0.5056

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−1.4300	−0.3680	−0.1030	−0.0008	0.2250	7.7300

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
(Intercept)	0.63275	0.63880	0.9905	0.3239
ExchRate.Index	−0.54836	0.43541	−1.2594	0.2103
ExchRate.Ita.Index	0.99274	0.74782	1.3275	0.1869

Total Sum of Squares: 92.233

Residual Sum of Squares: 89.909

R-Squared: 0.025203

Adj. R-Squared: 0.024588

F-statistic: 1.55038 on 2 and 120 DF, p-value: 0.21639

B.31 Exchange Rate Indexes - Not Eurozone Countries after Euro Introduction

Oneway (individual) effect Random Effect Model (Swamy-Arora's transformation)

Call: plm(formula = Export.Index ~ ExchRate.Index + ExchRate.Ita.Index, data = non.euro.post.euro, model = "random", index = c("Country", "Year"))

Balanced Panel: n=14, T=16, N=224

Effects:	var	std.dev	share
idiosyncratic	55.240	7.432	0.541
individual	46.908	6.849	0.459

theta: 0.7382

Residuals :

Min.	1st Qu.	Median	3rd Qu.	Max.
−17.50	−2.93	−1.45	1.90	61.30

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
(Intercept)	26.17469	3.87009	6.7633	$1.189e-10$***
ExchRate.Index	−0.33786	1.49544	−0.2259	0.8215
ExchRate.Ita.Index	−21.38488	3.43972	−6.2170	$2.498e-09$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: 14310

Residual Sum of Squares:12154

R-Squared: 0.15063

Adj. R-Squared: 0.14862

F-statistic: 19.5971 on 2 and 221 DF, p-value: $1.4621e-08$

B.32 Exchange Rate Indexes - All Countries after Euro Introduction

Oneway (individual) effect Random Effect Model (Swamy-Arora's transformation)

Call: plm(formula = Export.Index ~ ExchRate.Index + ExchRate.Ita.Index, data = post.euro, model = "random", index = c("Country", "Year"))

Balanced Panel: n=20, T=16, N=320

Effects:	var	std.dev	share
idiosyncratic	40.199	6.340	0.514
individual	37.933	6.159	0.486

theta: 0.7508

Residuals :

Min.	1st Qu.	Median	3rd Qu.	Max.
−17.90	−2.22	−1.15	1.13	62.00

Coefficients	Estimate	Std. Error	t-value	$Pr(>\|t\|)$
(Intercept)	18.71185	2.73859	6.8327	$4.275e-11$***
ExchRate.Index	0.75625	1.26200	0.5992	0.5494
ExchRate.Ita.Index	−16.11524	2.50859	−6.4240	$4.857e-10$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: 14388

Residual Sum of Squares: 12707

R-Squared: 0.11683

Adj. R-Squared: 0.11573

F-statistic: 20.9662 on 2 and 317 DF, p-value: $2.808e-09$

B.33 Indirect Exchange Rate

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ ExchRate.EuroLira, data = dati, index = c("Country", "Year"))

Balanced Panel: n=20, T=25, N=500

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−25400000	−6640000	−2100000	0	5570000	48500000

Coefficients	Estimate	Std. Error	t-value	$Pr(>\|t\|)$
ExchRate.EuroLira	30129.7	9739.8	3.0935	0.002094**

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: $5.8177e+16$

Residual Sum of Squares: $5.7038e+16$

R-Squared: 0.019587

Adj. R-Squared: 0.018764

F-statistic: 9.56949 on 1 and 479 DF, p-value: 0.002094

B.34 Hausman Test for Indirect Exchange Rate

Hausman Test

data: Export ∼ ExchRate.EuroLira chisq = 6.8745, df = 1, p-value = 0.008744 alternative hypothesis: one model is inconsistent

B.34.1 Random Effects on Indirect Exchange Rate

Oneway (individual) effect Random Effect Model (Swamy-Arora's transformation)

Call: plm(formula = Export ∼ ExchRate.EuroLira, data = dati, model = "random", index = c("Country", "Year"))

Balanced Panel: n=20, T=25, N=500

Effects:	var	std.dev	share
idiosyncratic	$1.191e+14$	$1.091e+07$	0.381
individual	$1.939e+14$	$1.392e+07$	0.619

theta: 0.8451

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−22400000	−6990000	−3440000	0	5050000	51500000

Coefficients	Estimate	Std. Error	t-value	$Pr(>\|t\|)$
(Intercept)	17258337.3	3220026.2	5.3597	$1.277e-07$***
ExchRate.EuroLira	13641.7	7437.6	1.8341	0.06723.

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: $6.0392e+16$

Residual Sum of Squares: $5.9987e+16$

R-Squared: 0.0067098

Adj. R-Squared: 0.006683

F-statistic: 3.36408 on 1 and 498 DF, p-value: 0.067229

B.35 Indirect Exchange Rate - Pre-Euro Period

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ ExchRate.EuroLira, data = pre.euro, index = c("Country", "Year"))

Balanced Panel: n=20, T=9, N=180

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−8740000	−1060000	−173000	0	1150000	9970000

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
ExchRate.EuroLira	−2657.7	5054.3	−0.5258	0.5997

Total Sum of Squares: $1.3042e + 15$

Residual Sum of Squares: $1.302e + 15$

R-Squared: 0.0017359

Adj. R-Squared: 0.0015334

F-statistic: 0.276486 on 1 and 159 DF, p-value: 0.59975

B.36 Indirect Exchange Rate - Pre-Euro Period (Eurozone)

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ ExchRate.EuroLira, data = euro.pre.euro, index = c("Country", "Year"))

Balanced Panel: n=6, T=9, N=54

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−8910000	−1240000	8020	0	1610000	7430000

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
ExchRate.EuroLira	−1844965	3347494	−0.5511	0.5841

Total Sum of Squares: $5.2e + 14$

Residual Sum of Squares: $5.1666e + 14$

R-Squared: 0.0064216

Adj. R-Squared: 0.0055891

F-statistic: 0.303764 on 1 and 47 DF, p-value: 0.58414

B.37 Indirect Exchange Rate - Pre-Euro Period (Not Eurozone

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ ExchRate.EuroLira, data = non.euro.pre.euro, index = c(”Country”, ”Year”))

Balanced Panel: n=14, T=9, N=126

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−8240000	−1020000	−212000	942000	9970000	

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
ExchRate.EuroLira	−2652.0	4688.1	−0.5657	0.5727

Total Sum of Squares: $7.8422e + 14$

Residual Sum of Squares: $7.8197e + 14$

R-Squared: 0.0028747

Adj. R-Squared: 0.0025324

F-statistic: 0.320007 on 1 and 111 DF, p-value: 0.57275

B.38 Indirect Exchange Rate - Not Eurozone Countries after Euro Introduction

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ ExchRate.EuroLira, data = non.euro.post.euro, index = c(”Country”, ”Year”))

Balanced Panel: n=14, T=16, N=224

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−24100000	−5760000	88900	0	4990000	38900000

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
ExchRate.EuroLira	35238	13391	2.6315	0.009135**

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares: $2.1325e + 16$
Residual Sum of Squares: $2.0641e + 16$
R-Squared: 0.03207
Adj. R-Squared: 0.029923
F-statistic: 6.92476 on 1 and 209 DF, p-value: 0.0091348

B.39 Indirect Exchange Rate - All Countries after Euro Introduction

Oneway (individual) effect Within Model
Call: plm(formula = Export ∼ ExchRate.EuroLira, data = post.euro, index = c("Country", "Year"))
Balanced Panel: n=20, T=16, N=320
Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−24100000	−6040000	105000	5500000	38900000	

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
ExchRate.EuroLira	35238	13927	2.5302	0.01191*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Total Sum of Squares: $3.2626e + 16$
Residual Sum of Squares: $3.1942e + 16$
R-Squared: 0.020962
Adj. R-Squared: 0.019586
F-statistic:6.40177 on 1 and 299 DF, p-value: 0.011914

B.40 Hausman Test on Indirect Exchange Rate

Hausman Test
data: Export ∼ ExchRate.EuroLira chisq = 5.6085, df = 1, p-value = 0.01787
alternative hypothesis: one model is inconsistent

B.40.1 Random Effects on Indirect Exchange Rate

Oneway (individual) effect Random Effect Model (Swamy-Arora's transformation)

Call: plm(formula = Export ∼ ExchRate.EuroLira, data = non.euro.post.euro, model = "random", index = c("Country", "Year"))

Balanced Panel: n=14, T=16, N=224

Effects:	var	std.dev	share
idiosyncratic	$9.876e+13$	$9.938e+06$	0.374
individual	$1.654e+14$	$1.286e+07$	0.626

theta: 0.8104

Residuals :

Min.	1st Qu.	Median	3rd Qu.	Max.
−18600000	−6200000	−1590000	4850000	44400000

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
(Intercept)	16984627.6	3658342.0	4.6427	$5.884e-06$***
ExchRate.EuroLira	9995.0	8105.6	1.2331	0.2188

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: $2.2527e+16$

Residual Sum of Squares: $2.2374e+16$

R-Squared: 0.0068026

Adj. R-Squared: 0.0067419

F-statistic: 1.52053 on 1 and 222 DF, p-value: 0.21884

B.41 Coffeehouse Outlets

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ CafeOutlet, data = dati, model = "within", index = c("Country", "Year"))

Balanced Panel: n=20, T=14, N=280

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−29500000	−5800000	258000	0	5210000	36800000

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
CafeOutlet	−206.555	89.164	−2.3166	0.02131*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: $2.5711e + 16$

Residual Sum of Squares: $2.5189e + 16$

R-Squared: 0.020299

Adj. R-Squared: 0.018777

F-statistic: 5.36649 on 1 and 259 DF, p-value: 0.021308

B.42 Coffeehouse Turnover

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ CafeTurnover, data = dati, model = "within", index = c("Country", "Year"))

Balanced Panel: n=20, T=14, N=280

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−27100000	−6100000	−463000	0	5010000	33200000

Coefficients	Estimate	Std. Error	t-value	$Pr(> \|t\|)$
CafeTurnover	0.00139675	0.00027775	5.0289	$9.224e - 07$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: $2.5711e + 16$

Residual Sum of Squares: $2.3424e + 16$

R-Squared: 0.088957

Adj. R-Squared: 0.082286

F-statistic: 25.2897 on 1 and 259 DF, p-value: $9.2237e - 07$

B.43 HoReCa Outlets

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ HorecaOutlet, data = dati, model = "within", index = c("Country", "Year"))

Balanced Panel: n=20, T=14, N=280

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−26500000	−6230000	−99500	0	5090000	35300000

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
HorecaOutlet	5.5457	1.6225	3.418	0.0007326***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Total Sum of Squares: $2.5711e+16$
Residual Sum of Squares: $2.4601e+16$
R-Squared: 0.043159
Adj. R-Squared: 0.039922
F-statistic: 11.6824 on 1 and 259 DF, p-value: 0.00073261

B.44 HoReCa Turnover

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ HorecaTurnover, data = dati, model = "within", index = c("Country", "Year"))

Balanced Panel: n=20, T=14, N=280

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−23600000	−6080000	42600	0	4850000	28500000

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
HorecaTurnover	$9.8247e-05$	$1.7056e-05$	5.7603	$2.374e-08$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Total Sum of Squares: $2.5711e+16$
Residual Sum of Squares: $2.2791e+16$
R-Squared: 0.11356
Adj. R-Squared: 0.10505
F-statistic: 33.1809 on 1 and 259 DF, p-value: $2.3742e-08$

B.45 Chained Outlets

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ ChainedOutlet, data = dati, model = "within", index = c("Country", "Year"))

Balanced Panel: n=20, T=14, N=280

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−22300000	−5460000	97100	0	4750000	26200000

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
ChainedOutlet	463.874	51.641	8.9827	$< 2.2e-16$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Total Sum of Squares: $2.5711e+16$
Residual Sum of Squares: $1.9604e+16$
R-Squared: 0.23754
Adj. R-Squared: 0.21972
F-statistic: 80.6889 on 1 and 259 DF, p-value: $< 2.22e-16$

B.46 Chained Turnover

Oneway (individual) effect Within Model
Call: plm(formula = Export ∼ ChainedTurnover, data = dati, model = "within", index = c("Country", "Year"))
Balanced Panel: n=20, T=14, N=280
Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−21700000	−5920000	101000	0	4940000	24700000

Coefficients	Estimate	Std. Error	t-value	Pr(> $\|t\|$)
ChainedTurnover	$6.0818e-04$	$6.5184e-05$	9.3301	$< 2.2e-16$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Total Sum of Squares: $2.5711e+16$
Residual Sum of Squares: $1.9243e+16$
R-Squared: 0.25156
Adj. R-Squared: 0.23269
F-statistic: 87.0516 on 1 and 259DF, p-value: $< 2.22e-16$

B.47 Pizzerias Outlets

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ PizzaOutlet, data = dati, model = "within", index = c("Country", "Year"))

Balanced Panel: n=20, T=14, N=280

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−32200000	−5910000	138000	0	5010000	27500000

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
PizzaOutlet	7197.8	1000.4	7.1947	$6.741e-12$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: $2.5711e+16$

Residual Sum of Squares: $2.1428e+16$

R-Squared: 0.16657

Adj. R-Squared: 0.15408

F-statistic: 51.7637 on 1 and 259 DF, p-value: $6.7408e-12$

B.48 Pizzerias Turnover

Oneway (individual) effect Within Model

Call: plm(formula = Export ∼ PizzaTurnover, data = dati, model = "within", index = c("Country", "Year"))

Balanced Panel: n=20, T=14, N=280

Residuals :

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
−25600000	−5620000	−79800	0	4540000	26500000

Coefficients	Estimate	Std. Error	t-value	Pr(> |t|)
PizzaTurnover	0.0086927	0.0008233	10.558	$< 2.2e-16$***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: $2.5711e+16$

Residual Sum of Squares: $1.7974e+16$

R-Squared: 0.3009

Adj. R-Squared: 0.27834

F-statistic: 111.479 on 1 and 259 DF, p-value: $< 2.22e-16$

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