The Price Elasticity of Demand of Fair Trade Coffee

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THE PRICE ELASTICITY OF DEMAND OF FAIR TRADE COFFEE

Demand for Fair Trade certified products has been continuously growing during the past decade. In 2008 the sales of all Fair Trade products grew by 57% showing the strong growth in this market. However, little research has been done on the European market on the demand and price elasticity of demand of Fair Trade products. Fair Trade is a voluntary certification system, where certain conditions are set on the production of mainly agricultural products. Fair Trade goods produced according to the Fair Trade criteria are guaranteed a minimum price above the world market price, as well as a social premium on top of the price.

An important part of the Fair Trade initiative is the market for these products in the developed countries. The aim of this study is to investigate the factors affecting the demand for Fair Trade coffee in Finland and calculate the price elasticity of demand for this type of coffee. Thus the research aims to give an answer to why consumers are prepared to pay a higher price for Fair Trade products than their conventional substitutes. The impacts of the price elasticity of demand on retail profits are also commented.

The research questions were answered by conducting a literature review on previous research, as well as formulating a theoretical model of price elasticity of demand and a linear regression model based on price and sales data from a 3,5-year period from a Finnish retail chain. The findings of the study were that demand for Fair Trade coffee depends on functional characteristics such as taste, brand, sales location and price, as well as supplementary characteristics like altruism, impure altruism (warm-glow) and the desire to gain esteem by purchasing Fair Trade products.

From the three theoretical models based on the supplementary utility it can be concluded that price elasticity of demand depends on the price difference between regular and Fair Trade coffee as well as the share of Fair Trade coffee demand compared to total coffee consumption. The linear regression model is based mainly on functional utility, and shows that the price elasticity of demand for Fair Trade coffee is inelastic (-0.50), while the same figures for conventional and Utz certified coffee are elastic. However, the explanation power of the Fair Trade regression model remains quite low partly due to the inability to include variables describing the supplementary utility gained by purchasing Fair Trade coffee. In conclusion, the inelasticity of demand of Fair Trade coffee allows retailers to make use of anticompetitive behaviour such as differentiation and product bundling in order to discriminate between customers and gain profits on the market.

Keywords: Fair Trade certification, coffee, price elasticity of demand, inelastic demand

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REILUN KAUPAN KAHVIN KYSYNNÄN HINTAJOUSTO

Reilu kauppa-sertifioitujen tuotteiden kysyntä on kasvanut kiivasta tahtia viimeisen vuosikymmenen ajan. Vuonna 2008 kaikkien Reilun kaupan tuotteiden myynti kasvoi 57% osoittaen näiden markkinoiden vahvan kasvun. Reilun kaupan tuotteiden kysyntää tai kysynnän hintajoustoa eurooppalaisilla markkinoilla ei kuitenkaan ole laajemmin tutkittu. Reilu kauppa on vapaaehtoinen sertifiointijärjestelmä, joka asettaa tietyt standardit pääasiallisesti maataloustuotteiden tuotannolle. Reilun kaupan standardien mukaan tuotetuille raaka-aineille taataan tietty minimihinta, ja tuottajalle maksetaan Reilun kaupan lisää tuotteen perushinnan päälle.

Tärkeä osa Reilu kauppa-järjestelmää on näiden tuotteiden myynti kehittyneissä maissa. Tämän tutkimuksen tavoitteena on tarkastella Reilun kaupan kahvin kysyntään vaikuttavia tekijöitä Suomen markkinoilla, ja laskea arvo Reilun kaupan kahvin kysynnän hintajoustolle. Tutkielma pyrkii vastaamaan kysymykseen miksi kuluttajat ovat valmiita maksamaan korkeampaa hintaa Reilun kaupan kahvista kuin sen sertifioimattomasta korvikkeesta. Tutkimuksessa kommentoidaan myös Reilun kaupan kahvin kysynnän hintajouston vaikutuksia vähittäiskaupan katteisiin.

Tutkimuskysymyksiin pyritään vastaamaan tarkastelemalla olemassa olevaa kirjallisuutta aiheesta ja muotoilemalla teoreettinen kysynnän hintajoustomalli sekä lineaarinen regressiomalli. Regressiomallissa käytetään S-ryhmältä saatua hinta- ja myyntiaineistoa pääkaupunkiseutualueen kaupoista viimeisen kolmen ja puolen vuoden ajalta. Tutkimuksessa löydettiin että Reilun kaupan kahvin kysyntä riippuu funktionaalisista tekijöistä kuten maku, tuotemerkki, myyntipaikka ja hinta sekä liitännäistekijöistä kuten altruismi, epäpuhdas altruismi (warm-glow/lämmin hehku) ja kuluttajan halusta herättää arvostusta itseään kohtaan ostamalla Reilun kaupan tuotteita.

Tutkimuksessa muotoillut kolme teoreettista mallia perustuvat ensisijaisesti liitännäistekijöihin, ja malleista voidaan päätellä että Reilun kaupan kahvin kysynnän hintajousto riippuu tavallisen ja Reilun kaupan kahvin hintaerosta sekä Reilun kaupan kahvin kysynnästä suhteessa kahvin kokonaiskysyntään. Lineaarinen regressiomalli taas pohjautuu vahvemmin funktionaalisiin tekijöihin, ja sen perusteella voidaan päätellä että Reilun kaupan kahvin kysyntä on hintajoustamatonta (-0,50), kun taas tavallisen kahvin ja Utz-sertifioidun kahvin kysyntä on joustavaa. Reilun kaupan kahvin regressiomallin selittävyysaste jää matalaksi, osaksi johtuen siitä ettei malliin voitu lisätä kysyntään vaikuttavia liitännäishyödyn tekijöitä. Tutkimuksen tuloksen pohjalta voimme päätellä että Reilun kaupan kahvin kysynnän joustamattomuus mahdollistaa vähittäiskaupalle joidenkin kilpailua vääristävien keinojen kuten differentiaation, tuotenippujen ja hintadiskriminaation käytön voittojen kasvattamiseksi.

Avainsanat: Reilu kauppa, Reilun kaupan sertifikaatti, kahvi, kysynnän hintajousto, joustamaton kysyntä

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1. Introduction

1.1. Background and motivation

In recent decades, a significant growth in the number of ethically aware consumers has caused a strong demand for socially and ecologically sustainable products, not only in the niche markets, but also among the masses (Barrientos, Conroy & Jones, 2007). One of the most successful trends has been the Fair Trade movement, a market-driven trade initiative aiming to combine trade and development issues by securing the producers in developing countries a fair return on their products. The idea behind the movement is that socially conscious consumers in the developed world express their feelings of responsibility towards society through ethical consumption. These consumers are willing to pay an additional price for Fair Trade products, because they feel they can directly improve the conditions of producers in developing countries. Fair Trade has been seen as "an effective tool for alleviating poverty and a reasonable alternative to aid and free trade" (Maseland & Vaal, 2002, p. 252).

The sales of products with the Fair Trade certification have grown significantly in Finland and other developed countries during the past decade (RKE, 2009a). According to the Association for Promoting Fair Trade (2009a), the total sales of Fair Trade products in the Finnish market grew by 57% in 2008. The sales for Fair Trade coffee in particular grew in Finland by 17% in 2008 (RKE, 2009a) and globally by 19% in 2007 (FLO, 2008). In 2008, Finnish consumers spent on average 10, 22€ on Fair Trade products finishing third after Switzerland and Great Britain in per capita expenditure (RKE, 2009). Currently there is a wide variety of Fair Trade products available in the Finnish retail market, over 1000 in total, ranging from coffee, tea, chocolate and wine to clothes made out of Fair Trade cotton. Fair Trade is no longer a marginal market, but becoming increasingly popular in mainstream businesses such as supermarkets.

Figure 1 Estimated retail value of Fair Trade certified products

Source: FLO (2009), http://www.fairtrade.net/facts_and_figures.html

As Fair Trade products are currently seen as a significant market opportunity, it is important to study, what factors affect the demand and price elasticity of Fair Trade products. However, little research has been done on the demand side of Fair Trade products. The only papers with an empirical study on price elasticity of demand of Fair Trade coffee are by Arnot, Boxall and Cash (2006) for the Canadian market and Galarraga and Markandya (2004) for the UK market. Becchetti and Rosati (2007) also touch on the issue of price elasticity of demand of Fair Trade coffee in their paper. In addition there are studies for example by Loureiro and Lotade (2005), Pelsmacker, Driesen and Rayp (2005), Maietta (2004) as well as Galarraga and Markandya (2004) that study consumers’ willingness to pay for Fair Trade coffee. However, there is a gap in the research on the retail and pricing practices of Fair Trade products in the developed markets, especially in Europe, since current research generally concentrates on examining Fair Trade practices in the beginning of the supply chain.

1.1. Objective of the study and research questions

An integral part of the whole Fair Trade coffee value chain is the retail of products to the final customer. In order to understand and evaluate the sustainability of Fair Trade as a significant development policy, it is important to carefully analyze also the final market for Fair Trade coffee. Since the Fair Trade minimum price and the social premium is not tied to the retail price of the coffee and constitutes only a small part of the actual sales price of coffee in developed countries, it is interesting to look into how retailers price Fair Trade products. A central motivation for this thesis is that according to Arnot, Boxall and Cash (2006) as well as Kilian, Jones, Pratt and Villalobos (2006) retailers in the North American market can collect a higher margin from Fair Trade products, since customers are willing to pay a higher price on the products due to their “fairness”.

From a redistributive and welfare perspective it is interesting to know to what extent consumers in developed countries are willing to pay a premium for Fair Trade products. This research will thus also look into the reasons why consumers are prepared to pay a higher price for Fair Trade products than their conventional substitutes from an economic point of view. In addition to the altruistic willingness to help poor producers in the developing countries, consumers might have other motives to buy ethical products, such as the good feeling gained from consuming Fair Trade products, as well as signalling others that they are socially conscious customers (Harbaugh, 1998).

In order to analyze the Fair Trade coffee market Finland, this research will tackle the following research questions:

1) What factors affect the demand of Fair Trade coffee?

2) What is the price elasticity of demand for Fair Trade coffee?

3) What impacts does the price elasticity of demand have on retail margins?

The two first questions will be the main focus of the study, whereas the third one will mainly be referred to in the conclusions. The research will use Fair Trade coffee as a representative for other Fair Trade products. Fair Trade coffee is a product of interest for several reasons. Coffee is the second largest traded commodity globally after oil, making it a relevant area to study due to its volumes (Grodnik & Conroy, 2007; Murray & Raynolds, 2007). Coffee is also the core of the Fair Trade movement globally, as it is the oldest and most valuable Fair Trade product, generating around a quarter of all earnings within Fair Trade (Raynolds &

Long, 2007). Furthermore, most of the available research on Fair Trade concentrates on coffee.

In a country like Finland where coffee consumption per capita is one of the highest in the world, Fair Trade coffee can be seen as a significant market opportunity for the whole Fair Trade movement. Fair Trade certified coffee has been available in Finland for ten years[1], but still the share of certified coffee such as Fair Trade and Utz Certified is still somewhat below 5% of the total coffee market (Kauppalehti, 2007a). In Europe the share of sustainable coffee of all coffee sales is around 1,6% (Raynolds, Murray & Heller, 2007), while globally the share is even less, around 1% (FLO, 2006). While market shares for sustainable coffee are still small, the growth rates in the segment are one of the largest in the coffee market.

Although studying a more homogenous product such as bananas might be easier than a product where the taste has a larger impact, the study of a non-perishable good such as coffee with possibilities for wider differentiation raises interesting research questions. Coffee allows for speciality markets where price premiums are possible due to new quality attributes (Raynolds, 2007).

1.2. Research method and data

A major part of this study will deal with available literature on Fair Trade coffee demand as well as the price elasticity of Fair Trade coffee to set the background for the study. In order to formulate the theoretical price elasticity of demand model, the central theories of demand for charity and giving will be summarized.

The research questions posed above will also be approached by building a theoretical model for the price elasticity of demand for Fair Trade coffee. Within this model, factors that affect the demand such as price of Fair Trade coffee, price of conventional coffee and the effect of pure and impure altruism as well as esteem will be analyzed.

[1] Coffee produced according to the Fair Trade criteria has been sold in Finland for longer than 10 years through so called world shops or Alternative Trading Organization. However, Fair Trade labelled coffee became available in 1999.

The third method used to answer the research question is to perform linear regression models on Fair Trade and regular coffee sales data from a Finnish retail chain in order to find the price elasticity of demand. The data used in this study was acquired from the S-group which is one of the largest retail chains in Finland. The data is daily price and sales quantity data for 42 selected weeks during 2006 to June 2009. The daily data has been collected for each week that coincides with the 15^{th} day of each month. The data includes 160 stores in the Helsinki Metropolitan area (Helsinki, Vantaa, Espoo, Kirkkonummi, Kerava, Hyvinkää). Data is available for the majority of coffee brands sold in the stores belonging to this Finnish retail chain. In addition to information on sales and prices of all coffee types per store, the data includes information on the coffee brand, roast level, package size, producer, certification, preparation type, caffeine content and flavour of the coffees.

1.3. Main findings

In the study based on available literature it is found that the utility gained from purchasing Fair Trade coffee can be divided into two parts; the functional utility that includes attributes such as taste, price and quality as well as the supplementary utility which again includes altruistic and "warm-glow" feelings of purchasing Fair Trade coffee.

The theoretical model concentrates on the supplementary utility and forms three theoretical price elasticity of demand-models; one based on pure altruism, the second on warm-glow feelings or impure altruism and the third on esteem gained by purchasing Fair Trade coffee. The price elasticity of demand for Fair Trade coffee depends on the price difference between regular and Fair Trade coffee as well as the shares of these coffee types purchased of total coffee consumption. In the linear regression model, which is mainly based on the functional utility, the price elasticity of demand for Fair Trade coffee is inelastic (-0,50), while demand for regular and Utz certified coffee is elastic.

The inelasticity of demand of Fair Trade coffee allows for retailers to make use of anticompetitive behaviour such as differentiation and product bundling in order to discriminate between customers and gain profits on the market.

1.4. Central definitions

Some of the most central concepts of this research are defined below. It is important to note that the terms regular, conventional and non-certified coffee will be used interchangeably to refer to non-Fair Trade coffee.

Fair Trade

"Fair Trade is a development tool that uses existing capitalist supply chains to return more income to producers. It does this through improving free-market mechanisms as well as through non-market measures such as price floors. The principal idea is that producers in the developing world get a fair share of the profits of the products as compensation for their work." (Nicholls and Opal, 2005.)

The concept of Fair Trade used in this research should not be confused with the more general goal of fair or free trade between nations, including the abolishment of anti-dumping measures.

Fair Trade minimum price

The Fair Trade minimum price is the minimum price that a buyer of Fair Trade products has to pay to a producer organisation for their product. The minimum price is fixed in time, but a higher than minimum price can be negotiated and the minimum should be seen as the lowest possible starting point for price negotiations between producer and purchaser. It is set at a level which ensures that producer organisations receive a price that covers the cost of sustainable production for their product. This means it also acts as a safety net for farmers at times when world market prices fall below production costs and can no longer provide livelihood for the producers. However, when the market price is higher than the Fair Trade minimum, the buyer must pay the market price. Producers and traders can also negotiate a higher price, for example on the basis of quality, and for some products, the Fair Trade Labelling Organizations International (FLO) also sets different prices for organic crops, or for particular grades of produce. (Fairtrade Foundation, 2009.)

Fair Trade premium

The Fair Trade premium is a sum of money paid on top of the agreed Fair Trade price for investment in social, environmental or economic development projects, decided upon democratically by producers within the farmers' organisation[2]. The premium is fixed by the Fair Trade Labelling Organizations International (FLO) Standards Unit in the same way as the minimum price and remains the same, even if the producer is paid more than the minimum price for the product. The premium fund is typically invested in education and healthcare, farm improvements to increase yield and quality, or processing facilities to increase income (Fairtrade Foundation, 2009). The premium can also be used for the development of the producer organization and paying certification (Valkila & Nygren, 2009).

Ethical consumerism

Ethical consumerism involves purchasing decisions that are made with consideration for moral dimensions of how products are produced (Arnot et al., 2006). Consumers are concerned over issues such as environmental degradation, human rights, labour conditions, animal well-being and the social inequalities brought by international trade and reflect these concerns in their purchases (Raynolds, Murray & Heller, 2007).

Social or Ethical labels

Social or ethical labels are the words and symbols on products which seek to influence the economic decisions of one set of stakeholders by providing an assurance about the social and ethical impact of a business process on another group of stakeholders. If social trademarks are used, the institutions awarding the certificates vouch for the maintenance of the social standards they have established. (Steinrücken and Jaenichen, 2007.)

Social preferences

A person shows social preferences if he does not only care about the material resources allocated to himself but also about what is allocated to other relevant reference agents, or when a person cares about the well-beings of other individuals, or a "fair " allocation among members in society in addition to their own material benefits. (Becchetti & Rosati, 2007.)

[2] In the case of coffee cooperatives of small producers.

1.5. Structure of the study

This research is divided into eight chapters, out of which the first one introduces the subject of research. The second chapter will introduce the Fair Trade coffee market and its specific characteristics both globally and in Finland. The third chapter continues by giving an overview of the factors that affect Fair Trade demand, while the fourth chapter analyses the price elasticity of demand of Fair Trade coffee and its consequences on coffee markets. In the fifth chapter some general charity and social theories that are relevant when considering Fair Trade demand will be summarize. The sixth chapter will be dedicated to building the Fair Trade price elasticity of demand-model, while the seventh chapter concentrates on the linear regression models for Fair Trade, conventional and Utz certified coffees and finding the price elasticity of demand for these three types. The final chapter concludes and suggests areas for further research.

2. Characteristics of the Fair Trade coffee market

Coffee has a key role in the development of rural employment and poverty in developing countries, since it is the basis for livelihood for many families. Coffee is also a crucial source of foreign exchange earnings for developing countries (Maietta, 2004). As an even higher part of income in the coffee production chain is generated in the coffee consuming nations, the Fair Trade movement tries to tackle this negative trend. This is done by securing a certain price for Fair Trade coffee and allowing producers to differentiate their product, as well as supporting the producers in the developing countries (Kilian et al., 2006).

It has been estimated that about 78% of Fair Trade certified coffee comes from Latin America, with Mexico, Peru, Guatemala, Colombia, and Nicaragua being the largest exporters (Valkila & Nygren, 2009). As Latin America is a large producer of conventional coffee, it is quite natural that the majority of Fair Trade certified coffee also comes from the same area. Compared to the Latin and Central American producers, the poorest coffee producing countries such as Madagascar, Kenya, Tanzania and Zambia only export a fraction of all Fair Trade coffee. Thus it remains controversial whether Fair Trade succeeds in supporting the poorest producers in the world in exporting their products.

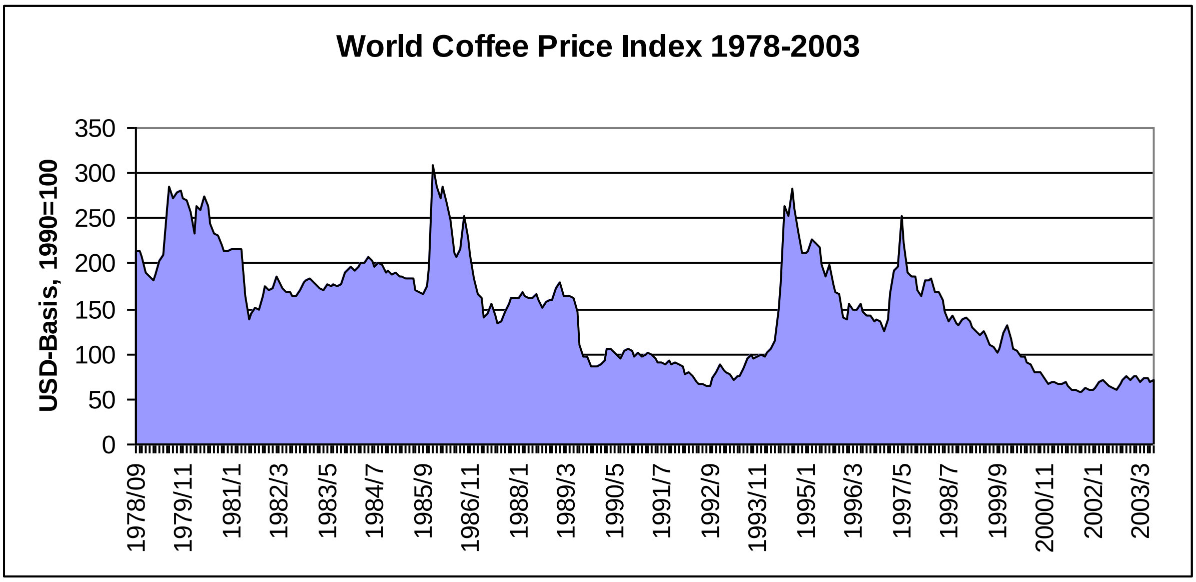
In coffee production, only cooperatives buying from small producers are Fair Trade certified, leaving large plantations outside the certification (Murray & Raynolds, 2007). It is also important to note that the vast majority of Fair Trade coffee also has the certification for organic coffee (Kilian et al., 2006).

The idea of Fair Trade was born already in the 1950s, but the first international labelling system started in 1989, when Dutch companies began importing Fair Trade coffee from Mexican producers. The idea behind the movement was that different countries and social classes do not necessarily benefit equally from the growth in international trade. Thus the Fair Trade movement, through "world shops" specialized in offering and promoting Fair Trade products or other alternative trading organizations (ATOs), started selling products that guaranteed fair returns to their producers. This enabled producers in the developing world to gain easier and straighter access to markets in the developed world. (Steinrücken and Jaenichen, 2007.)

The popularity of Fair Trade in the coffee market increased in the 1990s, when the worldwide regulation of coffee markets was abolished. Up until 1989 the global coffee market was regulated by the International Coffee Agreement (ICA), originally managed by the United Nations. Through the ICA, quotas on coffee exports were set in order to stabilize world coffee prices. Since the consuming and producing countries could not reach an agreement on the conditions and the distribution of the export quotas, the agreement was not renewed in 1989. When the ICA broke down, the trend of decreasing world coffee prices continued (Gilbert, 1996). Also the emergence of new large coffee producer countries such as Vietnam caused the global coffee price to drop significantly in the end of the 1990s (Nicholls and Opal, 2005).

It is often argued that due to the abandoning of global coffee export quotas and the introduction of new large producers in the market, coffee prices became more volatile than before the ICA (Steinrücken and Jaenichen, 2007). This, combined with the decreasing trend in the price of raw materials, such as agricultural products, has been argued to lead to previously unknown low prices and price volatility of raw coffee. However, if the variances of coffee prices before and after the ICA are compared, there is no significant difference, as can be seen from figure 2 below. Also the International Coffee Organization (ICO, 2005a) has concluded in their studies that the volatility recorded since 2000 is no more marked than in previous years although a weak upward trend can be found.

Figure 2 World Coffee Price Index for 1978-2003



Source: HWWA World Commodity Price Indices

2.1. Fair Trade criteria

Fair Trade is a voluntary certification system, where certain conditions are set on the production of mainly agricultural products. As stated earlier, Fair Trade aims to empower poor farmers and workers through minimum prices above the world price, improved working conditions and a social premium intended for funding development projects in the communities of farmers and workers (Steinrücken and Jaenichen, 2007). Fair Trade can act as a tool to improve agricultural practices, to encourage rural entrepreneurship, create additional value to low-value-added products as well as improve access for poor farmers to international markets. According to the Association for Promoting Fair Trade in Finland (2007) 73% of Finnish consumers are familiar with the Fair Trade certification system (57% in 2005) and 51% recognize the label (35% in 2005). In addition, 82% of the respondents thought that the certification system is very or quite reliable.

Fair Trade goods produced according to the Fair Trade criteria are guaranteed a minimum price above the world market price, as well as a social premium on top of the price. Other important benefits of Fair Trade include long term contracts and advance credit (Steinrücken and Jaenichen, 2007; Valkila & Nygren, 2009). It has been found that larger Fair Trade producers benefit to a greater extent from the Fair Trade minimum prices, whereas smaller producers gain more from the projects funded by the Fair Trade social premium (Valkila & Nygren, 2009). In essence, Fair Trade is normal trade with similar import and distribution channels to any other commercial initiative, but only with more specific criteria on the raw material. Voluntary incentives of this kind, such as the certification of child-labour free carpets or environmentally friendly products, have been much more popular than the complete banning of products that do not meet certain social minimum standards (Steinrücken and Jaenichen, 2007).

According to the Association for Promoting Fair Trade in Finland (2009b) the contracts are drawn up with as few intermediaries as possible to avoid parts of the profits ending up to unnecessary parties and to guarantee the largest possible profit for the producers. However, this argument is ambiguous since Fair Trade uses mainly the same channels as mainstream business.[3]

In order to gain the benefits above, the producers must fulfil the Fair Trade criteria which include the abolishment of forced and child labour and obeying international employment protection guidelines. One of the most important aims of Fair Trade is also to raise awareness of the fairness of international trade in the developed world.

2.2. The retail of Fair Trade coffee

In Finland, like in other countries worldwide, the retail of Fair Trade products started through so called ”world shops” already in the 1970s. The popularity of these types of products showed more mainstream retailers that there existed a large market for Fair Trade products also in Finland.

3 Information provided by Joni Valkila through e-mail communication on 19th March 2009.

For large retailers it is easy to sell products that are certified with already well-established social labels such as Fair Trade due to the recognition of the label. In Finland, the main certifications in the coffee market are organic, Fair Trade, Rainforest Alliance as well as Utz Certified coffee, of which the latter two have their own set of social and environmental standards (Raynolds et al., 2007a). However, out of the social certifications Fair Trade has the strictest standards. All major Finnish retailers offer Fair Trade products.
A major actor in the Finnish Fair Trade market is the Association for Promoting Fair Trade (RKE), who is in charge of monitoring the use of the Fair Trade label in Finland, certifying Finnish producers of Fair Trade products (e.g. Meira), promoting the sales of Fair Trade products, as well as communicating Finnish consumers about Fair Trade. The association itself does not participate in trading. Other important global actors are the Fair Trade Labelling Organizations International (FLO) and FLO-CERT. FLO-International coordinates the global network of national Fair Trade organizations and certifies suppliers, while FLO-CERT is an independent organization which is in charge of supervising that Fair Trade requirements are fulfilled throughout the Fair Trade supply chain. (RKE, 2009b.)

The retail and production of Fair Trade products is based on licensing, and differs in this sense significantly from the production of conventional food products. The monitoring of this type of products, which include an element of charity, is very costly and requires great effort, since the trust properties of the product cannot be experienced even after consuming the product. Indeed, it is the very existence of the labelling system and the licenses that enables profit seeking companies to produce and sell Fair Trade products credibly (Becchetti and Huybrechts, 2007). The cost of monitoring the production would be too high for any individual consumer. Without any type of monitoring organization, the producers could make use of the information deficit or asymmetry of consumers, and be tempted to sell normal products as “high social quality” products. Therefore social labels are used as signalling instruments, and guarantee a certain standard.

2.3. The cost structure of Fair Trade coffee

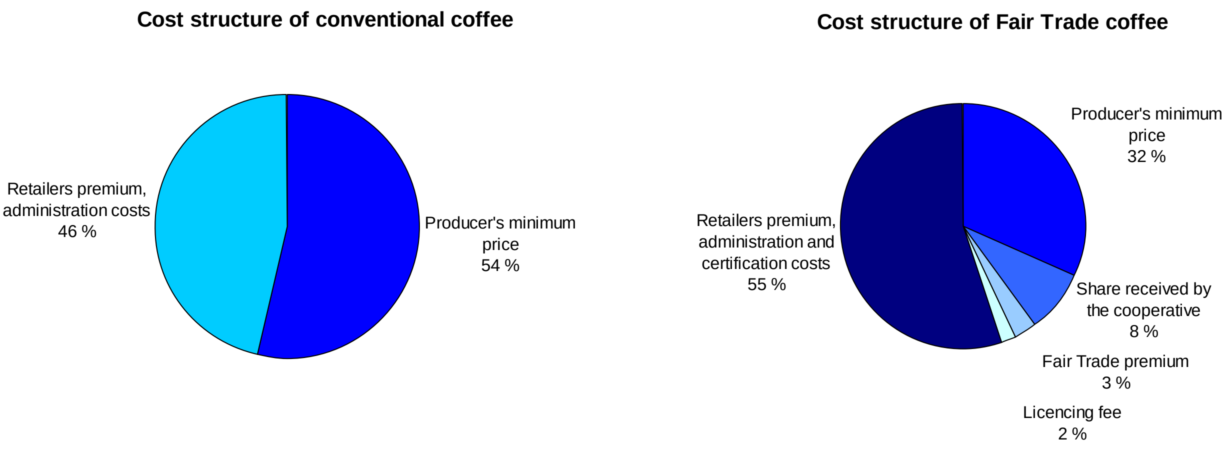
The retail price of Fair Trade coffee is often almost double the price of conventional coffee (Haaparanta, 2007a). The main reasons for the higher price are that Fair Trade coffee is guaranteed a minimum price above the world market price, as well as a Fair Trade premium for social and educational projects. There are also additional costs accrued in the certification of the products such as the certification fees for producers and licensing fees for retailers, as well as administrative costs of maintaining the certification. In addition, the Fair Trade movement has not been able to gain economies of scale, and thus costs are higher along the production chain (Kilian et al. 2006). However, Kilian et al. (2006) argue that in the future, the price of Fair Trade coffee will decrease due to benefits from specialization.

A part of the Fair Trade coffee retail price is licensing fees, which are charged from the consumers. In Finland 1-3% of the Fair Trade retail price is licensing fees (RKE, 2009b). In the United Kingdom these are around 1% which means 8% of the Fair Trade turnover. The licensing fees are a main source of income also for the Finnish Association for Promoting Fair Trade. In the UK the majority of the licensing income was spent on product development, campaigning, promoting the Fair Trade brand (Booth and Whetstone, 2007). Thus a part of the Fair Trade mark-up is spent on administrative costs. The Fair Trade social premium, which is used for social projects by the Fair Trade cooperatives, is around 3% of the retail price of a Finnish Fair Trade coffee package.

From the producers point of view it makes no difference how large a share of the retail price they receive, but rather how large the absolute sum is. In the end, the producer is interested if the price is enough to cover costs and even gain profit. The general view is that the share of the retail price the producer receives is larger for Fair Trade products than for conventional products, in total around 25-30% (RKE, 2009b). Estimates are often calculated based on the share that is delivered to the producer cooperatives, rather than the share that the producer itself receives. The collectives decide among themselves how the revenues are divided between individual producers (RKE, 2009b). To give some figures for comparison, the International Coffee Organization (ICO) has estimated that producers of regular coffee only gain 8-15 % of the retail price (RKE, 2009b). Other sources state that the share received by conventional coffee producers has constantly dropped from 20% in 1989-1990, to 13% in 1994-1995, and to as low as 10% in the early 2000s (Mendoza & Bastiaensen, 2003).

However, in order to produce comparable data between Fair Trade and conventional coffee producers, the share that the producers receive must be calculated. According to calculations made by information collected in Nicaragua and retail prices in Finland, the shares are quite different and can be seen from the tables below.

Figure 3 The cost structure of conventional and Fair Trade coffee prices before tax



Source: Association for Promoting Fair Trade in Finland (2009b), information received from Joni Valkila on 22nd April 2009

It is thus possible that Fair Trade producers receive a smaller share (conventional coffee 54% vs. FT coffee 32%) of the retail price paid by the consumers than regular coffee producers. However, it can be argued that Fair Trade consumers support not only the producers but also the producer cooperatives, and that producers can benefit from being members of cooperatives by receiving for example credit.

The share of the Fair Trade coffee retail price (and especially of the Fair Trade premium) received by the producer is interesting, since the mathematical model of Fair Trade demand formulated further on depends on the share of the Fair Trade premium of the price difference between Fair Trade and regular coffee the consumer thinks is received by the producer. This will be the share of "charity" that consumers feel they are giving to the producer by buying the product (including both the minimum price and the social premium). Consumers might assume that the mark-up of Fair Trade coffee compared to conventional coffee is practically all additional premium for the farmers, while the share of Fair Trade price used by the cooperative and different administrative costs and licensing fees is quite large.

If the consumer feels that a larger share of the regular coffee price than of the Fair Trade coffee price is received by the producer, than the "charity" part of Fair Trade coffee is not seen as efficient as before. The premiums received by the retailer of Fair Trade and regular coffee retail prices are also interesting to look at in order to have an idea of the profits the retailer makes on selling these products.

With this background information on the global coffee market, the Fair Trade criteria as well as aspects specific to Fair Trade retail, the following chapter will focus on the factors affecting the demand for Fair Trade coffee.

3. Demand for Fair Trade coffee

The demand for Fair Trade coffee in Finland has been increasing in recent years with for example a 17% increase from 2007 to 2008. However, Fair Trade coffee demand is still marginal, constituting an around 1.5% of the total coffee market (RKE, 2009a). According to a survey by the Association for Promoting Fair Trade in Finland (2007) 69% of the respondents stated to have purchased Fair Trade products.

Coffee is a heterogeneous good and thus also the demand for Fair Trade coffee depends on several variables (Maietta, 2004). In general it has been found that price, quality, convenience, flavour, blend and brand familiarity are often still the most important factors affecting purchasing decisions (Pelsmacker, Driesen and Rayp, 2005a). Factors affecting purchasing decisions are also the country of origin as well as ethical characteristics such as organic, shade-grown or Fair Trade certifications.

It can be argued that the utility consumers gain from consuming Fair Trade coffee is divided into two parts. The first is functional utility, which includes attributes such as taste, price and quality. The second part is the supplementary utility the consumer gains from purchasing a certain brand. Supplementary utility can also include the altruistic and “warm-glow” utility gained from consuming a product, which has positive effects on the quality of life of others. Furthermore, consumers might gain supplementary utility from the esteem they gain by buying Fair Trade products and this way signalling their ethical awareness.

The following analysis will focus on aspects that differ between the demand for conventional coffee and Fair Trade coffee. Therefore the study will not concentrate on factors such as taste, which can be expected to differ both between variants of conventional coffee as well as between Fair Trade coffee brands. After looking briefly into the demand for conventional coffee, this chapter will continue by examining different factors affecting the demand for Fair Trade coffee as well as some important economic characteristics related to Fair Trade coffee demand such as differentiation and bundling.

3.1. Demand for conventional coffee

Finns are one of the most eager coffee drinking populations in the world, consuming around 11kg of coffee per year per capita (ICO, 2005b). There is a large variety of coffee types available in the Finnish market and the overall quality of the coffee in Finland is among the highest in the world, although the specialty market remains quite small (Giovannucci, 2003). Perhaps due to the large volume of the markets, Finnish retail prices of regular coffee are among the lowest in the developed world, partly because coffee discounts are seen as a way for retailers to attract new customers. Another particular trait of the market is that Finns drink the most lightly roasted coffee in the world, which reduces the loss of green coffee in the roasting process and enables lower prices. Almost 97% of all coffee consumed in Finland is light roast. The instant coffee market makes only 1% of total sales. Most coffee is imported to Finland from Brazil, Colombia, Guatemala and Nicaragua.

In Finland, like in other traditional coffee-drinking countries, consumption seems to have reached a saturation point. Coffee per capita consumption has fallen in a number of countries despite the low price level characterising the market. Currently the changes in blends are the determining factor in changes in demand, rather than the fall in prices (ICO, 2005b). According to Edgerton, Assarsson & Hummelmose (1996) the share of Finnish consumers' budget that goes to all beverages (including soft drinks, hot drinks and alcoholic drinks) is around 27%, indicating that the share of hot beverages such as coffee has an even smaller share of total income. In the same study the demand for hot drinks in Nordic countries was shown to be inelastic.

The extent to which Fair Trade and regular coffee are substitutes depends on several issues such as taste and quality. Although promoters of Fair Trade coffee claim that it is a good substitute for conventional coffee, Kilian et al. (2006) argue that there is a limited number of ethical consumers willing to buy Fair Trade coffee because of its production standards, and that the majority of consumers pay much more attention to the price and taste of coffee.

When it comes to the quality of the coffee, there is similar variety among Fair Trade coffee types as among regular coffee. Some analysts consider that Fair Trade coffee belongs to the gourmet high quality market and thus might be a closer substitute to speciality coffees than regular coffee. Others claim that Fair Trade coffee cannot be associated directly with speciality coffee, since it also comes in a variety of qualities (ICO, 2005b; Richardson and Stähler, 2007). By paying attention to the coffee quality, taste and degree of roasting, one can find comparable pairs of Fair Trade and regular coffee.

3.2. “Fair” quality

Most mainstream economic theories are based on the concept that consumers act as a *homo oeconomicus* and aim to maximize their subjective utility. In choice situations, *homo oeconomicus* will choose the alternative that gives the maximum utility with lowest price (Murray & Raynolds, 2007). Therefore it seems irrational that a consumer would be prepared to pay more for the Fair Trade product than for a similar conventional substitute if product quality would be exactly similar (Steinrücken and Jaenichen, 2007).

An explanation for this is that consumers are increasingly interested about the conditions under which the goods are produced, although it might not have an effect on the regular quality of the product (Bird & Hughes, 1997). Becchetti and Huybrechts (2007) describe Fair Trade coffee as a product innovation, where the improvement of the production process increases the “fair” quality of the product. Ethically aware consumers, who prefer this type of products, will be willing to pay for the improved “fair” quality of the product. There might even be cases where conventional and Fair Trade coffees are originally from the same plantation, but only have been distributed in different ways.

As explained earlier, the functional utility of coffee includes for example the taste, price and quality of the product, whereas the supplementary utility can include the altruistic and warm-glow feeling, as well as the social reputation the consumer gains from buying Fair Trade products. Due to altruistic motives, even the Fair Trade producers’ utility can be included in the consumer’s utility function. When comparing conventional and Fair Trade coffee, the functional utility can be the same, but the supplementary utility is larger for the Fair Trade variant. Therefore, if the net utility (the sum of the functional utility and the supplementary utility) is the highest for Fair Trade coffee, and the supplementary utility exceeds the net price difference between the Fair Trade and the regular coffee, the product will be purchased.

The problem for the consumer is that even if the functional utility of the products is similar, the consumer cannot experience any difference in the supplementary utility, i.e. in the conditions under which the items are produced (Raynolds, Murray and Heller, 2007). The properties of a good that cannot be experienced when consuming the product are called credence properties. Since the process standards cannot be verified by examining the final product, certification systems are needed to verify the fulfilment of the criteria. Also retailers have started paying greater attention to the supplementary characteristics of coffee. While coffee has traditionally been purchased according to product standards such as the quality of the beans and the taste of brewed coffee, currently the negotiations also include a variety of process standards related to the "social" or "fair" quality of the product (Dankers & Liu, 2003). In conclusion, the "fair" quality of the product is an important factor affecting the demand of Fair Trade coffee and the most important trait differentiating it from conventional coffee.

3.3. Willingness to pay

It has been found in several surveys that consumers want to help other people, in this case the producers in the developing world, in an altruistic manner. Maseland and Vaal (2002) even argue that consumers feel obliged to pay prices above market levels for products that are produced under the Fair Trade criteria. Ottowitz (1997, as quoted in Steinrücken and Jaenichen, 2007) found that 74,8% of the purchasers of Fair Trade coffee argue that their decision is influenced by a wish to support the producers, and only for 6,5% the taste was the decisive factor to buy Fair Trade coffee. By linking a social aim with a product, it can be assumed that the willingness to pay increases among certain consumer groups.

The fact that Fair Trade products have been introduced to mainstream markets only a decade ago have limited the amount of research based on revealed purchasing decisions and on actual price elasticity of demand, since comparable and accurate data has not been available (Loureiro & Lotade, 2005). The only research found that actually tests revealed preferences by manipulating prices in shops is written by Arnot et al (2006). The reason why actual purchasing preference research is lacking might be the difficulty to find retailers that are willing to cooperate with research by changing prices.

Thus the current literature on socially responsible purchases as well as specific Fair Trade research relies heavily on hypothetical questionnaires and so called stated preferences on purchasing choices. There has been considerable critique against the reliability of stated preference studies or measurements of consumer's willingness to pay for Fair Trade products, since there is an attitude-behaviour gap between real or revealed action and the stated preferences (Galarraga & Markandya, 2004). Attitudes have in general been argued to be a poor predictor of actually buying behaviour (Pelsmacker, Driesen & Rayp, 2005). However, since most research relies on hypothetical questionnaires and willingness to pay-research, some of the most important findings will be summarized here. An interesting question to study would be to see what the correlation between willingness to pay and actual price elasticity of demand is.

Willingness to pay is a measurement of buying intention that can be seen as a realistic estimation for actual buying behaviour (Pelsmacker et al., 2005a). Loureiro and Lotade (2005) estimated the average willingness to pay (WTP) for Fair Trade, shade grown and organic coffee. According to their results, consumers were willing to pay on average a premium of 0,36€/kg (21,64 cents/pound[4]) over the original conventional coffee price for Fair Trade coffee. They argue that a reason for why consumers were willing to pay more for Fair Trade coffee than organic or shade grown coffee is the fact that in the survey many participants were concerned about the general working conditions in developing countries. Thus, altruism towards the producers can play an important role when evaluating Fair Trade purchasing behaviour.

Pelsmacker et al. (2005a) found that the average willingness to pay for Belgian consumers was 10% above the reference price (1,87€). However, the figure varied between different consumer groups, and can be seen in the table XX below. Around 10% of all consumers were willing to pay the actual premium (27%) of Belgian Fair Trade coffee.

The hedonistic price for Fair Trade coffee was estimated for the Italian market by Maietta (2004). The hedonistic price is used to explain the price of a differentiated product and to estimate the implicit shadow prices of its quality characteristics. The research showed that the coefficient on

[4] A rate of 1€=1,32$ was used.

the ethical content in a regression analysis was significant and also larger than the coefficients for packaging or brand of the coffee. Maietta estimated that the marginal value of the Fair Trade content in coffee consumption was 2,36€/kg. In addition, no differences between different areas in Italy remained after controlling for income. However, these results are not easily comparable to Finland, since the coffee markets are very different. A similar hedonistic price technique was used in a paper by Galarraga & Markandya (2004) on the UK coffee market. They estimated that prices for Fair Trade/environmental coffee labels are 11% higher than for regular substitutes. The results have been summarized in the table below.

Table 1 Summary of willingness to pay and hedonistic price estimates

Research	**Country**	**Method**	**Measure**	**Extra paid for Fair Trade coffee**
Loureiro & Lotade (2005)	Spain	Survey	Willingness to pay	0,36€/kg
Pelsmacker et al.	Belgium	Survey	Willingness to pay	10% or 1,87€
Maietta (2004)	Italy	Calculations	Hedonistic price	2,36€
Galarraga & Markandya (2004)	United Kingdom	Calculations	Hedonistic price	11%

Naturally these types of results can be affected by some type of “social desirability” bias where there is a tendency to give answers that are expected from you when responding to survey questions (Pelsmacker et al., 2005a; Loureiro & Lotade, 2005). Furthermore, respondents are not always willing to report their attitudes accurately in the case of socially sensitive issues such as ethical consumption behaviour (Pelsmacker et al., 2005a). In addition, these surveys can be biased because consumers taking the time to answer the questionnaires or surveys might be more sensitive to the issues than the ones choosing not to answer the questionnaires (Loureiro & Lotade, 2005).

Information on price differentials between fair trade and other coffee is useful but not the most important factor to look at, even for policy purposes. Much more useful information is data on the sensitivity of demand for fair trade coffee with respect to the prices of coffees, which is the aim of this thesis.

3.4. Consumer types

Consumers buying Fair Trade products do not represent the typical consumer population, but rather represent a set of special socio-economic factors. In general Fair Trade consumers are highly educated, wealthier, most often female, over 30-years old, cause-friendly individuals with sensitivity towards environmental issues and often employed in the public sector or in other “caring professions” (Grodnik & Conroy, 2007; Loureiro & Lotade, 2005). The Fair Trade buying consumer group is in general prepared to pay a price premium for products differentiated by higher quality, better taste, ethical values and freshness. It has also been found that older consumers are less likely to pay for Fair Trade products (Loureiro & Lotade, 2005). Consumers of Fair Trade products also attach more importance to altruism, equality, peace and an environmentally secure world (Pelsmacker et al., 2005a) than regular consumers. However, there exist studies which support an opposing view that for example gender does not influence ethical buying behaviour (Pelsmacker et al., 2005a).

In general, consumers can be divided into different groups of ethical consumers. For some consumers the ethical characteristics of a product might be valuable, while for others price may be a more important factor. Bird & Hughes (1997) divide customers into three groups. The first group, which supports high moral values and will pay a premium for charity alone can be called “social activists” (Becchetti and Huybrechts, 2007) or “ethical consumers” (Bird & Hughes, 1997). This group will trade off other product or brand benefits for the “feel good factor” or “warm-glow” of ethical products. The second group of consumers; the “semi ethical consumers” emphasise quality and brands. If they buy ethical goods, the “ethical” quality of the product is a bonus feature. Another feature of this group is that although they are sceptical about the ethical features of the products, they can be persuaded to purchase the good. The third, and last, group of consumers is more concerned about the price and traditional quality issues of the product, and seldom buys ethical goods (Bird and Hughes, 1997).

Pelsmacker et al. (2005a) divide Fair Trade consumers into four groups: Fair Trade lovers, Fair Trade likers, flavour lovers and brand lovers. Fair Trade lovers express a clear preference for the Fair Trade label, whereas Fair Trade likers show a relative balance between each attribute, but still favoured the Fair Trade label. In contrast, the flavour lovers barely noted other attributes than flavour, and brand lovers put relative importance on the brand of the coffee. In order for Fair Trade coffee to appeal to Fair Trade likers, the Fair Trade coffee should match the quality of regular brands. Out of the whole sample in the research, 11% were categorized as Fair Trade lovers. However, this share cannot be considered equivalent to actual market shares, since the amount of coffee that they buy relative to the total population is unknown.

The research by Arnot et al (2006) supports these types of groupings, since it found that the group consuming Fair Trade coffee, although relatively small, was not very responsive to price changes. This would confirm that the consumers base their purchasing decision on other factors than price. When the price of Fair Trade coffee was lowered, part of the largest group of regular coffee consumers switched to Fair Trade coffee. Demographics alone are insufficient to determine the ethical consumer, and much research has been done on the values of consumers more inclined to buy Fair Trade products (e.g. Pelsmacker et al., 2005b). However, this is beyond the scope of this research.

3.5. Sales location

Retail prices of products vary according to the area where the products are sold. There can be quite a large variety in prices between different shops even in a small area due to several reasons. Consumers are willing to pay more for products that are sold in a good location. Additionally some shops can gain local market power. In the research by Becchetti and Rosati (2007) it was found that the demand for Fair Trade products is negatively correlated with the geographical distance from the nearest shop. Customers who lived more than a 40 minute distance from the retail shop spent around half of those who lived within a 10 to 20 minute distance from the retail shop.

Logically, the prices of Fair Trade products should vary between different shops in a similar manner as the prices of regular products vary, unless there are some attributes that allow retailers to price them differently. The effect of location depends on whether consumers are mobile and shop at different locations, or whether they are regulars and buy everything in one location. If consumers are assumed to act rationally, they are prepared to pay extra for a convenient location both with regular as well as Fair Trade products.

It seems that the different consumer groups prefer purchasing their products at different locations. Empirical analyses find that customers buying from alternative trading organizations (ATOs) or "world shops" are more socio-politically aware, and value consumer education aspects. In contrast, supermarket consumers value more the distance to the shops as well as flexible opening hours. Thus ATOs and supermarkets can serve two very different groups of customers (Becchetti and Rosati, 2007). According to Becchetti and Huybrechts (2007) it has also been found that consumers who value price are more likely to purchase Fair Trade products from supermarkets. However, they also argue that due to economies of scale, supermarkets should be able to sell Fair Trade products at lower prices than ATOs.

3.6. Differentiation of conventional and Fair Trade coffee

To briefly describe the concept of differentiation, products are horizontally differentiated when a product is adapted to different consumer tastes and there are different varieties of the same product. This is the case when a product is provided for example in different colours. In contrast, if products are vertically differentiated, the products differ in terms of quality and all consumers agree that the higher quality product is better than the lower quality, although not all consumers are prepared to pay for the higher quality product. (Pepall, Richards & Norman, 2005). In the case of Fair Trade products, the product is differentiated already in the production process through the ethical production standards (Richardson and Stähler 2007).

This raises an interesting question; are Fair Trade products horizontally or vertically differentiated? On one hand it could be argued that Fair Trade products are horizontally differentiated substitutes to normal products. For example in the case of Fair Trade coffee, the consumer might see the Fair Trade label as a certain brand that regular coffee does not have. Especially when Fair Trade products are compared with other products with social labels, such as Rainforest Alliance, Utz Certified, Bird-Friendly coffee and organic labels, one might consider all of these as horizontally differentiated products (Grodnik & Conroy, 2007). On the other hand, the improved conditions under which the Fair Trade products are produced increase the "social" or "fair" quality of the product. This way, models with increased quality can be used to analyze Fair Trade products. Actually, there is an interesting example that might imply that Fair Trade products are indeed vertically differentiated. Consider the case where customers buy Fair Trade products and are in charge of weighing and pricing them in the shop, which happens with Fair Trade bananas and other fruits in Finnish supermarkets. Customers often choose Fair Trade products, but weigh them at the price of normal fruits. This would suggest that at least some Fair

Trade products are vertically differentiated, since customers prefer the Fair Trade products to the regular ones, but are not prepared to pay the higher price for them.

Another example that shows that Fair Trade products could indeed classify as vertical price differentiation is when a Finnish petrol station chain started serving only Fair Trade coffee in 2007. This implies that the chain did not find that selling both regular and Fair Trade coffee would enable reaching a larger group of consumer through horizontal differentiation. Rather it shows that through offering only Fair Trade coffee, the stations could encourage customers to buy only Fair Trade products. This could be an analogy to for example car sellers only selling models with airbags and not providing the cheaper option without additional safety features. It might well be that it is worthwhile to offer only Fair Trade product if selling only to wealthy and educated customers (Grodnik & Conroy, 2007). However, while this research was written, the chain of petrol stations returned to serving regular as well as Fair Trade coffee (Vihreä Lanka, 2009).

When considering the two different arguments, it could be argued that the evidence that Fair Trade products are more vertically than horizontally differentiated is more intuitive. However, there might be differences among different consumer groups. Generalizing, one might argue that high-income and highly educated consumers might see Fair Trade products as being of better quality, and thus treat them as vertically differentiated. However, low-income consumers might not be as sensitive to the “quality”-argument of Fair Trade products, and thus see them as substitutes to regular food products.

3.7. Product bundling

An important aspect that needs to be analyzed in Fair Trade coffee is bundling. Bundling, by definition, is the practice of selling two or more products as a single package containing a specific amount of each product. Richardson and Stähler (2007) suggest that Fair Trade products can be perceived as product bundles, where in addition to the actual product (e.g. coffee) a certain amount of charity is sold. To explain further, instead of a customer purchasing normal coffee and some other charity product, they can buy the bundle of the product, and continuously support some type of social cause. Nothing separates physically Fair Trade coffee from regular coffee. Instead, the invisible characteristics come with the producing and trading conditions (Becchetti and Adriani, 2002). The “fair” dimension of the product is an invisible, but very powerful attribute that differentiates the Fair Trade products from regular ones (Becchetti and Huybrechts, 2007).

Adams and Yellen (1976) argue that mixed bundling is at least as good for the seller as pure bundling, since gains from bundling arise from the ability to sort customers into groups with different reservation price characteristics, and hence to extract consumer surplus. In the Fair Trade case, if the product is examined as a bundle of a regular product such as coffee and some amount of charity, then selling these both separately[5] as well as in a bundle will extract all the different kinds of preferences in the market. It can be argued that for normal consumers Fair Trade products are an "easy" way to be an ethical consumer, and support a certain cause.

4. Price elasticity of demand of Fair Trade coffee

The price elasticity of demand of a good measures the responsiveness of demand to changes in its price. Price elasticity of demand for normal goods has a negative value, which means that a fall in prices encourages an increase in demand. The price elasticity of demand of Fair Trade coffee is significant in many aspects. On one hand, a low price elasticity of demand allows retailers to price discriminate between customers. On the other hand Maseland and de Vaal (2002) found in their research that the relative benefit of Fair Trade products to the producers depends on the price elasticity of demand of the product. If the demand is inelastic, producers will only suffer a small decrease in demand, even if the prices of coffee are higher. This means that the smaller the price elasticity of the demand for Fair Trade coffee, the greater will be the revenue gained from the sales of the product, even if coffee prices rise.

While the price elasticity of demand for conventional coffee is quite elastic (ICO, 2005b), there is consensus that demand for Fair Trade coffee is less price elastic in demand than that of conventional coffee (Hayes, 2008). From earlier research it has been found (Krishnamurthi and Raj, 1991) that demand for individual brands of regular coffee are very elastic from -1.0 to -14.8. However, Fair Trade coffee is separated from traditional coffee by its "fair" quality, and the fair quality bundled with a regular product makes consumers less respondent to price changes and thus the demand will be quite inelastic.

[5] Of course through another distribution channel, since retail shops seldom sell direct charity.

As stated earlier, there is little research with actual purchasing data that would measure the price elasticity of demand of coffee. In a Canadian paper Arnot, Boxall and Cash (2006) experimented with consumer purchasing behaviour by changing prices of both Fair Trade coffee and conventional coffee in a café. In order for the products to be as close substitutes as possible, the researcher made sure that the Colombian regular coffee and Nicaraguan Fair Trade coffee had similar flavour and aroma. The hypothetical bias was minimized by conducting the research in a shop where the shop-keeper allowed making actual price changes. It was found that students purchased Fair Trade coffee more often than staff (26.5% and 17% respectively) and females purchased Fair Trade coffee slightly more often than males (23% and 20% respectively). The main result was that increasing the price of the Fair Trade coffee had a significantly less of a negative effect on the probability of purchasing Fair Trade coffee than on other regular coffee varieties. This showed that buyers of Fair Trade coffee are less price responsive than buyers of regular coffee and the portion of purchasers switching away from the Fair Trade product is quite low if price increases. This was supported by the observations of the café personnel, who confirmed that there is a segment of consumers who are loyal purchasers of Fair Trade coffee.

The conclusions of the research by Arnot et al. are that ethical attributes have a large influence on consumers who buy Fair Trade coffee. This group of consumers is mainly driven by the will to consume socially responsible products, and motivated by price only secondarily. The demonstration of low sensitivity to price suggests that the market premiums identified by stated preference studies do indeed exist and are not merely artefacts of hypothetical settings. Arnot et al. showed that the price elasticity of demand for Fair Trade coffee is close to zero, it would imply that the retailer can increase revenues by increasing the price of Fair Trade coffee. It should be recalled that the focus of the study was on brewed coffee, where the share of the coffee beans of the total price of the coffee cup is quite small. Therefore it could be argued that the price elasticity of demand for brewed Fair Trade coffee is even smaller than for Fair Trade coffee beans.

The research by Becchetti and Rosati (2007) found that the price elasticity of demand for Fair Trade products in general is less than unit income elastic. A limitation of the study is that as it concentrates only on Fair Trade consumers, it has an inbuilt selection bias which excludes all consumers not buying Fair Trade products from the sample. In addition, the price elasticity of demand between different Fair Trade products can vary significantly, and thus the price elasticity of demand of coffee must be measured separately.

Contrary to other papers, in a research by Galarraga and Markandya (2004), the price elasticity of demand for Fair Trade coffee was found to be more elastic than that of regular coffee. This contradicting result compared to other research is justified by the fact that Fair Trade coffee is a new good in the market, and there are only few brands available. Thus if the prices of both Fair Trade and regular coffee rise, the authors expect much more substitution within regular coffee brands and less towards Fair Trade coffee, while there is less room for substitution within the Fair Trade brands. Secondly, they argue that it might take time before the demand for Fair Trade coffee is fully established. Although generally the demand for "green" products is inelastic due to consumers wanting to buy only "green products", Galarraga and Markandya (2004) argue that there is a "fashion" component that explains greater elasticity among some consumers. Therefore, if the number of consumers buying based on fashion is greater than the number of consumers buying out of concern for "green" issues, then the aggregate demand could be elastic. All in all, the authors agree that the price elasticity of demand might become inelastic in the medium or long term as the number of Fair Trade coffee brands increase.

A low price elasticity of demand can lead to price premiums. According to Wathieu and Bertini (2007) price premiums can be interpreted as either discriminating factors for less-price-sensitive consumers, a credible signal of the value of intangible benefits, a mechanism for consumers wealth signalling or a signal for product quality. The concept of quality has already been addressed in earlier sections, and so issues of price discrimination as well as consumer signalling will be dealt with in the sections that follow.

4.1. Price discrimination

Retailers find Fair Trade labelling useful, since with the help of it, customers reveal hidden preferences and differences in their willingness to pay. Hence consumers can be divided into different segments according to their different demands as described in the previous section. The ones with more elastic demand will pay less than consumers facing a smaller price elasticity of demand. If suppliers have sufficient market power they can demand different prices for an almost identical product from consumers.

The Fair Trade market seems to fit into the definition of third degree price discrimination. The retailers can recognize that there are different customer segments, but cannot identify different consumer groups from each other. Furthermore, they do not have information about the demand functions of the consumers. As different consumers show a willingness to pay different prices for a product, which is relatively homogeneous with respect to its functional utility, retailers of Fair Trade products can discriminate products by adding a “fairness” quality to the product through improved social standards in the production, thus collecting higher prices for products that are more fairly produced. Price discrimination might be more common in stores with generally high price level since the customer base is in general more active in charity than customers in other stores (Haaparanta, 2007a).

As Pepall et al. (2005) argued, consumers with low elasticity of demand should be charged a higher price than consumers for whom the elasticity of demand is relatively high. This seems to be the case also with Fair Trade products. Although the Fair Trade market is not a monopoly, according to Harford (2006) as well as Haaparanta (2007a) there can be seen some signs of price discrimination. This is further enforced by the idea that buying Fair Trade products is considered an ethical action, and thus pricing Fair Trade products higher can be seen as legitimate, which in turn decreases the price elasticity of demand even more (Haaparanta 2007a). Previous research by Wathieu and Bertini (2007) actually suggests that retailers should practise moderate over-pricing with products such as Fair Trade coffee, in order to encourage consumers to think about the personal relevance of the offered benefit.

A factor that greatly affects the possibility for retailers to price discriminate Fair Trade products is the information asymmetry created by the Fair Trade label. Consumers are given information on the social standards that the production of Fair Trade products should meet, but trust is required from the consumer side for the system to work (Becchetti and Huybrechts, 2007). This is especially because Fair Trade products are not “experience goods”, where by consuming the product several times the consumer could gain more information about the socially responsible dimension. Although the aim of Fair Trade licensing is that all production can be guaranteed to fulfil the Fair Trade criteria, customers cannot be completely sure that the extra margin that they pay for Fair Trade products completely benefits producers in developing countries. Thus there is incomplete information in the market, and retailers can benefit from this situation.

4.2. Profits in the Fair Trade retail industry

One of the most controversial aspects of the mainstreaming of Fair Trade products to supermarkets has been retail pricing and profits. As Fair Trade regulations prevent the Fair Trade Labelling Organization (FLO) or other Fair Trade promoting associations from intervening in the market, there is no maximum level on the retail prices charged from consumers. In addition to premiums, retailers are interested in positive publicity as well as the possibility to increase market share with Fair Trade products and seek growth in an otherwise quite stagnant market (Grodnik & Conroy, 2007).

In general, the retail price of Fair Trade coffee is higher than that of conventional coffee due to the higher costs of securing certain social standards, including above-market producer prices and a social premium (Nicholls and Opal, 2005). However, there has been some ambiguity whether the price premium of Fair Trade certified coffee covers the higher costs of the certified beans or even allows for higher profits (Giovannucci, 2003). Since the trade channels for Fair Trade products and regular products are the same, one could assume that both products would be priced in a similar manner (Haaparanta, 2007a). Nicholls and Opal (2005) argue that in general, the price differential between Fair Trade and non-Fair Trade goods are consistent within local markets. They feel that the reason for large price differences between conventional and Fair Trade products are due to the concentration and maturity of retail markets for non-Fair Trade products, rather than exploitative retailers. They conclude by predicting that if there are attractive premiums in the retail of Fair Trade markets, these should be driven down by the introduction of new retailers of Fair Trade products, and supermarkets own brands of Fair Trade coffee.

Figure 4 Coffee prices along the trade channels in USA and Europe

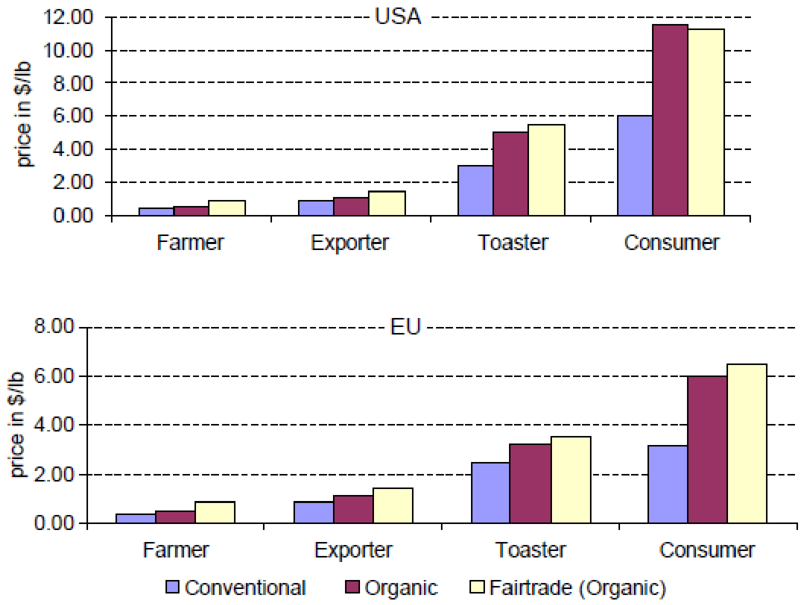


Chart 7. Coffee prices along the trade channels. Source: CIMS, 2004 and ICO, 2004.

Source: Kilian et al. 2006, p. 329

As can be seen from the chart above, in the case of coffee, the prices along the trade channel differ after the roaster level between EU and the USA. Both wholesale and consumer prices are higher in the US than in Europe. There is a clear price difference between conventional and organic or Fair Trade coffee of around $1/pound, and at the consumer level the prices are often twice conventional coffee. In their research, Kilian et al. (2006) found that retail prices of Fair Trade coffee in the USA were even $10 per pound over the price of conventional coffee.

Stecklow and White (2004) from the *Wall Street Journal* investigated the composition of retail prices in supermarkets in the UK and USA and provided strong evidence that some retailers were exploiting the ethically aware consumers' willingness to pay more for Fair Trade products. They found for example that a certain chain of bookstores were charging $4 extra per pound for organic Fair Trade coffee compared to organic non-Fair Trade. Out of that extra four dollars paid by the consumers, only 15% or $0.61 ended up in the producers hands.

It seems that the possibility to price discriminate customers is even larger when selling brewed coffee. Harford (2006) found in London that a coffee bar charged £0.10 more for a cup of Fair Trade coffee than for a regular cup of brewed coffee. However, he argued that the price of green Fair Trade coffee should be two or three times the market price of raw coffee before it added noticeable costs to producing one cup of coffee. After investigating how large a part of the retail price went to the Guatemalan farmers, Harford found that farmers were paid a premium between £0.40 and £0.55 per pound of coffee. Since a typical cup of coffee only uses a quarter-ounce of coffee beans, the cost increase per cup caused by using Fair Trade coffee should be less than £0.01. Thus over 90% of the price of the cup went to other middlemen than the producer of the coffee.

Different researchers have found that retailers ask for a higher margin in the case of Fair Trade products. The explanation cannot be only additional costs, but taking advantage of favourable market conditions. However, Kilian et al. (2006) argue that as the Fair Trade market matures, retail prices should fall as has been seen in Europe where the Fair Trade products have been on the market longer. Still, by overpricing the products, the retailers can risk the benefits of the whole Fair Trade concept. Currently, the largest benefit of Fair Trade is for the participants further on the supply chain, and fewer benefits can be seen for the producers in the beginning of the channel, although that is where the benefits are aimed.

These types of higher mark-up levels for Fair Trade products than for regular products might not be such a problem, if the Fair Trade movement really works as effectively as it is argued. If the case is that the higher mark-up levels attract retailers to widen their selection of Fair Trade products, and the Fair Trade concept becomes more popular, this can hopefully empower an even greater share of producers in the developing countries.

However, Haaparanta (2007a) raises the question that if Fair Trade products are priced higher only due to the fact that consumers can be exposed to price discrimination, is it fair that consumers believe they are purchasing products that benefit producers in developing countries by the price difference between regular products and the Fair Trade versions? If, on one hand, consumers gain more utility from consuming Fair Trade products the more expensive the product is, then it could be argued that the higher pricing is fair. In addition, it should be remembered that some of the price difference is collected in taxes, and can in this way benefit the society in general. Consumers might also buy Fair Trade products for less altruistic reasons, since by buying

Fair Trade products they give a signal that they are ethically aware consumers. This again can lead to Fair Trade being a "fashion-movement", where consumers no longer question the effectiveness of Fair Trade, but consume it in order to increase their own well-being and image (Haaparanta 2007a). Indeed, Richardson and Stähler (2007) found this non-altruistic, so called "warm-glow" effect a crucial one in the whole rise of the Fair Trade movement. They argue that there would be no Fair Trade, without this "warm-glow" effect.

On the other hand, Haaparanta argues that this type of high pricing is especially unfair, if consumers would have been willing to support developing countries through some other aid form with the amount of the price difference between regular and Fair Trade products, but substitute other charity forms for Fair Trade believing they support developing countries through their purchases. This claim can be supported with a study by Bird & Hughes (1997) where over half of the ethical consumers stated that they would prefer to buy Fair Trade products than to give money to charity. Since part of the price difference is retail profits, the actual sum delivered to developing countries is smaller than donating the total price difference and purchasing conventional coffee. This diminishes the amount of normal development aid, which is unfair, if it would have been a more effective development tool.[6]

5. Charity and social theories with Fair Trade

The charity component of Fair Trade coffee has been discussed on several occasions in this research, as it is a significant character affecting consumers' purchasing decisions. This chapter will go through some general theories on charitable giving and social behaviour, in order to analyze Fair Trade consumption with the help of them. In the case of Fair Trade coffee, only a small part of the price is transferred to charity, and thus most consumers are mainly concerned about the coffee they buy. However, standard economic theory finds it hard to explain unselfish behaviour, such as donating hard earned income to the benefit of complete strangers, even if the donations are as small as in the case of Fair Trade coffee.

The consumers' willingness to pay for the public good of charity can depend on several reasons. Part of the motivation can be altruism; the want to support local communities and

[6] This again is a question of endless debate, to which there is no explicit answer.

production with fair returns to the producers. The willingness to pay can also increase from the desire to show a commitment to social and environmental responsibility to friends and acquaintances. Alternatively Fair Trade can be seen as an "ideological constraint" analogous to budget constraints (Maseland & Vaal, 2002). In this case the preferences are not part of a utility function, but have to rather be weighed against such constraints. However, the majority of current literature follows an approach where Fair Trade consumption is included in the utility function, and this is the approach taken in the following section.

This section will start by dealing with Fair Trade as a form of charity, and then continue in the second part with applications of pure altruism theory. In the third part the "warm-glow" or feel-good component of giving will be included. The final part of this chapter will concentrate on the effect of gaining esteem by purchasing Fair Trade products.

5.1. Fair Trade as a form of charity

Fair Trade coffee attracts ethically aware consumers who are willing to pay a premium on the coffee price in order to support low-income producers. The Fair Trade premium can be considered as a transfer from the consumer to the producer, and thus this part of the mark-up is a charitable donation (Booth and Whetstone, 2007). As noted earlier, Fair Trade coffee can be considered as a mixed bundle between coffee and a contribution to a social cause, as alternatively consumers could buy regular coffee and contribute the price difference to some other social cause (Steinrücken and Jaenichen, 2007).

There are several reasons why consumers might prefer to buy Fair Trade products rather than support traditional charity foundations. The cost of contributing to the social cause is quite small, and contributions are made in small parts. It has been found that in this type of "low-cost situation" ethical and moral behaviour is more likely to occur (Kirchgässner 1992). Consumers might feel that by channelling their charity through Fair Trade rather than more traditional development cooperation, they build a more "personal" relationship with the recipient of the donation (Booth and Whetstone, 2007). As the Fair Trade Labelling Organizations International (FLO) takes care of certifying the products and supervising that all Fair Trade criteria is fulfilled, the consumer does not have to spend much time collecting information about the efficiency of the aid. In addition, the consumer transaction costs can decrease by combining the act of purchasing coffee and making a donation, instead of buying coffee and charity separately.

Consumers often want to support entrepreneurship instead of traditional development aid that can make aid recipients more passive. In a study by Bird & Hughes (1997) over half of the ethical consumers stated that they would prefer to buy Fair Trade products than to give money to charity. Furthermore, many feel that Fair Trade is also a more transparent and efficient form of aid, with less administrative costs than in traditional development aid. Becchetti and Huybrechts (2007) even go as far to argue that the Fair Trade model generates higher social transfers to developing countries than would be the case if governments in the developed world would optimize the amount of development aid. Thus according to them, Fair Trade can be seen as a market substitute for global governance.

However, Fair Trade has not been proven to be more "ethical" or efficient than any other type of charity, and traditional forms can be argued to be aimed at beneficiaries who are poorer than coffee farmers. In addition, according to Nicholls and Opal (2005) administrative costs are a higher part of the donation through Fair Trade than through traditional aid organizations. While Fair Trade can be seen as a "fresh" form of supporting developing countries, and might attract new donors with a new form of charity, it cannot be argued to be fairer to buy regular coffee and give some share of your income to traditional charity (Booth and Whetstone, 2007).

5.2. Pure altruism-theory

This chapter will concentrate on pure altruism-theory and its links with Fair Trade. Altruism can be defined as a motivation to help others or a want to do good without reward, and should be separated from a feeling of duty or other moral obligation to help others (Malkavaara and Yeung, 2007). However, altruism does not necessarily mean that the donor has to sacrifice something for one's own part in order to help others. In economic terms, a pure altruist is a person who is concerned about other people's utility and respects their preferences (Jones-Lee, 1991) and maximizes a utility function that includes the well-being of others or the whole society. This is opposed to selfishness, where one's own needs and preferences are placed above the needs and desires of others. However, these two motives do not exclude each other and acts of charity are often a combination of the two.

In the case of Fair Trade, donors are in the developed countries, and beneficiaries in the developing world. It is therefore quite unlikely that donors are motivated by reasons such as desiring more of the service provided by the charity or so called enlightened self-interest, i.e. expecting that one day the donor itself might need the services it is donating to. A likely reason for giving is therefore pure altruism such as fairness and inequity aversion, where the donor gains utility from the welfare of others. The consumers see Fair Trade producers as an enlargement of the reference group when exhibiting social preferences (Becchetti & Rosati, 2007).

The mathematical models for altruistic giving are strongly based on the work of Andreoni (1990, 2006b) and can be described as follows. The simplest model assumes that the public charity good does not receive government support and thus only individuals provide the good with the help of voluntary donations. Individuals allocate their income between private consumption and the charity good. The consumers maximize their utility and it is assumed that they care to some extent about the well-being of the ones who the donation is aimed at.

Here it is assumed that there are $i = 1, \ldots, n$ individuals in the economy, and each individual *i*, has income *I*, which is allocated between consumption of private good x_i and public good *G*. The individual's donation to the public good is g_i, and this sums up in the economy to

$$G = \sum_{i=1}^{n} g_i$$

For simplicity, it can be assumed that the public good can be produced from the private good with a simple linear technology and both goods are expressed in the same units. Then the individual's optimization problem is such that

(1)

$$\max_{x,g} u(x_i, G)$$

$$\text{s.t.} \quad x_i + g_i = I_i$$

$$G = \sum_{i=1}^{n} g_i$$

$$g_i \geq 0$$

The model can be solved assuming Nash equilibrium where individuals behave as Nash utility maximizes (Andreoni, 1988). In this case, each person *i* takes the gifts of others, in other words the public good paid by others, (G_{-i}) as given. G_{-i} is equal to the total contribution of all individuals except person *i* and

$$G_{-i} = \sum_{i \neq j} g_i = G - g_i$$

To understand how consumers make decisions and how the individual decisions depend on the decisions of others one typically focuses on the Nash equilibrium. To derive the Nash equilibrium it is assumed that each individual *i* treats the contribution of others G_{-i} as independent from their own contribution g_i when maximizing their utility in (1). This means that each individual is acting as if they are increasing the charitable good from G_{-i} to their own optimal level *G* or the individual chooses to give a zero gift ($G = G_{-i}$). This can be shown by adding G_{-i} to both sides of the budget constraint in (1) and to the constraint $g_i \geq 0$. Therefore the maximization problem can be rewritten as follows:

(2)

$$\max_{x,g} u(x_i, G)$$

$$\text{s.t.} \qquad x_i + G = m_i + G_{-i}$$

$$G \geq G_{-i}$$

To find the solution, first solve (2) by ignoring the inequality constraint $G \geq G_{-i}$. Then, find a solution to (2) from setting the marginal rate of substitution equal to unity, which means

$$\frac{\partial u_i / \partial G}{\partial u_i / \partial x_i} = 1$$

Solving this, individual supply equations $G = f_i\ (I_i + G_{-i}\ )$ or equivalently
$g_i = f_i\ (I_i + G_{-i}\ ) - G_{-i}$. are found.

This shows an important implication of the public goods models. Under pure altruism each individual acts as though their “social income” plus the value of her social environment which is the sum of a person's own income and the monetary value to her of the characteristics of others were $I_i + G_{-i}$ (Andreoni, 2006). This formulation implies that pure altruists treat giving by others G_{-i} as perfect substitutes for personal income I_i (Andreoni, 1989).

Since it can be assumed that people can only give positive amounts to the public good, the individual supply function can be written as

(3) $$g_i = \max\{\ f_i\,(I_i + G_{-i}) - G_{-i}\,,\ 0\}$$

Finally, one can assume that both public and private goods are normal goods, which means that there exists a α such that $0 < f_i \leq \alpha < 1$ for all i in the set of givers. This assumption guarantees that there exists a unique Nash equilibrium. The definition and proof of the existence of Nash equilibrium are as follows. A Nash equilibrium is a partition of the set of individuals into a set of givers S and of non-givers S', such that for all i 2 S, $f_i\,(I_i + G_{-i}) - G_{-i} \geq 0$, and for all j that are a part of set S', $g_i = 0$ and $f_i\,(I_i + G_{-i}) - G_{-i} > 0$ (Andreoni, 2006). It can be shown that a Nash equilibrium will exists and be unique when assuming normal goods, it is defined as a vector of gifts

$$(g_1^*, g_2^*, \ldots, g_n^*)$$

such that the supply function in (3) maps this vector into itself.

In the case of Fair Trade, the private donation g_i and the public donation G_i could be modelled as follows. The term g_i describes the private donation made by customer i when buying Fair Trade products. G_i again presents the total of the private donations in a certain country, i.e. the total of Fair Trade social premium in Finland. This can be formally represented as:

$$g_i = \theta(p_F - p_C)x_F$$

$$G = \sum_{i=1}^{n} g_i = \sum_{i=1}^{n} \theta(p_F - p_C)x_F$$

where

p_F= price for Fair Trade coffee

p_C = price for conventional coffee

θ = the share of the price difference between Fair Trade and conventional coffee that consumers believe is transferred to the Fair Trade producer

x_F = demand for Fair Trade coffee and

x_C = demand for regular coffee.

It will be assumed that the general information available on Fair Trade has unified the perception of the share of the price difference between Fair Trade and conventional coffee that consumers believe is transferred to the Fair Trade producer and thus theta is assumed to be the same for all consumers. These will be treated in more detail when modelling the Fair Trade demand function.

When analyzing the part of Fair Trade products that is charity, it can be argued that consumers buy the product in order to increase the wellbeing of the producers of coffee. The charity part of Fair Trade coffee is a public good, and thus some consumers might opt out of buying Fair Trade coffee, since they are free riders and trust that producers will be better off due to other consumers buying Fair Trade products (Andreoni, 2006). When donating out of purely altruistic reasons, the donor is concerned with the total supply of the charitable good. If buying of Fair Trade products would be based on completely altruistic motives, the prediction would be that less consumers would buy Fair Trade products the more popular the idea becomes, since the possibility to free ride increases. Thus the model based on purely altruistic behaviour does not describe the demand for Fair Trade products very well.

Andreoni continues developing his formal model by analyzing the crowding out mechanisms of private donations with government taxes and subsidies. However, for the purposes of analyzing the charity component of Fair Trade coffee, this brief analysis of pure altruism theory explains enough about the basic concepts of theory of giving, and the theory will now be further explored by adding “warm-glow” components in the following section.

5.3. “Warm-glow”-theory

The previous model assumed that individuals are indifferent between the sources of the donation and thus treat donations made by themselves and by others as perfect substitutes.

However, it can be argued that people care for other aspects than their private consumption and the total supply of the public good (Andreoni, 2006). This can be seen when the increase of public donations does not crowd out private donations. Thus it can be argued that warm-glow is an important motive for giving.

Andreoni (1990) claims that donations to charity are not based only on purely altruistic means, but the givers experience internal satisfaction, so called warm-glow from the act of giving. Briefly defined "warm-glow" is the utility one gets from the act of giving without any concern for the interests of others (Andreoni, 2006). Consumers with warm-glow included in their preferences buy Fair Trade products, not for pure altruism, but to increase their own utility (Becchetti and Huybrechts, 2007). Therefore, consumers are not indifferent to who is the giver, but prefer that the donation comes from them. This would imply that giving causes private benefit that is unique to the person who makes the donation. Thus individuals do not see donations by themselves and donations by others as perfect substitutes. (Vesterlund, 2006.)

When buying Fair Trade coffee, consumers gain an emotional or psychological return, receive self-identity reinforcement, avoid guilt or satisfy their values. These are not only related to neighbours or colleagues, but to distant producers, which shows a widening of the group which the consumer takes into account in his/her choice (Becchetti and Huybrechts, 2007). The seeking of this type of "warm-glow" should be included in individual consumers' utility functions, since it is crucial in decision making when it comes to donations.

While earlier research acknowledges the existence of this type of "warm-glow", it has not been taken into account in preferences. Also utility functions have been modelled to depend only on private consumption and the total supply of the public good, and not on the individual donations. However, Andreoni (1990) asserts that "pure altruism" models lack predictive power, and thus introduces a general model of the standard public goods model that includes both altruistic and impurely altruistic motives for giving.

The model, called the model of warm-glow giving, describes real world data much better than the model for pure altruism. In the model individuals care not only about the total supply of the public good, but also about their own contribution. In this model giving due to pure altruism and due to "warm-glow" are complements. Individuals act as if there is some private goods benefit from the act of giving. The warm-glow is introduced by adding the individual's donation to the utility function. Individuals are endowed with wealth I_i that can be allocated between the private good x_i, and their gift to the public good g_i , As in the model for purely altruistic behaviour, it is assumed that the private good can be converted to the public good by a linear technology. Thus individuals optimize between consumption of a private placed in the utility function so that $u_i = u_i (x_i \; G, g_i)$. Now g_i enters the utility function twice, as part of the public good and as a private good, since donations have qualities of both the public and private type. This is especially the case, when Fair Trade products are concidered, since it is a bundle of a public and private good.

Below the individual's optimization problem is shown:

(4)
$$\max_{x,g,G} u(x_i, G, g_i)$$
$$\text{s.t.} \quad x_i + g_i = I_i$$
$$G = G_{-i} + g_i$$

From here two special cases can be derived; one where the consumer has purely altruistic preferences $u_i = e_i (x_i , G_i)$ and consumption depends purely on private consumption and the total supply of the public good. The extreme case is when the individual is purely egoistic, and has utility $u_i = u_i (x_i , g_i)$ and cares only about warm-glow and nothing about the public good. It is quite reasonable to expect that preferences are a combination of both altruism and egoism.

As in the purely altruistic case, G_{-i} can be treated exogenously under Nash assumption. The optimization problem can now be written so that the individual is choosing G rather than g:

(5)
$$\max_{x_i, g_i, G} u\,(x_i , G, G- G_{-i})$$
$$\text{s.t.} \quad x_i + G= I_i + G_{-i}$$

By solving the above equation it is found that the individual donation function depends on social income, but also on the separate argument for G_{-i} resulting from the new argument of the utility function:

(6) $$g_i = f_i\,(I_i + G_{-i},\, G_{-i}) - G_{-i}.$$

The first argument of (6) comes from the altruism argument in the utility function, which is the so called public goods argument. The second argument comes from the private goods dimension of the utility function. Let f_{ia} be the derivative with respect to the public goods dimension. If both charity and the private good are normal, then $0 < f_{ia} < 1$. Then, let f_{ie} be the derivative with respect to the private goods dimension, or the egoism argument. If G_{-i} is reduced by one dollar, but simultaneously increased I_i by one unit so that the value of the argument remains unchanged, then when assuming that both warm glow and the private good are normal, some of the new income I_i will go towards increasing consumption of each. The result is that G will fall, and thus $f_{ie} > 0$. Under these conditions, there exists a Nash equilibrium. If it is assumed that $0 < f_{ia} + f_{ie} \leq 1$ then it can be shown that the Nash equilibrium is unique and stable.

Taking the derivative of this function with respect to G_{-i} gives

(7)

$$\frac{\partial g_i}{\partial G_{-i}} = f_{ia} + f_{ie} - 1 = -(1 - f_{ia}) + f_{ie}$$

This formulation shows the primary difference between purely altruistic and warm-glow models of giving. With no warm-glow pure altruists treat giving by others G_{-i} as perfect substitute for one's own giving, and will reduce giving when other increase is. This is highlighted by $-(1 - f_{ia})$ in (7). However, with warm-glow the donations of others are imperfect substitutes for one's own giving. Thus with warm-glow a person does not want to reduce his own contribution in response to increased donations by others. This is highlighted by f_{ie} above. Therefore, if a person is impurely altruistic and experiences warm-glow in addition to altruistic tendencies, there will be some stickiness to giving and people are no longer indifferent to the source of the donation. They will prefer the bundle with the most warm-glow. At the other extreme with pure egoism people only care about warm-glow and changes in the contributions of others has no effect on giving. In that case

$$\frac{\partial g_i}{\partial G_{-i}} = 0$$

and $f_{ia} + f_{ie} = 1$.

As in the case of the pure altruism model, the implications of the warm-glow model on crowding out of private donations will be disregarded, and one can continue by considering the effect of esteem on donations.

5.4. Esteem

A third aspect that needs consideration when analyzing the charity component of Fair Trade products is esteem. People are sometimes motivated by a desire to win prestige, respect, friendship and other social and psychological objectives. In addition to receiving social status or praise, individuals might be motivated to charitable action in order to avoid negative feedback or guilt. Consumers are thus motivated by impure altruism other than “warm-glow” such as esteem or prestige, respect and even friendship.

Esteem can be a very powerful motivator. If someone is positively esteemed, it is probable that his or her actions with other people will be easier, and smoother, and this will lead to better economic and other success. However, the actions of esteem are not as straightforward as those of for example trust, since esteem cannot be explicitly traded. If you actively seek esteem, you will not be esteemed. The exchange of esteem might work if we are able to conceal that we are waiting for something in return. However, if the active search for esteem forces one to make more socially conscious choices or be more considerate towards others, it might not be considered as self-centred action. (Brennan and Petit, 2004.)

One important factor affecting the demand of esteem is that it is more important to be esteemed by people who make a difference in your economic actions or life (e.g. friends, trading partners, employers, clients) than people you do not interact with. However, the larger the group in which you are esteemed, the better chances you have to increase your utility.

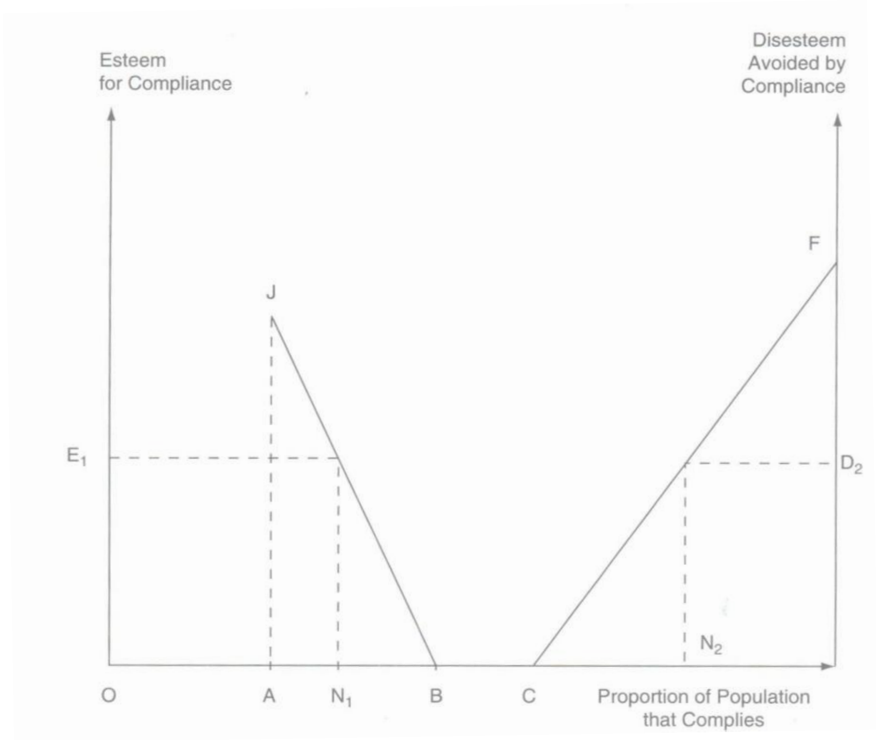
A further important aspect of esteem is information cascades. These are situations where if I think well of you, my friends think well of you, and the impression passes on to other people who think well of you because their friends think well of you. In this case, it becomes irrelevant what the original esteemed action was, as long as everyone trusts the impressions of others.

All of the aspects considered above can have an effect on the demand for Fair Trade coffee. In the case of purchasing Fair Trade products, esteem models can be limited to ones where either you gain esteem buy purchasing Fair Trade products, or you can cause disesteem by not purchasing them. However, no difference will be made in the case of esteem on how much of the product will be purchased, but the situation will rather be analyzed as an on/off situation (Brennan & Pettit, 2004), rather than a situation where the degree of action will be considered (such as the case with for example esteem from acting courageously or playing the piano well, where there is a difference in how courageously one has acted or how well one plays the piano). Although purchasing a Fair Trade product in order to increase one's own esteem is quite selfish, it should be included in the utility function.

Brennan and Pettit (2004) provide a model of esteem which takes into account the relation between the number of persons complying with a given ideal, and the esteem-based incentive associated with compliance. The esteem-based incentive either gives positive esteem based on complying or a level of disesteem avoided by compliance. Once a certain practice, the purchasing of Fair Trade coffee, is established, positive esteem will be gained when the number of compliers is relatively low. When the number of compliers increases, the amount of esteem that is associated with compliance will fall. Once the level of compliance reaches a certain threshold level, there will be disesteem for non-compliance, and the level of disesteem that is attached to non-compliance increases as the number of complying people increase. This can be seen graphically in figure 5 below.

On the horizontal axis there is proportion n of the population that complies with the ideal, in the case of purchasing Fair Trade products. On the left vertical axis the amount of esteem that each complier enjoys for various levels of n is depicted, and similarly on the right vertical axis the amount of disesteem each complier avoids (or each non-complier suffers) for various levels of n. Here it is assumed that compliance is an on-off matter. If one complies, one enjoys the esteem attached to the compliance and if one does not comply, one vice versa suffers the disesteem associated. This seems reasonable in the case of purchasing Fair Trade products. It seems that it is sufficient to buy some Fair Trade products in order to be esteemed, although it might be the case that esteem grows as the amount of Fair Trade products purchased increases. Within the range from 0 to A, there is virtually no compliance, and the behavioural practice has not yet been registered as an ideal. The range A to B the practice becomes established as an ideal, and there is positive esteem associated with compliance, but no disesteem is associated with non-compliance. The line JB indicates that esteem is positive but declining as the proportion of the population that comply increases.

Figure 5 The relation between esteem, disesteem and the proportion of population that complies with a certain ideal



Source: Brennan & Pettit, 2004, p. 239

For example, if the number of compliers is N_1, an amount of esteem given E_1 can be given to all those who comply. As the proportion of the population that complies increases to point B, the esteem that can be achieved by compliance disappears. At B compliance is common enough to be unremarkable and therefore no esteem is attached to compliance. In the final range from C to 100 per cent, disesteem is attached to non-compliance although no esteem is available for compliance. In this range most consumers comply with the ideal and non-compliance is distinctive. The disesteem attached to non-compliance increases as the number of compliers increases. For example, when the level of compliance is at N1, the disesteem avoided by compliance is D2, whereas at F the level of disesteem reaches its maximum since everyone complies.

In the figure there is a range between B and C where neither esteem nor disesteem accrues. However, it may be that no such range exists. The function JBCF indicates the esteem incentive associated with compliance at all possible compliance level. Therefore it can be thought to represent a demand curve for compliance where esteem is the currency of reward paid by observers. Brennan and Pettit's model describes well the basic model of the exchange of esteem. Keeping this background in mind, this study will continue to find a way to model esteem in the consumer's utility function.

A further aspect of esteem with the purchase of Fair Trade products is that consumption of Fair Trade products at workplaces, cafés or such might give more esteem to the consumers, than regular consumption at home. At home the esteem is not as large, due to the group who can notice the consumption (Grodnik & Conroy, 2007). It might be that for the consumption at home, the warm-glow effect is larger.

Harbaugh (1998) presents a model where donors get utility from both esteem/prestige and warm-glow. This is quite suitable for Fair Trade products, since the consumers can signal the purchases of Fair Trade coffee and the consumers can benefit from buying Fair Trade coffee instead of regular coffee by gaining respect from people, who recognize that buying Fair Trade products is ethical. Thus the consumer gains utility both from the knowledge of donating to a preferred cause as well as the respect of others by acting as a socially conscious citizen.

If x is the amount of private good demanded, e is esteem or prestige and g[7] is warm-glow, the donor optimizes the following utility:

$$\max U = u(x, e, g)$$

[7] Harbaugh uses originally *d* to notate warm-glow, but the notation has been changed here in order to keep it consistent between models.

The donor faces the budget constraint $I = x + qg$, where I is income and q is the after-tax price of giving. Harbaugh assumes that esteem is equal to the publicly reported amount of the donation, and for simplicity that $q = 1$. Substituting the budget constraint into the utility function gives:

$$U = u(I\text{-}g, e, g) \text{ or } U = V(e, g; I).$$

An important part of Harbaugh's model is the impact of reporting of donors on the amount of donations. However, in this model, it will not be included, since although people can observe whether others buy Fair Trade products or not, the sum is quite small compared to theories considering much larger donations.

Becker and Murphy (2000) also introduced social capital in the utility function

$$U=u(x, y; S)$$

where x and y are goods of all kinds and the variable S stands for the social influences on utility through "social capital". The social capital S can bee used as a proxy for the esteem e in Harbaugh's model. Contrary to the usual approach where social norms are considered external to the utility function, in this case a change in social capital does not shift the utility curve, but raise or lower the level of utility instead. In this model it is assumed that x and social capital S are complements, so that an increase in S raises the marginal utility from x even if the increase in social capital itself lowers utility. This type of complementary nature between S and x means that an increase in S causes a rise in demand for x. For example, a consumer would be more likely to buy Fair Trade products, if his friends, colleagues or family buy Fair Trade products. In this case, very strong complementarity will not be taken into consideration since this would leave practically no room for individual choice. This is not very realistic in the case of purchasing Fair Trade products.

Becker and Murphy (2000) continue the model by assuming that each person takes S as exogenous to his own choices, although the collective choices by everyone may have an impact in determining S. The utility function will be maximized subject to a given value $S= S_0$ and the budget constraint will be

$p_x x + y = I$

where y is a numeraire and I represents income. The usual assumptions about quasi-concavity of the utility function were made. From the first-order maximizing conditions below it is implied that an exogenous increase in S raises the demand for x if it raises the marginal utility of x relative to the (price) adjusted marginal utility of relative to the (price) adjusted marginal utility of y.

$$\frac{\partial x}{\partial S} = \frac{p_x U_{yS} - U_{xS}}{D > 0} \quad \text{if}$$

$$U_{xS} > p_x U_{yS}$$

The model is further developed by assuming that social capital equals the aggregate consumption of a good by members of the same social group. Furthermore, the group is assumed to be sufficiently large that changes in the consumption of that good by other members have a negligible effect on the social capital stock and therefore on the behaviour of other members.

In a general form, the stock S equals the average of the x's chosen by all members of the same social group:

$$S = X = \frac{1}{N} \sum x^j$$

where the sum is over j belonging to the group G and where N is assumed to be large enough so that changes in any x hardly affects S. A member of group G chooses x by maximizing his utility subject to his personal budget constraint and to a given value of S given by the previous equation.

The result is a demand function for each x:

$$x^j = d^j(e^j, p, S = X)$$

where j=1, 2, …, N. The variable e is an idiosyncratic one that affects j alone, such as her income or other demographic factors, p is a variable that is common to all members of the group, such as the price of x, and X is the level of social capital assumed by j in choosing her optimal x. By summing over all the x*'s* the equilibrium level of X can be solved:

$$X = \sum \frac{d^j(e^j, p, X)}{N} = \sum \frac{x^i}{N}$$

Taking the total derivative of the equation one finds:

$$\frac{dS}{dp} = \frac{dX}{dp} = \frac{\sum dx^i / dp}{N} = \frac{\sum \partial x^i / \partial p}{N} + \frac{\sum (\partial x^i / \partial S)/(dS/dp)}{N}$$

or

$$\frac{dS}{dp} = \frac{\frac{1}{N}\sum \partial x^y / \partial p}{1 - m}$$

where

$$m = (1/N)\sum (\partial x^j / \partial S) > 0$$

The numerator is simply the average change of individual demands and it can be small if complementarities with social capital are strong. However, complementarity between social capital and the demand for goods magnifies the aggregate effect of changes in variables that affect all members of the group. If each member for example increases her demand for x that will stimulate the demands of other members by a small amount because of the groups' complementarity. This is why the numerator is divided by 1-m, a term less than one.

6. Modelling the price elasticity of demand of Fair Trade coffee in Finland

This chapter will analyze how factors like altruism, warm-glow, esteem as well as prices affect the price elasticity of demand of Fair Trade coffee. First there will be a brief overview on existing utility-functions for Fair Trade coffee, and then the chapter continues with a new model for Fair Trade price elasticity.

In modelling Fair Trade demand Richardson and Stähler (2007) use a quasi-linear utility-function. They insert both high and low quality coffee separately in the demand function. However, in their case the low quality coffee is described as instant coffee, so it is quite safe to use only one quality of coffee when modelling the Finnish market, because of the low consumption of instant coffee. They also introduce a warm-glow factor, which depends on the wage paid to Fair Trade producers. A similar estimate is the one, where θ describes the share of the price difference between Fair Trade and conventional coffee that can be assumed to go to the Fair Trade producers. Richardson and Stähler's model can be described as:

$$U = u\,(x_C, x_F) + g$$ [8]

Where, x_C denotes consumption of the low quality commodity, x_F denotes consumption of the high quality commodity produced by the Fair Trade firm, and g is a numeraire for the consumption of "warm glow".

Also LeClair (2002) includes the indirect utility function of the Fair Trade producer in the consumer's utility function. Formalizing,

$$u(x, x_F, \mathrm{W}\,(p_F, (\mathrm{c}+a)\,\mathrm{x_F}))$$
$$\text{s.t. } \mathrm{I} = Px + (1 + a)\,x_F,$$ [9]

where M is income, x = a vector of consumption goods, $\mathrm{x_F}$ is the quantity of the Fair Trade good, W is the indirect utility function of the Fair Trade producer, c is the mark-up over cost on the traditional market and a is the mark-up for the Fair Trade product. P is the vector of prices for consumption goods.

8 Richardson and Stähler's original notation was U = u(X, Y, z) + Q, where X denotes consumption of the low quality commodity, Y(z) denotes consumption of the high quality commodity produced by the Fair Trade firm, and Q is a numeraire for the consumption of "warm glow".

9 LeClair's original notation is u(x, z, W (Pf, (c+a) z)) s.t. M = PX + (1 + a) z, where M is income, x = a vector of consumption goods, z is the quantity of the fairly traded good, W is the indirect utility function of the Fair Trade producer, c is the mark-up over cost on the traditional market and a is the mark-up for the Fair Trade product. P is the vector of prices for consumption goods.

In this model the marginal utility of consuming the Fair Trade product is equal to both the direct impact of increased consumption and the indirect impact through the producer's indirect utility function. This increase in incremental utility, representing a shift in demand, permits the charging of a higher price for the Fair Trade product. As long as consumers receive utility through goodwill or a sense that they have helped improve the living conditions of subsistence producers, marginal utility of consumption will be higher. As a result of its higher incremental utility, demand for the Fair Trade product will rise; permitting producers to both sell more and receive higher prices.

Becchetti and Adriani (2002) describe the Fair Trade consumers' utility function as follows.

$$U= u(x_F, \mathrm{g}, \mathrm{h}, \alpha)=(\mathrm{gh})^{\alpha}\, x_F^{(1-\alpha)}$$ [10]

where x_F is the quantity of the Fair Trade good, g is a qualitative variable taking value 1 if the good is considered "fair" and otherwise less than 1 and h is a variable taking value 1 if the good is produced in the North and θ if produced in the South. The h variable takes into account the national components of altruism in the preferences. Thus low α individuals receive utility mainly from the quantity consumed, whereas high α consumers gain utility mainly from product fairness. This model differs from the previous ones in the sense that rather than introducing a separate altruism term in the utility function, the altruism is revealed from the term α.

The utility-functions described above provide a good overview of the different ways of modelling utilities in the case of Fair Trade coffee. However, the articles where these models are presented do not proceed to formulate a demand model, but rather use the utility functions to formulate production functions and examine the world coffee market equilibriums. Thus taking these models into account, a new model for the price elasticity of demand of Fair Trade coffee will now be formulated.

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[10] Again, in order to simplify notation between different models, Becchetti and Adriani's original notation has been modified. The original model was U= u(q, g, h, α)=(gh)α(1-α), where q is the quantity of the Fair Trade good, g is a qualitative variable taking value 1 if the good is considered "fair" and otherwise less than 1. h again is a variable taking value 1 if the good is produced in the North and *theta* if produced in the South.

6.1. The price elasticity of demand-models

The aim of this section is to formulate a mathematical model for the price elasticity of demand of Fair Trade coffee. In these models, the price as well as the consumption of both regular and Fair Trade coffee will be taken into account. The first model will concentrate on the warm-glow gained from buying Fair Trade products which depends on the price difference between Fair Trade and regular coffee, while the second model will be formulated with pure altruism as a motivator. The third model will include esteem as part of the utility function. The utility of Fair-trade coffee can be divided into four parts; the utility of consuming the product itself (coffee), the utility of giving a gift, the utility from the public good of giving money to charity as well as the utility of gaining esteem by buying Fair Trade products.

These models were initially formulated by using a Cobb-Douglas as a proxy for the form of the utility function, as in the case of Becchetti and Adriani (2002). However, the model was not very successful, since due to the properties of the Cobb-Douglas function, the incentive to buy Fair Trade coffee $\theta(p_F - p_C)$ disappeared from the objective function, and was therefore not very useful as a model for investigating the factors affecting the price elasticity of demand of Fair Trade coffee.

Consider the following utility functions:

1) The case of warm-glow giving (Andreoni, 1990), where the quasi-linear utility-function can be formalized as

$$U = u(x_i, g_i) + y$$

where *g* describes the warm-glow the consumer feels by purchasing Fair Trade coffee:

$$g_i = \theta(p_F - p_C)x_{F_i}$$

2) The purely altruistic case (Andreoni, 1990), where the quasi-linear utility-function can be formalized as

$$U = u(x_i, G) + y$$

where *G* describes the public charity good given by the consumers in a certain country. In this case it will be the sum of all the donations *g* made by the Fair Trade consumers through purchases of Fair Trade coffee:

$$G = \sum_i g_i = \sum_i \theta(p_F - p_C)x_{F_i}$$

3) The case with esteem, where the quasi-linear utility-function can be formalized as

$$U = u(x_i, e) + y$$

where *e* describes the esteem gained by an individual by purchasing Fair Trade products. The esteem is proportional to the average consumption of Fair Trade products in the society:

$$e = \frac{1}{n}G = \frac{1}{n}\sum_i \theta(p_F - p_C)x_{F_i}$$

In all of the utility functions x_i is the sum of the consumption of Fair Trade (x_F) and conventional coffee (x_C):

$$x_i = x_{F_i} + x_{C_i}$$

Conventional coffee and Fair Trade coffee are similar in all other characteristics except the "fair quality" of the coffee, and are thus assumed to have the same roast, taste, brand etc. Furthermore p_F- p_C describes the difference between Fair Trade price (p_F) and regular coffee price (p_C), and θ describes the share of the price difference that is given as the Fair Trade premium (charity).

As can be seen in appendices 1, 2 and 3, the utility functions are maximized subject to a budget constraint, and then formulate the first order conditions into logarithmic difference equations. By simplifying the equations with some specific notation, two equations are found for all three cases, which can be solved for price elasticities with the help of the Cramer rule. For complete derivation, please see appendices 1-3.

The share of the price difference compared to the price of Fair Trade coffee is noted as

$$\frac{p_F}{(p_F - p_C)} = \frac{1}{\rho_F}$$

$$\frac{p_F}{(p_F - p_C)} - \frac{p_C}{(p_F - p_C)} = \frac{1}{\rho_F} + \left(1 - \frac{1}{\rho_F}\right)$$

the shares of total coffee sales as

$$\frac{x_C}{(x_C + x_F)} = \gamma_C$$

$$\frac{x_F}{(x_C + x_F)} = \gamma_F = (1 - \gamma_C)$$

and changes in consumption as

$$\frac{dx_C}{x_C} = \hat{x}_C$$

Also the following notation is given for second derivatives:

$$\frac{\partial^2 u}{\partial x^2} \frac{(x_C + x_F)}{u_x} = \varepsilon_{U_X}$$

$$\frac{\partial^2 u}{\partial x^2} \frac{\theta(p_F - p_C)x_F}{u_x} = \frac{\partial^2 u}{\partial x^2} \frac{g}{u_x} = \varepsilon_{U_g}$$

$$\frac{\partial^2 u}{\partial x \partial g} \frac{(x_C + x_F)}{u_g} = \varepsilon_{U_{gX}}$$

and

$$\frac{\partial^2 u}{\partial g^2} \frac{\theta(p_F - p_C)x_F}{u_g} = \frac{\partial^2 u}{\partial g^2} \frac{g}{u_g} = \varepsilon_{U_{gg}}$$

The results from this derivation are the price elasticities of demand for both regular and Fair Trade coffee for the models with warm-glow, pure altruism and esteem. It is important to look carefully at these elasticities in order to analyze what factors affect the size and sign of the terms. Due to the quasi-concave form of the utility function that the determinant, i.e. the denominator is positive for all of the equations (1-4). Some of the epsilon terms above are positive and some negative due to the decreasing marginal utility. More specifically the terms below are negative

$$\varepsilon_{U_X} < 0$$
$$\varepsilon_{U_g} < 0$$
$$\varepsilon_{U_{XX}} < 0$$
$$\varepsilon_{U_{gg}} < 0$$

and $\varepsilon_{U_{gX}}$ can be either positive or negative depending if the fair quality is a complement for drinking coffee or a substitute for it. In other words it depends on if the Fair Trade quality increases the marginal benefit of drinking coffee or makes it lower. If these two features are not related, then $\varepsilon_{U_{gX}} = 0$

Also recalling that the terms:

$$0 < \gamma_C < 1$$
$$0 < \rho_F < 1$$

Now each elasticity equation will be studied individually. If the price elasticity of demand equations for Fair Trade coffee for all these three models are compared, it can be seen that the elasticities for the warm-glow and esteem models are exactly the same due to the formulation of the esteem-factor. Thus it does not make a difference which one of them is picked

The price elasticity of demand of regular coffee for the warm-glow and esteem model

(1)

$$\frac{\hat{x}_{C|\hat{p}_C}}{\hat{p}_C} = \frac{(1-\gamma_C)\left(3-\rho_F-\frac{1}{\rho_F}\right)\varepsilon_{U_X} + \left(2-\rho_F-\frac{1}{\rho_F}\right)\varepsilon_{U_g} + \left[1-(1-\gamma_C)\rho_F\right]\varepsilon_{U_{gX}}}{(\rho_F-1)\left[\gamma_C^2\varepsilon_{U_X}\varepsilon_{U_g} - \varepsilon_{U_X}\varepsilon_{U_{gg}} + \gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}} - \gamma_C^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]} +$$
$$\frac{(1-\rho_F)\varepsilon_{U_{gg}} - (1-\gamma_C)\left(2-\rho_F-\frac{1}{\rho_F}\right)\varepsilon_{U_g}\varepsilon_{U_{gX}} + \left[2-(1-\gamma_C)\left(\rho_F+\frac{1}{\rho_F}\right)\right]\varepsilon_{U_X}\varepsilon_{U_{gg}}}{(\rho_F-1)\left[\gamma_C^2\varepsilon_{U_X}\varepsilon_{U_g} - \varepsilon_{U_X}\varepsilon_{U_{gg}} + \gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}} - \gamma_C^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}$$

As mentioned earlier, the denominator is positive. All of the epsilon terms are negative, except ε_{gX}, which will be assumed to be 0 since the demand for the fair quality is assumed to be independent of the demand for coffee.

The term

$$3-\rho_F-\frac{1}{\rho_F}$$

is an inverted U-function with respect to rho. Thus the partial derivatives are

$$\frac{\partial\left(3-\rho_F-\frac{1}{\rho_F}\right)}{\partial\rho_F}=-1+\frac{1}{\rho^2{}_F}=0$$

when

$$\rho_F=1$$

and

$$\frac{\partial^2\left(3-\rho_F-\frac{1}{\rho_F}\right)}{\partial\rho^2{}_F}=-\frac{2}{\rho^3{}_F}<0$$

Thus the function is maximized when rho is one, and then the value of the function is

$$3-\rho_F-\frac{1}{\rho_F}=1$$

Also recall that

$$\rho_F=\frac{(p_F-p_C)}{p_F}$$

From this it can be deduced that if the price difference is very small, i.e. rho is close to 0 (or smaller than approx. 0,382), the function will be negative, and otherwise it will be positive. In the case in question, it is difficult to say whether the price difference is small or large, since it depends on which Fair Trade coffee and conventional coffee is compared. If some expensive conventional coffee, for example a dark-roasted speciality coffee is compared with a similar brand of Fair Trade coffee, then the price difference is small and rho is close to zero. However, if an expensive Fair Trade coffee is compared with a popular, cheap conventional coffee brand, then the price difference can be large, and rho would be close to one. However, based on the data provided from a Finnish retail chain presented in the following section (Table 2), it will be assumed that price difference between a Fair Trade coffee and its conventional substitute will be small enough for rho to be closer to 0, and thus the function above will be negative.

Looking at the other inverted-U formed function of rho and repeating the same procedure as above it can be seen that the function

$$2-\rho_F-\frac{1}{\rho_F}$$

is always non-positive, i.e. it gets the value 0 when rho=1 and is otherwise negative.

In addition, the term gamma

$$\gamma_C=\frac{x_C}{(x_F+x_C)}$$

will be quite close to one, since in Finland the share of conventional coffee of the total market is close to 99%.

By keeping in mind these findings, the numerator of equation (1) can be analyzed. The first term will be positive since the inverted-U-function is negative (price difference small) and the epsilon term is negative. The second term will be positive, since both the inverted-U-term and the epsilon term are negative. The third and fifth terms will be 0 due to the term ε_{gX} being 0. In turn, the fourth term will be negative, while the sixth term will be positive. Thus there will be one negative term and three positive terms, which makes it more probable that the nominator is positive, but difficult to conclude the size of the epsilon terms is not known. Thus is difficult to deduce whether the demand is elastic or inelastic without knowing the size of the epsilons.

The price elasticity of demand of Fair Trade coffee for the warm-glow and esteem model

(2)

$$\frac{\hat{x}_{F|\hat{p}_F}}{\hat{p}_F}=\frac{\gamma_C\left[\left(2-\frac{1}{\rho_F}\right)\varepsilon_{U_X}-\left(1-\frac{1}{\rho_F}\right)\varepsilon_{U_g}\varepsilon_{U_{gX}}+\left(1-\frac{1}{\rho_F}\right)\varepsilon_{U_X}\varepsilon_{U_{gg}}\right]}{(\rho_F-1)\left[\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_g}-\varepsilon_{U_X}\varepsilon_{U_{gg}}+\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}-\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}$$

Equation (2) can be analyzed based on the assumptions gamma is close to one, and rho is small, since the price difference based on data presented in the following section is small. The first term will be positive since price difference is small and the sign of epsilon is negative.

The second term again will be zero due to ε_{gX} being zero. The third term will be negative independent of the price difference since rho must be between 0 and 1 and thus all three variables are negative. Thus it can be concluded that the nominator can be either positive or negative depending on the sizes of the epsilon terms. Since the denominator is positive, the price elasticity of demand of Fair Trade coffee is negative in the case of the nominator being negative, and positive if the nominator is positive. Assuming that sizes of epsilon would cause the nominator to be negative would support the hypothesis that the own price elasticity of demand for Fair Trade coffee is negative. However, it cannot be completely verified with the information at hand.

The price elasticity of demand of regular coffee for the purely altruistic model

(3)

$$\frac{\hat{x}_{C|\hat{p}_C}}{\hat{p}_C}=\frac{\left(1+(1-\gamma_C)\rho_F-(1-\gamma_C)\frac{1}{\rho_F}\right)\varepsilon_{U_X}-\left(1-\rho_F+\frac{1}{\rho_F}\right)\varepsilon_{U_G}+(n-\rho_F)\varepsilon_{U_{GG}}+(n-\rho_F)\gamma_C\varepsilon_{U_{GX}}}{(\rho_F-1)\gamma_C n\left[\varepsilon_{U_X}\varepsilon_{U_{GG}}-(1+\gamma_C)\varepsilon_{U_X}\varepsilon_{U_{GX}}-(1-\gamma_C)\varepsilon_{U_G}\varepsilon_{U_{GX}}\right]}+$$

$$\frac{(1+n)\left(-\frac{1}{\rho_F}-1\right)n\varepsilon_{U_G}\varepsilon_{U_{GG}}+\left(2-\rho_F-\frac{1}{\rho_F}\right)\gamma_C n\varepsilon_{U_G}\varepsilon_{U_{GX}}+(\gamma_C-1)\left(\frac{1}{\rho_F}n-\rho_F\right)\varepsilon_{U_X}\varepsilon_{U_{GX}}}{(\rho_F-1)\gamma_C n\left[\varepsilon_{U_X}\varepsilon_{U_{GG}}-(1+\gamma_C)\varepsilon_{U_X}\varepsilon_{U_{GX}}-(1-\gamma_C)\varepsilon_{U_G}\varepsilon_{U_{GX}}\right]}$$

In this equation the sign of the first term is ambiguous and depend on the size of rho and gamma. Even with the assumption that that rho is closer to 0 and gamma is closer to 1, as assumed in earlier cases, it depends strongly on the exact sizes of the variables whether the term is positive or negative. The second term is positive since the term in brackets is positive, and the epsilon term is negative. The sign of the third term will be negative since

$n > \rho_F$

and the sign of epsilon is negative. The fourth term is 0 since it is assumed that the epsilon term is 0. The fifth and sixth terms are negative, due to the assumption that rho is closer to 0 and both of the epsilon terms are negative. The last term is also 0, since the last epsilon term is assumed to be zero. In this case it seems that the nominator is negative, but it still can depend on the exact sizes of the epsilon terms.

When looking at the denominator of equation (3) it can be found that all of the terms inside the brackets will be positive. The whole sum of the terms within the bracket needs to be negative, since the factors

$(\rho_F - 1)\gamma_C n < 0$

are negative and the denominator needs to be positive. This is because utility functions take a quasi-concave form and the determinant of this type of functions is positive. Therefore the nominator would need to be negative in order for the whole price elasticity of demand to be negative. However, the size of the elasticity equation cannot be deduced, since the sizes of the epsilon terms are not known.

The price elasticity of demand of Fair Trade coffee for the purely altruistic model

(4)

$$\frac{\hat{x}_{F|\hat{p}_F}}{\hat{p}_F} = \frac{\left(1-\frac{1}{\rho_F}\right)\varepsilon_{U_X} - 2\frac{1}{\rho_F}\varepsilon_{U_X}\varepsilon_{U_G} + \left(1-\frac{1}{\rho_F}\right)n\varepsilon_{U_G}\varepsilon_{U_{GX}} + \left(1-\frac{1}{\rho_F}\right)n\varepsilon_{U_X}\varepsilon_{U_{GG}}}{(\rho_F - 1)n\left[\varepsilon_{U_X}\varepsilon_{U_{GG}} - (1+\gamma_C)\varepsilon_{U_X}\varepsilon_{U_{GX}} - (1-\gamma_C)\varepsilon_{U_G}\varepsilon_{U_{GX}}\right]}$$

Here the case of the denominator is the same as with equation (3), and thus the same analysis applies here. In order to determine the sign of the nominator, the sign of all terms will be analyzed. Since rho is assumed to be between 0 and 1, but closer to 0, the first term has two negative factors and will thus be positive. The second term will be negative, while the third term will be 0 since the last epsilon term is assumed to be zero. The last term is negative since all three factors are negative. Thus one term is positive and two are negative, but the sign of the nominator again depends on the sizes of the epsilons. However, in order for the elasticity of demand to be negative in line with the hypothesis, the nominator would need to be negative, since the denominator is positive. However, it cannot be deduced whether the demand is elastic or inelastic.

In conclusion, the sign of the price elasticity of demand of Fair Trade coffee (2) depends on the sizes of the epsilon terms, which are unknown. It is important to notice that the price elasticity is highly dependent on rho, i.e. share of the price difference between Fair Trade coffee and regular coffee compared to the price of Fair Trade coffee. This is in line with the initial hypothesis. The elasticity also depends on the share of Fair Trade purchases compared to total coffee purchases. The effect of the share of charity given through Fair Trade θ is unclear, since the term is hidden within the second derivatives described with the notation epsilon. Comparing the elasticities of Fair Trade (2) and regular coffee (1) in the altruistic and esteem case is difficult due to the complexity of the nominator of (1).

Also, the sign of the price elasticity of demand of Fair Trade coffee (4) depends on the sizes of the epsilon terms, although it seems to be negative. Similarly to equation (2), the price elasticity of demand for Fair Trade coffee in equation (4) is highly dependent on rho, i.e. share of the price difference between Fair Trade coffee and regular coffee compared to the price of Fair Trade coffee. This is in line with the initial hypothesis. Note that in the case of purely altruistic preferences, the nominator of (3) and (4) depends on *n*, the number of consumers. Similarly to the previous elasticity-pair, comparing (3) and (4) is difficult due to the complexity of the nominator of (3). The cross price elasticity of demand between Fair Trade coffee and regular coffee was derived as a side product. The cross price elasticity is not the focus of this paper but it would be an interesting topic for further research.

Since the earlier analysis of the price elasticity of demand equations did not give any straightforward results, the utility functions will be analyzed in another manner. The quasi-linear utility function used in modelling the price elasticity of demand has the following special features when the Fair Trade and conventional coffee are similar in the consumption of the coffee itself.

In the case of warm-glow, the utility function is:

$$U = u(x_i, g) + y = u[(x_C + x_F), \theta(p_F - p_C)x_F] + y$$

and the first order conditions (FOC) are

$$\frac{\partial u}{\partial x}[(x_C + x_F), \theta(p_F - p_C)x_F] = p_C$$

and

$$\frac{\partial u}{\partial x}[(x_C + x_F), \theta(p_F - p_C)x_F] + \frac{\partial u}{\partial g}[(x_C + x_F), \theta(p_F - p_C)x_F]\theta(p_F - p_C) = p_F$$

When the first equation is inserted into the second one, it gets the following form:

$$p_C + \frac{\partial u}{\partial g}[(x_C + x_F), \theta(p_F - p_C)x_F]\theta(p_F - p_C) = p_F$$

which is the same as

$$\frac{\partial u}{\partial g}[(x_C + x_F), \theta(p_F - p_C)x_F] = \frac{1}{\theta}$$

This means that the consumer's purchasing choice can be divided into two parts. The first one examines how much the consumer consumes coffee in total, and how much positive warm-glow he demands. The second part looks at how the consumption of coffee is divided between the different coffee types. The equations can be written in the form

$$\frac{\partial u}{\partial x} = u_x = p_C$$

$$\frac{\partial u}{\partial g} = u_g = \frac{1}{\theta}$$

Using the Cramer's rule one can solve the following matrix equation:

$$\begin{bmatrix} u_{xx} & u_{xg} \\ u_{xg} & u_{gg} \end{bmatrix} \begin{bmatrix} dx \\ dg \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \end{bmatrix} dp_C + \begin{bmatrix} 0 \\ 1 \end{bmatrix} d\left(\frac{1}{\theta}\right)$$

Assuming that the utility function is concave, the determinant of the matrix on the left is positive, and will be denoted by D. Now:

$$\frac{dx}{dp_C} = \frac{u_{gg}}{D} < 0$$

$$\frac{dx}{d\left(\frac{1}{\theta}\right)} = -\frac{u_{xg}}{D} < 0 \quad \text{or} \quad \frac{dx}{d\left(\frac{1}{\theta}\right)} = -\frac{u_{xg}}{D} > 0$$

$$\frac{dg}{dp_C} = -\frac{u_{xg}}{D} < 0 \quad \text{or} \quad \frac{dg}{dp_C} = -\frac{u_{xg}}{D} > 0$$

$$\frac{dg}{d\left(\frac{1}{\theta}\right)} = \frac{u_{xx}}{D} < 0$$

The last result shows that the larger the part of the price difference theta that is assumed to benefit the producers of Fair Trade coffee, the more demand there is for warm-glow.

Since

$$g = \theta(p_F - p_C)$$

the demand for Fair Trade coffee will be

$$x_F = \frac{g\left(p_C, \frac{1}{\theta}\right)}{\theta(p_F - p_C)}$$

From the equation it can be seen that a rise in the price of Fair Trade coffee will reduce the demand. The rise in the price of conventional coffee p_C can either increase of decrease the demand for Fair Trade coffee. The increase in demand for Fair Trade coffee is caused by the relation between the prices of the coffee in the total amount of warm-glow gained. Explaining further, increasing warm-glow, when the difference between the prices diminishes, is only possible by increasing the demand for Fair Trade coffee.

The price of conventional coffee also affects the demand of warm-glow. If warm-glow and coffee are complements in the wellbeing of consumers, i.e. $u_{gX} > 0$, then the rise in the price of coffee decreases the demand for warm-glow. Then the total effect on the demand for Fair Trade coffee is ambiguous. If they are substitutes the demand for Fair Trade coffee will increase. Also the effect of the variable theta on the demand for Fair Trade coffee is unclear.

The demand for regular coffee is now:

$$x_C = x\left(p_C, \frac{1}{\theta}\right) - x_F = x\left(p_C, \frac{1}{\theta}\right) - \frac{g\left(p_C, \frac{1}{\theta}\right)}{\theta(p_F - p_C)}$$

From this equation it can be seen that the effect of Fair Trade coffee on the price elasticity of demand of regular coffee is ambiguous. Interestingly the rise of the price of Fair Trade coffee increases the demand for Fair Trade coffee. This is due to the effect that with a higher level of Fair Trade coffee prices it is easier to achieve warm-glow.

The same will be repeated for the case of pure altruism. Here the utility function is of the form:

$$U = u(x_i, G) + y = u\left[(x_C + x_F), \sum_i \theta(p_F - p_C)x_F\right] + y$$

and the first order conditions (FOC) are

$$\frac{\partial u}{\partial x}\left[(x_C + x_F), \theta(p_F - p_C)nx_F\right] = p_C$$

and

$$\frac{\partial u}{\partial x}\left[(x_C + x_F), \theta(p_F - p_C)nx_F\right] + \frac{\partial u}{\partial G}\left[(x_C + x_F), \theta(p_F - p_C)nx_F\right]\theta(p_F - p_C) = p_F$$

(see appendix 2 for detailed derivation).

When the first equation is inserted into the second one, it gets the following form:

$$p_C + \frac{\partial u}{\partial G}\left[(x_C + x_F), \theta(p_F - p_C)nx_F\right]\theta(p_F - p_C) = p_F$$

which is the same as

$$\frac{\partial u}{\partial G}\left[(x_C + x_F), \theta(p_F - p_C)nx_F\right] = \frac{1}{\theta}$$

This means that the consumer's purchasing choice can be divided into two parts. The first part examines how much the consumer consumes coffee in total, and how much of the public good G the consumer demands. In the second part it looks at how the consumption of coffee is divided between the different coffee types. The equations can be written in the form

$$\frac{\partial u}{\partial x} = u_x = p_C$$

$$\frac{\partial u}{\partial G} = u_G = \frac{1}{\theta}$$

which is similar to the earlier case.

Using the Cramer's rule one can solve the following matrix equation:

$$\begin{bmatrix} u_{xx} & u_{xG} \\ u_{xG} & u_{GG} \end{bmatrix} \begin{bmatrix} dx \\ dG \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \end{bmatrix} dp_C + \begin{bmatrix} 0 \\ 1 \end{bmatrix} d\left(\frac{1}{\theta}\right)$$

Assuming that the utility function is concave, the determinant of the matrix on the left is positive, and will be denoted by D. Now:

$$\frac{dx}{dp_C} = \frac{u_{GG}}{D} < 0$$

$$\frac{dx}{d\left(\frac{1}{\theta}\right)} = -\frac{u_{xG}}{D} < 0 \quad \text{or} \quad \frac{dx}{d\left(\frac{1}{\theta}\right)} = -\frac{u_{xG}}{D} > 0$$

$$\frac{dG}{dp_C} = -\frac{u_{xG}}{D} < 0 \quad \text{or} \quad \frac{dG}{dp_C} = -\frac{u_{xG}}{D} > 0$$

$$\frac{dG}{d\left(\frac{1}{\theta}\right)} = \frac{u_{xx}}{D} < 0$$

The last result shows that the larger part of the price difference theta is assumed to benefit the producers of Fair Trade coffee, the more demand there is for the charity good G.

Since

$$G = \theta(p_F - p_C)nx_F$$

the demand for Fair Trade coffee will be

$$x_F = \frac{G\left(p_C, \frac{1}{\theta}\right)}{\theta(p_F - p_C)n}$$

From the equation it can be seen that a raise in the price of Fair Trade coffee will reduce the demand. The rise in the price of conventional coffee p_C can either increase of decrease the demand for Fair Trade coffee. The increase in demand for Fair Trade coffee is due to the relation between the prices of the coffee in the total amount of public good *G* gained. Increasing the consumption of good *G* when the difference between the prices diminishes is only possible by increasing the demand for Fair Trade coffee.

The price of conventional coffee also affects the demand of public good *G*. If *G* and coffee are complements in the utility of consumers, i.e. $u_{GX} > 0$, then the rise in the price of coffee decreases the demand for *G*. Then the total effect on the demand for Fair Trade coffee is ambiguous. If they are substitutes the demand for Fair Trade coffee will increase. Also the effect of the variable theta on the demand for Fair Trade coffee is unclear. An increase in the number of people *n* consuming public good *G* will decrease the demand for Fair Trade coffee, since the consumers feel that there is enough of the public good, and there is no need for them to purchase it.

The demand for regular coffee is now:

$$x_C = x\left(p_C, \frac{1}{\theta}\right) - x_F = x\left(p_C, \frac{1}{\theta}\right) - \frac{G\left(p_C, \frac{1}{\theta}\right)}{\theta(p_F - p_C)n}$$

From this equation it can be seen that the impact of introducing Fair Trade coffee on the market on the price elasticity of demand of conventional coffee is ambiguous. Interestingly the rise of the price of Fair Trade coffee increases the demand for conventional coffee. This is due to the effect that with a higher level of Fair Trade coffee prices it is easier to achieve public good *G*. The effect of theta is unclear, while an increase in the number of consumers *n* would lead to an increase in the demand for conventional coffee.

Now the case for coffee demand with esteem will be analyzed. The utility function is of the form:

$$U = u(x_i, e) + y = u\left[(x_C + x_F), \frac{1}{n}\sum_i \theta(p_F - p_C)x_F\right] + y$$

and the first order conditions (FOC) are

$$\frac{\partial u}{\partial x}[(x_C + x_F), \theta(p_F - p_C)x_F] = p_C$$

and

$$\frac{\partial u}{\partial x}[(x_C + x_F), \theta(p_F - p_C)x_F] + \frac{\partial u}{\partial e}[(x_C + x_F), \theta(p_F - p_C)x_F]\theta(p_F - p_C)\frac{1}{n} = p_F$$

(see appendix 3 for detailed derivation).

When the first equation is inserted into the second one, it gets the following form:

$$p_C + \frac{\partial u}{\partial e}[(x_C + x_F), \theta(p_F - p_C)x_F]\theta(p_F - p_C)\frac{1}{n} = p_F$$

which is the same as

$$\frac{\partial u}{\partial e}[(x_C + x_F), \theta(p_F - p_C)x_F] = \frac{n}{\theta}$$

This means that the consumer's purchasing choice can be divided into two parts. First of all one can examine how much the consumer consumes coffee in total, and how much of the esteem *e* the consumer demands. Secondly one can look at how the consumption of coffee is divided between the different coffee types. The equations can be written in the form

$$\frac{\partial u}{\partial x} = u_x = p_C$$

$$\frac{\partial u}{\partial e} = u_e = \frac{n}{\theta}$$

Using the Cramer's rule one can solve the following matrix equation:

$$\begin{bmatrix} u_{xx} & u_{xg} \\ u_{xg} & u_{gg} \end{bmatrix} \begin{bmatrix} dx \\ de \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \end{bmatrix} dp_C + \begin{bmatrix} 0 \\ 1 \end{bmatrix} d\left(\frac{n}{\theta}\right)$$

Assuming that the utility function is concave, the determinant of the matrix on the left is positive, and will be denoted by D. Now:

$$\frac{dx}{dp_C} = \frac{u_{gg}}{D} < 0$$

$$\frac{dx}{d\left(\frac{1}{\theta}\right)} = -\frac{u_{xg}}{D} < 0 \quad \text{or} \quad \frac{dx}{d\left(\frac{1}{\theta}\right)} = -\frac{u_{xg}}{D} > 0$$

$$\frac{de}{dp_C} = -\frac{u_{xg}}{D} < 0 \quad \text{or} \quad \frac{de}{dp_C} = -\frac{u_{xg}}{D} > 0$$

$$\frac{de}{d\left(\frac{1}{\theta}\right)} = \frac{u_{xx}}{D} < 0$$

The last result shows that the larger the part of the price difference is assumed to benefit the producers of Fair Trade coffee (the larger theta is), the more demand there is for esteem *e*.

Since

$$e = \frac{1}{n}\sum_i \theta(p_F - p_C)x_F = \theta(p_F - p_C)x_F$$

the demand for Fair Trade coffee will be

$$x_F = \frac{e\left(p_C, \frac{1}{\theta}\right)}{\theta(p_F - p_C)}$$

The implications of the demand equation above are the same as in the case of warm-glow. A rise in the price of Fair Trade coffee will reduce the demand. The rise in the price of conventional coffee p_C can either increase of decrease the demand for Fair Trade coffee. The increase in demand for Fair Trade coffee is based on the relation between the prices of the coffee in the esteem e gained, since increasing the consumption of esteem when the difference between the prices diminishes is only possible by increasing the demand for Fair Trade coffee.

The price of conventional coffee also affects the demand of esteem. If esteem and coffee are complements in the utility of consumers, i.e. $u_{gX} > 0$, then the rise in the price of coffee decreases the demand for esteem. Then the total effect on the demand for Fair Trade coffee is ambiguous. If they are substitutes the demand for Fair Trade coffee will increase. Also the effect of the variable theta on the demand for Fair Trade coffee is unclear.

The demand for regular coffee is now:

$$x_C = x\left(p_C, \frac{1}{\theta}\right) - x_F = x\left(p_C, \frac{1}{\theta}\right) - \frac{e\left(p_C, \frac{1}{\theta}\right)}{\theta(p_F - p_C)}$$

From this equation it can be seen that the impact of introducing Fair Trade coffee on the market on the price elasticity of demand of conventional coffee is ambiguous. Interestingly the rise of the price of Fair Trade coffee increases the demand for conventional coffee. This is due to the effect that with a higher level of Fair Trade coffee prices it is easier to achieve esteem e. The effect of theta is unclear. The demand equations derived for all the three charity models do not directly include the price of Fair Trade coffee, although it should be inserted based on theory. This model can thus act as a preliminary estimate in order to facilitate the creation of a more sophisticated model which also includes the price of Fair Trade coffee.

All of these results depend on the fact that the coffees are perfect substitutes in the consumption of the coffee itself, so that the demand for Fair Trade coffee is only demand for warm-glow, public good G or esteem in the three respective cases and nothing else. It can be concluded that the demands for both Fair Trade and regular coffee behave in a very similar manner independent of the ethical motivator of the demand (warm glow, pure altruism and esteem). All of these have their special characteristics, but in order to find a global demand model, they should be combined in the same utility function. However, this will most probably lead to complicated results which cannot be interpreted.

There are several limitations to the model. The model gives a quite complex result from which the specific effects of each variable are difficult to analyze. The results of the model are naturally strongly dependent on the choice of the form of the utility function (in this case the quasi-linear utility-function). In addition, there is a variety of ways of modelling the warm-glow factor. Many models use the salary gained by the Fair Trade producers as a proxy. In addition this model does not take income into account, which can be a serious limitation to the model. The fact that income is not taken into account can be described by stating that the income elasticity of demand is zero, which again might not be a realistic assumption.

Also in the model it is assumed that the share of the price mark-up between Fair Trade and regular coffee assumed to be directed to the Fair Trade producers θ is the same among all consumers, rather than varying by consumer. Thus it can be assumed that there is a representative consumer that can be used to model the group of homogenous consumers. However, the case could be that the share θ_i would vary between consumers, in which case the size of θ_i would represent the weight the consumer places on the charity channelled through Fair Trade. If the share θ_i varied between consumers, each consumer would have a threshold for purchasing Fair Trade products and thus donating through Fair Trade depending on the premium Fair Trade producers gain from the sales of certified products. Thus if the premium rises, consumers would buy more of the products, which might lead to a case where consumers buy more of the product even if the price rises. The share θ_i could also be divided into two parts; the importance the consumer places on the consumption of ethical products as well as the belief of how much of the share is actually delivered through Fair Trade. The model does not separate between these two effects, which could be seen as a limitation to the model.

7. Linear model for conventional coffee and Fair Trade coffee demand in Finland

In this section a linear regression model for Fair Trade, regular and Utz certified coffee will be formulated in order to find the price elasticity of demand of each coffee type. This chapter will first give an overview on the type of data and some key figures.

7.1. Description of data

The data used in this study was acquired from one of the largest retail chains in Finland; SOK or S-group. The data is daily price and sales quantity data collected for 42 selected weeks during 2006 to June 2009. The daily data has been collected for the week that coincides with the 15th day of each month. The data includes 160 stores in the Helsinki Metropolitan area (Helsinki, Vantaa, Espoo, Kirkkonummi, Kerava, Hyvinkää). From these stores 57 are S-market supermarkets, 11 are Prisma hypermarkets and 92 are Alepa grocery stores.

Data is available for the majority of coffee brands sold in the stores belonging to this Finnish retail chain. The 33 different coffee brands represent around 90% of all coffee sales, and include 2 Fair Trade brands, 4 Utz brands, 1 organic brand and 13 speciality coffees. In addition to information on total sales and prices of all coffee types per store, the data includes information on the coffee brand, roast level, package size, producer, certification, preparation type, caffeine content and flavour of the coffees. A detailed account on the different coffee characteristics of the brand included in the data can be found in Appendix 4. From the data control variables were created for weekdays, month and year as well as store type (Alepa, Prisma, S-market).

The reason for choosing the Helsinki metropolitan area (i.e. the stores of HOK-Elanto) as a sample is that this chain of stores is the largest in Finland within the S-group, and therefore will have the largest set of data to look at. Out of all the regional chains, HOK-Elanto also has the largest amounts of individual stores, thus making the results statistically relevant, which might not be the case if a smaller regional chain would have been chosen. In addition the hypothesis is that since there is a higher concentration of students and highly educated consumers in the metropolitan area, the consumption of Fair Trade coffee here could be higher. In other areas the consumption of Fair Trade coffee might be too small to be of statistical relevance.

Dummy variables for controlling different time effects were created. The yearly dummies can help to explain yearly differences such as generally high global coffee prices in 2006 or the effects of the global economic crisis on demand since 2008. The monthly dummies again can help to explain the monthly variation of demand (e.g. possible peaks at Christmas, less demand in summer months), whereas the daily dummies control for daily variation such as discount offers during weekdays or less demand on Sundays due to smaller opening hours. In addition, the price and sales variables were modified into logarithmic form in order to analyze the results given as elasticities.

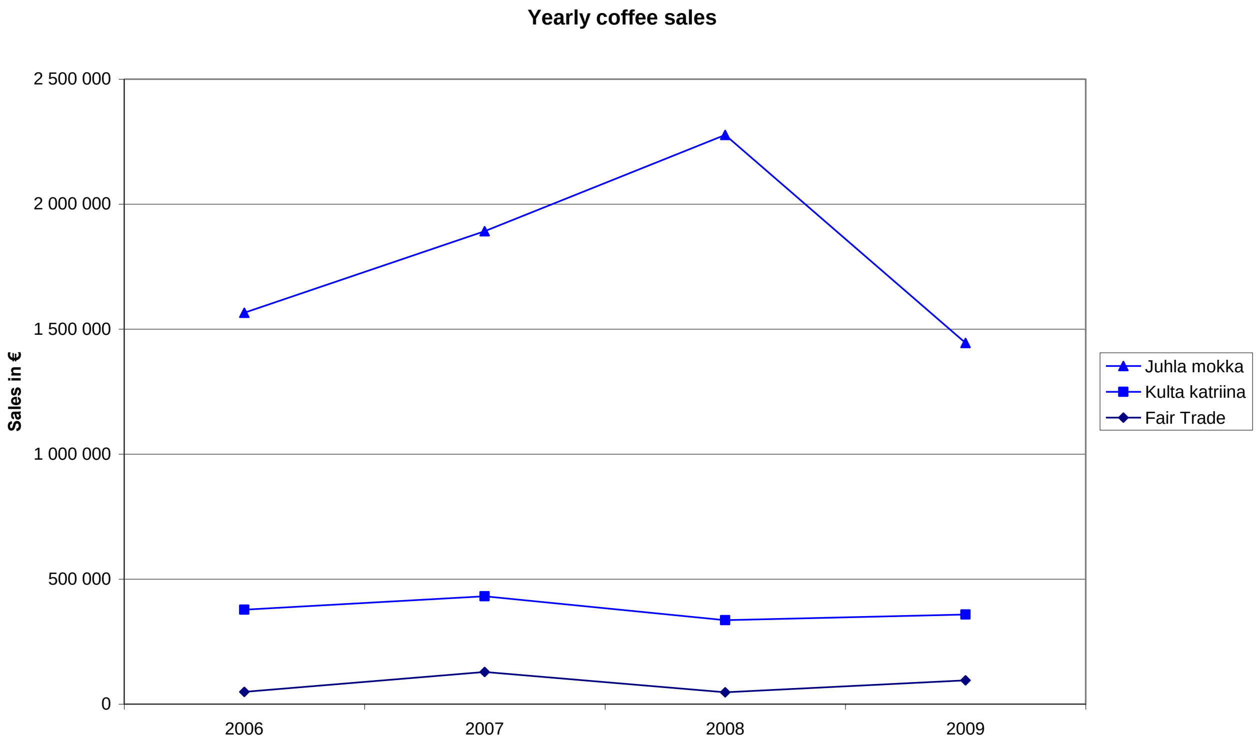
The panel data is unbalanced, since different retail outlets have different selection of products and thus there are no observations for all coffee brands in all stores. In addition new stores were opened and some existing stores were closed down during the observation period of 2006 to June 2009, and thus the data can be unbalanced on a store-level as well. Furthermore new coffee brands were introduced to the stores during the observation period. Since the data is an unbalanced panel, there is a possibility that the effects of missing observations are endogenous to the model.

7.2. Key figures from data

In order to describe the data some key figures were calculated for the Fair Trade coffee brands (Meira Reilu kahvi and Nordqvist Classic Reko) as well as for conventional coffee brands Paulig Juhla mokka and Meira Kulta Katriina. Paulig Juhla Mokka was chosen since it is the most popular Finnish coffee brand, whereas Meira Kulta Katriina was chosen since it has comparable characteristics with the Meira Fair Trade brand. When looking at the key figures it must be recalled that data is daily data from each month collected during the week containing the 15th for 2006 to 2009. There might be differences in sales between the weeks of the month and since the data only describes the middle week, it cannot give an exhaustive explanation on coffee sales.

Below in figure 6 are the trends for the yearly sales for Meira Kulta Katriina, Paulig Juhla Mokka and the total sales of Fair Trade coffee. It seems that Fair Trade has a clear rising trend, whereas Paulig Juhla Mokka sales were declining during 2009. The values for 2009 have been estimated by doubling the sales of the first six months of 2009, since there is only data available between January and June. From the graph it is also clear that Fair Trade coffee sales are still marginal compared to the mainstream brands.

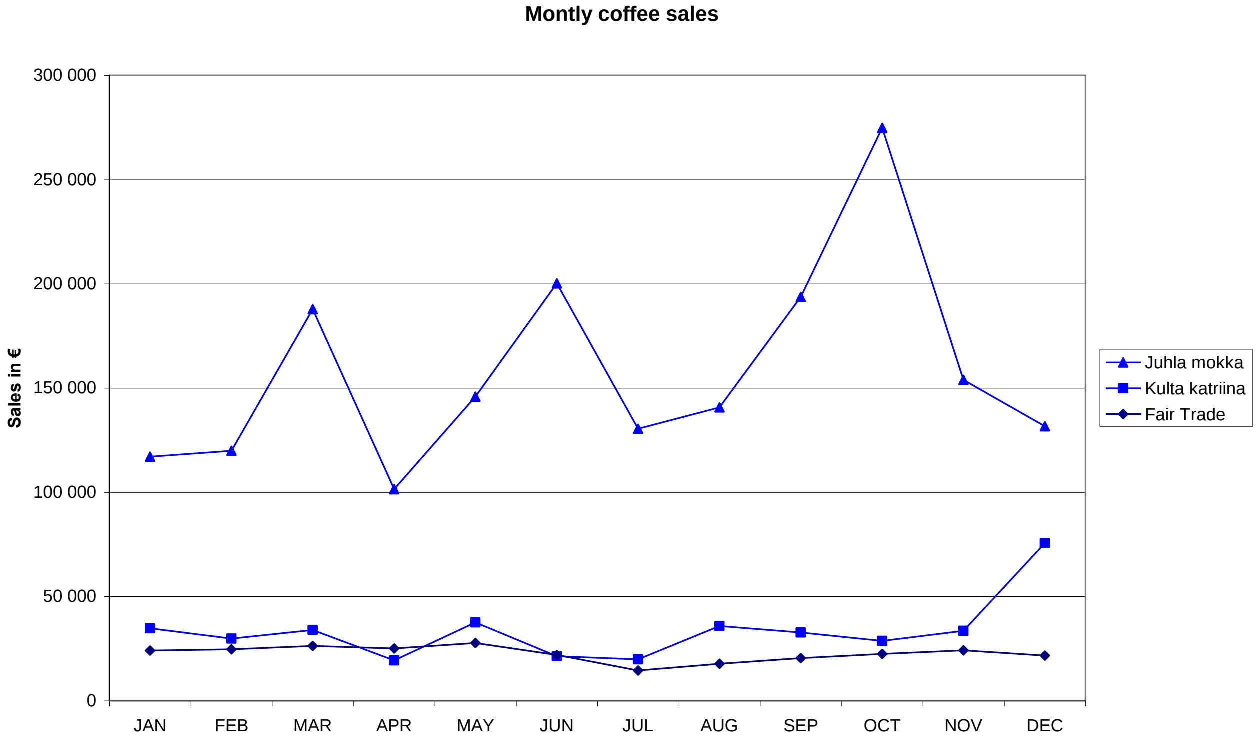
Figure 6 Yearly coffee sales of Fair Trade coffee, Juhla Mokka and Kulta Katriina



Source: Calculations based on data from S-group

Figure 7 below shows that sales vary greatly on a monthly basis, but that there is no clear seasonal trend between different months.

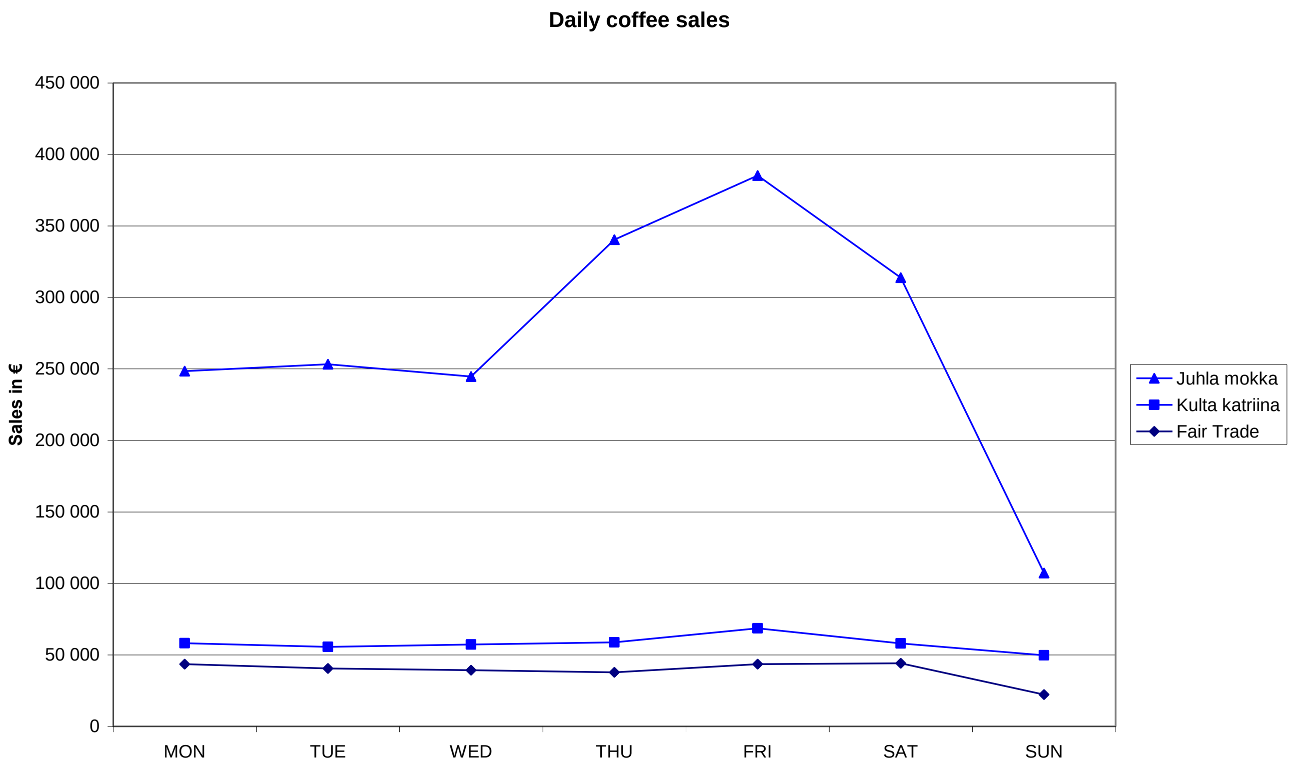
Figure 7 Monthly coffee sales of Fair Trade coffee, Juhla Mokka and Kulta Katriina



Source: Calculations based on data from S-group

Figure 8 depicting weekly coffee sales shows that coffee demand increases on Fridays and Saturdays, but drops on Sundays since not all shops are open on Sundays. Sales during the week can vary between different coffee brands.

Figure 8 Daily coffee sales of Fair Trade coffee, Juhla Mokka and Kulta Katriina



Source: Calculations based on data from S-group

From table 2 one can see that average prices for Fair Trade coffee and regular coffee brands vary greatly. Whereas the average unit price for the Fair Trade coffee brands was 3,84€, Juhla mokka and Kulta Katriina cost on average 2,72€ and 2,39€ respectively. The average sales figures show the popularity of Juhla Mokka, with an average daily sales of 170,5€ per store during the observation period. Meira Reilu kahvi and Nordqvist Classic Reko were only sold for a daily value of 2,57€ and 6,16€ respectively. The small values are partly explained by the fact that most stores in the Helsinki region are small and thus average sales per store do not reach very high numbers. There is a larger variety between the minimum and maximum prices found in the data for Fair Trade coffee than for the two regular coffee brands; Meira Reilu kahvi was sold at prices between 1,05€ and 4,09€ during the observation period, whereas Nordqvist Classic Reko's price varied between 1,91€ and 4,25€.

Table 2 Selected prices and sales for Fair Trade, Juhla mokka and Kulta Katriina coffee brands

	Average unit prices (€)	Average kg prices (€)	Average sales/day (€)	Min price (€)	Max price (€)
Fair Trade	**3,84**	**7,67**	**9,11**	**1,05**	**4,25**
Classic Reko	3,08	6,16	6,16	1,91	4,25
Reilu kahvi	2,57	5,14	2,57	1,05	4,09
Juhla mokka	**2,72**	**5,47**	**170,50**	**0,87**	**3,19**
Kulta katriina	**2,39**	**4,78**	**36,36**	**0,75**	**2,85**

Source: Calculations based on data from S-group

Although the following regression model will not take into account differences in location of the shops, the figures in table 3 were calculated to show that there does exist variation in Fair Trade coffee sales according to size and location of shops.

Table 3 Average daily Fair Trade sales in selected stores in the Helsinki metropolitan area

Store	Fair Trade average sales €
Alepa Asematunneli	3,96
Alepa Kallio	6
Alepa Kerava	3,96
Alepa Otaniemi	10,09
Alepa Porvoonkatu	10,09
Alepa Ullanlinna	3,96
Alepa Viiskulma	3,96
Prisma Iso omena	9,81
Prisma Kerava	9,81
S-Market Kerava	9,46
S-Market Korso	3,91
S-Market Sokos	25,85
S-Market Ympyrätalo	9,36

Source: Calculations based on data from S-group

From the table above one sees that Fair Trade coffee sales depend on both the size of the store (small Alepa stores compared to large Prisma stores) as well as the location of the stores. For example the sales of Fair Trade coffee in S-Market Korso (a suburb in the metropolitan area) are much smaller than the sales of Fair Trade coffee at S-Market Sokos downtown Helsinki. This can depend both on the location of the store (S-Market Sokos is very centrally and conveniently located) as well as the customer base of the stores. The customer base clearly also has an effect on the sales, since there is no difference between Alepa Asematunneli at the Central Railway station and Alepa Viiskulma or Ullanlinna which are much more remotely located in Southern Helsinki, and they still have the same average sales figures. Also it seems at a first glance that sales in Eastern Helsinki (Kallio, Ympyrätalo, Porvoonkatu) are generally higher. These are interesting differences that should be studied more in depth in order to reach conclusions. However, with this small cross section it can be concluded that the location and size of the store has an effect on the sales of Fair Trade coffee.

7.3. Limitations of data

The data only allows factors related to the functional utility of coffee to be analyzed, and thus important factors such as altruism and warm-glow will not be included in the price elasticity of demand calculations. This study will assume heterogeneity among consumers, since there is no consumer-specific data available. The case where the share of the price mark-up between Fair Trade and regular coffee assumed to be directed to the Fair Trade producers θ_i varies between consumers will not be studied, but will rather be taken as an exogenous factor.

Optimally data would have been found for years when world coffee prices have been low (e.g. 2003-2004) and for years when world coffee prices have been high (e.g. 2007-2008) in order to estimate the effect of changes of world green coffee prices on retail prices of regular coffee and Fair Trade coffee. However, the retail chain in question could only provide data from 2006 onward.

Important effects that have not been taken into account in this model are for example the impact of consumer's characteristics (age, income, occupation) on the purchasing decision. However, information on these could not be combined with the purchasing data at hand, since although it is collected, it is illegal in Finland to publish customer data combined with their purchases. In addition, inflation during 2006-2009 has not been taken into account. Other variables that were not taken into account are the coffee beans (due to the difficulty of acquiring data) and other specific attributes that were only related to some coffee brands (e.g. origin of the coffee in the case of Guatemala-coffee). However, it can be argued that these will not have significant effects on the results of the model.

In the actual regression model, the locations of the shops have not been taken into account. All the shops are located within the Helsinki metropolitan area, and the assumption is that consumers can shop quite flexibly within the area. They might not for example always do their shopping in the shop closest to their home, but rather at a convenient store along their way to work or school. Therefore it can be assumed that the area is small enough for it not to make a difference where the shops is located, but rather more important what type the store is due to the size of the sample. In addition, the data includes some large stores which are in convenient locations for many customers in Helsinki and thus it is difficult to determine the actual living area of the customers. Thus without information on the customer’s profile (age, occupation, income), which could be matched through living areas, the addition of an area variable does not seem important.

Some weaknesses on the data include that the data did not include observations on coffee that had not been sold. In other words there were no prices available for coffee types that had not been sold during a particular day. This might have quite a strong effect on the model, since there is no information on coffees that were too expensive for consumers to buy. Furthermore, the results might be affected by random errors such as wrong classifications of roast level, or simple typing errors when inserting dummy variables. However, these types of errors should be minor.

7.4. Model for Fair Trade coffee demand

In this section a linear regression model will be composed using the data for Fair Trade coffee sales. As there are only two brands for Fair Trade coffee; the Reilu kahvi by Meira and REKO Classic coffee by Nordqvist, there are significantly less dummy variables in use than with the regression model of regular coffee. The Reilu kahvi-brand is of light roast, whereas the REKO Classic is of dark roast. The dummies for producers are linearly dependent on the dummies for roast and therefore these will be dropped. All of the control dummy variables (months, weekdays) will be included, although some of them are not statistically significant, since they do not affect the final results and can be of interest for the analysis.

The models created will explain with the help of several independent variables the behaviour of the dependent variable coffee sales in kg. The sales revenue (*price*quantity)*could be used as the dependent variable, but in that case it would be unclear whether a rise in revenue would be due to rise in price or rise in quantity demanded.

The formulated model is:
ln(sales in kg)= f(prisma, s-market, 2007, 2008, 2009, February, March, April, May, June, July, August, September, October, November, December, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday, dark, ln(kg price in €))+ α+ε=

$\alpha+\beta_1 prisma+ \beta_2 s\text{-}market+ \beta_3 2007+ \beta_4 2008+ \beta_5 2009+ \beta_6 February+ \beta_7 March+ \beta_8 April+ \beta_9 May+ \beta_{10} June+ \beta_{11} July+ \beta_{12} August+ \beta_{13} September+ \beta_{14} October+ \beta_{15} November+ \beta_{16} December+ \beta_{17} Tuesday+ \beta_{18} Wednesday+ \beta_{19} Thursday +\beta_{20}\, Friday+ \beta_{21} Saturday+ \beta_{22} Sunday+ \beta_{23} dark+ \beta_{24l} ln(kg\ price\ in\ €)+\varepsilon$

See appendix 5 for specific information on formulation of dummy variables. Both the sales in kg-variable and kg price in €-variable have been modified to logarithmic form in order to facilitate analysis. For all dummy-variables (variables which take either value 0 or 1), the control variable has been left out in order to avoid the dummy-trap. The hypothesis is that β_{24} will be negative and less than 1, as this would indicate price inelastic demand.

Here are the results for the regression made on the model.

Source	SS	df	MS
Model	1440.43142	24	60.0179756
Residual	11833.7787	29696	.398497398
Total	13274.2101	29720	.446642333

Number of obs	=	29721
F(24, 29696)	=	150.61
Prob > F	=	0.0000
R-squared	=	0.1085
Adj R-squared	=	0.1078
Root MSE	=	.63127

sales_in_k~c	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
prisma	.6007063	.0121668	49.37	0.000	.5768589	.6245537
s_market	.2552104	.008656	29.48	0.000	.2382443	.2721765
_2007	.0859438	.0108312	7.93	0.000	.0647141	.1071735
_2008	.1729034	.0164552	10.51	0.000	.1406505	.2051562
_2009	.1602888	.017659	9.08	0.000	.1256764	.1949012
february	-.0004064	.0171282	-0.02	0.981	-.0339785	.0331658
march	.0156647	.017048	0.92	0.358	-.0177501	.0490794
april	.0483664	.0174246	2.78	0.006	.0142134	.0825194
may	.0282514	.0172456	1.64	0.101	-.0055507	.0620536
june	-.035899	.0179826	-2.00	0.046	-.0711457	-.0006523
july	-.0768186	.0204536	-3.76	0.000	-.1169085	-.0367288
august	.035251	.020501	1.72	0.086	-.0049319	.0754338
september	.0631842	.0199475	3.17	0.002	.0240862	.1022822
october	.0907663	.0194561	4.67	0.000	.0526314	.1289012
november	.1062104	.0191532	5.55	0.000	.0686692	.1437515
december	.0436324	.0193782	2.25	0.024	.0056503	.0816146
tue	-.0412499	.013287	-3.10	0.002	-.0672931	-.0152068
wed	-.0611333	.0132826	-4.60	0.000	-.0871677	-.035099
thu	-.0532474	.0134907	-3.95	0.000	-.0796898	-.0268049
fri	-.0032202	.0132326	-0.24	0.808	-.0291568	.0227163
sat	.0051474	.0132621	0.39	0.698	-.0208468	.0311416
sun	-.0857296	.0150129	-5.71	0.000	-.1151554	-.0563037
dark	.0082876	.0096032	0.86	0.388	-.0105352	.0271104
kg_price_l~c	-.5025948	.0854897	-5.88	0.000	-.6701583	-.3350313
_cons	.6350485	.1665932	3.81	0.000	.3085185	.9615786

A 95% confidence level will be required, and generally the independent variables with a p-statistic of greater than 0.05 will be rejected. The variables with a p-statistic greater than 0.05 are *February, March, May, August, Friday, Saturday* and *dark*. However, since the variables describing weekdays and months are only used as control variables, they will be left in the model since they should not affect the results. Also the dummy variable describing the roast of the coffee, i.e. *dark*. is statistically insignificant, but since the variable is interesting for the analysis, it will be included.

Since autocorrelation and heteroscedasticity can create problems with panel data, it is common practise to correct for average errors. In the panel data it is quite probable that error terms are correlated. In the case of the Fair Trade coffee demand model this can mean that observations from the same store are correlated. Since autocorrelation factors can vary between cross section units, it is not as common to test autocorrelation in a panel data as in time series data. Therefore autocorrelation and heteroscedasticity will be corrected for by using a variance-covariance-estimator within a certain cluster. Now the regression shows:

```
Linear regression                                      Number of obs =   29721
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1085
                                                       Root MSE      =  .63127

                                    (Std. Err. adjusted for 3 clusters in store)
```

sales_in_k~c	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
prisma	.6007063	.0153656	39.09	0.001	.5345933	.6668193
s_market	.2552104	.0140415	18.18	0.003	.1947945	.3156262
_2007	.0859438	.0238748	3.60	0.069	-.0167814	.1886689
_2008	.1729034	.0511731	3.38	0.078	-.0472766	.3930834
_2009	.1602888	.0237003	6.76	0.021	.0583146	.262263
february	-.0004064	.0090347	-0.04	0.968	-.0392797	.038467
march	.0156647	.0093303	1.68	0.235	-.0244803	.0558097
april	.0483664	.0204039	2.37	0.141	-.0394247	.1361575
may	.0282514	.0264912	1.07	0.398	-.0857312	.142234
june	-.035899	.0173146	-2.07	0.174	-.1103975	.0385995
july	-.0768186	.0105347	-7.29	0.018	-.1221457	-.0314916
august	.035251	.0305833	1.15	0.368	-.0963384	.1668404
september	.0631842	.0421841	1.50	0.273	-.1183192	.2446876
october	.0907663	.0230558	3.94	0.059	-.0084346	.1899673
november	.1062104	.0284892	3.73	0.065	-.016369	.2287897
december	.0436324	.0258467	1.69	0.233	-.0675769	.1548418
tue	-.0412499	.020704	-1.99	0.185	-.130332	.0478321
wed	-.0611333	.0151204	-4.04	0.056	-.1261913	.0039247
thu	-.0532474	.0113919	-4.67	0.043	-.1022628	-.0042319
fri	-.0032202	.0580965	-0.06	0.961	-.2531894	.2467489
sat	.0051474	.0854099	0.06	0.957	-.3623417	.3726364
sun	-.0857296	.055036	-1.56	0.260	-.3225303	.1510712
dark	.0082876	.0496123	0.17	0.883	-.2051768	.221752
kg_price_l~c	-.5025948	.029122	-17.26	0.003	-.6278969	-.3772928
_cons	.6350485	.1027961	6.18	0.025	.1927524	1.077345

After correcting for average errors, many of the control variables become statistically insignificant. However, these variables will be kept in the regression model, since they are interesting for the analysis.

Since all of the variables except the natural logarithm of the kg-price of the coffee are dummy variables, not much can be interpreted from their coefficients apart from their signs. It seems that in the model, the months of February, June and July have a negative effect on Fair Trade coffee purchases, which was already noted earlier when summarizing the data. On the other hand, the model shows that buying the coffee on other days than Saturday will also have a negative effect on Fair Trade coffee sales. However, not much weight can be given to these results, as many of the weekdays and months are not within the required level of significance. The significance of the dark roast (recall that one of the Fair Trade brands was dark roast, and the other of light roast) is quite small, which can be explained by the wide popularity of light roasted coffee in Finland in general.

The topic of interest, the price elasticity of demand of Fair Trade coffee, can be interpreted from the results of the regression. According to the model, a 1% increase in the price of the Fair Trade coffee causes a 0,5% decrease in kilogram sales. In fact, the price elasticity of demand for Fair Trade coffee is -0.50. This would confirm that the price elasticity of demand of Fair Trade coffee is indeed inelastic as was the hypothesis. A rise in price will have such a small effect on the drop in demand that the total revenue will rise.

The goodness of fit described by the R-squared value of 0.1085 is quite low; meaning that around 10% of the variance of *sales in kg* is accounted for by variables of the model. However, this is a quite common value in this type of model where there are not many explanatory variables. There can be several reasons to this low explanatory power of the model. First of all, since there was only two Fair Trade coffee brands available, the data is quite small although sales and price figures are available for all stores in the Helsinki metropolitan area for 3,5 years. Furthermore, the model relies heavily on dummy variables. In addition, the model does not include variables such as altruism, consumer income, consumer occupation and others that were discussed earlier in the theoretical framework. These are variables that are either hard to quantify (altruism) or difficult to find on store level (consumer income, consumer characteristics). Still, the model does manage to give a confirmation that most probably the price elasticity of demand for Fair Trade coffee is inelastic as has been assumed, although the actual value of the coefficient cannot be considered as entirely reliable.

When conducting regression diagnostics on the data, the following issues arise. The panel data consists of multiple observations on the different variables. Thus it is quite sure that the variables are correlated across observations, at least within one variable. In this case they are even the same for all observations of a single variable. The data has been checked for unusual data, possible outliers and influential points. Since dummy variables are used in the regression, the predictor variables are not normally distributed.

Correlation between the different variables has also been checked for, but from table 4 in appendix 6 it can be seen that none of the variables correlate very strongly with each other. The strongest correlations can be found between the dark roast and the kilogram price, due to the darker brand being more expensive, as well as between the different year variables (2007, 2008, 2009) as well as *prisma* and *s-market.* Since heteroscedasticity has already been corrected, there is no need not test for it with for example the White's test or the Breusch-Pagan test. When trying to detect for multicollinearity the *variance inflation factor* is computed for the regression. As the VIF value is less than 10, it seems that there is no need to be concerned about multicollinearity problems. The tables for regression diagnostics can be found in appendix 6.

In order to improve the predictability of the model, more data with different Fair Trade coffee brands would be needed. However, this is a difficult demand in a market where Fair Trade is still a marginal product compared to the total sales of coffee.

7.5. Model for conventional coffee demand

The model will be repeated in a similar manner for the demand for conventional coffee. In this case there are many more explanatory variables available, since there are a total of 27 different coffee brands in the data which are not certified (Utz certification will be touched on in the following section). The linear model will include the following independent variables explaining the logarithmic kg sales of coffee:

Variables explaining conventional coffee demand

Price statistics (logarithmic price per kilogram (€))
Year: 4 dummies (2006, 2007, 2008, 2009)
Weekday: 7 dummies (Monday, Tuesday, Wednesday, Thursday, Saturday, Sunday)
Month: 12 dummies (January, February, March, April, May, June, July, August, September, October, November, December)
Intrinsic characteristics – Roast quality: 5 dummies (very light, light, dark, very dark, none)
Intrinsic characteristics – Flavour: 2 dummies (flavoured, not flavoured)
Speciality coffee: 2 dummies (speciality, normal)
Brewing type: 4 dummies (bean, filter, pot, other)
Caffeine: 2 dummies (caffeine-free, caffeinated)
Retailer: 3 dummies (Alepa, Prisma, S-market)
Producers: 8 dummies (Paulig, Meira, Nordqvist, Kraft, Roberts, Lavazza, Segafredo, X-tra)

Certification: 4 dummies (Fair Trade, Utz, Organic, None)

Package size: 2 dummies (small, normal)

See appendix 5 for more detailed information on the formulation of dummy variables. The data has been modified in a similar manner as in the Fair Trade coffee model to facilitate analysis. The results are now:

```
Linear regression                                      Number of obs =  352300
                                                       F(  1,      2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.6486
                                                       Root MSE      =   .8431

                                   (Std. Err. adjusted for 3 clusters in store2)
```

sales_in_k~c	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
prisma	1.03905	.0281751	36.88	0.001	.9178224	1.160278
s_market	.4955203	.0121599	40.75	0.001	.4432004	.5478402
_2007	.2134578	.0148413	14.38	0.005	.1496008	.2773148
_2008	.3498263	.0515587	6.79	0.021	.127987	.5716657
_2009	.2919291	.0091586	31.87	0.001	.2525227	.3313354
february	.0060487	.0108407	0.56	0.633	-.0405951	.0526924
march	-.1234092	.0126838	-9.73	0.010	-.1779831	-.0688354
april	-.0201419	.0326857	-0.62	0.601	-.1607771	.1204933
may	.0366821	.0072792	5.04	0.037	.0053621	.0680022
june	-.0320844	.0224435	-1.43	0.289	-.128651	.0644822
july	-.0868715	.0422519	-2.06	0.176	-.2686666	.0949235
august	.031362	.0397676	0.79	0.513	-.1397442	.2024682
september	.0648212	.0108463	5.98	0.027	.0181533	.1114892
november	.0269614	.0220968	1.22	0.347	-.0681136	.1220363
october	.0543494	.0238426	2.28	0.150	-.0482372	.1569359
december	-.0968084	.0216761	-4.47	0.047	-.1900731	-.0035437
tue	-.0411839	.0209527	-1.97	0.188	-.1313361	.0489683
wed	-.0421288	.0104314	-4.04	0.056	-.0870115	.0027538
thu	-.0303095	.0136008	-2.23	0.156	-.0888289	.0282098
fri	.007267	.0506858	0.14	0.899	-.2108164	.2253503
sat	-.0815056	.0781015	-1.04	0.406	-.4175492	.254538
sun	-.2048522	.1011288	-2.03	0.180	-.6399742	.2302698
caffeine	3.247043	.1094061	29.68	0.001	2.776307	3.71778
speciality	4.029233	.3330177	12.10	0.007	2.596373	5.462092
flavour	1.722444	.1209283	14.24	0.005	1.202132	2.242756
filter	.5610801	.1818874	3.08	0.091	-.2215183	1.343678
pot	-.9865483	.3682316	-2.68	0.116	-2.570921	.5978242
bean	.6251795	.087603	7.14	0.019	.248254	1.002105
very_light	-2.201759	.5765932	-3.82	0.062	-4.68264	.2791214
light	-3.143628	.5920183	-5.31	0.034	-5.690877	-.5963788
dark	-2.953109	.6514577	-4.53	0.045	-5.756105	-.1501128
very_dark	-4.005091	.7658493	-5.23	0.035	-7.300275	-.7099076
meira	-1.850816	.1971186	-9.39	0.011	-2.698949	-1.002683
roberts	-4.850448	.6199556	-7.82	0.016	-7.517901	-2.182995
lavazza	-.935699	.0890658	-10.51	0.009	-1.318918	-.5524798
segafredo	-1.664579	.1699354	-9.80	0.010	-2.395752	-.9334055
x_tra	-4.728756	.6273315	-7.54	0.017	-7.427946	-2.029566
nordqvist	-2.943206	.4381794	-6.72	0.021	-4.82854	-1.057872
kraft	-3.246739	.4725239	-6.87	0.021	-5.279846	-1.213633
small_pack~e	.0838254	.0242557	3.46	0.074	-.0205383	.1881892
kg_price_l~c	-4.701272	.5691546	-8.26	0.014	-7.150147	-2.252398
_cons	8.224681	1.737177	4.73	0.042	.7502114	15.69915

Thus the final model can be described as

ln(sales in kg)= f(prisma, s-market, 2007, 2008, 2009, February, March, April, May, June, July, August, September, October, November, December, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday, caffeine, speciality, flavour, filter, pot, bean, very light, light, dark, very dark, Meira, Robert's, Lavazza, Segafredo, X-tra, Nordqvist, Kraft, small package, ln(kg price in €))+ $\alpha+\varepsilon=$

$\alpha+\beta_1 prisma+ \beta_2 s\text{-}market+ \beta_3 2007+ \beta_4 2008+ \beta_5 2009+ \beta_6 February+ \beta_7 March+ \beta_8 April+ \beta_9 May+ \beta_{10} June+ \beta_{11} July+ \beta_{12} August+ \beta_{13} September+ \beta_{14} October+ \beta_{15} November+ \beta_{16} December+ \beta_{17} Tuesday+ \beta_{18} Wednesday+ \beta_{19} Thursday +\beta_{20}\ Friday+ \beta_{21} Saturday+ \beta_{22} Sunday+ \beta_{23}\ caffeine+ \beta_{24}\ speciality+ \beta_{25}\ flavour+ \beta_{26}\ filter+ \beta_{27}\ pot+ \beta_{28}\ bean+ \beta_{29}\ very\ light+ \beta_{30}\ light+ \beta_{31}\ dark+ \beta_{32}\ very\ dark+ \beta_{33}\ Meira+ \beta_{34}\ Robert's+ \beta_{35} Lavazza+ \beta_{36}\ Segafredo+ \beta_{37}\ X\text{-}tra+ \beta_{38}\ Nordqvist+ \beta_{39}\ Kraft+ \beta_{40}\ small\ package+\beta_{41\ l} ln(kg\ price\ in\ €)_5+\varepsilon$

Although some of the non-control variables have higher p-value than the generally accepted 0.05 for the level of significance (filter, pot, very light, small package), these variables can be kept in the analysis, since they are barely above the desired p-level, and their impact on the regression model will be interesting to study.

Since all of the variables except the natural logarithm of the kg-price of the coffee are dummy variables, much more than the signs cannot be interpreted from the coefficients. The linear regression model shows that the months of March, April, June, July and December have a negative effect on coffee sales. This could be seen from the general description of the data, where coffee sales varied according to the month. In the case of regular coffee only Saturday has a positive effect on sales. Not surprisingly the caffeine-variable has a large and positive coefficient showing that caffeine has a strong effect on coffee demand. Also speciality coffee and flavour (such as chocolate and vanilla) have a positive effect on coffee sales. When taking a look at the coffee preparation methods it can be seen that filter coffee and beans have a positive coefficient, while bean coffee has a negative influence on coffee sales. Surprisingly all of the roast dummies have a negative coefficient, meaning that they have a negative effect on sales. Also all the producer dummies have negative coefficients showing the importance of the control dummy of Paulig, which is the most popular coffee producer in Finland.

The coefficient that is of greatest interest is the one describing the effect of logarithmic kilogram price on coffee sales. As could have been predicted, the coefficient is negative and greater than one, -4.701 to be exact. This shows that the demand for regular coffee is price elastic and that for a 1% increase in price, the demand for coffee will drop by 4,7%. Since coffee demand is elastic, it also means that a rise in prices will lead to a drop in revenues.

The goodness of fit of the conventional coffee regression is much better than that of the Fair Trade coffee, with the R-squared value being 0.6486. This means that that 64% of the variance of *sales in kg* is accounted for by variables of the model. The improved goodness of fit of the model is explained by the increased number of explanatory (dummy) variables available, and thus the results can be treated with moderate confidence.

Some brief regression diagnostics will follow. The data has been checked for possible outliers and influential points. Similarly to the Fair Trade coffee model, since dummy variables are used in the regression, the predictor variables are not normally distributed. When testing for correlation between the different variables (see correlation tables in appendix 6), it can be seen that the strongest correlation is for the producer dummy of Robert's coffee and flavour, since both of the flavoured brands are produced by Robert's. Strong positive correlation also exists between kg price and small package, as well as speciality coffee and small package, which is natural due to the higher kilogram prices of smaller packages and the fact that speciality coffee is often sold in small packages.

Looking at multicollinearity it was found that the VIF value is 82.12, which means that in this model multicollinearity can be a problem. However, all in all the regression diagnostics show that the model can reasonably predict the demand and price elasticity of demand for conventional coffee.

7.6. Model for Utz certified coffee demand

As comparison, the calculations are repeated for the price elasticity of demand for Utz coffee. The model regressed was:

ln(sales in kg)= f(prisma, s-market, 2007, 2008, 2009, February, March, April, May, June, July, August, September, October, November, December, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday, speciality, bean, light ln(kg price in €))+ α+ε=

$\alpha+\beta_1 prisma+ \beta_2 s\text{-}market+ \beta_3 2007+ \beta_4 2008+ \beta_5 2009+ \beta_6 February+ \beta_7 March+ \beta_8 April+ \beta_9 May+ \beta_{10} June+ \beta_{11} July+ \beta_{12} August+ \beta_{13} September+ \beta_{14} October+ \beta_{15} November+ \beta_{16} December+ \beta_{17} Tuesday+ \beta_{18} Wednesday+ \beta_{19} Thursday +\beta_{20}\ Friday+ \beta_{21} Saturday+ \beta_{22} Sunday+ \beta_{23} ln(kg\ price\ in\ €)+ \beta_{25} speciality+ \beta_{26} bean+ \beta_{27} light +\varepsilon$

```
Linear regression                                      Number of obs =   49665
                                                       F(  0,      1) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.5460
                                                       Root MSE      =  .61477

                                   (Std. Err. adjusted for 2 clusters in prisma)
```

sales_in_k~c	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
prisma	.8167884	.043657	18.71	0.034	.2620736	1.371503
s_market	.3355855	.0231241	14.51	0.044	.0417663	.6294048
_2007	.0623962	.0585361	1.07	0.480	-.681376	.8061685
_2008	.1509465	.0906912	1.66	0.344	-1.001395	1.303288
_2009	.1352983	.1075504	1.26	0.428	-1.231259	1.501856
february	.0261307	.0248972	1.05	0.485	-.2902178	.3424792
march	.0000998	.0263975	0.00	0.998	-.3353126	.3355122
april	.0662285	.0576553	1.15	0.456	-.6663515	.7988084
may	.0386152	.0389141	0.99	0.502	-.4558356	.5330661
june	.0110833	.0402427	0.28	0.829	-.5002482	.5224149
july	-.0150569	.0605695	-0.25	0.845	-.7846647	.754551
august	.0988367	.0788758	1.25	0.429	-.9033755	1.101049
september	.1319077	.0702392	1.88	0.311	-.7605661	1.024382
october	.0629144	.072301	0.87	0.544	-.8557563	.9815851
november	.0672926	.0560235	1.20	0.442	-.6445537	.779139
december	-.0220457	.0657824	-0.34	0.794	-.8578901	.8137986
tue	-.0558693	.0035245	-15.85	0.040	-.1006527	-.0110859
wed	-.0538447	.0005572	-96.64	0.007	-.0609244	-.0467649
thu	-.0595317	.0184481	-3.23	0.191	-.2939376	.1748741
fri	-.0050024	.0454917	-0.11	0.930	-.5830287	.573024
sat	-.0131502	.0726152	-0.18	0.886	-.9358135	.9095132
sun	-.1095083	.0080802	-13.55	0.047	-.2121773	-.0068392
speciality	1.391509	.6862068	2.03	0.292	-7.327575	10.11059
bean	-.2414699	.1276317	-1.89	0.310	-1.863184	1.380244
light	.0749708	.0164439	4.56	0.137	-.1339683	.28391
kg_price_l~c	-2.718128	.9411811	-2.89	0.212	-14.67697	9.240712
_cons	4.704771	1.64331	2.86	0.214	-16.17546	25.58501

Although the p-values for some of the non-control variables such as speciality, bean, light and kg-price are above the desired level of 0.05, they will still be included in the analysis, since otherwise the number of dummy variables will be reduced. The goodness of fit of the model is significantly better than that of Fair Trade coffee with an R-squared value of 0,5460. This is probably due to the larger data, since there were four different Utz coffees available for the model, more dummy variables as well as more sales observations.

The demand for Utz coffee is elastic with a value of -2.71. This can be interpreted as Utz coffee to be a closer substitute to regular coffee than Fair Trade coffee. It might be that consumers are not as aware of the criteria for Utz certification as for the Fair Trade certification, and thus the Utz label does not have as large an effect on the demand of coffee. Another plausible explanation is that Paulig, which is the producer of all of the Utz certified coffees, has converted many known brands to Utz certified coffee (e.g. Brasil) and thus people still demand them in a similar manner to regular coffee.

8. Conclusions and suggestions for further research

In this research the aim was to investigate the different factors that affect the demand for Fair Trade coffee, calculate the price elasticity of demand for Fair Trade coffee as well as draw some conclusions on the effects of the price elasticity of demand on the retail margins. It is important to notice that demand for Fair Trade coffee is still marginal in Finland compared to the total market for coffee. However, the demand is constantly growing, and thus it is important to study the demand structure.

This study concludes that some consumers are prepared to pay more for Fair Trade coffee than for regular coffee. The reason behind this is that consumers want to help the poor producers in developing countries by making the right consumption choices. By purchasing Fair Trade coffee, the consumer can feel good about him/herself and signal to others that he/she is an ethical consumer. The conclusion of the literary review is that the utility of purchasing Fair Trade products can be divided into the functional utility (price, taste, quality) as well as supplementary utility (altruism, warm-glow, esteem).

Based on the three theoretical models of price elasticity of demand, which concentrate on the supplementary utility, the price elasticity of demand for Fair Trade coffee is found to depend on the price difference between regular and Fair Trade coffee as well as the shares of these coffee types purchased of total coffee consumption. In conclusion, the demand for Fair Trade coffee in the Helsinki metropolitan area is inelastic (-0,50), which is a similar to previous research findings. The demand for conventional (-4.70) and Utz certified coffee (-2.71) on the other hand is elastic.

In conclusion, the Fair Trade market exhibits several types of non-competitive features, such as price discrimination, vertical product differentiation and bundling. The general argument for defending these market failures is that the Fair Trade movement supports the empowerment of poor producers in the developing countries, and thus supports a social cause. However, it seems clear that the retailers in developed countries such as Finland are able to gain significant profits from this increasingly popular market. In general, vertical product differentiation, price discrimination as well as product bundling tend to decrease the consumer surplus, and thus might seem ambiguous ways of transferring this surplus to retail profits. It is difficult to determine whether the use of price discrimination or bundling increases market efficiency with limited knowledge about the demand structure. However, more detailed research is required on this sector.

The inelastic demand also implies that retailers can price discriminate between consumers and earn a larger premium by selling Fair Trade coffee than regular coffee. A reason for the larger price premium is that the cost of production of Fair Trade coffee is larger than for regular coffee. However, the Fair Trade premium is a share of the green coffee price, not of the retail price, and does thus not constitute a large part of the total retail price. Since it indeed seems that the retail margins for Fair Trade coffee are larger than those for regular coffee one could question the need for government support policies for the Fair Trade movement. The policies might distort competition when compared for example with Utz or Rainforest Alliance certification.

The issue of price elasticity of demand has been important to study for reasons other than those related to price discrimination or possibilities to gain profits in the retail of these products. Price elasticity of demand has also consequences when modelling international trade. For example Maseland and Vaal (2002) state in their model that in order to determine whether Fair Trade or free trade is more efficient, one must know the price elasticity of demand of the good in questions. They further conclude that if the price elasticity of demand is sufficiently low, both the producers of conventional coffee and Fair Trade coffee are better of in a poor country with Fair Trade than with free trade (see Maseland & Vaal, 2002 for more details). Without taking any stand to whether Fair Trade or free trade is more efficient, it is important to take note of the wide significance of the price elasticity of demand. Also, according to Hayes (2008) where the demand for Fair Trade goods is inelastic, Fair Trade is good for the producers and for society as a whole, but may harm non-Fair Trade producers of competing goods. On the other hand Steinrücken and Jaenichen (2007) argue that Fair Trade enables a Pareto improvement for both consumers and producers. As long as some consumers' willingness to pay is high enough to cover transaction costs for supervision and other administration of such quality labels, they can exist.

The future development of the Fair Trade movement raises several questions that this study cannot answer. One of the greatest concerns around Fair Trade is whether the certification and the movement around it is just a passing fashion. If it is just a passing trend, the concern for distorting market signals and producers investing in an unsustainable livelihood gains much larger relevance. If again Fair Trade sector will be growing as exponentially as it has until now there definitely might be an economic incentive to enter the market with similar ethical/social labels (such as the Rainforest Alliance). The lack of information of consumers could even lead different corporations to distort the informational value of certificates by issuing their own certificates, if consumers cannot distinguish between the certificates. The number and complexity of competing labelling programs may confuse consumers and undermine the credibility of these programs.

The results of the research should be quite easily transferrable to other Fair Trade markets in any developed country where Fair Trade products are sold in a similar manner. The results are expected to have wider significance also for assessing the possibilities of consumer driven ethical purchasing movements such as Product Red ™ and voluntary flight taxes and other private sources of development finance in delivering desired development outcomes. The analysis can also be generalized to fit other ethical labels with the limitation that Fair Trade specific characters such as licensing might not apply.

8.1. Suggestions for further research

Some interesting areas for further research arose when conducting this study. It would be interesting to study the elasticity of demand for Fair Trade coffee with a larger sample of national data, where the impact of different areas and income could be taken into account.

Furthermore, the inelasticity of demand models already formed the cross price elasticity equations for regular and Fair Trade coffee, which would be interesting to study more in detail. Another relevant question would be to study the income elasticity of demand of Fair Trade coffee.

An important question in the future is what will happen to Fair Trade as it becomes more popular and more common among the mainstream. What will happen to the price elasticity of demand of Fair Trade coffee as the availability of similar products increases? If the demand becomes more elastic, will then a smaller part of the income go to the producers in the developing countries?

The production side of the Fair Trade chain was excluded from this essay, but would be an interesting area of further study. For example Richardson and Stähler (2007) investigate the dynamics of the Fair Trade market and build a model including producers and retailers, in order to better understand the retail of Fair Trade products. Indeed, it is quite difficult to make definite conclusions about for example the market form of Fair Trade products without including the early end of the production chain. Investigating the whole chain would bring about several new aspects such as how Fair Trade retailers deal with the moral hazard problems in production, and whether there are incentives to limit the amount of Fair Trade retailers. Furthermore, questions such as whether there is oversupply of the raw material due to the Fair Trade premium, or whether at some point of the supply chain there is buyer power due to several small producers in the beginning of the production chain are examples of interesting issues to further explore.

The focus of this study has been on decisions of individuals. However, it would be important to continue researching what factors would affect the general equilibrium of the Fair Trade market. People may have a tendency to make ethical choices as it is becoming an economic fashion, and it could be argued that in the end consumers want to be similar to others, rather than help producers in the developing world, a phenomenon called “informational cascades”. It would be interesting to have a look at what factors affect the formation of Fair Trade to become a fashion, or even evolve into a norm.

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Appendix 1 Complete model for Fair Trade price elasticity of demand with warm-glow

Considering the case of warm-glow giving (Andreoni, 1990), where the quasi-linear utility-function can be formalized as

$$U = u(x_i, g_i) + y$$

Here x_i the sum of the consumption of Fair Trade (x_F) and conventional coffee (x_C) is

$$x_i = x_F + x_C$$

and g describes the warm-glow the consumer feels by purchasing Fair Trade coffee:

$$g = \theta(p_F - p_C)x_F$$

where p_F- p_C describes the difference between Fair Trade price (p_F) and regular coffee price (p_C), and θ describes the share of the price difference that is given as the Fair Trade premium (charity).

The utility function that contains the total consumption of coffee and the warm-glow g will be maximized:

$$U = u[(x_C + x_F), \theta(p_F - p_C)x_F] + y$$

subject to the budget constraint

$$I = p_y y + p_F x_F + p_C x_C$$

where y is consumption of all goods except coffee, and price of y (p_y) has been normalized to 1, giving

$$I = y + p_F x_F + p_C x_C$$

This again can be rearranged as

$$y = I - p_C x_C - p_F x_F$$

Now the utility function above can be maximized subject to the budget constraint as below.

$$U = u[(x_C + x_F), \theta(p_F - p_C)x_F] + (I - p_C x_C - p_F x_F)$$

The first order conditions (FOC) will be:

$$\frac{\partial u}{\partial x}[(x_C + x_F), \theta(p_F - p_C)x_F] = p_C$$

and

$$\frac{\partial u}{\partial x}\left[(x_C + x_F), \theta(p_F - p_C)x_F\right] + \frac{\partial u}{\partial g}\left[(x_C + x_F), \theta(p_F - p_C)x_F\right]\theta(p_F - p_C) = p_F$$

Now, concentrate on the first FOC. The FOC can be formulated into a logarithmic difference equation by taking the second derivative of the equation and dividing each term by

$$\frac{\partial u}{\partial x} = u_x = p_C$$

Each term can be formulated in a way that will make it easier for them to be simplified later on. Now the equation is of the form:

$$\frac{\partial^2 u}{\partial x^2}\frac{(x_C + x_F)}{u_x}\frac{x_C}{(x_C + x_F)}\frac{dx_C}{x_C} + \frac{\partial^2 u}{\partial x^2}\frac{(x_C + x_F)}{u_x}\frac{x_F}{(x_C + x_F)}\frac{dx_F}{x_F} + \frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F - p_C)x_F}{u_x}\frac{dx_F}{x_F} +$$
$$\frac{\partial^2 u}{\partial x^2}\frac{\theta x_F(p_F - p_C)}{u_x}\frac{(dp_F - dp_C)}{(p_F - p_C)} + \frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F - p_C)x_F}{u_x}\frac{d\theta}{\theta} = \frac{dp_C}{p_C}$$

The price term can be simplified:

$$\frac{(dp_F - dp_C)}{(p_F - p_C)}$$

in the equation by using the following notation:

$$\frac{p_F}{(p_F - p_C)} = \frac{1}{\rho_F}$$

$$\frac{p_C}{(p_F - p_C)} = \frac{1}{\rho_C}$$

$$\frac{p_F}{(p_F - p_C)} - \frac{p_C}{(p_F - p_C)} = \frac{1}{\rho_F} + \left(1 - \frac{1}{\rho_F}\right)$$

Now the price term can be simplified by substituting with these equations, in order to clarify the impact of the price. Thus:

$$\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F - p_C)x_F}{u_x}\left(\frac{dp_F - dp_C}{(p_F - p_C)}\right) = \frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F - p_C)x_F}{u_x}\left(\frac{p_F\dfrac{dp_F}{p_F} - p_C\dfrac{dp_C}{p_C}}{(p_F - p_C)}\right)$$

$$\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F - p_C)x_F}{u_x}\left(\frac{p_F\dfrac{dp_F}{p_F}}{(p_F - p_C)} - \frac{p_C\dfrac{dp_C}{p_C}}{(p_F - p_C)}\right) = \frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F - p_C)x_F}{u_x}\left(\frac{1}{\rho_F}\frac{dp_F}{p_F} + \left(1 - \frac{1}{\rho_F}\right)\frac{dp_C}{p_C}\right)$$

The share of total coffee sales will be noted as:

$$\frac{x_C}{(x_C + x_F)} = \gamma_C$$

and

$$\frac{x_F}{(x_C + x_F)} = \gamma_F = (1 - \gamma_C)$$

Also recall that the warm-glow term is:

$$g = \theta(p_F - p_C)x_F$$

By inserting the notations from above the following equation is derived:

$$\frac{\partial^2 u}{\partial x^2}\frac{(x_C + x_F)}{u_x}\gamma_C\frac{dx_C}{x_C} + \frac{\partial^2 u}{\partial x^2}\frac{(x_C + x_F)}{u_x}(1 - \gamma_C)\frac{dx_F}{x_F} + \frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F - p_C)x_F}{u_x}\frac{dx_F}{x_F} +$$
$$\frac{\partial^2 u}{\partial x^2}\frac{\theta x_F(p_F - p_C)}{u_x}\left[\frac{1}{\rho_F}\frac{dp_F}{p_F} + \left(1 - \frac{1}{\rho_F}\right)\frac{dp_C}{p_C}\right] + \frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F - p_C)x_F}{u_x}\frac{d\theta}{\theta} = \frac{dp_C}{p_C}$$

Now all small changes will be noted in the following style:

$\dfrac{dx_C}{x_C} = \hat{x}_C$, $\dfrac{dp_C}{p_C} = \hat{p}_C$ and so on.

Also the notation can be simplified by using the following notation for second derivatives:

$$\frac{\partial^2 u}{\partial x^2}\frac{(x_C + x_F)}{u_x} = \varepsilon_{U_X}$$

and

$$\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F - p_C)x_F}{u_x} = \frac{\partial^2 u}{\partial x^2}\frac{g}{u_x} = \varepsilon_{U_g}$$

Now the equation above can be reformulated, giving:

$$\varepsilon_{U_x}\gamma_C\hat{x}_C + \varepsilon_{U_x}(1-\gamma_C)\hat{x}_F + \varepsilon_{U_g}\hat{x}_F + \varepsilon_{U_g}\left[\frac{1}{\rho_F}\hat{p}_F + \left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right] + \varepsilon_{U_g}\hat{\theta} = \hat{p}_C$$

which again can be rearranged to give:

$$\varepsilon_{U_x}\gamma_C\hat{x}_C + \varepsilon_{U_x}(1-\gamma_C)\hat{x}_F + \varepsilon_{U_g}\hat{x}_F = \hat{p}_C - \varepsilon_{U_g}\left[\frac{1}{\rho_F}\hat{p}_F + \left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right] - \varepsilon_{U_g}\hat{\theta}$$

or

$$\gamma_C\varepsilon_{U_x}\hat{x}_C + (\varepsilon_{U_x} - \gamma_C\varepsilon_{U_x} + \varepsilon_{U_g})\hat{x}_F = \left(1-\varepsilon_{U_g} + \frac{1}{\rho_F}\varepsilon_{U_g}\right)\hat{p}_C - \varepsilon_{U_g}\frac{1}{\rho_F}\hat{p}_F - \varepsilon_{U_g}\hat{\theta}$$

Now the first FOC has been modified, and the focus will be on the second FOC. Starting with the FOC:

$$\frac{\partial u}{\partial x}\left[(x_C + x_F), \theta(p_F - p_C)x_F\right] + \frac{\partial u}{\partial g}\left[(x_C + x_F), \theta(p_F - p_C)x_F\right]\theta(p_F - p_C) = p_F$$

The first partial derivative in the FOC will be the same as earlier with the first FOC, so the focus will be on the second part. As earlier, the share of total consumption of coffee can be simplified by using appropriate symbols.

As earlier, the FOC will be formulated into a logarithmic difference equation by taking a second derivative and dividing each term by

$$\frac{\partial u}{\partial x} = u_x = p_F$$

By simplifying the price term and the appropriate symbols for shares of total consumptions of coffee and substituting this into the equation the result is:

$$\frac{\partial^2 u}{\partial x^2}\frac{(x_C+x_F)}{u_x}\gamma_C\frac{dx_C}{x_C}+\frac{\partial^2 u}{\partial x^2}\frac{(x_C+x_F)}{u_x}(1-\gamma_C)\frac{dx_F}{x_F}+\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)x_F}{u_x}\frac{dx_F}{x_F}+$$
$$\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)x_F}{u_x}\left(\frac{1}{\rho_F}\frac{dp_F}{p_F}+\left(1-\frac{1}{\rho_F}\right)\frac{dp_C}{p_C}\right)+\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)x_F}{u_x}\frac{d\theta}{\theta}+$$
$$\theta(p_F-p_C)\frac{u_g}{u_x}\Bigg[\frac{\partial^2 u}{\partial x\partial g}\frac{(x_C+x_F)}{u_g}\gamma_C\frac{dx_C}{x_C}+\frac{\partial^2 u}{\partial x\partial g}\frac{(x_C+x_F)}{u_g}(1-\gamma_C)\frac{dx_F}{x_F}+\frac{\partial^2 u}{\partial g^2}\frac{\theta(p_F-p_C)x_F}{u_g}\frac{dx_F}{x_F}+$$
$$\frac{\partial^2 u}{\partial g^2}\frac{\theta(p_F-p_C)x_F}{u_g}\frac{1}{\rho_F}\frac{dp_F}{p_F}+\frac{\partial^2 u}{\partial g^2}\frac{\theta(p_F-p_C)x_F}{u_g}\left(1-\frac{1}{\rho_F}\right)\frac{dp_C}{p_C}+\frac{\partial^2 u}{\partial g^2}\frac{\theta(p_F-p_C)x_F}{u_g}\frac{d\theta}{\theta}+$$
$$\frac{\theta p_F}{\theta(p_F-p_C)}\frac{dp_F}{p_F}+\frac{\theta p_F}{\theta(p_F-p_C)}\frac{dp_C}{p_C}+\frac{d\theta}{\theta}\Bigg]=\frac{dp_F}{p_F}$$

Again this can again be simplified by noting all small changes in the form:

$\frac{dx_C}{x_C}=\hat{x}_C$, $\frac{dp_C}{p_C}=\hat{p}_C$ and so on.

The following notation will be used to describe the second derivatives:

$$\frac{\partial^2 u}{\partial x^2}\frac{(x_C+x_F)}{u_x}=\varepsilon_{U_X}$$

$$\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)x_F}{u_x}=\frac{\partial^2 u}{\partial x^2}\frac{g}{u_x}=\varepsilon_{U_g}$$

$$\frac{\partial^2 u}{\partial x\partial g}\frac{(x_C+x_F)}{u_g}=\varepsilon_{U_{gX}}$$

and

$$\frac{\partial^2 u}{\partial g^2}\frac{\theta(p_F-p_C)x_F}{u_g}=\frac{\partial^2 u}{\partial g^2}\frac{g}{u_g}=\varepsilon_{U_{gg}}$$

Now:

$$\varepsilon_{U_x}\gamma_C\hat{x}_C+\varepsilon_{U_x}(1-\gamma_C)\hat{x}_F+\varepsilon_{U_g}\hat{x}_F+\varepsilon_{U_g}\left[\frac{1}{\rho_F}\hat{p}_F+\left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right]+\varepsilon_{U_g}\hat{\theta}+$$

$$\theta(p_F-p_C)\frac{u_g}{u_x}\left[\varepsilon_{U_{gX}}\gamma_C\hat{x}_C+\varepsilon_{U_{gX}}(1-\gamma_C)\hat{x}_F+\varepsilon_{U_{gg}}\hat{x}_F+\varepsilon_{U_{gg}}\left[\frac{1}{\rho_F}\hat{p}_F+\left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right]+\varepsilon_{U_{gg}}\hat{\theta}+\right.$$

$$\left.\frac{1}{\rho_F}\hat{p}_F+\left(1-\frac{1}{\rho_F}\right)\hat{p}_C+\hat{\theta}\right]=\hat{p}_F$$

In order to substitute for the factor

$$\theta(p_F-p_C)\frac{u_g}{u_x}$$

The second FOC is divided by the first FOC in order to get:

$$1+\theta(p_F-p_C)\frac{u_g}{u_x}=\frac{p_F}{p_C}$$

which is the same as:

$$\theta(p_F-p_C)\frac{u_G}{u_x}=\frac{p_F}{p_C}-1=\frac{p_F-p_C}{p_C}=\rho_C=(1-\rho_F)$$

This can be inserted into the equation above in order to simplify it a bit.

$$\varepsilon_{U_x}\gamma_C\hat{x}_C+\varepsilon_{U_x}(1-\gamma_C)\hat{x}_F+\varepsilon_{U_g}\hat{x}_F+\varepsilon_{U_g}\left[\frac{1}{\rho_F}\hat{p}_F+\left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right]+\varepsilon_{U_g}\hat{\theta}+$$

$$(1-\rho_F)\left[\varepsilon_{U_{gX}}\gamma_C\hat{x}_C+\varepsilon_{U_{gX}}(1-\gamma_C)\hat{x}_F+\varepsilon_{U_{gg}}\hat{x}_F+\varepsilon_{U_{gg}}\left[\frac{1}{\rho_F}\hat{p}_F+\left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right]+\varepsilon_{U_{gg}}\hat{\theta}+\right.$$

$$\left.\frac{1}{\rho_F}\hat{p}_F+\left(1-\frac{1}{\rho_F}\right)\hat{p}_C+\hat{\theta}\right]=\hat{p}_F$$

Continuing by multiplying all terms:

$$\gamma_C\varepsilon_{U_X}\hat{x}_C+(1-\rho_F)\varepsilon_{U_{gX}}\gamma_C\hat{x}_C+\varepsilon_{U_x}(1-\gamma_C)\hat{x}_F+\varepsilon_{U_g}\hat{x}_F+(1-\rho_F)\varepsilon_{U_{gX}}(1-\gamma_C)\hat{x}_F+(1-\rho_F)\varepsilon_{U_{gg}}\hat{x}_F$$

$$\varepsilon_{U_g}\left[\frac{1}{\rho_F}\hat{p}_F+\left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right]+(1-\rho_F)\varepsilon_{U_{gg}}\left[\frac{1}{\rho_F}\hat{p}_F+\left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right]+(1-\rho_F)\frac{1}{\rho_F}\hat{p}_F+(1-\rho_F)\left(1-\frac{1}{\rho_F}\right)\hat{p}_C+$$

$$\varepsilon_{U_g}\hat{\theta}+(1-\rho_F)\varepsilon_{U_{gg}}\hat{\theta}+(1-\rho_F)\hat{\theta}=\hat{p}_F$$

Now by rearranging one finds:

$$\left[\varepsilon_{U_X}+\varepsilon_{U_{gX}}(1-\rho_F)\right]\gamma_C\hat{x}_C+\left[(1-\gamma_C)\varepsilon_{U_X}+\varepsilon_{U_g}+\varepsilon_{U_{gX}}-\varepsilon_{U_{gX}}\rho_F-\varepsilon_{U_{gX}}\gamma_C+\varepsilon_{U_{gX}}\gamma_C\rho_F+\varepsilon_{U_{gg}}(1-\rho_F)\right]\hat{x}_F=$$
$$\left[-\varepsilon_{U_g}+\varepsilon_{U_g}\frac{1}{\rho_F}-\varepsilon_{U_{gg}}(1-\rho_F)+\varepsilon_{U_{gg}}(1-\rho_F)\frac{1}{\rho_F}+\rho_F+\frac{1}{\rho_F}-2\right]\hat{p}_C+$$
$$\left[2-\varepsilon_{U_g}\frac{1}{\rho_F}-\varepsilon_{U_{gg}}\left(\frac{1}{\rho_F}-1\right)-\frac{1}{\rho_F}\right]\hat{p}_F+\left[-\varepsilon_{U_g}-\varepsilon_{U_{gg}}(1-\rho_F)-1+\rho_F\right]\hat{\theta}$$

Now the set of two equations can be solved by using the Cramer rule:

The first FOC:

$$\gamma_C\varepsilon_{U_X}\hat{x}_C+(\varepsilon_{U_X}-\gamma_C\varepsilon_{U_X}+\varepsilon_{U_g})\hat{x}_F=\left(1-\varepsilon_{U_g}+\frac{1}{\rho_F}\varepsilon_{U_g}\right)\hat{p}_C-\varepsilon_{U_g}\frac{1}{\rho_F}\hat{p}_F-\varepsilon_{U_g}\hat{\theta}$$

The second FOC:

$$\left[\varepsilon_{U_X}+\varepsilon_{U_{gX}}(1-\rho_F)\right]\gamma_C\hat{x}_C+\left[(1-\gamma_C)\varepsilon_{U_X}+\varepsilon_{U_g}+\varepsilon_{U_{gX}}-\varepsilon_{U_{gX}}\rho_F-\varepsilon_{U_{gX}}\gamma_C+\varepsilon_{U_{gX}}\gamma_C\rho_F+\varepsilon_{U_{gg}}(1-\rho_F)\right]\hat{x}_F=$$
$$\left[-\varepsilon_{U_g}+\varepsilon_{U_g}\frac{1}{\rho_F}-\varepsilon_{U_{gg}}(1-\rho_F)+\varepsilon_{U_{gg}}(1-\rho_F)\frac{1}{\rho_F}+\rho_F+\frac{1}{\rho_F}-2\right]\hat{p}_C+$$
$$\left[2-\varepsilon_{U_g}\frac{1}{\rho_F}-\varepsilon_{U_{gg}}\left(\frac{1}{\rho_F}-1\right)-\frac{1}{\rho_F}\right]\hat{p}_F+\left[-\varepsilon_{U_g}-\varepsilon_{U_{gg}}(1-\rho_F)-1+\rho_F\right]\hat{\theta}$$

are in matrix form:

$$
\begin{bmatrix} \gamma_C \varepsilon_{U_X} & \left((1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_g}\right) \\ \left[\varepsilon_{U_X} + \varepsilon_{U_{gX}}(1-\rho_F)\right]\gamma_C & \left[(1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_g} + \varepsilon_{U_{gX}} - \varepsilon_{U_{gX}}\rho_F - \varepsilon_{U_{gX}}\gamma_C + \varepsilon_{U_{gX}}\gamma_C\rho_F + \varepsilon_{U_{gg}}(1-\rho_F)\right] \end{bmatrix} \begin{bmatrix} \hat{x}_C \\ \hat{x}_F \end{bmatrix} =
$$

$$
\begin{bmatrix} \left(1 - \varepsilon_{U_g} + \frac{1}{\rho_F}\varepsilon_{U_g}\right) \\ \left[-\varepsilon_{U_g} + \varepsilon_{U_g}\frac{1}{\rho_F} - \varepsilon_{U_{gg}}(1-\rho_F) + \varepsilon_{U_{gg}}(1-\rho_F)\frac{1}{\rho_F} + \rho_F + \frac{1}{\rho_F} - 2\right] \end{bmatrix} \hat{p}_C +
$$

$$
\begin{bmatrix} -\frac{1}{\rho_F}\varepsilon_{U_g} \\ \left[2 - \varepsilon_{U_g}\frac{1}{\rho_F} - \varepsilon_{U_{gg}}\left(\frac{1}{\rho_F} - 1\right) - \frac{1}{\rho_F}\right] \end{bmatrix} \hat{p}_F +
$$

$$
\begin{bmatrix} -\varepsilon_{U_g} \\ \left[-\varepsilon_{U_g} - \varepsilon_{U_{gg}}(1-\rho_F) - 1 + \rho_F\right] \end{bmatrix} \hat{\theta}
$$

The determinant of the matrix is:

$$
\det \begin{vmatrix} \gamma_C \varepsilon_{U_X} & \left[(1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_g}\right] \\ \left[\varepsilon_{U_X} + \varepsilon_{U_{gX}}(1-\rho_F)\right]\gamma_C & \left[(1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_g} + \varepsilon_{U_{gX}} - \varepsilon_{U_{gX}}\rho_F - \varepsilon_{U_{gX}}\gamma_C + \varepsilon_{U_{gX}}\gamma_C\rho_F + \varepsilon_{U_{gg}}(1-\rho_F)\right] \end{vmatrix} =
$$

$$
\gamma_C \varepsilon_{U_X} * \left[(1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_g} + \varepsilon_{U_{gX}} - \varepsilon_{U_{gX}}\rho_F - \varepsilon_{U_{gX}}\gamma_C + \varepsilon_{U_{gX}}\gamma_C\rho_F + \varepsilon_{U_{gg}}(1-\rho_F)\right] -
$$

$$
\left[\varepsilon_{U_X} + \varepsilon_{U_{gX}}(1-\rho_F)\right]\gamma_C * \left[(1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_g}\right] =
$$

$$
\left[(\rho_F - 1)\gamma_C^{\,2}\varepsilon_{U_X}\varepsilon_{U_g} + (1-\rho_F)\varepsilon_{U_X}\varepsilon_{U_{gg}} + (\rho_F - 1)\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}} + (1-\rho_F)\gamma_C^{\,2}\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]
$$

Then the terms $\hat{x}_F$ and $\hat{x}_C$ can be solved conditional to the prices of Fair Trade coffee and conventional coffee, as well as conditional to the share θ that consumer believe is delivered to Fair Trade producers of the price difference between regular and Fair Trade coffee.

Since the definition of price elasticity of demand is

$$
PED = -\frac{dx/x}{dp/p}
$$

then for example the term

$$
PED = -\frac{dx}{x}\frac{p}{dp} = \frac{\hat{x}_{F|\hat{p}_F}}{\hat{p}_F}
$$

will represent the price elasticity of demand of Fair Trade coffee. Using the Cramer rule the following results are found:

The price elasticity of demand of regular coffee

$$\frac{\hat{x}_{C|\hat{p}_C}}{\hat{p}_C}=\frac{\left((1-\varepsilon_{U_g}+\frac{1}{\rho_F}\varepsilon_{U_g}\right)*\left[(1-\gamma_C)\varepsilon_{U_X}+\varepsilon_{U_g}+\varepsilon_{U_{gX}}-\varepsilon_{U_{gX}}\rho_F-\varepsilon_{U_{gX}}\gamma_C+\varepsilon_{U_{gX}}\gamma_C\rho_F+\varepsilon_{U_{gg}}(1-\rho_F)\right]}{\left[(\rho_F-1)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_g}+(1-\rho_F)\varepsilon_{U_X}\varepsilon_{U_{gg}}+(\rho_F-1)\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}+(1-\rho_F)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}-$$

$$\frac{\left((1-\gamma_C)\varepsilon_{U_X}+\varepsilon_{U_g}\right)*\left[-\varepsilon_{U_g}+\varepsilon_{U_g}\frac{1}{\rho_F}-\varepsilon_{U_{gg}}(1-\rho_F)+\varepsilon_{U_{gg}}(1-\rho_F)\frac{1}{\rho_F}+\rho_F+\frac{1}{\rho_F}-2\right]}{\left[(\rho_F-1)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_g}+(1-\rho_F)\varepsilon_{U_X}\varepsilon_{U_{gg}}+(\rho_F-1)\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}+(1-\rho_F)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}=$$

$$\frac{\left(3-3\gamma_C-\rho_F-\frac{1}{\rho_F}+\gamma_C\rho_F+\gamma_C\frac{1}{\rho_F}\right)\varepsilon_{U_X}+\left(2-\rho_F-\frac{1}{\rho_F}\right)\varepsilon_{U_g}+(1-\gamma_C+\gamma_C\rho_F)\varepsilon_{U_{gX}}}{\left[(\rho_F-1)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_g}+(1-\rho_F)\varepsilon_{U_X}\varepsilon_{U_{gg}}+(\rho_F-1)\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}+(1-\rho_F)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}+$$

$$\frac{(1-\rho_F)\varepsilon_{U_{gg}}+\left(-2+2\gamma_C+\rho_F+\frac{1}{\rho_F}-\gamma_C\rho_F-\gamma_C\frac{1}{\rho_F}\right)\varepsilon_{U_g}\varepsilon_{U_{gX}}+\left(2-\rho_F-\frac{1}{\rho_F}+\gamma_C\rho_F+\gamma_C\frac{1}{\rho_F}\right)\varepsilon_{U_X}\varepsilon_{U_{gg}}}{\left[(\rho_F-1)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_g}+(1-\rho_F)\varepsilon_{U_X}\varepsilon_{U_{gg}}+(\rho_F-1)\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}+(1-\rho_F)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}$$

Thus:

$$\frac{\hat{x}_{C|\hat{p}_C}}{\hat{p}_C}=\frac{(1-\gamma_C)\left(3-\rho_F-\frac{1}{\rho_F}\right)\varepsilon_{U_X}+\left(2-\rho_F-\frac{1}{\rho_F}\right)\varepsilon_{U_g}+\left[1-(1-\gamma_C)\rho_F\right]\varepsilon_{U_{gX}}}{(\rho_F-1)\left[\gamma_C^2\varepsilon_{U_X}\varepsilon_{U_g}-\varepsilon_{U_X}\varepsilon_{U_{gg}}+\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}-\gamma_C^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}+$$

$$\frac{(1-\rho_F)\varepsilon_{U_{gg}}-(1-\gamma_C)\left(2-\rho_F-\frac{1}{\rho_F}\right)\varepsilon_{U_g}\varepsilon_{U_{gX}}+\left[2-(1-\gamma_C)\left(\rho_F+\frac{1}{\rho_F}\right)\right]\varepsilon_{U_X}\varepsilon_{U_{gg}}}{(\rho_F-1)\left[\gamma_C^2\varepsilon_{U_X}\varepsilon_{U_g}-\varepsilon_{U_X}\varepsilon_{U_{gg}}+\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}-\gamma_C^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}$$

The price elasticity of demand of Fair Trade coffee

$$\frac{\hat{x}_{F|\hat{p}_F}}{\hat{p}_F}=\frac{\gamma_C\varepsilon_{U_X}*\left[2-\varepsilon_{U_g}\frac{1}{\rho_F}-\varepsilon_{U_{gg}}\left(\frac{1}{\rho_F}-1\right)-\frac{1}{\rho_F}\right]+\frac{1}{\rho_F}\varepsilon_{U_g}*\left[\varepsilon_{U_X}+\varepsilon_{U_{gX}}(1-\rho_F)\right]\gamma_C}{\left[(\rho_F-1)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_g}+(1-\rho_F)\varepsilon_{U_X}\varepsilon_{U_{gg}}+(\rho_F-1)\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}+(1-\rho_F)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}=$$

$$\frac{\left(2-\frac{1}{\rho_F}\right)\gamma_C\varepsilon_{U_X}+\left(\frac{1}{\rho_F}-1\right)\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}+\left(1-\frac{1}{\rho_F}\right)\gamma_C\varepsilon_{U_X}\varepsilon_{U_{gg}}}{\left[(\rho_F-1)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_g}+(1-\rho_F)\varepsilon_{U_X}\varepsilon_{U_{gg}}+(\rho_F-1)\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}+(1-\rho_F)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}$$

With the help of the model the cross-price elasticity between Fair Trade and regular coffee, as well as the elasticity of the coffees with regards to the share θ given to charity are found. These are given, but have not been simplified and will not be analyzed, since they are beyond the scope of this paper.

Cross-price elasticity of demand of Fair Trade coffee with respect to regular coffee prices

$$\frac{\hat{x}_{F|\hat{p}_C}}{\hat{p}_C} = \frac{\gamma_C \varepsilon_{U_X} * \left[-\varepsilon_{U_g} + \varepsilon_{U_g} \frac{1}{\rho_F} - \varepsilon_{U_{gg}} (1-\rho_F) + \varepsilon_{U_{gg}} (1-\rho_F) \frac{1}{\rho_F} + \rho_F + \frac{1}{\rho_F} - 2 \right] - \left((1-\varepsilon_{U_g} + \frac{1}{\rho_F} \varepsilon_{U_g} \right) * \left[\varepsilon_{U_X} + \varepsilon_{U_{gX}} (1-\rho_F) \right] \gamma_C}{\left[(\rho_F - 1) \gamma_C{}^2 \varepsilon_{U_X} \varepsilon_{U_g} + (1-\rho_F) \varepsilon_{U_X} \varepsilon_{U_{gg}} + (\rho_F - 1) \gamma_C \varepsilon_{U_g} \varepsilon_{U_{gX}} + (1-\rho_F) \gamma_C{}^2 \varepsilon_{U_X} \varepsilon_{U_{gX}} \right]}$$

Cross-price elasticity of demand of regular coffee with respect to Fair Trade coffee prices

$$\frac{\hat{x}_{C|\hat{p}_F}}{\hat{p}_F} = \frac{-\frac{1}{\rho_F} \varepsilon_{U_g} * (1-\gamma_C) \varepsilon_{U_X} + \varepsilon_{U_g} + \varepsilon_{U_{gX}} - \varepsilon_{U_{gX}} \rho_F - \varepsilon_{U_{gX}} \gamma_C + \varepsilon_{U_{gX}} \gamma_C \rho_F + \varepsilon_{U_{gg}} (1-\rho_F) - \left((1-\gamma_C) \varepsilon_{U_X} + \varepsilon_{U_g} \right) * \left[2 - \varepsilon_{U_g} \frac{1}{\rho_F} - \varepsilon_{U_{gg}} \left(\frac{1}{\rho_F} - 1 \right) - \frac{1}{\rho_F} \right]}{\left[(\rho_F - 1) \gamma_C{}^2 \varepsilon_{U_X} \varepsilon_{U_g} + (1-\rho_F) \varepsilon_{U_X} \varepsilon_{U_{gg}} + (\rho_F - 1) \gamma_C \varepsilon_{U_g} \varepsilon_{U_{gX}} + (1-\rho_F) \gamma_C{}^2 \varepsilon_{U_X} \varepsilon_{U_{gX}} \right]}$$

Elasticity of regular coffee demand with respect to share θ given to charity

$$\frac{\hat{x}_{C|\hat{\theta}}}{\hat{\theta}} = \frac{-\varepsilon_{U_g} * \left[(1-\gamma_C) \varepsilon_{U_X} + \varepsilon_{U_g} + \varepsilon_{U_{gX}} - \varepsilon_{U_{gX}} \rho_F - \varepsilon_{U_{gX}} \gamma_C + \varepsilon_{U_{gX}} \gamma_C \rho_F + \varepsilon_{U_{gg}} (1-\rho_F) \right] - \left((1-\gamma_C) \varepsilon_{U_X} + \varepsilon_{U_g} \right) * \left[-\varepsilon_{U_g} - \varepsilon_{U_{gg}} (1-\rho_F) - 1 + \rho_F \right]}{\left[(\rho_F - 1) \gamma_C{}^2 \varepsilon_{U_X} \varepsilon_{U_g} + (1-\rho_F) \varepsilon_{U_X} \varepsilon_{U_{gg}} + (\rho_F - 1) \gamma_C \varepsilon_{U_g} \varepsilon_{U_{gX}} + (1-\rho_F) \gamma_C{}^2 \varepsilon_{U_X} \varepsilon_{U_{gX}} \right]}$$

Elasticity of Fair Trade coffee demand with respect to share θ given to charity

$$\frac{\hat{x}_{F|\hat{\theta}}}{\hat{\theta}} = \frac{\gamma_C \varepsilon_{U_X} * \left[-\varepsilon_{U_g} - \varepsilon_{U_{gg}} (1-\rho_F) - 1 + \rho_F \right] + \varepsilon_{U_g} * \left[\varepsilon_{U_X} + \varepsilon_{U_{gX}} (1-\rho_F) \right] \gamma_C}{\left[(\rho_F - 1) \gamma_C{}^2 \varepsilon_{U_X} \varepsilon_{U_g} + (1-\rho_F) \varepsilon_{U_X} \varepsilon_{U_{gg}} + (\rho_F - 1) \gamma_C \varepsilon_{U_g} \varepsilon_{U_{gX}} + (1-\rho_F) \gamma_C{}^2 \varepsilon_{U_X} \varepsilon_{U_{gX}} \right]}$$

Appendix 2 Complete model for Fair Trade price elasticity of demand with pure altruism

Considering the purely altruistic case (Andreoni, 1990), where the quasi-linear utility-function can be formalized as

$$U = u(x_i, G_i) + y$$

Again x_i describes the sum of the consumption of Fair Trade (x_F) and conventional coffee (x_C)

$$x_i = x_F + x_C$$

while now *G* describes the public charity good given by the consumers in a certain country. In this case this will be the sum of all the donations *g* made by the Fair Trade consumers through purchases of Fair Trade coffee:

$$G = \sum_{i=1}^{n} g_i = \sum_{i=1}^{n} \theta(p_F - p_C)x_F$$

where p_F- p_C describes the difference between Fair Trade price (p_F) and regular coffee price (p_C), and θ describes the share of the price difference that is given as the Fair Trade premium (charity).

Maximizing the utility function that contains the total consumption of coffee and the public charity good *G*

$$U = u\left(x_C + x_F, \sum_{i=1}^{n} \theta(p_F - p_C)x_F \right) + y$$

subject to the budget constraint

$$I = p_y y + p_F x_F + p_C x_C$$

where *y* is consumption of all goods except coffee, and price of *y* p_y has been normalized to 1, gives:

$$I = y + p_F x_F + p_C x_C$$

This again can be rearranged as

$$y = I - p_C x_C - p_F x_F$$

Now the utility function above is maximized subject to the budget constraint as below.

$$U = u\left(x_C + x_F, \sum_{i=1}^{n} \theta(p_F - p_C)x_F \right) + (I - p_C x_C - p_F x_F)$$

The first order conditions (FOC) will be:

$$\frac{\partial u}{\partial x}\left[(x_C + x_F), \theta(p_F - p_C)\sum_{i=1}^{n} x_F \right] = p_C$$

and

$$\frac{\partial u}{\partial x}\left[(x_C + x_F), \theta(p_F - p_C)\sum_{i=1}^{n} x_F \right] + \frac{\partial u}{\partial G}\left[(x_C + x_F), \theta(p_F - p_C)\sum_{i=1}^{n} x_F \right]\theta(p_F - p_C) = p_F$$

If it is assumed that all consumers are equal and have similar coffee buying habits, i.e. that

$$x_i = x = x_i$$

then the sum of x_F from the utility function above can be stated as:

$$\sum_{i=1}^{n} x_F = nx_F$$

Inserting this into the FOC's gives:

$$\frac{\partial u}{\partial x}\left[(x_C + x_F), \theta(p_F - p_C)nx_F \right] = p_C$$

and

$$\frac{\partial u}{\partial x}\left[(x_C + x_F), \theta(p_F - p_C)nx_F \right] + \frac{\partial u}{\partial G}\left[(x_C + x_F), \theta(p_F - p_C)nx_F \right]\theta(p_F - p_C) = p_F$$

Now, concentrate on the first FOC. The FOC is formulated into a logarithmic difference equation by taking the second derivative of the equation and dividing each term by

$$\frac{\partial u}{\partial x} = u_x = p_C$$

Each term will also be formulated in a way that will make it easier for them to be simplified later on. Now one gets:

$$\frac{\partial^2 u}{\partial x^2}\frac{(x_C+x_F)}{u_x}\frac{x_C}{(x_C+x_F)}\frac{dx_C}{x_C}+\frac{\partial^2 u}{\partial x^2}\frac{(x_C+x_F)}{u_x}\frac{x_F}{(x_C+x_F)}\frac{dx_F}{x_F}+\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)nx_F}{u_x}\frac{dx_F}{x_F}+$$
$$\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)nx_F}{u_x}\frac{(dp_F-dp_C)}{(p_F-p_C)}+\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)nx_F}{u_x}\frac{d\theta}{\theta}+\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)nx_F}{u_x}\frac{dn}{n}=\frac{dp_C}{p_C}$$

The price terms and shares of total coffee sales will now be simplified in a similar manner to appendix 1. Also recall that the public charity good *G* is:

$$G=\sum_{i=1}^{n}g_i=\sum_{i=1}^{n}\theta(p_F-p_C)x_F$$

By inserting the notations from above the following equation is derived:

$$\frac{\partial^2 u}{\partial x^2}\frac{(x_C+x_F)}{u_x}\gamma_C\frac{dx_C}{x_C}+\frac{\partial^2 u}{\partial x^2}\frac{(x_C+x_F)}{u_x}(1-\gamma_C)\frac{dx_F}{x_F}+\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)nx_F}{u_x}\frac{dx_F}{x_F}+$$
$$\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)nx_F}{u_x}\left[\frac{1}{\rho_F}\frac{dp_F}{p_F}+\left(1-\frac{1}{\rho_F}\right)\frac{dp_C}{p_C}\right]+\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)nx_F}{u_x}\frac{d\theta}{\theta}+$$
$$\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)nx_F}{u_x}\frac{dn}{n}=\frac{dp_C}{p_C}$$

Now all small changes are written in the following style:

$\frac{dx_C}{x_C}=\hat{x}_C$, $\frac{dp_C}{p_C}=\hat{p}_C$ and so on.

Also the equation can be simplified by using the following notation for second derivatives:

$$\frac{\partial^2 u}{\partial x^2}\frac{(x_C+x_F)}{u_x}=\varepsilon_{U_X}$$

and

$$\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)nx_F}{u_x}=\frac{\partial^2 u}{\partial x^2}\frac{G}{u_x}=\varepsilon_{U_G}$$

Now the equation above can be reformulated giving:

$$\varepsilon_{U_X}\gamma_C\hat{x}_C+\varepsilon_{U_X}(1-\gamma_C)\hat{x}_F+\varepsilon_{U_G}\hat{x}_F+\varepsilon_{U_G}\left[\frac{1}{\rho_F}\hat{p}_F+\left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right]+\varepsilon_{U_G}\hat{\theta}+\varepsilon_{U_G}\hat{n}=\hat{p}_C$$

which can be rearranged to give:

$$\varepsilon_{U_x}\gamma_C\hat{x}_C + \varepsilon_{U_x}(1-\gamma_C)\hat{x}_F + \varepsilon_{U_G}\hat{x}_F = \hat{p}_C - \varepsilon_{U_G}\left[\frac{1}{\rho_F}\hat{p}_F + \left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right] - \varepsilon_{U_G}\hat{\theta} - \varepsilon_{U_G}\hat{n}$$

or

$$\gamma_C\varepsilon_{U_x}\hat{x}_C + \left(\varepsilon_{U_x} - \gamma_C\varepsilon_{U_x} + \varepsilon_{U_G}\right)\hat{x}_F = \left(1-\varepsilon_{U_G} + \frac{1}{\rho_F}\varepsilon_{U_G}\right)\hat{p}_C - \varepsilon_{U_G}\frac{1}{\rho_F}\hat{p}_F - \varepsilon_{U_G}\hat{\theta} - \varepsilon_{U_G}\hat{n}$$

The first FOC is now reformulated. The second FOC will be formulated in a similar manner. Starting with the FOC:

$$\frac{\partial u}{\partial x}\left[(x_C + x_F), \theta(p_F - p_C)nx_F\right] + \frac{\partial u}{\partial G}\left[(x_C + x_F), \theta(p_F - p_C)nx_F\right]\theta(p_F - p_C) = p_F$$

The first partial derivative in the FOC will be the same as earlier with the first FOC, so the focus will be on the second part. As earlier the FOC will be formulated into a logarithmic difference equation by taking a second derivative and dividing each term by

$$\frac{\partial u}{\partial x} = u_x = p_F$$

and get:

$$\frac{\partial^2 u}{\partial x^2}\frac{(x_C + x_F)}{u_x}\gamma_C\frac{dx_C}{x_C} + \frac{\partial^2 u}{\partial x^2}\frac{(x_C + x_F)}{u_x}(1-\gamma_C)\frac{dx_F}{x_F} + \frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F - p_C)nx_F}{u_x}\frac{dx_F}{x_F} +$$
$$\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F - p_C)nx_F}{u_x}\frac{(dp_F - dp_C)}{(p_F - p_C)} + \frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F - p_C)nx_F}{u_x}\frac{d\theta}{\theta} + \frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F - p_C)nx_F}{u_x}\frac{dn}{n} +$$
$$\left[\theta(p_F - p_C)n\right]\frac{u_G}{u_x}\left[\frac{\partial^2 u}{\partial x \partial G}\frac{(x_C + x_F)}{u_G}\gamma_C\frac{dx_C}{x_C} + \frac{\partial^2 u}{\partial x \partial G}\frac{(x_C + x_F)}{u_G}(1-\gamma_C)\frac{dx_F}{x_F} + \frac{\partial^2 u}{\partial G^2}\frac{\theta(p_F - p_C)nx_F}{u_G}\frac{dx_F}{x_F} + \right.$$
$$\frac{\partial^2 u}{\partial G^2}\frac{\theta(p_F - p_C)nx_F}{u_G}\frac{(dp_F - dp_C)}{(p_F - p_C)} + \frac{\partial^2 u}{\partial G^2}\frac{\theta(p_F - p_C)nx_F}{u_G}\frac{d\theta}{\theta} + \frac{\partial^2 u}{\partial G^2}\frac{\theta(p_F - p_C)nx_F}{u_G}\frac{dn}{n} +$$
$$\left.\frac{\theta p_F}{\theta(p_F - p_C)n}\frac{dp_F}{p_F} + \frac{\theta p_C}{\theta(p_F - p_C)n}\frac{dp_C}{p_C} + \frac{d\theta}{\theta}\right] = \frac{dp_F}{p_F}$$

The price term can be simplified and the same notation will be used to show the share of total consumption of coffee as before, so these symbols can be inserted into the equations to get:

$$\frac{\partial^2 u}{\partial x^2}\frac{(x_C+x_F)}{u_x}\gamma_C\frac{dx_C}{x_C}+\frac{\partial^2 u}{\partial x^2}\frac{(x_C+x_F)}{u_x}(1-\gamma_C)\frac{dx_F}{x_F}+\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)nx_F}{u_x}\frac{dx_F}{x_F}+$$

$$\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)nx_F}{u_x}\left[\frac{1}{\rho_F}\frac{dp_F}{p_F}+\left(1-\frac{1}{\rho_F}\right)\frac{dp_C}{p_C}\right]+\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)nx_F}{u_x}\frac{d\theta}{\theta}+\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)nx_F}{u_x}\frac{dn}{n}+$$

$$[\theta(p_F-p_C)n]\frac{u_G}{u_x}\left[\frac{\partial^2 u}{\partial x\partial G}\frac{(x_C+x_F)}{u_G}\gamma_C\frac{dx_C}{x_C}+\frac{\partial^2 u}{\partial x\partial G}\frac{(x_C+x_F)}{u_G}(1-\gamma_C)\frac{dx_F}{x_F}+\frac{\partial^2 u}{\partial G^2}\frac{\theta(p_F-p_C)nx_F}{u_G}\frac{dx_F}{x_F}+\right.$$

$$\frac{\partial^2 u}{\partial G^2}\frac{\theta(p_F-p_C)nx_F}{u_G}\left[\frac{1}{\rho_F}\frac{dp_F}{p_F}+\left(1-\frac{1}{\rho_F}\right)\frac{dp_C}{p_C}\right]+\frac{\partial^2 u}{\partial G^2}\frac{\theta(p_F-p_C)nx_F}{u_G}\frac{d\theta}{\theta}+\frac{\partial^2 u}{\partial G^2}\frac{\theta(p_F-p_C)nx_F}{u_G}\frac{dn}{n}+$$

$$\left.\frac{\theta p_F}{\theta(p_F-p_C)n}\frac{dp_F}{p_F}+\frac{\theta p_C}{\theta(p_F-p_C)n}\frac{dp_C}{p_C}+\frac{d\theta}{\theta}\right]=\frac{dp_F}{p_F}$$

This can again be simplified by noting all small changes in the form:

$\frac{dx_C}{x_C}=\hat{x}_C$, $\frac{dp_C}{p_C}=\hat{p}_C$ and so on.

The terms below will be denoted as:

$$\frac{\partial^2 u}{\partial x^2}\frac{(x_C+x_F)}{u_x}=\varepsilon_{U_X}$$

$$\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)nx_F}{u_x}=\frac{\partial^2 u}{\partial x^2}\frac{G}{u_x}=\varepsilon_{U_G}$$

$$\frac{\partial^2 u}{\partial x\partial G}\frac{(x_C+x_F)}{u_G}=\varepsilon_{U_{GX}}$$

and

$$\frac{\partial^2 u}{\partial G^2}\frac{\theta(p_F-p_C)x_F}{u_G}=\frac{\partial^2 u}{\partial G^2}\frac{G}{u_G}=\varepsilon_{U_{GG}}$$

Now:

$$\varepsilon_{U_x}\gamma_C\hat{x}_C+\varepsilon_{U_x}(1-\gamma_C)\hat{x}_F+\varepsilon_{U_G}\hat{x}_F+\varepsilon_{U_G}\left[\frac{1}{\rho_F}\hat{p}_F+\left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right]+\varepsilon_{U_G}\hat{\theta}+\varepsilon_{U_G}\hat{n}+$$

$$[\theta(p_F-p_C)n]\frac{u_G}{u_x}\Big[\varepsilon_{U_{GX}}\gamma_C\hat{x}_C+\varepsilon_{U_{GX}}(1-\gamma_C)\hat{x}_F+\varepsilon_{U_{GG}}\hat{x}_F+\varepsilon_{U_{GG}}\left[\frac{1}{\rho_F}\hat{p}_F+\left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right]+\varepsilon_{U_{GG}}\hat{\theta}+\varepsilon_{U_{GG}}\hat{n}+$$

$$\frac{1}{n\rho_F}\hat{p}_F+\left(\frac{1}{n}-\frac{1}{n\rho_F}\right)\hat{p}_C+\hat{\theta}\Big]=\hat{p}_F$$

In order to substitute for the factor

$$[\theta(p_F-p_C)n]\frac{u_G}{u_x}$$

the second FOC is divided by the first FOC to get:

$$1+\theta(p_F-p_C)\frac{u_G}{u_x}=\frac{p_F}{p_C}$$

which is the same as:

$$\theta(p_F-p_C)\frac{u_G}{u_x}=\frac{p_F}{p_C}-1=\frac{p_F-p_C}{p_C}=\rho_C=(1-\rho_F)$$

This can be inserted into the equation above in order to simplify it a bit.

$$\varepsilon_{U_x}\gamma_C\hat{x}_C+\varepsilon_{U_x}(1-\gamma_C)\hat{x}_F+\varepsilon_{U_G}\hat{x}_F+\varepsilon_{U_G}\left[\frac{1}{\rho_F}\hat{p}_F+\left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right]+\varepsilon_{U_G}\hat{\theta}+\varepsilon_{U_G}\hat{n}+$$

$$(1-\rho_F)n\Bigg[\varepsilon_{U_{GX}}\gamma_C\hat{x}_C+\varepsilon_{U_{GX}}(1-\gamma_C)\hat{x}_F+\varepsilon_{U_{GG}}\hat{x}_F+\varepsilon_{U_{GG}}\left[\frac{1}{\rho_F}\hat{p}_F+\left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right]+\varepsilon_{U_{GG}}\hat{\theta}+\varepsilon_{U_{GG}}\hat{n}+$$

$$\frac{1}{n\rho_F}\hat{p}_F+\left(\frac{1}{n}-\frac{1}{n\rho_F}\right)\hat{p}_C+\hat{\theta}\Bigg]=\hat{p}_F$$

Continuing by multiplying all terms:

$$\gamma_C\varepsilon_{U_X}\hat{x}_C+\varepsilon_{U_X}\hat{x}_F-\gamma_C\varepsilon_{U_X}\hat{x}_F+\varepsilon_{U_G}\hat{x}_F+\varepsilon_{U_G}\frac{1}{\rho_F}\hat{p}_F+\varepsilon_{U_G}\hat{p}_C-\varepsilon_{U_G}\frac{1}{\rho_F}\hat{p}_C+\varepsilon_{U_G}\hat{\theta}+\varepsilon_{U_G}\hat{n}+$$
$$(1-\rho_F)n\varepsilon_{U_{GX}}\gamma_C\hat{x}_C+(1-\rho_F)n\varepsilon_{U_{GG}}\hat{x}_F-(1-\rho_F)n\varepsilon_{U_{GX}}\gamma_C\hat{x}_F+(1-\rho_F)n\varepsilon_{U_{GG}}\hat{x}_F+$$
$$(1-\rho_F)n\varepsilon_{U_{GG}}\frac{1}{\rho_F}\hat{p}_F+(1-\rho_F)n\varepsilon_{U_{GG}}\hat{p}_C-(1-\rho_F)n\varepsilon_{U_{GG}}\frac{1}{\rho_F}\hat{p}_C+(1-\rho_F)n\varepsilon_{U_{GG}}\hat{\theta}+(1-\rho_F)n\hat{\theta}+$$
$$(1-\rho_F)n\frac{1}{n\rho_F}\hat{p}_F+(1-\rho_F)n\frac{1}{n}\hat{p}_C-(1-\rho_F)n\frac{1}{n\rho_F}\hat{p}_C+(1-\rho_F)n\varepsilon_{U_{GG}}\hat{n}=\hat{p}_F$$

or

$$\varepsilon_{U_X}\hat{x}_F-\gamma_C\varepsilon_{U_X}\hat{x}_F+\varepsilon_{U_G}\hat{x}_F+(1-\rho_F)n\varepsilon_{U_{GG}}\hat{x}_F-(1-\rho_F)n\varepsilon_{U_{GX}}\gamma_C\hat{x}_F+$$
$$\gamma_C\varepsilon_{U_X}\hat{x}_C+(1-\rho_F)n\varepsilon_{U_{GX}}\gamma_C\hat{x}_C+$$
$$\varepsilon_{U_G}\frac{1}{\rho_F}\hat{p}_F+(1-\rho_F)n\varepsilon_{U_{GG}}\frac{1}{\rho_F}\hat{p}_F+(1-\rho_F)n\frac{1}{n\rho_F}\hat{p}_F+$$
$$\varepsilon_{U_G}\hat{p}_C-\varepsilon_{U_G}\frac{1}{\rho_F}\hat{p}_C+(1-\rho_F)n\varepsilon_{U_{GG}}\hat{p}_C-(1-\rho_F)n\varepsilon_{U_{GG}}\frac{1}{\rho_F}\hat{p}_C+(1-\rho_F)n\frac{1}{n}\hat{p}_C-(1-\rho_F)n\frac{1}{n\rho_F}\hat{p}_C$$
$$\varepsilon_{U_G}\hat{\theta}+(1-\rho_F)n\varepsilon_{U_{GG}}\hat{\theta}+(1-\rho_F)n\hat{\theta}+\varepsilon_{U_G}\hat{n}+(1-\rho_F)n\varepsilon_{U_{GG}}\hat{n}=\hat{p}_F$$

Now by rearranging the result is:

$$\left[\varepsilon_{U_X}-\gamma_C\varepsilon_{U_X}+\varepsilon_{U_G}+(1-\rho_F)n\varepsilon_{U_{GG}}-(1-\rho_F)n\varepsilon_{U_{GX}}\gamma_C\right]\hat{x}_F+\left[\gamma_C\varepsilon_{U_X}+(1-\rho_F)n\varepsilon_{U_{GX}}\gamma_C\right]\hat{x}_C=$$
$$\left[1-\varepsilon_{U_G}\frac{1}{\rho_F}-(1-\rho_F)n\varepsilon_{U_{GG}}\frac{1}{\rho_F}-(1-\rho_F)n\frac{1}{n\rho_F}\right]\hat{p}_F+$$
$$\left[-\varepsilon_{U_G}+\varepsilon_{U_G}\frac{1}{\rho_F}-(1-\rho_F)n\varepsilon_{U_{GG}}+(1-\rho_F)n\varepsilon_{U_{GG}}\frac{1}{\rho_F}-(1-\rho_F)+(1-\rho_F)\frac{1}{\rho_F}\right]\hat{p}_C+$$
$$\left[-\varepsilon_{U_G}-(1-\rho_F)n\varepsilon_{U_{GG}}-(1-\rho_F)n\right]\hat{\theta}+\left[-\varepsilon_{U_G}-(1-\rho_F)n\varepsilon_{U_{GG}}\right]\hat{n}$$

The result is a set of two equations, which can be solved by using the Cramer's rule:

The first FOC:

$$\gamma_C\varepsilon_{U_X}\hat{x}_C+\left(\varepsilon_{U_X}-\gamma_C\varepsilon_{U_X}+\varepsilon_{U_G}\right)\hat{x}_F=\left(1-\varepsilon_{U_G}+\frac{1}{\rho_F}\varepsilon_{U_G}\right)\hat{p}_C-\varepsilon_{U_G}\frac{1}{\rho_F}\hat{p}_F-\varepsilon_{U_G}\hat{\theta}-\varepsilon_{U_G}\hat{n}$$

The second FOC:

$$\left[\varepsilon_{U_X} - \gamma_C\varepsilon_{U_X} + \varepsilon_{U_G} + (1-\rho_F)n\varepsilon_{U_{GG}} - (1-\rho_F)n\varepsilon_{U_{GX}}\gamma_C\right]\hat{x}_F + \left[\gamma_C\varepsilon_{U_X} + (1-\rho_F)n\varepsilon_{U_{GX}}\gamma_C\right]\hat{x}_C =$$
$$\left[1-\varepsilon_{U_G}\frac{1}{\rho_F} - (1-\rho_F)n\varepsilon_{U_{GG}}\frac{1}{\rho_F} - (1-\rho_F)n\frac{1}{n\rho_F}\right]\hat{p}_F +$$
$$\left[-\varepsilon_{U_G} + \varepsilon_{U_G}\frac{1}{\rho_F} - (1-\rho_F)n\varepsilon_{U_{GG}} + (1-\rho_F)n\varepsilon_{U_{GG}}\frac{1}{\rho_F} - (1-\rho_F) + (1-\rho_F)\frac{1}{\rho_F}\right]\hat{p}_C +$$
$$\left[-\varepsilon_{U_G} - (1-\rho_F)n\varepsilon_{U_{GG}} - (1-\rho_F)n\right]\hat{\theta} + \left[-\varepsilon_{U_G} - (1-\rho_F)n\varepsilon_{U_{GG}}\right]\hat{n}$$

$$\gamma_C\varepsilon_{U_X}\hat{x}_C + \left(\varepsilon_{U_X} - \gamma_C\varepsilon_{U_X} + \varepsilon_{U_G}\right)\hat{x}_F = \left(1-\varepsilon_{U_G} + \frac{1}{\rho_F}\varepsilon_{U_G}\right)\hat{p}_C - \varepsilon_{U_G}\frac{1}{\rho_F}\hat{p}_F - \varepsilon_{U_G}\hat{\theta} - \varepsilon_{U_G}\hat{n}$$

are in matrix form:

$$\begin{bmatrix} \gamma_C\varepsilon_{U_X} & \left(\varepsilon_{U_X} - \gamma_C\varepsilon_{U_X} + \varepsilon_{U_G}\right) \\ \left[\gamma_C\varepsilon_{U_X} + (1-\rho_F)n\varepsilon_{U_{GX}}\gamma_C\right] & \left[\varepsilon_{U_X} - \gamma_C\varepsilon_{U_X} + \varepsilon_{U_G} + (1-\rho_F)n\varepsilon_{U_{GG}} - (1-\rho_F)n\varepsilon_{U_{GX}}\gamma_C\right] \end{bmatrix}\begin{bmatrix}\hat{x}_C \\ \hat{x}_F\end{bmatrix} =$$
$$\begin{bmatrix} \left(1-\varepsilon_{U_G} + \frac{1}{\rho_F}\varepsilon_{U_G}\right) \\ \left[-\varepsilon_{U_G} + \varepsilon_{U_G}\frac{1}{\rho_F} - (1-\rho_F)n\varepsilon_{U_{GG}} + (1-\rho_F)n\varepsilon_{U_{GG}}\frac{1}{\rho_F} - (1-\rho_F) + (1-\rho_F)\frac{1}{\rho_F}\right] \end{bmatrix}\hat{p}_C +$$
$$\begin{bmatrix} -\varepsilon_{U_G}\frac{1}{\rho_F} \\ \left[1-\varepsilon_{U_G}\frac{1}{\rho_F} - (1-\rho_F)n\varepsilon_{U_{GG}}\frac{1}{\rho_F} - (1-\rho_F)n\frac{1}{n\rho_F}\right] \end{bmatrix}\hat{p}_F +$$
$$\begin{bmatrix} -\varepsilon_{U_G} \\ \left[-\varepsilon_{U_G} - (1-\rho_F)n\varepsilon_{U_{GG}} - (1-\rho_F)n\right] \end{bmatrix}\hat{\theta} + \begin{bmatrix} -\varepsilon_{U_G} \\ \left[-\varepsilon_{U_G} - (1-\rho_F)n\varepsilon_{U_{GG}}\right] \end{bmatrix}\hat{n}$$

The determinant of the matrix is:

$$\det = \begin{vmatrix} \gamma_C\varepsilon_{U_X} & \left(\varepsilon_{U_X} - \gamma_C\varepsilon_{U_X} + \varepsilon_{U_G}\right) \\ \left[\gamma_C\varepsilon_{U_X} + (1-\rho_F)n\varepsilon_{U_{GX}}\gamma_C\right] & \left[\varepsilon_{U_X} - \gamma_C\varepsilon_{U_X} + \varepsilon_{U_G} + (1-\rho_F)n\varepsilon_{U_{GG}} - (1-\rho_F)n\varepsilon_{U_{GX}}\gamma_C\right] \end{vmatrix} =$$
$$\gamma_C\varepsilon_{U_X} * \left[\varepsilon_{U_X} - \gamma_C\varepsilon_{U_X} + \varepsilon_{U_G} + (1-\rho_F)n\varepsilon_{U_{GG}} - (1-\rho_F)n\varepsilon_{U_{GX}}\gamma_C\right] -$$
$$\left[\gamma_C\varepsilon_{U_X} + (1-\rho_F)n\varepsilon_{U_{GX}}\gamma_C\right] * \left(\varepsilon_{U_X} - \gamma_C\varepsilon_{U_X} + \varepsilon_{U_G}\right) =$$
$$(1-\rho_F)\gamma_C n\left[\varepsilon_{U_X}\varepsilon_{U_{GG}} - (1+\gamma_C)\varepsilon_{U_X}\varepsilon_{U_{GX}} - (1-\gamma_C)\varepsilon_{U_G}\varepsilon_{U_{GX}}\right]$$

Then the terms $\hat{x}_F$ and $\hat{x}_C$ can be solved conditional to the prices of Fair Trade coffee and conventional coffee, as well as conditional to the share θ that consumer believe is delivered to Fair Trade producers of the price difference between regular and Fair Trade coffee and the number of consumers *n*.

Since the definition of price elasticity of demand is

$$PED = -\frac{dx/x}{dp/p}$$

then for example the term

$$PED = -\frac{dx}{x}\frac{p}{dp} = \frac{\hat{x}_{F|\hat{p}_F}}{\hat{p}_F}$$

will represent the price elasticity of demand of Fair Trade coffee.

Using the Cramer rule the results are as follow:

The price elasticity of demand of regular coffee

$$\frac{\hat{x}_{C|\hat{p}_C}}{\hat{p}_C} = \frac{\left(1-\varepsilon_{U_G}+\frac{1}{\rho_F}\varepsilon_{U_G}\right)*\left[\varepsilon_{U_X}-\gamma_C\varepsilon_{U_X}+\varepsilon_{U_G}+(1-\rho_F)n\varepsilon_{U_{GG}}-(1-\rho_F)n\varepsilon_{U_{GX}}\gamma_C\right]-}{(1-\rho_F)\gamma_C n\left[\varepsilon_{U_X}\varepsilon_{U_{GG}}-(1+\gamma_C)\varepsilon_{U_X}\varepsilon_{U_{GX}}-(1-\gamma_C)\varepsilon_{U_G}\varepsilon_{U_{GX}}\right]}$$

$$\frac{\left(\varepsilon_{U_X}-\gamma_C\varepsilon_{U_X}+\varepsilon_{U_G}\right)\left[-\varepsilon_{U_G}+\varepsilon_{U_G}\frac{1}{\rho_F}-(1-\rho_F)n\varepsilon_{U_{GG}}+(1-\rho_F)n\varepsilon_{U_{GG}}\frac{1}{\rho_F}-(1-\rho_F)+(1-\rho_F)\frac{1}{\rho_F}\right]}{(1-\rho_F)\gamma_C n\left[\varepsilon_{U_X}\varepsilon_{U_{GG}}-(1+\gamma_C)\varepsilon_{U_X}\varepsilon_{U_{GX}}-(1-\gamma_C)\varepsilon_{U_G}\varepsilon_{U_{GX}}\right]} =$$

$$\frac{\left(\gamma_C\frac{1}{\rho_F}+\gamma_C\rho_F-\rho_F-\frac{1}{\rho_F}+\gamma_C+1\right)\varepsilon_{U_X}-\left(\frac{1}{\rho_F}-\rho_F+1\right)\varepsilon_{U_G}+(n-\rho_F)\varepsilon_{U_{GG}}+(n-\rho_F)\gamma_C\varepsilon_{U_{GX}}}{(1-\rho_F)\gamma_C n\left[\varepsilon_{U_X}\varepsilon_{U_{GG}}-(1+\gamma_C)\varepsilon_{U_X}\varepsilon_{U_{GX}}-(1-\gamma_C)\varepsilon_{U_G}\varepsilon_{U_{GX}}\right]}+$$

$$\frac{\left(\frac{1}{\rho_F}-\frac{1}{\rho_F}n-n-1\right)n\varepsilon_{U_G}\varepsilon_{U_{GG}}+\left(2\gamma_C n-\rho_F\gamma_C n-\frac{1}{\rho_F}\gamma_C n\right)\varepsilon_{U_G}\varepsilon_{U_{GX}}+\left(\frac{1}{\rho_F}\gamma_C n+\rho_F\gamma_C-\rho_F-\frac{1}{\rho_F}n\right)\varepsilon_{U_X}\varepsilon_{U_{GX}}}{(1-\rho_F)\gamma_C n\left[\varepsilon_{U_X}\varepsilon_{U_{GG}}-(1+\gamma_C)\varepsilon_{U_X}\varepsilon_{U_{GX}}-(1-\gamma_C)\varepsilon_{U_G}\varepsilon_{U_{GX}}\right]}$$

The price elasticity of demand of Fair Trade coffee

$$\frac{\hat{x}_{F|\hat{p}_F}}{\hat{p}_F} = \frac{\gamma_C \varepsilon_{U_X} * \left[1 - \varepsilon_{U_G}\frac{1}{\rho_F} - (1-\rho_F) n \varepsilon_{U_{GG}} \frac{1}{\rho_F} - (1-\rho_F) n \frac{1}{n\rho_F}\right] + \left[\varepsilon_{U_X} + (1-\rho_F) n \varepsilon_{U_{GX}}\right] \gamma_C * \varepsilon_{U_G}\frac{1}{\rho_F}}{(1-\rho_F)\gamma n \left[\varepsilon_{U_X}\varepsilon_{U_{GG}} - (1+\gamma_C)\varepsilon_{U_X}\varepsilon_{U_{GX}} - (1-\gamma_C)\varepsilon_{U_G}\varepsilon_{U_{GX}}\right]} =$$

$$\frac{\left(1-\frac{1}{\rho_F}\right)\varepsilon_{U_X} - 2\frac{1}{\rho_F}\varepsilon_{U_X}\varepsilon_{U_G} + \left(1-\frac{1}{\rho_F}\right) n \varepsilon_{U_{GX}}\varepsilon_{U_G} + \left(1-\frac{1}{\rho_F}\right) n \varepsilon_{U_X}\varepsilon_{U_{GG}}}{(1-\rho_F) n \left[\varepsilon_{U_X}\varepsilon_{U_{GG}} - (1+\gamma_C)\varepsilon_{U_X}\varepsilon_{U_{GX}} - (1-\gamma_C)\varepsilon_{U_G}\varepsilon_{U_{GX}}\right]}$$

With the help of the model also the cross-price elasticity between Fair Trade and regular coffee can be found, as well as the elasticity of the coffees with regards to the share θ given to charity, as well as number of consumers *n.* These can be found below, but have not been simplified and will not be analyzed, since they are beyond the scope of the research question.

Cross-price elasticity of demand of Fair Trade coffee with respect to regular coffee prices

$$\frac{\hat{x}_{F|\hat{p}_C}}{\hat{p}_C} = \frac{\gamma_C \varepsilon_{U_X} * \left[-\varepsilon_{U_G} + \varepsilon_{U_G}\frac{1}{\rho_F} - (1-\rho_F) n \varepsilon_{U_{GG}} + (1-\rho_F) n \varepsilon_{U_{GG}}\frac{1}{\rho_F} - (1-\rho_F) + (1-\rho_F)\frac{1}{\rho_F}\right] - \left(1 - \varepsilon_{U_G} + \frac{1}{\rho_F}\varepsilon_{U_G}\right) * \left[\varepsilon_{U_X} + (1-\rho_F) n \varepsilon_{U_{GX}}\right]\gamma_C}{(1-\rho_F)\gamma_C n \left[\varepsilon_{U_X}\varepsilon_{U_{GG}} - (1+\gamma_C)\varepsilon_{U_X}\varepsilon_{U_{GX}} - (1-\gamma_C)\varepsilon_{U_G}\varepsilon_{U_{GX}}\right]}$$

Cross-price elasticity of demand of regular coffee with respect to Fair Trade coffee prices

$$\frac{\hat{x}_{C|\hat{p}_F}}{\hat{p}_F} = \frac{-\varepsilon_{U_G}\frac{1}{\rho_F} * \left[(1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_G} + (1-\rho_F) n \varepsilon_{U_{GG}} - (1-\rho_F) n \varepsilon_{U_{GX}}\gamma_C\right] - \left((1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_G}\right)\left[1 - \varepsilon_{U_G}\frac{1}{\rho_F} - (1-\rho_F) n \varepsilon_{U_{GG}}\frac{1}{\rho_F} - (1-\rho_F) n \frac{1}{n\rho_F}\right]}{(1-\rho_F)\gamma_C n \left[\varepsilon_{U_X}\varepsilon_{U_{GG}} - (1+\gamma_C)\varepsilon_{U_X}\varepsilon_{U_{GX}} - (1-\gamma_C)\varepsilon_{U_G}\varepsilon_{U_{GX}}\right]}$$

Elasticity of regular coffee demand with respect to share θ given to charity

$$\frac{\hat{x}_{C|\hat{\theta}}}{\hat{\theta}} = \frac{-\varepsilon_{U_G} * \left[(1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_G} + (1-\rho_F) n \varepsilon_{U_{GG}} - (1-\rho_F) n \varepsilon_{U_{GX}}\gamma_C\right] - \left((1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_G}\right) * \left[-\varepsilon_{U_G} - (1-\rho_F) n \varepsilon_{U_{GG}} - (1-\rho_F) n\right]}{(1-\rho_F)\gamma_C n \left[\varepsilon_{U_X}\varepsilon_{U_{GG}} - (1+\gamma_C)\varepsilon_{U_X}\varepsilon_{U_{GX}} - (1-\gamma_C)\varepsilon_{U_G}\varepsilon_{U_{GX}}\right]}$$

Elasticity of Fair Trade coffee demand with respect to share θ given to charity

$$\frac{\hat{x}_{F|\hat{\theta}}}{\hat{\theta}} = \frac{\gamma_C \varepsilon_{U_X} * \left[-\varepsilon_{U_G} - (1-\rho_F)n\varepsilon_{U_{GG}} - (1-\rho_F)n\right] + \left[\gamma_C \varepsilon_{U_X} + (1-\rho_F)n\varepsilon_{U_{GX}}\gamma_C\right] * \varepsilon_{U_G}}{(1-\rho_F)\gamma_C n\left[\varepsilon_{U_X}\varepsilon_{U_{GG}} - (1+\gamma_C)\varepsilon_{U_X}\varepsilon_{U_{GX}} - (1-\gamma_C)\varepsilon_{U_G}\varepsilon_{U_{GX}}\right]}$$

Elasticity of regular coffee demand with respect to number of consumer *n*

$$\frac{\hat{x}_{C|\hat{n}}}{\hat{n}} = \frac{-\varepsilon_{U_G} * \left[(1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_G} + (1-\rho_F)n\varepsilon_{U_{GG}} - (1-\rho_F)n\varepsilon_{U_{GX}}\gamma_C\right] - \left((1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_G}\right) * \left[-\varepsilon_{U_G} - (1-\rho_F)n\varepsilon_{U_{GG}}\right]}{(1-\rho_F)\gamma_C n\left[\varepsilon_{U_X}\varepsilon_{U_{GG}} - (1+\gamma_C)\varepsilon_{U_X}\varepsilon_{U_{GX}} - (1-\gamma_C)\varepsilon_{U_G}\varepsilon_{U_{GX}}\right]}$$

Elasticity of Fair Trade coffee demand with respect to number of consumer *n*

$$\frac{\hat{x}_{F|\hat{n}}}{\hat{n}} = \frac{\varepsilon_{U_X} * \left[-\varepsilon_{U_G} - (1-\rho_F)n\varepsilon_{U_{GG}}\right] + \varepsilon_{U_G} * \left[\varepsilon_{U_X} + (1-\rho_F)n\varepsilon_{U_{GX}}\right]}{(1-\rho_F)n\left[\varepsilon_{U_X}\varepsilon_{U_{GG}} - (1+\gamma_C)\varepsilon_{U_X}\varepsilon_{U_{GX}} - (1-\gamma_C)\varepsilon_{U_G}\varepsilon_{U_{GX}}\right]}$$

Appendix 3 Complete model for Fair Trade price elasticity of demand with esteem

Considering the case with esteem, where the quasi-linear utility-function can be formalized as

$$U = u(x_i, e_i) + y$$

Once again, x_i depicts the sum of the consumption of Fair Trade (x_F) and conventional coffee (x_C)

$$x_i = x_F + x_C$$

and now e describes the esteem gained by an individual by purchasing Fair Trade products. Esteem can be claimed to be proportional to the average consumption of Fair Trade products in the society:

$$e_i = \frac{1}{n} G_i = \frac{1}{n} \sum_{i=1}^{n} \theta (p_F - p_C) x_F$$

where p_F- p_C describes the difference between Fair Trade price (p_F) and regular coffee price (p_C), and θ describes the share of the price difference that is given as the Fair Trade premium (charity).

Maximizing the utility function that contains the total consumption of coffee and the element for esteem e gives:

$$U = u\left(x_C + x_F, \frac{1}{n} \sum_{i=1}^{n} \theta (p_F - p_C) x_F \right) + y$$

subject to the budget constraint

$$I = p_y y + p_F x_F + p_C x_C$$

where y is consumption of all goods except coffee, and price of y p_y has been normalized to 1, giving

$$I = y + p_F x_F + p_C x_C$$

which is the same as:

$$y = I - p_C x_C - p_F x_F$$

Now the utility function above will be maximized subject to the budget constraint as below.

$$U = u\left(x_C + x_F, \frac{1}{n} \sum_{i=1}^{n} \theta (p_F - p_C) x_F \right) + (I - p_C x_C - p_F x_F)$$

The first order conditions (FOC) will be:

$$\frac{\partial u}{\partial x}\left[(x_C + x_F), \theta(p_F - p_C)\frac{1}{n}\sum_{i=1}^{n} x_F\right] = p_C$$

and

$$\frac{\partial u}{\partial x}\left[(x_C + x_F), \theta(p_F - p_C)\frac{1}{n}\sum_{i=1}^{n} x_F\right] + \frac{\partial u}{\partial e}\left[(x_C + x_F), \theta(p_F - p_C)\frac{1}{n}\sum_{i=1}^{n} x_F\right]\theta(p_F - p_C)\frac{1}{n} = p_F$$

As in the case of pure altruism, if it is assumed that all consumers are equal and have similar coffee buying habits, i.e. that

$$x_i = x = x_i$$

then the sum of x_F from the utility function above can be stated as:

$$\sum_{i=1}^{n} x_F = n x_F$$

Now the FOC's are:

$$\frac{\partial u}{\partial x}\left[(x_C + x_F), \theta(p_F - p_C)\frac{1}{n} n x_F\right] = \frac{\partial u}{\partial x}\left[(x_C + x_F), \theta(p_F - p_C)x_F\right] = p_C$$

and

$$\frac{\partial u}{\partial x}\left[(x_C + x_F), \theta(p_F - p_C)x_F\right] + \frac{\partial u}{\partial e}\left[(x_C + x_F), \theta(p_F - p_C)x_F\right]\theta(p_F - p_C)\frac{1}{n} = p_F \, .$$

Now, concentrate on the first FOC. The FOC is formulated into a logarithmic difference equation by taking the second derivative of the equation and dividing each term by

$$\frac{\partial u}{\partial x} = u_x = p_C$$

Each term will also be formulated in a way that will make it easier for them to be simplified later on. The result is a similar equation as in the warm-glow model:

$$\frac{\partial^2 u}{\partial x^2}\frac{(x_C+x_F)}{u_x}\frac{x_C}{(x_C+x_F)}\frac{dx_C}{x_C}+\frac{\partial^2 u}{\partial x^2}\frac{(x_C+x_F)}{u_x}\frac{x_F}{(x_C+x_F)}\frac{dx_F}{x_F}+\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)x_F}{u_x}\frac{dx_F}{x_F}+$$
$$\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)x_F}{u_x}\frac{(dp_F-dp_C)}{(p_F-p_C)}+\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)x_F}{u_x}\frac{d\theta}{\theta}=\frac{dp_C}{p_C}$$

Simplifying the price terms and the shares of consumption of total coffee one finds:

$$\frac{\partial^2 u}{\partial x^2}\frac{(x_C+x_F)}{u_x}\gamma_C\frac{dx_C}{x_C}+\frac{\partial^2 u}{\partial x^2}\frac{(x_C+x_F)}{u_x}(1-\gamma_C)\frac{dx_F}{x_F}+\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)x_F}{u_x}\frac{dx_F}{x_F}+$$
$$\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)x_F}{u_x}\left[\frac{1}{\rho_F}\frac{dp_F}{p_F}+\left(1-\frac{1}{\rho_F}\right)\frac{dp_C}{p_C}\right]+\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)x_F}{u_x}\frac{d\theta}{\theta}=\frac{dp_C}{p_C}$$

All small changes will be noted in the following style:

$\frac{dx_C}{x_C}=\hat{x}_C$, $\frac{dp_C}{p_C}=\hat{p}_C$ and so on.

Also the notation will be simplified by using the following terms for second derivatives:

$$\frac{\partial^2 u}{\partial x^2}\frac{(x_C+x_F)}{u_x}=\varepsilon_{U_x}$$

and

$$\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F-p_C)x_F}{u_x}=\frac{\partial^2 u}{\partial x^2}\frac{g}{u_x}=\varepsilon_{U_g}$$

Now the equation above can be reformulated to give:

$$\varepsilon_{U_x}\gamma_C\hat{x}_C+\varepsilon_{U_x}(1-\gamma_C)\hat{x}_F+\varepsilon_{U_g}\hat{x}_F+\varepsilon_{U_g}\left[\frac{1}{\rho_F}\hat{p}_F+\left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right]+\varepsilon_{U_g}\hat{\theta}=\hat{p}_C$$

which can be rearranged to give:

$$\varepsilon_{U_x}\gamma_C\hat{x}_C+\varepsilon_{U_x}(1-\gamma_C)\hat{x}_F+\varepsilon_{U_g}\hat{x}_F=\hat{p}_C-\varepsilon_{U_g}\left[\frac{1}{\rho_F}\hat{p}_F+\left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right]-\varepsilon_{U_g}\hat{\theta}$$

or

$$\gamma_C \varepsilon_{U_x} \hat{x}_C + (\varepsilon_{U_x} - \gamma_C \varepsilon_{U_x} + \varepsilon_{U_g}) \hat{x}_F = \left(1 - \varepsilon_{U_g} + \frac{1}{\rho_F} \varepsilon_{U_g}\right) \hat{p}_C - \varepsilon_{U_g} \frac{1}{\rho_F} \hat{p}_F - \varepsilon_{U_g} \hat{\theta}$$

Now the second FOC will be reformulated in a similar manner to the first FOC. Starting with the first order condition:

$$\frac{\partial u}{\partial x}\left[(x_C + x_F), \theta(p_F - p_C)x_F\right] + \frac{\partial u}{\partial e}\left[(x_C + x_F), \theta(p_F - p_C)x_F\right]\theta(p_F - p_C)\frac{1}{n} = p_F$$

The first partial derivative in the FOC will be the same as earlier with the first FOC, so the focus will be on the second part. Similarly to the first FOC, the second one will be formulated into a logarithmic difference equation by taking a second derivative and dividing each term by

$$\frac{\partial u}{\partial x} = u_x = p_F$$

The notation for the share of total consumption of coffee and to simplify the price terms is the same as for the earlier cases. The equation found is:

$$\frac{\partial^2 u}{\partial x^2}\frac{(x_C + x_F)}{u_x}\gamma_C \frac{dx_C}{x_C} + \frac{\partial^2 u}{\partial x^2}\frac{(x_C + x_F)}{u_x}(1 - \gamma_C)\frac{dx_F}{x_F} + \frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F - p_C)x_F}{u_x}\frac{dx_F}{x_F} +$$

$$\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F - p_C)x_F}{u_x}\left(\frac{1}{\rho_F}\frac{dp_F}{p_F} + \left(1 - \frac{1}{\rho_F}\right)\frac{dp_C}{p_C}\right) + \frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F - p_C)x_F}{u_x}\frac{d\theta}{\theta} +$$

$$\theta(p_F - p_C)\frac{u_g}{u_x}\left[\frac{\partial^2 u}{\partial x \partial g}\frac{(x_C + x_F)}{u_g}\gamma_C \frac{dx_C}{x_C} + \frac{\partial^2 u}{\partial x \partial g}\frac{(x_C + x_F)}{u_g}(1 - \gamma_C)\frac{dx_F}{x_F} + \frac{\partial^2 u}{\partial g^2}\frac{\theta(p_F - p_C)x_F}{u_g}\frac{dx_F}{x_F} + \right.$$

$$\frac{\partial^2 u}{\partial g^2}\frac{\theta(p_F - p_C)x_F}{u_g}\frac{1}{\rho_F}\frac{dp_F}{p_F} + \frac{\partial^2 u}{\partial g^2}\frac{\theta(p_F - p_C)x_F}{u_g}\left(1 - \frac{1}{\rho_F}\right)\frac{dp_C}{p_C} + \frac{\partial^2 u}{\partial g^2}\frac{\theta(p_F - p_C)x_F}{u_g}\frac{d\theta}{\theta} +$$

$$\left.\frac{\theta p_F}{\theta(p_F - p_C)}\frac{dp_F}{p_F} - \frac{\theta p_C}{\theta(p_F - p_C)}\frac{dp_C}{p_C} + \frac{d\theta}{\theta} + \frac{d\frac{1}{n}}{1/n}\right] = \frac{dp_F}{p_F}$$

This can again be simplified by noting all small changes in the form:

$\frac{dx_C}{x_C} = \hat{x}_C$, $\frac{dp_C}{p_C} = \hat{p}_C$ and so on.

As with the warm-glow model the terms below are noted as:

$$\frac{\partial^2 u}{\partial x^2}\frac{(x_C + x_F)}{u_x} = \varepsilon_{U_X}$$

$$\frac{\partial^2 u}{\partial x^2}\frac{\theta(p_F - p_C)x_F}{u_x} = \frac{\partial^2 u}{\partial x^2}\frac{g}{u_x} = \varepsilon_{U_g}$$

$$\frac{\partial^2 u}{\partial x \partial g}\frac{\left(x_C + x_F\right)}{u_g} = \varepsilon_{U_{gX}}$$

and

$$\frac{\partial^2 u}{\partial g^2}\frac{\theta(p_F - p_C)x_F}{u_g} = \frac{\partial^2 u}{\partial g^2}\frac{g}{u_g} = \varepsilon_{U_{gg}}$$

Now:

$$\varepsilon_{U_X}\gamma_C\hat{x}_C + \varepsilon_{U_X}\left(1-\gamma_C\right)\hat{x}_F + \varepsilon_{U_g}\hat{x}_F + \varepsilon_{U_g}\left(\frac{1}{\rho_F}\hat{p}_F + \left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right) + \varepsilon_{U_g}\hat{\theta} +$$

$$\theta(p_F - p_C)\frac{u_g}{u_x}\left[\varepsilon_{U_{gX}}\gamma_C\hat{x}_C + \varepsilon_{U_{gX}}\left(1-\gamma_C\right)\hat{x}_F + \varepsilon_{U_{gg}}\hat{x}_F + \varepsilon_{U_{gg}}\frac{1}{\rho_F}\hat{p}_F + \varepsilon_{U_{gg}}\left(1-\frac{1}{\rho_F}\right)\hat{p}_C + \right.$$

$$\left.\varepsilon_{U_{gg}}\hat{\theta} + \frac{1}{\rho_F}\hat{p}_F + \left(1-\frac{1}{\rho_F}\right)\hat{p}_C + \hat{\theta} + \frac{\hat{1}}{n}\right] = \hat{p}_F$$

In order to substitute for the factor

$$\theta(p_F - p_C)\frac{u_g}{u_x}$$

the second FOC is divided by the first FOC to get:

$$1 + \theta(p_F - p_C)\frac{u_g}{u_x} = \frac{p_F}{p_C}$$

which is the same as:

$$\theta(p_F - p_C)\frac{u_G}{u_x} = \frac{p_F}{p_C} - 1 = \frac{p_F - p_C}{p_C} = \rho_C = \left(1-\rho_F\right)$$

This can be inserted into the equation above in order to simplify it a bit.

$$\varepsilon_{U_X}\gamma_C\hat{x}_C + \varepsilon_{U_X}(1-\gamma_C)\hat{x}_F + \varepsilon_{U_g}\hat{x}_F + \varepsilon_{U_g}\left(\frac{1}{\rho_F}\hat{p}_F + \left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right) + \varepsilon_{U_g}\hat{\theta} +$$
$$(1-\rho_F)\Big[\varepsilon_{U_{gX}}\gamma_C\hat{x}_C + \varepsilon_{U_{gX}}(1-\gamma_C)\hat{x}_F + \varepsilon_{U_{gg}}\hat{x}_F + \varepsilon_{U_{gg}}\frac{1}{\rho_F}\hat{p}_F + \varepsilon_{U_{gg}}\left(1-\frac{1}{\rho_F}\right)\hat{p}_C +$$
$$\varepsilon_{U_{gg}}\hat{\theta} + \frac{1}{\rho_F}\hat{p}_F + \left(1-\frac{1}{\rho_F}\right)\hat{p}_C + \hat{\theta} + \frac{\hat{1}}{n}\Big] = \hat{p}_F$$

Continuing by multiplying all terms:

$$\varepsilon_{U_X}\gamma_C\hat{x}_C + \varepsilon_{U_X}(1-\gamma_C)\hat{x}_F + \varepsilon_{U_g}\hat{x}_F + \varepsilon_{U_g}\left(\frac{1}{\rho_F}\hat{p}_F + \left(1-\frac{1}{\rho_F}\right)\hat{p}_C\right) + \varepsilon_{U_g}\hat{\theta} +$$
$$\Big[\varepsilon_{U_{gX}}(1-\rho_F)\gamma_C\hat{x}_C + \varepsilon_{U_{gX}}(1-\rho_F)(1-\gamma_C)\hat{x}_F + \varepsilon_{U_{gg}}(1-\rho_F)\hat{x}_F + \varepsilon_{U_{gg}}(1-\rho_F)\frac{1}{\rho_F}\hat{p}_F + \varepsilon_{U_{gg}}(1-\rho_F)\left(1-\frac{1}{\rho_F}\right)\hat{p}_C +$$
$$\varepsilon_{U_{gg}}(1-\rho_F)\hat{\theta} + \frac{1}{\rho_F}(1-\rho_F)\hat{p}_F + (1-\rho_F)\left(1-\frac{1}{\rho_F}\right)\hat{p}_C + (1-\rho_F)\hat{\theta} + (1-\rho_F)\frac{\hat{1}}{n}\Big] = \hat{p}_F$$

or

$$\varepsilon_{U_X}\gamma_C\hat{x}_C + \varepsilon_{U_{gX}}(1-\rho_F)\gamma_C\hat{x}_C +$$
$$\varepsilon_{U_X}\hat{x}_F - \varepsilon_{U_X}\gamma_C\hat{x}_F + \varepsilon_{U_g}\hat{x}_F + \varepsilon_{U_{gX}}(1-\rho_F)(1-\gamma_C)\hat{x}_F + \varepsilon_{U_{gg}}(1-\rho_F)\hat{x}_F +$$
$$\varepsilon_{U_g}\frac{1}{\rho_F}\hat{p}_F + \varepsilon_{U_{gg}}(1-\rho_F)\frac{1}{\rho_F}\hat{p}_F + \frac{1}{\rho_F}(1-\rho_F)\hat{p}_F +$$
$$\varepsilon_{U_g}\hat{p}_C - \varepsilon_{U_g}\frac{1}{\rho_F}\hat{p}_C + \varepsilon_{U_{gg}}(1-\rho_F)\hat{p}_C - \varepsilon_{U_{gg}}(1-\rho_F)\frac{1}{\rho_F}\hat{p}_C + (1-\rho_F)\hat{p}_C - (1-\rho_F)\frac{1}{\rho_F}\hat{p}_C$$
$$\varepsilon_{U_g}\hat{\theta} + \varepsilon_{U_{gg}}(1-\rho_F)\hat{\theta} + (1-\rho_F)\hat{\theta} + (1-\rho_F)\frac{\hat{1}}{n} = \hat{p}_F$$

Now by rearranging one gets:

$$\left[\varepsilon_{U_X} + \varepsilon_{U_{gX}}(1-\rho_F)\right]\gamma_C\hat{x}_C + \left[(1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_g} + \varepsilon_{U_{gX}} - \varepsilon_{U_{gX}}\rho_F - \varepsilon_{U_{gX}}\gamma_C + \varepsilon_{U_{gX}}\gamma_C\rho_F + \varepsilon_{U_{gg}}(1-\rho_F)\right]\hat{x}_F =$$
$$\left[-\varepsilon_{U_g} + \varepsilon_{U_g}\frac{1}{\rho_F} - \varepsilon_{U_{gg}}(1-\rho_F) + \varepsilon_{U_{gg}}(1-\rho_F)\frac{1}{\rho_F} + \rho_F + \frac{1}{\rho_F} - 2\right]\hat{p}_C +$$
$$\left[2 - \varepsilon_{U_g}\frac{1}{\rho_F} - \varepsilon_{U_{gg}}\left(\frac{1}{\rho_F} - 1\right) - \frac{1}{\rho_F}\right]\hat{p}_F + \left[-\varepsilon_{U_g} - \varepsilon_{U_{gg}}(1-\rho_F) - 1 + \rho_F\right]\hat{\theta} - (1-\rho_F)\frac{\hat{1}}{n}$$

The result is a set of two equations, which can be solved by using the Cramer's rule:

The first FOC:

$$\gamma_C\varepsilon_{U_X}\hat{x}_C + (\varepsilon_{U_X} - \gamma_C\varepsilon_{U_X} + \varepsilon_{U_g})\hat{x}_F = \left(1-\varepsilon_{U_g} + \frac{1}{\rho_F}\varepsilon_{U_g}\right)\hat{p}_C - \varepsilon_{U_g}\frac{1}{\rho_F}\hat{p}_F - \varepsilon_{U_g}\hat{\theta}$$

The second FOC:

$$\left[\varepsilon_{U_X} + \varepsilon_{U_{gX}}(1-\rho_F)\right]\gamma_C\hat{x}_C + \left[(1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_g} + \varepsilon_{U_{gX}} - \varepsilon_{U_{gX}}\rho_F - \varepsilon_{U_{gX}}\gamma_C + \varepsilon_{U_{gX}}\gamma_C\rho_F + \varepsilon_{U_{gg}}(1-\rho_F)\right]\hat{x}_F =$$
$$\left[-\varepsilon_{U_g} + \varepsilon_{U_g}\frac{1}{\rho_F} - \varepsilon_{U_{gg}}(1-\rho_F) + \varepsilon_{U_{gg}}(1-\rho_F)\frac{1}{\rho_F} + \rho_F + \frac{1}{\rho_F} - 2\right]\hat{p}_C +$$
$$\left[2-\varepsilon_{U_g}\frac{1}{\rho_F} - \varepsilon_{U_{gg}}\left(\frac{1}{\rho_F}-1\right) - \frac{1}{\rho_F}\right]\hat{p}_F + \left[-\varepsilon_{U_g} - \varepsilon_{U_{gg}}(1-\rho_F) - 1 + \rho_F\right]\hat{\theta} - (1-\rho_F)\frac{\hat{1}}{n}$$

are in matrix form:

$$\begin{bmatrix} \gamma_C\varepsilon_{U_X} & \left((1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_g}\right) \\ \left[\varepsilon_{U_X} + \varepsilon_{U_{gX}}(1-\rho_F)\right]\gamma_C & \left[(1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_g} + \varepsilon_{U_{gX}} - \varepsilon_{U_{gX}}\rho_F - \varepsilon_{U_{gX}}\gamma_C + \varepsilon_{U_{gX}}\gamma_C\rho_F + \varepsilon_{U_{gg}}(1-\rho_F)\right] \end{bmatrix}\begin{bmatrix}\hat{x}_C \\ \hat{x}_F\end{bmatrix} =$$
$$\begin{bmatrix} \left(1-\varepsilon_{U_g} + \frac{1}{\rho_F}\varepsilon_{U_g}\right) \\ \left[-\varepsilon_{U_g} + \varepsilon_{U_g}\frac{1}{\rho_F} - \varepsilon_{U_{gg}}(1-\rho_F) + \varepsilon_{U_{gg}}(1-\rho_F)\frac{1}{\rho_F} + \rho_F + \frac{1}{\rho_F} - 2\right] \end{bmatrix}\hat{p}_C +$$
$$\begin{bmatrix} -\frac{1}{\rho_F}\varepsilon_{U_g} \\ \left[2-\varepsilon_{U_g}\frac{1}{\rho_F} - \varepsilon_{U_{gg}}\left(\frac{1}{\rho_F}-1\right) - \frac{1}{\rho_F}\right] \end{bmatrix}\hat{p}_F +$$
$$\begin{bmatrix} -\varepsilon_{U_g} \\ \left[-\varepsilon_{U_g} - \varepsilon_{U_{gg}}(1-\rho_F) - 1 + \rho_F\right] \end{bmatrix}\hat{\theta} + \begin{bmatrix} 0 \\ -(1-\rho_F) \end{bmatrix}\frac{\hat{1}}{n}$$

The determinant of the matrix is:

$$\det\begin{vmatrix} \gamma_C\varepsilon_{U_X} & \left[(1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_g}\right] \\ \left[\varepsilon_{U_X} + \varepsilon_{U_{gX}}(1-\rho_F)\right]\gamma_C & \left[(1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_g} + \varepsilon_{U_{gX}} - \varepsilon_{U_{gX}}\rho_F - \varepsilon_{U_{gX}}\gamma_C + \varepsilon_{U_{gX}}\gamma_C\rho_F + \varepsilon_{U_{gg}}(1-\rho_F)\right] \end{vmatrix} =$$
$$\gamma_C\varepsilon_{U_X} * \left[(1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_g} + \varepsilon_{U_{gX}} - \varepsilon_{U_{gX}}\rho_F - \varepsilon_{U_{gX}}\gamma_C + \varepsilon_{U_{gX}}\gamma_C\rho_F + \varepsilon_{U_{gg}}(1-\rho_F)\right] -$$
$$\left[\varepsilon_{U_X} + \varepsilon_{U_{gX}}(1-\rho_F)\right]\gamma_C * \left[(1-\gamma_C)\varepsilon_{U_X} + \varepsilon_{U_g}\right] =$$
$$\left[(\rho_F - 1)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_g} + (1-\rho_F)\varepsilon_{U_X}\varepsilon_{U_{gg}} + (\rho_F - 1)\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}} + (1-\rho_F)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]$$

Then the terms $\hat{x}_F$ and $\hat{x}_C$ can be solved conditional to the prices of Fair Trade coffee and conventional coffee, as well as conditional to the share θ that consumer believe is delivered to Fair Trade producers of the price difference between regular and Fair Trade coffee.

Since the definition of price elasticity of demand is

$$PED = -\frac{dx/x}{dp/p}$$

then for example the term

$$PED = -\frac{dx}{x}\frac{p}{dp} = \frac{\hat{x}_{F|\hat{p}_F}}{\hat{p}_F}$$

will represent the price elasticity of demand of Fair Trade coffee.

Using the Cramer rule the following results are found:

The price elasticity of demand of regular coffee

$$\frac{\hat{x}_{C|\hat{p}_C}}{\hat{p}_C}=\frac{\left(1-\varepsilon_{U_g}+\frac{1}{\rho_F}\varepsilon_{U_g}\right)*\left[(1-\gamma_C)\varepsilon_{U_X}+\varepsilon_{U_g}+\varepsilon_{U_{gX}}-\varepsilon_{U_{gX}}\rho_F-\varepsilon_{U_{gX}}\gamma_C+\varepsilon_{U_{gX}}\gamma_C\rho_F+\varepsilon_{U_{gg}}(1-\rho_F)\right]}{\left[(\rho_F-1)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_g}+(1-\rho_F)\varepsilon_{U_X}\varepsilon_{U_{gg}}+(\rho_F-1)\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}+(1-\rho_F)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}-$$

$$\frac{\left((1-\gamma_C)\varepsilon_{U_X}+\varepsilon_{U_g}\right)*\left[-\varepsilon_{U_g}+\varepsilon_{U_g}\frac{1}{\rho_F}-\varepsilon_{U_{gg}}(1-\rho_F)+\varepsilon_{U_{gg}}(1-\rho_F)\frac{1}{\rho_F}+\rho_F+\frac{1}{\rho_F}-2\right]}{\left[(\rho_F-1)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_g}+(1-\rho_F)\varepsilon_{U_X}\varepsilon_{U_{gg}}+(\rho_F-1)\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}+(1-\rho_F)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}=$$

$$\frac{\left(3-3\gamma_C-\rho_F-\frac{1}{\rho_F}+\gamma_C\rho_F+\gamma_C\frac{1}{\rho_F}\right)\varepsilon_{U_X}+\left(2-\rho_F-\frac{1}{\rho_F}\right)\varepsilon_{U_g}+(1-\gamma_C+\gamma_C\rho_F)\varepsilon_{U_{gX}}}{\left[(\rho_F-1)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_g}+(1-\rho_F)\varepsilon_{U_X}\varepsilon_{U_{gg}}+(\rho_F-1)\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}+(1-\rho_F)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}+$$

$$\frac{(1-\rho_F)\varepsilon_{U_{gg}}+\left(-2+2\gamma_C+\rho_F+\frac{1}{\rho_F}-\gamma_C\rho_F-\gamma_C\frac{1}{\rho_F}\right)\varepsilon_{U_g}\varepsilon_{U_{gX}}+\left(2-\rho_F-\frac{1}{\rho_F}+\gamma_C\rho_F+\gamma_C\frac{1}{\rho_F}\right)\varepsilon_{U_X}\varepsilon_{U_{gg}}}{\left[(\rho_F-1)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_g}+(1-\rho_F)\varepsilon_{U_X}\varepsilon_{U_{gg}}+(\rho_F-1)\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}+(1-\rho_F)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}$$

Thus

$$\frac{\hat{x}_{C|\hat{p}_C}}{\hat{p}_C}=\frac{(1-\gamma_C)\left(3-\rho_F-\frac{1}{\rho_F}\right)\varepsilon_{U_X}+\left(2-\rho_F-\frac{1}{\rho_F}\right)\varepsilon_{U_g}+\left[1-(1-\gamma_C)\rho_F\right]\varepsilon_{U_{gX}}}{(\rho_F-1)\left[\gamma_C^2\varepsilon_{U_X}\varepsilon_{U_g}-\varepsilon_{U_X}\varepsilon_{U_{gg}}+\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}-\gamma_C^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}+$$

$$\frac{(1-\rho_F)\varepsilon_{U_{gg}}-(1-\gamma_C)\left(2-\rho_F-\frac{1}{\rho_F}\right)\varepsilon_{U_g}\varepsilon_{U_{gX}}+\left[2-(1-\gamma_C)\left(\rho_F+\frac{1}{\rho_F}\right)\right]\varepsilon_{U_X}\varepsilon_{U_{gg}}}{(\rho_F-1)\left[\gamma_C^2\varepsilon_{U_X}\varepsilon_{U_g}-\varepsilon_{U_X}\varepsilon_{U_{gg}}+\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}-\gamma_C^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}$$

The price elasticity of demand of Fair Trade coffee

$$\frac{\hat{x}_{F|\hat{p}_F}}{\hat{p}_F}=\frac{\gamma_C\varepsilon_{U_X}*\left[2-\varepsilon_{U_g}\frac{1}{\rho_F}-\varepsilon_{U_{gg}}\left(\frac{1}{\rho_F}-1\right)-\frac{1}{\rho_F}\right]+\frac{1}{\rho_F}\varepsilon_{U_g}*\left[\varepsilon_{U_X}+\varepsilon_{U_{gX}}(1-\rho_F)\right]\gamma_C}{\left[(\rho_F-1)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_g}+(1-\rho_F)\varepsilon_{U_X}\varepsilon_{U_{gg}}+(\rho_F-1)\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}+(1-\rho_F)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}=$$

$$\frac{\left(2-\frac{1}{\rho_F}\right)\gamma_C\varepsilon_{U_X}+\left(\frac{1}{\rho_F}-1\right)\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}+\left(1-\frac{1}{\rho_F}\right)\gamma_C\varepsilon_{U_X}\varepsilon_{U_{gg}}}{\left[(\rho_F-1)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_g}+(1-\rho_F)\varepsilon_{U_X}\varepsilon_{U_{gg}}+(\rho_F-1)\gamma_C\varepsilon_{U_g}\varepsilon_{U_{gX}}+(1-\rho_F)\gamma_C{}^2\varepsilon_{U_X}\varepsilon_{U_{gX}}\right]}$$

With the help of the model one can also find the cross-price elasticity between Fair Trade and regular coffee, as well as the elasticity of the coffees with regards to the share θ given to charity. These can be found below, but have not been simplified and will not be analyzed, since they are beyond the scope of the research question.

Cross-price elasticity of demand of Fair Trade coffee with respect to regular coffee prices

$$\frac{\hat{x}_{F|\hat{p}_C}}{\hat{p}_C} = \frac{\gamma_C \varepsilon_{U_X} * \left[-\varepsilon_{U_g} + \varepsilon_{U_g} \frac{1}{\rho_F} - \varepsilon_{U_{gg}} (1-\rho_F) + \varepsilon_{U_{gg}} (1-\rho_F) \frac{1}{\rho_F} + \rho_F + \frac{1}{\rho_F} - 2 \right] - \left((1-\varepsilon_{U_g} + \frac{1}{\rho_F} \varepsilon_{U_g} \right) * \left[\varepsilon_{U_X} + \varepsilon_{U_{gX}} (1-\rho_F) \right] \gamma_C}{\left[(\rho_F - 1) \gamma_C{}^2 \varepsilon_{U_X} \varepsilon_{U_g} + (1-\rho_F) \varepsilon_{U_X} \varepsilon_{U_{gg}} + (\rho_F - 1) \gamma_C \varepsilon_{U_g} \varepsilon_{U_{gX}} + (1-\rho_F) \gamma_C{}^2 \varepsilon_{U_X} \varepsilon_{U_{gX}} \right]}$$

Cross-price elasticity of demand of regular coffee with respect to Fair Trade coffee prices

$$\frac{\hat{x}_{C|\hat{p}_F}}{\hat{p}_F} = \frac{-\frac{1}{\rho_F} \varepsilon_{U_g} * (1-\gamma_C) \varepsilon_{U_X} + \varepsilon_{U_g} + \varepsilon_{U_{gX}} - \varepsilon_{U_{gX}} \rho_F - \varepsilon_{U_{gX}} \gamma_C + \varepsilon_{U_{gX}} \gamma_C \rho_F + \varepsilon_{U_{gg}} (1-\rho_F) - \left((1-\gamma_C) \varepsilon_{U_X} + \varepsilon_{U_g} \right) * \left[2 - \varepsilon_{U_g} \frac{1}{\rho_F} - \varepsilon_{U_{gg}} \left(\frac{1}{\rho_F} - 1 \right) - \frac{1}{\rho_F} \right]}{\left[(\rho_F - 1) \gamma_C{}^2 \varepsilon_{U_X} \varepsilon_{U_g} + (1-\rho_F) \varepsilon_{U_X} \varepsilon_{U_{gg}} + (\rho_F - 1) \gamma_C \varepsilon_{U_g} \varepsilon_{U_{gX}} + (1-\rho_F) \gamma_C{}^2 \varepsilon_{U_X} \varepsilon_{U_{gX}} \right]}$$

Elasticity of regular coffee demand with respect to share θ given to charity

$$\frac{\hat{x}_{C|\hat{\theta}}}{\hat{\theta}} = \frac{-\varepsilon_{U_g} * \left[(1-\gamma_C) \varepsilon_{U_X} + \varepsilon_{U_g} + \varepsilon_{U_{gX}} - \varepsilon_{U_{gX}} \rho_F - \varepsilon_{U_{gX}} \gamma_C + \varepsilon_{U_{gX}} \gamma_C \rho_F + \varepsilon_{U_{gg}} (1-\rho_F) \right] - \left((1-\gamma_C) \varepsilon_{U_X} + \varepsilon_{U_g} \right) * \left[-\varepsilon_{U_g} - \varepsilon_{U_{gg}} (1-\rho_F) - 1 + \rho_F \right]}{\left[(\rho_F - 1) \gamma_C{}^2 \varepsilon_{U_X} \varepsilon_{U_g} + (1-\rho_F) \varepsilon_{U_X} \varepsilon_{U_{gg}} + (\rho_F - 1) \gamma_C \varepsilon_{U_g} \varepsilon_{U_{gX}} + (1-\rho_F) \gamma_C{}^2 \varepsilon_{U_X} \varepsilon_{U_{gX}} \right]}$$

Elasticity of Fair Trade coffee demand with respect to share θ given to charity

$$\frac{\hat{x}_{F|\hat{\theta}}}{\hat{\theta}} = \frac{\gamma_C \varepsilon_{U_X} * \left[-\varepsilon_{U_g} - \varepsilon_{U_{gg}} (1-\rho_F) - 1 + \rho_F \right] + \varepsilon_{U_g} * \left[\varepsilon_{U_X} + \varepsilon_{U_{gX}} (1-\rho_F) \right] \gamma_C}{\left[(\rho_F - 1) \gamma_C{}^2 \varepsilon_{U_X} \varepsilon_{U_g} + (1-\rho_F) \varepsilon_{U_X} \varepsilon_{U_{gg}} + (\rho_F - 1) \gamma_C \varepsilon_{U_g} \varepsilon_{U_{gX}} + (1-\rho_F) \gamma_C{}^2 \varepsilon_{U_X} \varepsilon_{U_{gX}} \right]}$$

Appendix 4 Description of coffee brands used in regression model for coffee demand

Coffee brand	Package size	Producer	Certification	Speciality/normal	Preparation type	Caffeine	Flavour	Roast
BRAZIL SJ	0,5	PAULIG	Utz	Normal	Filter	Normal	None	Light
CAFE AROME KAHVI SJ TUMMA	0,5	MEIRA	None	Normal	Filter	Normal	None	Dark
CAFE AROME KAHVI SJ VAALE	0,5	MEIRA	None	Normal	Filter	Normal	None	Light
CAFE AROME PAPUKAHVI TUMM	0,25	MEIRA	None	Normal	Bean	Normal	None	Dark
CAFE HAG KOFEIINITON KAHV	0,5	KRAFT FOODS	None	Speciality	Filter	Caffeine free	None	Not known
CAFE ORIGINAL KAHVI SJ	0,25	MEIRA	Organic	Normal	Filter	Normal	None	Dark
CAFFE ESPRESSO	0,25	LAVAZZA	None	Speciality	Other	Normal	None	Dark
CLASSIC KAFFE FRANSKROST	0,5	ARVID NORDQUIST	None	Speciality	Other	Normal	None	Very dark
CLASSIC REKO SJ	0,5	ARVID NORDQUIST	Fair Trade	Normal	Filter	Normal	None	Dark
ESPRESSO CASA	0,25	MEIRA	None	Speciality	Other	Normal	None	Dark
ESPRESSO ORIGINALE PAPU	0,25	PAULIG	Utz	Speciality	Other	Normal	None	Dark
ESPRESSO ORIGINALE	0,25	PAULIG	Utz	Speciality	Other	Normal	None	Dark
ESPRESSOKAHVI 250G	0,25	SEGAFREDO	None	Speciality	Other	Normal	None	Dark
GUATEMALA- KAHVI	0,25	PAULIG	None	Speciality	Other	Normal	None	Light
JUHLA MOKKA PJ	0,5	PAULIG	None	Normal	Pot	Normal	None	Very light
JUHLA MOKKA SJ	0,5	PAULIG	None	Normal	Filter	Normal	None	Very light
KRÖNUNG-KAHVI	0,5	KRAFT FOODS	None	Speciality	Other	Normal	None	Dark
KULTA KATRIINA PJ	0,5	MEIRA	None	Normal	Pot	Normal	None	Very ligh
KULTA KATRIINA SJ	0,5	MEIRA	None	Normal	Filter	Normal	None	Very light
MUNDO KAHVI SJ	0,5	PAULIG	Utz	Normal	Filter	Normal	None	Very light
PARISEN CAFE AU LAIT SJ	0,25	PAULIG	None	Speciality	Other	Normal	None	Very dark
PRESIDENTTI GOLD LABEL HJ	0,5	PAULIG	None	Normal	Filter	Normal	None	Light
PRESIDENTTI PJ	0,5	PAULIG	None	Normal	Pot	Normal	None	Very light
PRESIDENTTI SJ	0,5	PAULIG	None	Normal	Filter	Normal	None	Very light
PRESIDENTTI TUMMA P. SJ	0,5	PAULIG	None	Normal	Filter	Normal	None	Dark
PRESIDENTTI	0,25	PAULIG	None	Normal	Bean	Normal	None	Very light
REILU KAHVI SJ	0,5	MEIRA	Fair Trade	Normal	Filter	Normal	None	Light
SALUDO PJ	0,5	MEIRA	None	Normal	Pot	Normal	None	Very light
SALUDO SJ	0,5	MEIRA	None	Normal	Filter	Normal	None	Very light
SUKLAAKAHVI	0,2	ROBERTS COFFEE	None	Speciality	Other	Normal	Flavour	Not known
VANILJAKAHVI	0,2	ROBERTS COFFEE	None	Speciality	Other	Normal	Flavour	Not known
WATSA-KAHVI	0,4	ROBERT PAULIG	None	Speciality	Other	Normal	None	Not known
X-TRA KAHVI SJ	0,5	X-TRA	None	Normal	Filter	Normal	None	Light

Appendix 5 Complete list of variables used in regression models for coffee demand

Price and sales

Sales (kg) logarithmic (dependent variable)

Price per kilogram (€) logarithmic

Year

2006: described as 1 if 2006, 0 if not

2007: described as 1 if 2007, 0 if not

2008: described as 1 if 2008, 0 if not

2009: described as 1 if 2009, 0 if not

Month

January: described as 1 if January, 0 if not

February: described as 1 if February, 0 if not

March: described as 1 if March, 0 if not

April: described as 1 if April, 0 if not

May: described as 1 if May, 0 if not

June: described as 1 if June, 0 if not

July: described as 1 if July, 0 if not

August: described as 1 if August, 0 if not

September: described as 1 if September, 0 if not

October: described as 1 if October, 0 if not

November: described as 1 if November, 0 if not

December: described as 1 if December, 0 if not

Weekday:

Mon: described as 1 if Monday, 0 if not

Tue: described as 1 if Tuesday, 0 if not

Wed: described as 1 if Wednesday, 0 if not

Thu: described as 1 if Thursday, 0 if not

Fri: described as 1 if Friday, 0 if not

Sat: described as 1 if Saturday, 0 if not

Sun: described as 1 if Sunday, 0 if not

Retailer

Alepa: described as 1 if Alepa, 0 if not

Prisma: described as 1 if Prisma, 0 if not

S-Market: described as 1 if S-market, 0 if not

Coffee attributes

Caffeine-free: described as 1 if caffeine-free, 0 if not

Speciality: described as 1 if speciality coffee, 0 if not (if normal)

Small package size: described as 1 if small package size (0,2kg or 0,25kg), 0 if not

Flavour: described as 1 if flavoured coffee (chocolate, vanilla), 0 if not

Brewing type

Filter: described as 1 if filter coffee, 0 if not

Pot: described as 1 if pot coffee, 0 if not

Bean: described as 1 if bean coffee, 0 if not

Other: described as 1 if other type of brew, 0 if not

Certification

Fair Trade: described as 1 if Fair Trade certified, 0 if not

Utz: described as 1 if Utz-certified, 0 if not

Organic: described as 1 if organic certified, 0 if not

None: described as 1 if no certification

Roast

Very light: described as 1 if very light roast, 0 if not

Light: described as 1 if light roast, 0 if not

Dark: described as 1 if dark roast, 0 if not

Very dark: described as 1 if very dark roast, 0 if not

None: described as 1 if roast is not known, 0 if roast is known

Producer

Paulig: described as 1 if from Paulig, 0 if not

Meira: described as 1 if from Meira, 0 if not

Nordqvist: described as 1 if from August Nordqvist, 0 if not

Kraft: described as 1 if from Kraft Foods, 0 if not

Roberts: described as 1 if from Robert's coffee, 0 if not

Lavazza: described as 1 if from Lavazza, 0 if not

Segafredo: described as 1 if from Segafredo, 0 if not

X-tra: described as 1 if from X-tra, 0 if not

Appendix 6 Regression diagnostics for Fair Trade and conventional coffee linear regressions

Table 4 Correlation coefficients for Fair Trade coffee linear regression

	sales_..	prisma	s_market	_2007	_2008	_2009	february	march	april	may	june
sales_in_k~c	1.0000										
prisma	0.2526	1.0000									
s_market	0.0700	-0.3913	1.0000								
_2007	0.0071	-0.0053	0.0277	1.0000							
_2008	0.0365	0.0057	0.0118	-0.4181	1.0000						
_2009	0.0195	0.0125	-0.0034	-0.4176	-0.1910	1.0000					
february	-0.0004	-0.0049	-0.0104	-0.1022	0.1039	0.1112	1.0000				
march	0.0020	-0.0090	-0.0225	-0.1115	0.0941	0.1245	-0.1032	1.0000			
april	0.0135	-0.0106	-0.0247	-0.1079	0.1087	0.1162	-0.0994	-0.1007	1.0000		
may	0.0148	0.0056	0.0167	-0.1401	0.1220	0.1314	-0.1043	-0.1057	-0.1019	1.0000	
june	-0.0153	0.0198	0.0207	-0.0859	0.0764	0.0913	-0.0966	-0.0979	-0.0944	-0.0990	1.0000
july	-0.0394	0.0163	0.0222	0.1066	-0.0293	-0.1124	-0.0821	-0.0832	-0.0802	-0.0841	-0.0779
august	-0.0058	0.0072	0.0042	0.1881	-0.1169	-0.1168	-0.0853	-0.0865	-0.0833	-0.0874	-0.0810
september	-0.0046	-0.0086	-0.0063	0.1153	-0.1252	-0.1251	-0.0914	-0.0926	-0.0892	-0.0937	-0.0867
october	0.0093	-0.0098	-0.0041	0.0936	-0.1293	-0.1291	-0.0943	-0.0956	-0.0921	-0.0967	-0.0895
november	0.0212	0.0007	0.0047	0.1026	-0.1345	-0.1344	-0.0982	-0.0995	-0.0959	-0.1006	-0.0932
december	-0.0052	0.0053	0.0071	0.1092	-0.1304	-0.1302	-0.0951	-0.0964	-0.0929	-0.0975	-0.0903
tue	-0.0032	0.0009	0.0123	0.0026	-0.0054	0.0052	0.0043	-0.0060	0.0175	-0.0017	-0.0022
wed	-0.0137	0.0050	0.0157	-0.0102	0.0044	0.0089	-0.0007	0.0009	0.0130	-0.0022	0.0099
thu	-0.0073	0.0103	0.0156	-0.0192	-0.0013	0.0193	0.0026	0.0038	0.0161	-0.0362	0.0112
fri	0.0277	0.0124	0.0249	0.0058	0.0073	0.0056	0.0051	0.0034	-0.0022	0.0059	-0.0092
sat	0.0362	0.0188	0.0294	0.0053	-0.0003	-0.0094	0.0096	0.0095	0.0213	0.0009	-0.0387
sun	-0.0705	-0.0490	-0.1209	0.0204	-0.0179	-0.0179	-0.0276	-0.0226	-0.0295	0.0217	0.0322
dark	0.0374	0.0974	0.1905	-0.1437	-0.1011	-0.0270	0.0141	0.0203	0.0152	0.0169	0.0175
kg_price_l~c	-0.0535	-0.1320	0.0354	-0.1725	0.1186	0.3470	-0.0585	-0.0301	0.0376	0.1110	0.1062

	july	august	septem~r	october	november	december	tue	wed	thu	fri	sat
july	1.0000										
august	-0.0688	1.0000									
september	-0.0737	-0.0766	1.0000								
october	-0.0761	-0.0790	-0.0847	1.0000							
november	-0.0792	-0.0823	-0.0881	-0.0910	1.0000						
december	-0.0767	-0.0797	-0.0854	-0.0882	-0.0918	1.0000					
tue	-0.0022	-0.0009	0.0065	0.0044	-0.0085	-0.0075	1.0000				
wed	-0.0101	-0.0021	-0.0043	0.0075	-0.0083	-0.0063	-0.1765	1.0000			
thu	0.0054	-0.0093	0.0021	0.0037	-0.0011	0.0015	-0.1706	-0.1707	1.0000		
fri	-0.0004	-0.0038	0.0067	-0.0037	-0.0052	-0.0026	-0.1780	-0.1781	-0.1722	1.0000	
sat	-0.0131	-0.0044	0.0048	-0.0000	-0.0022	-0.0006	-0.1775	-0.1776	-0.1717	-0.1792	1.0000
sun	0.0268	0.0260	-0.0204	-0.0283	0.0224	0.0277	-0.1399	-0.1400	-0.1354	-0.1412	-0.1408
dark	0.0234	0.0089	-0.0159	-0.0382	-0.0329	-0.0303	-0.0027	0.0057	0.0112	0.0044	0.0166
kg_price_l~c	0.0463	0.0456	0.0208	-0.0573	-0.0585	-0.0559	-0.0047	0.0010	0.0054	0.0045	-0.0130

	sun	dark	kg_pri~c
sun	1.0000		
dark	-0.0395	1.0000	
kg_price_l~c	0.0215	0.2737	1.0000

Table 5 VIF-test for Fair Trade coffee linear regression

```
. vif
```

Variable	VIF	1/VIF
_2009	3.13	0.319605
_2008	2.72	0.367517
_2007	2.18	0.458076
november	2.16	0.462523
december	2.10	0.476130
october	2.09	0.479168
september	2.08	0.480976
august	1.95	0.512320
may	1.94	0.516599
kg_price_l~c	1.86	0.536392
march	1.86	0.538385
june	1.86	0.538782
february	1.83	0.545006
april	1.83	0.547496
july	1.82	0.550458
sat	1.69	0.592783
fri	1.69	0.593046
wed	1.68	0.595855
tue	1.68	0.595894
dark	1.67	0.598945
thu	1.65	0.605789
sun	1.51	0.661601
prisma	1.39	0.717460
s_market	1.39	0.718716
Mean VIF	1.91	

Table 6 Correlation coefficients for conventional coffee linear regression

	sales_..	prisma	s_market	_2007	_2008	_2009	february	march	april	may	june
sales_in_k~c	1.0000										
prisma	0.1340	1.0000									
s_market	0.0887	-0.2966	1.0000								
_2007	-0.0042	0.0013	0.0309	1.0000							
_2008	-0.0263	-0.0006	-0.0164	-0.3693	1.0000						
_2009	-0.0442	0.0216	0.0007	-0.3709	-0.1761	1.0000					
february	-0.0122	-0.0067	-0.0065	-0.1148	0.0925	0.0936	1.0000				
march	-0.0112	-0.0010	-0.0109	-0.1242	0.0917	0.1074	-0.1049	1.0000			
april	-0.0250	-0.0026	-0.0124	-0.1124	0.1091	0.1017	-0.0996	-0.0982	1.0000		
may	-0.0171	0.0071	0.0131	-0.1392	0.0883	0.1248	-0.1094	-0.1078	-0.1023	1.0000	
june	-0.0060	0.0106	0.0141	-0.0904	0.0441	0.0909	-0.1068	-0.1052	-0.0999	-0.1097	1.0000
july	-0.0065	0.0033	0.0080	0.0510	-0.0019	-0.1168	-0.0906	-0.0893	-0.0848	-0.0931	-0.0909
august	0.0215	0.0035	-0.0113	0.1676	-0.1159	-0.1164	-0.0903	-0.0890	-0.0845	-0.0928	-0.0905
september	0.0203	-0.0104	-0.0039	0.1420	-0.1158	-0.1163	-0.0903	-0.0889	-0.0844	-0.0927	-0.0905
october	0.0139	-0.0073	-0.0030	0.1414	-0.1138	-0.1143	-0.0887	-0.0874	-0.0830	-0.0911	-0.0889
november	0.0043	0.0019	0.0105	0.1481	-0.1183	-0.1188	-0.0922	-0.0908	-0.0863	-0.0947	-0.0925
december	0.0339	0.0072	0.0121	0.1438	-0.1184	-0.1189	-0.0923	-0.0909	-0.0863	-0.0948	-0.0925
tue	0.0035	0.0017	0.0121	-0.0052	-0.0007	0.0087	0.0003	-0.0005	0.0213	-0.0018	0.0017
wed	0.0052	0.0010	0.0112	-0.0005	-0.0029	0.0032	0.0011	-0.0009	0.0109	0.0005	0.0025
thu	0.0168	0.0066	0.0138	-0.0175	0.0002	0.0114	0.0014	0.0029	0.0201	-0.0324	0.0089
fri	0.0203	0.0121	0.0209	0.0066	0.0041	0.0068	0.0062	0.0077	-0.0168	0.0047	-0.0040
sat	-0.0066	0.0191	0.0266	0.0044	0.0040	-0.0187	0.0092	0.0075	0.0219	-0.0004	-0.0389
sun	-0.0532	-0.0431	-0.1042	0.0142	-0.0086	-0.0051	-0.0247	-0.0244	-0.0349	0.0267	0.0300
caffeine	0.0502	-0.0451	-0.0261	-0.0230	-0.0079	-0.0126	0.0002	-0.0016	-0.0038	-0.0123	-0.0013
speciality	-0.4960	0.0956	0.0409	0.0475	0.0198	0.0114	0.0101	0.0139	0.0174	0.0140	-0.0013
flavour	-0.2415	0.0867	0.0247	-0.0021	-0.0037	0.0044	-0.0003	-0.0019	-0.0025	0.0061	-0.0041
filter	0.4748	-0.0982	-0.0801	-0.0621	-0.0018	0.0100	-0.0148	-0.0137	-0.0155	-0.0163	-0.0120
pot	-0.0619	0.0218	0.0557	0.0359	-0.0185	-0.0317	0.0060	0.0015	-0.0003	0.0007	0.0105
bean	-0.1101	0.0328	0.0173	-0.0084	0.0142	0.0195	0.0109	0.0093	0.0133	0.0165	0.0089
very_light	0.4269	-0.0568	-0.0227	-0.0186	-0.0083	-0.0358	-0.0051	-0.0115	-0.0173	-0.0170	-0.0056
light	-0.0423	-0.0100	-0.0029	-0.0221	-0.0112	0.0207	0.0022	0.0034	0.0083	0.0068	0.0080
dark	-0.2370	0.0172	0.0163	0.0088	0.0099	0.0043	-0.0016	0.0037	0.0050	0.0062	0.0002
very_dark	-0.2130	0.0158	-0.0103	0.0434	0.0192	0.0243	0.0098	0.0125	0.0157	0.0106	0.0081
meira	-0.0255	-0.0106	-0.0068	-0.0067	-0.0200	-0.0031	0.0020	-0.0064	-0.0145	0.0003	-0.0015
roberts	-0.2425	0.0855	0.0235	0.0013	-0.0021	-0.0048	0.0009	-0.0006	-0.0013	0.0019	-0.0105
lavazza	-0.1909	0.0149	0.0079	0.0010	0.0027	-0.0038	0.0006	-0.0003	0.0029	-0.0011	-0.0051
segafredo	-0.0904	0.0430	0.0490	0.0159	0.0193	0.0165	-0.0056	-0.0068	-0.0019	0.0053	0.0069
x_tra	-0.0022	-0.0283	-0.0215	-0.0117	-0.0023	-0.0207	-0.0022	-0.0017	0.0023	-0.0043	-0.0018
nordqvist	-0.0713	0.0326	0.0089	0.0415	0.0144	0.0306	0.0012	0.0028	0.0055	0.0061	0.0021
kraft	-0.1104	0.0495	0.0479	0.0099	-0.0027	-0.0125	-0.0022	0.0014	0.0012	0.0040	-0.0035
small_pack~e	-0.4450	0.0739	0.0291	0.1030	-0.1721	0.0546	-0.0030	-0.0008	-0.0001	-0.0028	-0.0091
kg_price_l~c	-0.4613	0.0686	0.0183	0.0268	0.0522	0.0649	0.0151	0.0024	0.0249	0.0259	0.0027

	july	august	septem~r	october	november	december	tue	wed	thu	fri	sat
july	1.0000										
august	-0.0768	1.0000									
september	-0.0768	-0.0765	1.0000								
october	-0.0755	-0.0752	-0.0752	1.0000							
november	-0.0785	-0.0782	-0.0781	-0.0768	1.0000						
december	-0.0785	-0.0782	-0.0782	-0.0768	-0.0799	1.0000					
tue	-0.0047	-0.0046	-0.0007	0.0020	-0.0076	-0.0069	1.0000				
wed	-0.0041	-0.0037	0.0020	0.0030	-0.0050	-0.0067	-0.1758	1.0000			
thu	-0.0033	-0.0008	0.0029	0.0028	-0.0023	-0.0018	-0.1733	-0.1731	1.0000		
fri	-0.0001	-0.0041	0.0030	0.0017	-0.0021	-0.0016	-0.1779	-0.1776	-0.1751	1.0000	
sat	-0.0079	-0.0047	0.0030	0.0026	-0.0005	0.0003	-0.1757	-0.1754	-0.1729	-0.1775	1.0000
sun	0.0250	0.0243	-0.0198	-0.0211	0.0193	0.0260	-0.1426	-0.1424	-0.1404	-0.1441	-0.1423
caffeine	0.0034	0.0041	0.0031	0.0036	0.0032	0.0011	0.0001	-0.0020	0.0009	-0.0051	0.0003
speciality	-0.0126	-0.0120	-0.0143	-0.0155	-0.0110	-0.0036	-0.0077	-0.0107	-0.0093	0.0072	0.0231
flavour	-0.0086	-0.0046	-0.0024	-0.0010	0.0008	0.0226	-0.0061	-0.0038	-0.0026	0.0077	0.0139
filter	0.0177	0.0132	0.0174	0.0202	0.0182	0.0131	0.0038	0.0070	0.0046	-0.0101	-0.0179
pot	-0.0064	-0.0003	-0.0035	-0.0055	-0.0074	-0.0086	0.0032	0.0030	0.0038	0.0049	-0.0025
bean	-0.0099	-0.0156	-0.0129	-0.0145	-0.0146	-0.0129	-0.0002	-0.0022	-0.0019	0.0042	0.0063
very_light	0.0113	0.0149	0.0127	0.0128	0.0103	0.0011	0.0054	0.0060	0.0070	-0.0042	-0.0124
light	0.0005	-0.0064	-0.0060	-0.0037	-0.0057	-0.0082	0.0006	0.0015	0.0008	-0.0004	-0.0022
dark	-0.0046	-0.0028	-0.0021	-0.0044	-0.0022	0.0025	-0.0032	-0.0049	-0.0054	0.0004	0.0070
very_dark	-0.0057	-0.0100	-0.0135	-0.0140	-0.0119	-0.0169	-0.0021	-0.0036	-0.0037	-0.0004	0.0046
meira	0.0010	0.0103	0.0096	0.0038	0.0062	-0.0164	0.0044	0.0044	0.0030	-0.0020	-0.0089
roberts	-0.0076	-0.0036	-0.0013	0.0001	0.0019	0.0239	-0.0062	-0.0037	-0.0027	0.0076	0.0149
lavazza	-0.0039	0.0019	0.0002	0.0009	0.0014	0.0029	-0.0017	-0.0066	-0.0050	-0.0002	0.0083
segafredo	0.0002	0.0039	0.0001	-0.0006	0.0023	0.0030	-0.0006	-0.0030	-0.0038	0.0038	0.0096
x_tra	0.0068	0.0008	0.0019	0.0033	0.0018	-0.0029	0.0017	0.0028	0.0009	-0.0022	-0.0068
nordqvist	-0.0028	0.0015	-0.0014	-0.0062	-0.0025	-0.0061	-0.0010	-0.0005	-0.0015	0.0014	0.0025
kraft	-0.0016	-0.0002	0.0003	-0.0004	0.0013	0.0002	-0.0023	-0.0020	-0.0006	0.0062	0.0075
small_pack~e	-0.0119	0.0014	0.0033	0.0033	0.0074	0.0199	-0.0059	-0.0096	-0.0080	0.0057	0.0186
kg_price_l~c	-0.0138	-0.0206	-0.0165	-0.0116	-0.0059	-0.0209	-0.0048	-0.0081	-0.0101	0.0052	0.0181

	sun	caffeine	specia~y	flavour	filter	pot	bean	very_l~t	light	dark	very_d~k
sun	1.0000										
caffeine	0.0080	1.0000									
speciality	-0.0068	-0.1382	1.0000								
flavour	-0.0085	0.0137	0.3610	1.0000							
filter	0.0186	-0.0617	-0.5687	-0.2223	1.0000						
pot	-0.0155	0.0371	-0.2683	-0.1005	-0.6017	1.0000					
bean	-0.0071	0.0071	-0.0512	-0.0192	-0.1149	-0.0519	1.0000				
very_light	-0.0001	0.0872	-0.6308	-0.2362	0.1413	0.4254	0.0751	1.0000			
light	0.0002	0.0244	-0.1110	-0.0661	0.2434	-0.1789	-0.0342	-0.4205	1.0000		
dark	0.0045	0.0341	0.3633	-0.0783	-0.0928	-0.2499	-0.0400	-0.5876	-0.1644	1.0000	
very_dark	0.0034	0.0187	0.5097	-0.0505	-0.3026	-0.1368	-0.0261	-0.3215	-0.0900	-0.1257	1.0000
meira	-0.0056	0.0472	-0.1543	-0.1159	0.0603	0.0828	-0.0595	0.3620	-0.2202	-0.1154	-0.1739
roberts	-0.0088	0.0136	0.3705	0.9810	-0.2200	-0.0994	-0.0190	-0.2337	-0.0654	-0.0914	-0.0500
lavazza	0.0027	0.0126	0.3444	-0.0341	-0.2045	-0.0924	-0.0176	-0.2173	-0.0608	0.3698	-0.0465
segafredo	-0.0080	0.0056	0.1525	-0.0151	-0.0906	-0.0409	-0.0078	-0.0962	-0.0269	0.1638	-0.0206
x_tra	0.0035	0.0226	-0.1633	-0.0612	0.2751	-0.1655	-0.0316	-0.3891	0.9254	-0.1521	-0.0832
nordqvist	-0.0019	0.0099	0.2707	-0.0268	-0.1607	-0.0726	-0.0139	-0.1707	-0.0478	-0.0668	0.5311
kraft	-0.0119	-0.4035	0.3427	-0.0340	-0.1440	-0.0919	-0.0176	-0.2162	-0.0605	0.2923	-0.0462
small_pack~e	-0.0031	0.0292	0.7229	0.3753	-0.4569	-0.2143	0.1846	-0.4601	-0.0749	0.2376	0.3279
kg_price_l~c	-0.0045	-0.0641	0.7767	0.4286	-0.5039	-0.1804	0.1170	-0.3489	-0.4708	0.3728	0.3326

	meira	roberts	lavazza	segafr~o	x_tra	nordqv~t	kraft	small_~e	kg_pri~c
meira	1.0000								
roberts	-0.1264	1.0000							
lavazza	-0.1175	-0.0338	1.0000						
segafredo	-0.0520	-0.0150	-0.0139	1.0000					
x_tra	-0.2105	-0.0605	-0.0563	-0.0249	1.0000				
nordqvist	-0.0924	-0.0266	-0.0247	-0.0109	-0.0442	1.0000			
kraft	-0.1169	-0.0336	-0.0312	-0.0138	-0.0560	-0.0246	1.0000		
small_pack~e	-0.0740	0.3807	0.3533	0.1381	-0.1304	-0.0572	-0.0725	1.0000	
kg_price_l~c	-0.1865	0.4333	0.3214	0.1345	-0.5713	0.0428	0.1206	0.7253	1.0000