



2016

Price Analysis Under Production Differentiation in Green Coffee Markets

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Digital Object Identifier: <http://dx.doi.org/10.13023/ETD.2016.301>

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PRICE ANALYSIS UNDER PRODUCTION DIFFERENTIATION
IN GREEN COFFEE MARKETS

DISSERTATION

A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in the
College of Agriculture, Food and Environment at the
University of Kentucky

By

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Lexington, Kentucky

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Economics,
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2016

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ABSTRACT OF DISSERTATION

PRICE ANALYSIS UNDER PRODUCTION DIFFERENTIATION IN GREEN COFFEE MARKETS

To better understand the world green coffee market especially from the perspective of the coffee producing countries, I study three topics to overview and identify a puzzle: why growing differentiation of the coffee industry in final product markets has not been reflected in a similar pattern of differentiation to coffee farmers.

My first essay is a descriptive overview of the world coffee market, based on the framework and definition of competitiveness to understand both the demand and supply side of the coffee market. This paper then focuses on product differentiation as the source of competitiveness in the industry. Coffee as a physically differentiated crop and its nonphysical differentiation process are the two key sections of the overview, which provides a comprehensive background for the second and the third essays.

The second essay applies an Error Correction Model to identify the price links between the grower price and the world price for Colombian Milds and Vietnamese Robusta, focusing on both the long-run relationships and short-run adjustments. The long-run relationships between the world price and grower price are statistically significant for both Colombian Milds and Vietnamese Robusta. The short-run price adjustments toward equilibrium are asymmetric for both types. The degree of market integration for

Colombian Milds is slightly higher than for Robusta. The results have policy implications for the two quality-differentiated green coffee beans. Based on the results from the second essay, the producer price and the world price are adjusted asymmetrically and the causality is unidirectional from the world price to the producer price. In the third paper, market power may significantly affect the price relationship between upstream and downstream prices, and that is a possible explanation for the asymmetric price adjustment. These results have important implications for policy-makers and producers. Better organization of coffee producers can increase their bargaining power with the buyers in the market, which may result in higher prices at the farm level.

Key words: Coffee markets, Competitiveness, Product differentiation, Price transmission, Market power

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June 9, 2016

PRICE ANALYSIS UNDER PRODUCTION DIFFERENTIATION
IN GREEN COFFEE MARKETS

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To my beloved husband (Qingming, Gao), parents (Binyan, Li and Yinxiu, Jia), brothers (Yongyi, Li and Yonggang, Li), sister (Fangli, Li), nieces (Xintong, Wang and Yufei, Li), and nephews (Xuezheng, Li and Xincheng, Wang).

ACKNOWLEDGEMENTS

Many people and institutions made the completion of this dissertation possible. I am very grateful for all the support I received through my doctoral program at University of Kentucky.

I am thankful to my dissertation advisors, Dr. Reed and Dr. Sagahian. I thank them for their intellectual advice, constant support and understanding, both in research and in my life in the past six years. I am greatly indebted to them since the dissertation would not have been published without their tremendous help. In my heart, they are not only advisors; but also role model and father figures.

I also thank Dr. Woods, Dr. Scott, and Dr. Goodin for their availability, their guidance and patience as members and the outside examiner of my dissertation. I should also mention the guidance of Dr. Hall, Dr. Debertin, Dr. Pagoulatos and Dr. Hildebrand who provided me with invaluable advice in writing, critical thinking skills and in the clarification of the research questions of this dissertation.

I am also grateful to the support and good environment that I had with a diversity of graduate students, faculty and staff.

This dissertation and my doctoral training were made possible through Chinese Council Scholarship and the department of Agricultural Economics.

I am deeply thankful to the love, prayers and unconditional support of my husband, Qingming Gao. My husband was an exceptional companion during the challenging periods of my doctoral program. Finally, I want to express my debt and gratitude to my parents for having supported me for my life journey, I also want to express my siblings who always show their support and love in the past and in future years.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	iii
LIST OF TABLES	vi
LIST OF FIGURES	viii
CHAPTER ONE	1
AN OVERVIEW OF THE WORLD COFFEE MARKET	1
1.1 Introduction.....	1
1.2 Framework for overviewing the competitiveness of coffee producing countries	4
1.2.1 Definition of competitiveness.....	5
1.3 Product Differentiation.....	7
1.3.1 Coffee as a physically differentiated crop	8
1.4 Coffee market reforms and liberalization.....	13
1.5 Types of coffee in this study	17
1.6 Stagnancy of consumption growth.....	17
1.7 Coffee Prices	23
1.8 Rising costs	25
1.9 Nonphysical Differentiation Process.....	27
CHAPTER TWO	34

THE DYNAMICS OF PRICE TRANSMISSION IN THE PRESENCE OF A MAJOR QUALITY DIFFERENTIAL: THE CASE OF COLOMBIAN MILDS AND VIETNAMESE ROBUSTA COFFEE BEANS	34
2.1 Introduction.....	34
2.1 Data Description	36
2.2 Empirical Methodology	37
2.3 Empirical Results and Discussion.....	41
Summary and Conclusions	46
CHAPTER THREE	49
MARKET POWER IN HIGH QUALITY COFFEE MARKET	49
3.1 Introduction	49
3.2 A Theoretical Market Power Framework	51
3.3 Empirical Results	58
Summary and Conclusions	62
REFERENCES	65
Vita.....	76

LIST OF TABLES

Chapter 1 An Overview of the World Coffee Market	1
Table 1 Selected definitions on competitiveness	7
Table 2 Comparison of Arabica and Robusta coffees	10
Table 3 Comparison of the Characteristics before and after market reform.....	15
Table 4 Exports by major ICO-exporting member to all destinations.....	18
Table 5 World coffee consumption (thousand bags)	21
Table 6 Prices related to coffee value chain	23
Table 7 Four marketing strategies of product differentiation	28
Chapter 2 The Dynamics of Price Transmission in the Presence of A Major Quality Differential: the Case of Colombian Milds and Vietnamese Robusta Coffee Beans	34
Table 1 Descriptive statistics of coffee prices in the empirical model (US cents/lb).....	37
Table 2 Augmented Dickey-Fuller (ADF) test results.....	41
Table 3 Johansen test results for the world and grower Prices	42
Table 4 Results of Granger Causality Wald test for the world and grower prices	42
Table 5 Parameter Estimates for the long-run equilibrium relationships	44
Chapter 3 Market Power in High Quality Coffee Market.....	49
Table 1 Data definitions and sources	54
Table 2 Descriptive statistics for the variables, 1990-2012.....	58
Table 3 Augmented Dickey-Fuller (ADF) test results.....	58
Table 4 Johansen’s test of the world price and producer price for Colombian Milds	59

Table 5 Results of Granger Causality test for the world price and producer price.....	59
Table 6 The long-run relationships under perfect and imperfect competitive markets	60
Table 7 The empirical estimates of the speeds of adjustment	61

LIST OF FIGURES

Chapter 1 An Overview of The World Coffee Market	1
Figure 1 Framework for overviewing sources of competitiveness	4
Figure 2 Total production of top ten coffee exporting countries	12
Figure 3 World coffee production (1 bag = 60 kilogram = 132 lb)	13
Figure 4 Consumption trends comparison	22
Figure 5 Annual coffee price paid to growers (US cents/lb)	24
Figure 6 Production costs of selected coffee beans (US cents/lb)	26
Figure 7 Difference between Producer Price and Production Cost (US cents/lb)	26
Figure 8 Consumer price indexes for coffee, not seasonally adjusted.....	28
Figure 9 Retail prices of selected brands (2015)	32
Figure 10 Relationship between benefit and taste defined by different factors.....	33
Chapter 3 Market Power in High Quality Coffee Market.....	49
Figure 1 World and producer prices of Colombian Milds	55
Figure 2 The marketing costs.....	56
Figure 3 The demand shifter	57
Figure 4 The supply shifter	57

CHAPTER ONE

AN OVERVIEW OF THE WORLD COFFEE MARKET

1.1 Introduction

The legend about coffee is that it was discovered by a goat shepherd when he noticed his goats became so energetic after eating berries from a certain tree. Merriam-Webster defines coffee as a beverage made by percolation, infusion, or decoction from the roasted and ground seeds of a coffee plant. Coffee goes a long way and changes many hands from bean to cup (Ponte 2002). It is a process of transformation through roasting (drying and parching by exposure to heat) and brewing (infusing in hot water) the beans. The degree to which beans are roasted (light, medium or dark) affects the flavor of the beverage; lighter roasts will have maintained more of the beans' natural aromatic oils and acids to add to the taste.

As one of the popular beverages of the world, coffee has been the most highly traded commodity after oil since World War II (Ponte 2002; Murthy and Madhava Naidu 2012; Kaplinsky and Fitter 2001). About 75% of the consumption takes place in United States, European Union, and Japan, which are the world's largest importers of green coffee (Lewin, Giovannucci and Varangis 2004). World coffee consumption increased at an average annual rate of 1.9% over the last 50 years. From 57.9 million bags in 1964 to 142 million bags in 2012. Average consumption in the United States from 1990 to 2012 was 19.7 million bags, but the total consumption in 2012 was about 22.2 million bags, accounting for 15.7% of world consumption. The other leading countries are Germany (9.5 million bags), Japan (6.5 million), France (5.4 million) and Italy (5.2 million).

Moreover, the act of coffee drinking has changed over the last three decades in coffee importing countries (International Coffee Organization 2014). A ‘latte revolution’ has occurred, where specialty, fair trade, organic and bird friendly coffee markets gave rise to a “coffee boom” in traditional coffee importing markets such as the United States, the European Union and Japan (Durevall 2007; Daviron and Stefano 2005). Coffee bar chains have spread rapidly and consumers can choose hundreds of combinations of coffee variety, origin, brewing and grinding methods, flavoring, packaging, social “content,” and ambience (Ponte 2002; Teuber 2007; Bacon 2013). The average spread between consumer coffee prices and coffee bean prices increased by 186% between 1975 and 1994 (Morisset 1998). The multinational retailers, such as Walmart, McDonald’s, Starbucks, and other big coffee roasters have strategically built brand reputation and consumer trust to improve quality and profitability (Lewin et al. 2004).

However, the question is whether the above growing differentiation of the coffee industry in final product markets is reflected in a similar pattern of differentiation to coffee farmers. Green coffee price volatility has been significantly higher due to weather, disease and external shocks. Real green coffee prices have been very low over the last several years (Mehta and Chavas 2008). In many countries, the spread of coffee prices has fallen during periods of rising prices on the New York Coffee Exchange (Fitter and Kaplinsky 2001). More recent coffee prices have continued a downward trend with its monthly average falling by 6.7% in September 2015 alone, reaching its lowest since January 2014 (International Coffee Organization 2015). The cost of production has been rising in many coffee producing countries according to the International Coffee Organization, while farmers sometimes sold coffee at a price that did not cover costs

(Mehta and Chavas, 2008). This situation is considered as a “coffee crisis,” which began in 1999 (International Coffee Organization 2002).

As a major source of export revenue for low-and middle-income countries, coffee is produced in over 60 countries with more than 5 million farms and provides a livelihood for over 125 million people around the world (ICO 2002; Kaplinsky and Fitter 2001). Total coffee production in 2014/15 was about 143 million bags. In 2014, total world coffee consumption was estimated at more than 149 million bags with a 2.3% average annual growth rate since 2011 (ICO 2015). About 75% of the consumption takes place in United States, European Union, and Japan, which are the world’s largest importers of green coffee (Lewin et al. 2004).

The coexistence of a “coffee crisis” and a “coffee boom” is referred to as the “coffee paradox” in the global coffee-value chain (Daviro and Ponte, 2005; Kang and Kennedy, 2009; Schübler, 2009). Reasons behind this paradox are the oversupply of low quality coffee, strong demand for high quality coffee, asymmetric price transmission and market reforms (Schübler, 2009; Ponte 2002). This paper proposes that the essential reason behind the paradox is the disparity of the product differentiation process. In other words, the product differentiation is mostly happened in the downstream of coffee supply chain in the coffee importing countries. This research reported herein explores the above contradiction by providing an overview of the global coffee market with a focus on the producers’ perspective. It adds to the literature by providing explanations to coffee paradox from the new perspective of product differentiation coffee producers’ welfare. This paper applies the framework from Harrison and Kennedy (1997) on evaluation of

global agribusiness competitiveness, to the global coffee market but with a focus on producers' perspective.

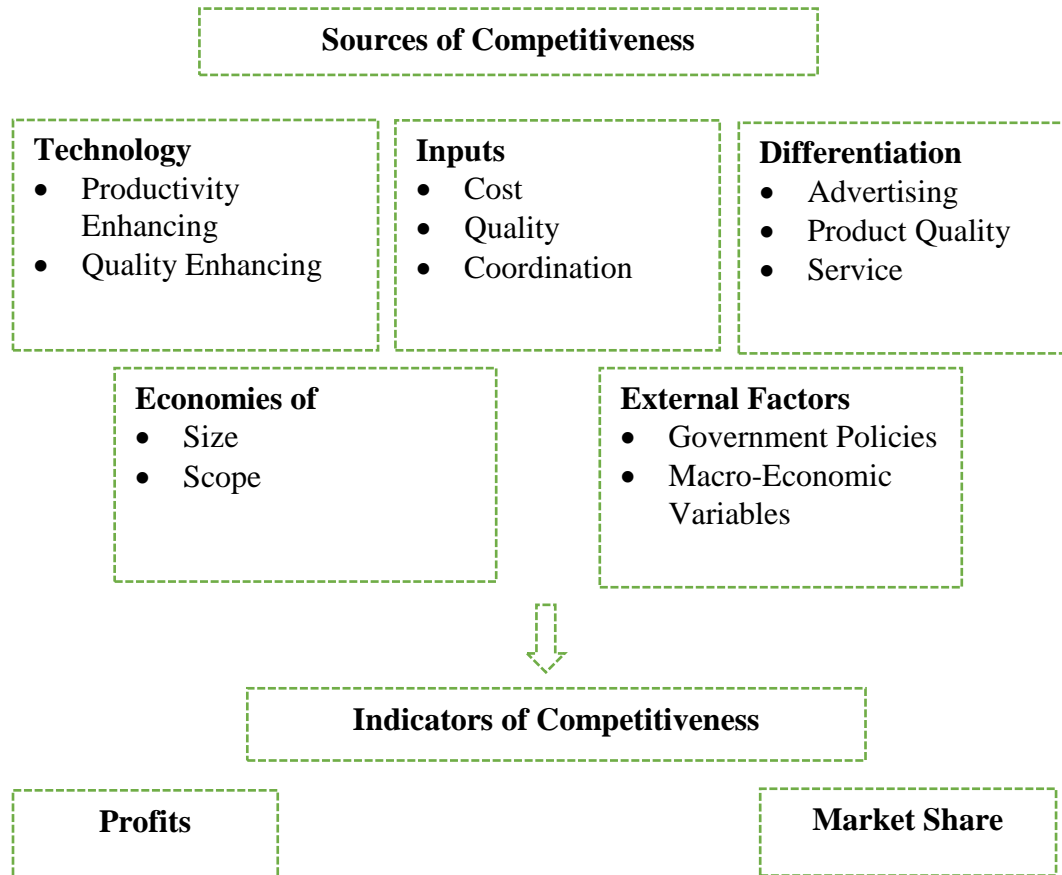


Figure 1 Framework for overviewing sources of competitiveness
Source: Harrison and Kennedy (1997)

1.2 Framework for overviewing the competitiveness of coffee producing countries

As Figure 1 shows, technology, attributes of inputs, production economics, product differentiation, and other external factors are the five primary sources of competitiveness (Harrison and Kennedy 1997). The competitiveness literature tends to cover the sources of competitiveness either from the firm level or demand side. Anver and Sutton (1987) explored the relationship between product differentiation and industrial structure, concluding that it is the interplay between consumers' tastes and the underlying

technology which simultaneously determine the degree of concentration and level of fixed costs. Other literatures study the relationship between product-differentiation and consumer demand (Manderscheid 1968; Alamo and Malaga 2012). Houston, Santillan and Marlowe (2003) evaluate the factors that influence U.S. consumption habits, coffee prices by origin, prices of near substitutes, U.S. income, the International Coffee Agreement (ICA), and NAFTA on U.S. consumption of certain types of coffee. But few studies investigate how producers can take advantage of product differentiation. Does the measure of competitiveness improve coffee producers' welfare? This paper applies the framework from Harrison and Kennedy (1997) on evaluation of global agribusiness competitiveness, to the global coffee market but with a focus on producers' perspective.

1.2.1 Definition of competitiveness

As Banse et al. (1999) pointed out, “no single measure or definition of competitiveness has gained the universal acceptance of either economists or management theorists.” Competitiveness for an economy implies achievement or maintenance of a high standard of living and productivity. Stanovnik and Kovačič (2000) noted that in the long-term international competitiveness depends on human and natural resources, infrastructure, management, capital, government intervention, and technological capability of firms. According to Stiglitz (2013), the most effective way of attaining competitiveness is to have strong competition. Krugman (1994) saw competitiveness as a dangerous obsession while Porter (1990) claimed that productivity is the only meaningful concept of competitiveness. Moreover, Artto (1987) summarized that cost-competitiveness, non-price competitiveness, and price-competitiveness are the three dimensions of competitiveness. Price competitiveness is meant for heterogeneous markets, usually

measured with the relative export selling price. A broader definition of competitiveness is the ability to secure and profitably maintain market share (Martin, Westgren and Duren 1991). More definition of competitiveness is given in Table 1.

The above broad definitions of competitiveness reflect the objective of competitiveness or being competitive. The ultimate goal is to improve the standard of living or income of a country either through higher productivity or lower cost. This implies that competitiveness is not an end but a means to the objective. However, it is necessary in this paper to narrow down the objective of competitiveness to improve the living standard of coffee-producers, since the concept of competitiveness is often viewed from a micro (firm) perspective and a macro (nation) perspective. The micro-dimension of competitiveness refers to competition among the firms within a nation and its implications in international markets and the macro-dimension refers to competition among nations (Scott and Lodge 1985; Porter 1990).

The coffee boom reflects the increasing competitiveness of firms in coffee consuming countries (offering highly differentiated products at the consumer level) while the coffee crisis indicates that the standard of living of coffee producers has been affected adversely. Therefore, the objective of this paper is focused on the well-being of coffee producers. It borrows the idea of both macro- and micro-dimensions of competitiveness but with the concentration on coffee producing countries and coffee producers. This paper analyzes how sources of competitiveness influence the trend, volatility, and stability of coffee producers' prices.

Table 1 Selected definitions on competitiveness

<p>“Competitiveness is the degree to which a nation can, under free and fair market conditions, produce goods and services that meet the test of international markets while simultaneously maintaining or expanding the real incomes of its citizens.” (Report of the President’s Commission on Industrial Competitiveness 1985)</p>
<p>“... refers to a country’s ability to create, produce, distribute and/or service products in international trade while earning rising returns on its resources.” (Scott and Lodge, 1985, p.3)</p>
<p>“...ability of country to realize central economic policy goals, especially growth in income and employment, without running into balance of payments difficulties.” (Fagergerg, 1988, p.355)</p>
<p>“... is a country’s capacity to sustain and expand its share of international markets and at the same time to improve its people’s standard of living.” (Fajnzylber, 1988, p.12)</p>
<p>“International competitiveness means the ability of a country’s producers to compete successfully in world markets and with imports in its own domestic market. Competitiveness is generally measured by results-by the shares which a country attains in its markets, due allowance being made for its size and stage of development. Competitiveness in this very general sense comes to being synonymous with overall economic performance.” (His Majesty’s Treasure, UK, 1983, p 1)</p>
<p>“No single measure or definition of competitiveness has gained the universal 80 acceptance of either economists or management theorists.” (Banse et al. 1999)</p>

Source: Waheeduzzaman and Ryans (1996)

1.3 Product Differentiation

Dickson and Ginter (1987) summarized that product differentiation is either an alternative to market segmentation or a complement to implementing market segmentation. Product differentiation is defined as a product offering that is perceived by the consumer to differ from its competition on any physical or nonphysical product characteristic including price (Dickson and Ginter 1987). At the firm level, product differentiation is the degree to which the products of competing sellers substitute for one

another in consumption (Marion, 1986). A primary way in which firm's differentiate their products is by providing superior product quality (Harrison and Kennedy 1997). The relationship between competitiveness and product differentiation, in general, assumes consumers' willingness to pay for quality improvement is different, because their income, tastes are different (Jaskold et al. 1981; Anver and Sutton 1987). Research and development, quality control and the use of higher quality inputs are the major sources affecting product quality (Harrison and Kennedy 1997). Coffee bean variety, processing method, geographic origin, roasting method, and brewing method can influence the overall quality of coffee. The intrinsic physical characteristics and perceived attributes are useful to understand the determination of the quality of coffee (Niederhauser et al. 2008). In the coffee market, we assume that natural inputs such as soil, climate and rainfall are the major sources of the intrinsic physical characteristics, and perceived attributes like brand and image are nonphysical characteristics.

1.3.1 Coffee as a physically differentiated crop

The process of coffee production starts off with a coffee seed. The coffee seed spends about six months in a coffee nursery farm and becomes a little coffee tree. Coffee farmers plant the coffee tree and start harvesting coffee beans three years later. After harvest, coffee changes many hands as it moves from whole green bean to coffee cup (farmer-exporter-trader-roaster-retailer-consumer).

There are approximate 25 to 100 different species of coffee beans, Arabica and Robusta are the two major commercial types of coffee which economically dominate the world coffee trade, accounting for about 99% of world production (ICO 2009). Arabica originated from Ethiopia and Robusta from Belgian Congo. As Table 2 shows,

environmental conditions such as temperature, rainfall, latitude, and altitudes are vital to coffee growth. For instance, Arabica is a shrub that thrives in the shade. The optimum air temperature for its growth ranges from 15 to 24-degree C. Temperatures higher than 30 degrees could result in yellow leaves and cause abortion of flowers, while Robusta prefers warmer weather for its growth ranges from 24-36-degree C. Due to different pollination characteristics, Arabica and Robusta are propagated in different ways. Arabica is self-pollinated by seed which assures homogenous characteristics of the progeny and less disease resistance. Robusta is cross-pollinated with no guarantee on the characteristics of the progeny but more disease resistance. Robusta coffee trees are more resistant to disease and can survive in areas where Arabica coffee cannot be planted for environmental reasons (Daviron and Ponte 2005). The most influential disease is the Coffee Leaf Rust, which is characterized by orange-yellow circular spots on the coffee leaves. In sum, the intrinsic physical characteristics and perceived attributes naturally differentiate the Arabica and Robusta coffee.

Coffee today is widely grown throughout tropical areas (the coffee bean belt) with different characteristics such as climate, soil and rainfall (Kaplinsky and Fitter 2001). It is grown in frost-free areas that are mostly within countries are classified as Least Developed (LDCs).

This section will analyze the major characteristics of coffee production by country. Brazil, Columbia and Vietnam, the top three coffee producing countries, accounted for approximately 60% of world coffee production in the past ten years. Moreover, swings in world total coffee production are mainly influenced by the fluctuations of coffee production in Brazil, since it accounts for over 30% of world supply as Figure 1 shows.

Table 2 Comparison of Arabica and Robusta coffees

	Arabica	Robusta
Date species described	1753	1895
Chromosomes(2n)	44	22
Time from flower to ripe cherry	9 months	10-11 months
Flowering	After rain	Irregular
Ripe cherries	Fall	Stay
Yield(kg beans/ha)	1500-3000	2300-4000
Root system	Deep	Shallow
Optimum temperature	15-24 C/ 59-75 F	24- 36 C/ 76-97 F
Optimal rainfall	12-22/5-8.5 in.	22-30 cm/8.5-12 in.
Optimum altitude	1000-2000m	0-700m
Hemileia vastatrix	Susceptible	Resistant
Koleroga	Susceptible	Tolerant
Nematodes	Susceptible	Resistant
Tracheomycosis	Resistant	Susceptible
Coffee berry disease	Susceptible	Resistant
Caffeine content of beans	0.8-1.4%	1.7-4.0%
Shape of bean	Flat	Oval
Typical brew characteristics	Acidity	Bitterness, full

Source: International Coffee Organization

First, the pattern of total coffee production has been characterized by biennial production cycle as Figure 2 shows. It is mainly dominated by Brazil's Arabica biannual production cycle for at least two reasons: 1) Brazil is the largest Arabica producer; 2) Arabica yield is higher and more volatile than Robusta production. For example, world coffee production experienced its third consecutive year of rising output in 2012, mainly due to Brazil Arabica enters the on-year of the biennial production cycle in 2012. Even 2013 is a down-year, the total production decreased a little bit due to temperate weather conditions. Dry weather and high temperatures in Brazil reduced the Robusta production in 2010. The majority of Arabica trees for 2004 are in the on-year of the production cycle, which explains in world coffee production with higher yields in the same year. "There are really two things that move coffee-a drought and a freeze; those are the two big wild cards (Joseph and Wexler 2014)."

Second, the world coffee market is also characterized by the oversupply of low quality coffee beans. Historically, Colombia has been the second largest coffee producer. However, Vietnam replaced Colombia as the second largest producer in the late 1990s due to its fast growth of coffee production, which explains the increasing trend of Robusta production. Exports from Vietnam were nonexistent prior to the 1980s. Vietnamese exports grew at an average annual rate of 18% between 1961 and 2003 (Feleke and Walters 2005). Vietnamese banks report that after the high coffee price in 1994, the 95/96 planting year resulted in the highest-ever borrowing for new plantations. When prices picked up again in 1997, there was renewed expansion as well. The supply elasticity of coffee is low in the short run and higher in the long run because it takes several years for supply can be increased only by changing the quantity of inputs and labor (Ghoshray 2009). In 2011/12, Vietnam reached a record level of 26 million bags due to the higher-than-expected area and yield according to the market report from United States Department of Agriculture (USDA 2012).

Third, there is a dire shortage of high-quality coffee in the industry mainly caused by climatic and environmental risks. Colombia' production fell from 2008 to 2012 due to the coffee cherry borer and rust. Torrential rains decreased coffee production in 2011. Yields were low in 1997 due to lack of rain and insect damage, but they increased in 1998 due to a long period of rain. Meantime, high humidity decreased the quality of coffee from Colombia. Colombia exports decreased 19% because of unseasonable strong rainfall caused an outbreak of coffee rust in 2012 (Josephs 2012 WSJ). Colombia is located on the Andes, where El Nino occurs, which takes fairly a long time to recover from such weathers.

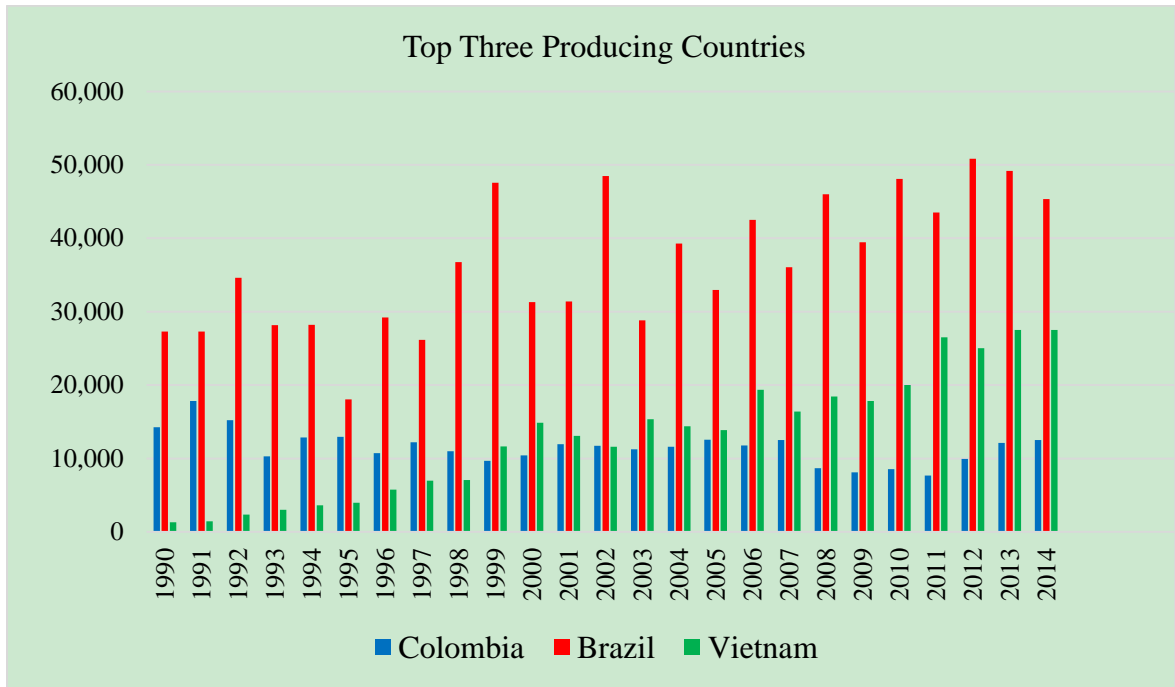


Figure 2 Total production of top ten coffee exporting countries
Source: ICO

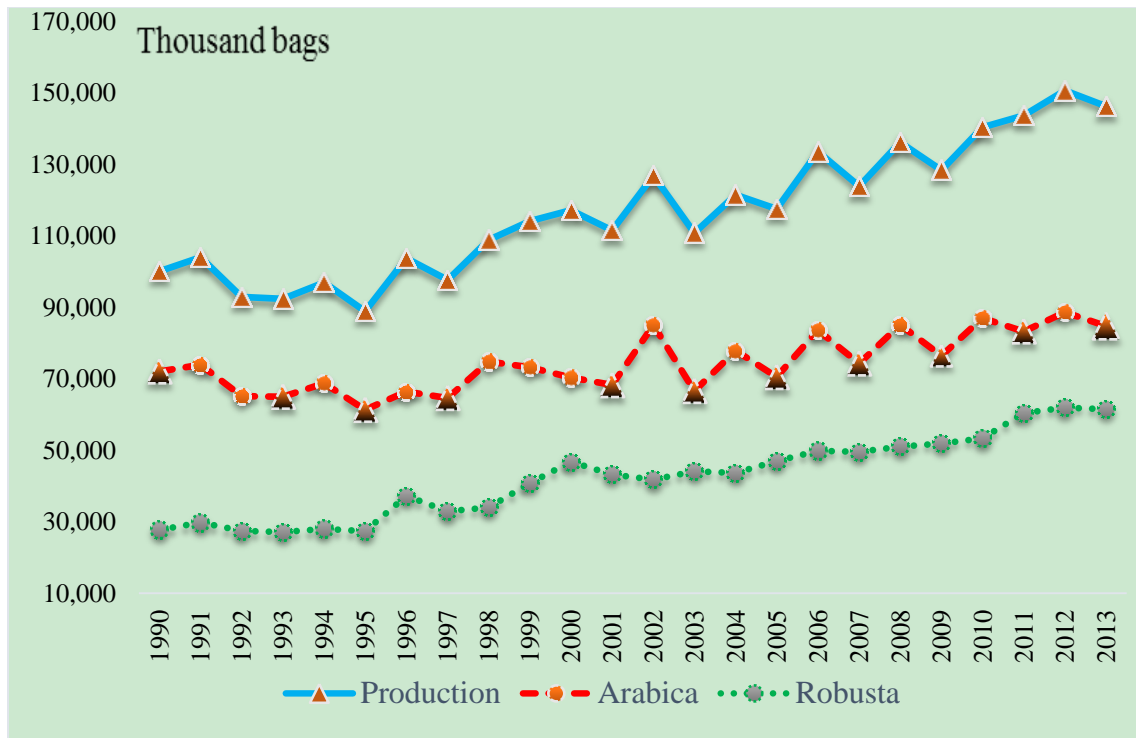


Figure 3 World coffee production (1 bag = 60 kilogram = 132 lb)
Source: Foreign Agricultural Service/USDA

1.4 Coffee market reforms and liberalization

The global coffee market was relatively stable during 1962 to 1989. It was influenced heavily by domestic government policy and quota agreement from International Coffee Organization (ICO). Before 1990, the main function of the ICO was to assign quota to each individual country according to its past exports or stocks. Since the collapse of the International Coffee Agreement (ICA) in 1989, the ICO plays a role as a forum for intergovernmental cooperation to improve coffee trade among countries and promote a sustainable coffee economy for participants; especially for small-scale farmers in producing countries.

Under the ICA, the ICO set quotas among a number of producing and consuming countries to manage the market, but the ICA was abandoned soon after trade

liberalization in 1989, since coffee producing countries were eager to explore more trading partners around the world. The collapse of the ICA led to several producing countries dismantling their centralized marketing systems and starting operating in a free market (Shepherd 2004). At the same time, this reform led to a rapidly deteriorating price. There are stark differences in price behavior during and after ICA. For instance in the 1980s, before the collapse of the ICA, coffee prices were 33.6 percent higher with a standard deviation 27.7 percent lower than the post-ICA period (Ghoshray 2010). Talbot (1997) answered the questions on the distribution of total coffee income between producing and consuming countries and on the costs of production at the each state of coffee commodity chain during the period 1971-1995. In early 1980s, producing countries retained 20% of total income on average and consuming countries retained 55%. During the time period of post ICA (1989-1990 and 1994-1995), producers only retained 13% of the total income and consuming countries retained 78% (Ponte 2002). Feleke and Walters (2005) predicted that this share would deteriorated given the low prices and the market situation.

However, after 1989, coffee producing countries were in shambles. Prices fell to their lowest levels in years, and farmers lost much needed income. The economic, social and environmental impacts of these trends in coffee are of such significance that the production side is facing its worst crisis in history. The coffee industry has been trapped

Table 3 Comparison of the Characteristics before and after market reform

	ICA regime (1962-89)	Post-ICA regime (1989-present)
Geography of production	Concentrated in few large producing countries such as Brazil and Colombia, increasing dispersed with new producers	Fragmentation continues
Characteristics of internationally traded product	Homogenous but distinguished by physical and intrinsic qualities	Bifurcated trend: increased homogenization of low quality coffee and increased trade of heterogeneous of high quality coffee beans
Distribution of total income generated along the chain	Relative stable, with farmers getting about 20% of the total, and consuming operators around 50%.	Shifted to the advantage of consuming country operators
Geography of consumption	Concentrated in North America, West Europe and Japan	Emergence of new markets (Eastern Europe, China, East Asia)
Typology of consumption	Segmented by group of countries, but relatively homogenous consumption within these geographical areas	Increased fragmentation: increasing importance of “single origin” coffees
Governance structure of the chain	Seller-driven, roasters are neither in the position to dictate the terms of the trade to traders, nor to set inclusion/exclusion thresholds; market power is limited	Buyer-driven, adoption of supplier-managed inventory (SMI) by roasters forces traders to integrate upstream; vertical integration by traders made easier by market liberalization in producing countries

Table 3 (continued)

Quality conventions	<p><i>International level:</i> quality assessed by the buyer <i>ex-post</i> <i>Domestic-level:</i> set by regulatory agency</p>	<p><i>International level:</i> increasing importance of conventions defined by buyers: process monitoring becomes important for fair trade, organic, shade-grown coffees; quality increasingly assessed by buyers <i>ex-ante</i> <i>Domestic-level:</i> increasingly set by buyers; formal rules of quality control remain but are increasingly disregarded</p>
Upgrading possibilities	<p>Limited; undifferentiated trade; producing countries achieve product valorization through higher international prices provided by the ICA (International Coffee Agreement)</p>	<p>Potentially increasing through marketing of “conscious” coffee and direct e-commerce sales</p>

Source: Ponte (2002)

in a vicious cycle of excess supply, sluggish demand, and collapsing prices. In importing countries, markets are expanding, differentiated products are being developed, and profits are increasing. Firms in consuming countries and multinational firms have been more successful in capturing downstream margins than most producers, who have seen their share of value decline substantially from about 30% of the total to about 5% in the past two decades (Lewin, Giovannucci and Varangis 2004). Table 3 is a brief comparison of ICA regime and post-ICA regime.

1.5 Types of coffee in this study

The ICO divides exports by type of coffee. Table 4 shows that Mild Arabica consists of “Colombian Milds” and “Other Milds.” Colombian Milds are mainly produced in Colombia, Kenya, and Tanzania. Other Milds are supplied by Guatemala, Mexico and India. Brazilian Naturals refer to Hard Arabicas from Brazil and Ethiopia. Hard Arabica is a lower quality Arabica compare to Mild Arabica from Colombia. The last category includes Robusta from all origins with Vietnam as the main producer. In this paper, we chose three countries-Colombia, Brazil, and Vietnam as the major producing countries representing different qualities and types of coffee. In particular, Columbian Milds, as the highest quality among the other types of coffee, have the highest producer prices, while Robusta have the lowest prices.

1.6 Stagnancy of consumption growth

Total coffee consumption increased from 57.9 million bags in 1964 to 142 million bags in 2012.

Table 4 Exports by major ICO-exporting member to all destinations
(thousand bags)

Country	1989/90	1999/00	2009/10	2011/12	2012/13	2013/14
Colombian	15459	12023	9437	10000	11284	2861
<i>Milds</i>						
<u>Colombia</u>	12920	9679	8098	8500	9500	1214
Kenya	1677	1502	630	750	767	838
Tanzania	862	842	709	750	1017	809
Other	12075	19191	16374	18183	17201	16718
<i>Milds</i>						
Guatemala	3473	5120	3835	3750	3143	3159
Mexico	5050	6219	4200	4600	3900	3916
India	1785	4867	4764	5333	5258	5075
Honduras	1767	2985	3575	4500	4900	4568
Brazilian	27980	51362	46901	51796	58926	55679
<i>Naturals</i>						
<u>Brazil</u>	24541	47578	39970	43484	50826	49152
Ethiopia	3439	3784	6931	8312	8100	6527
Robustas	14624	27370	34172	30200	39930	44689
Cote d'Ivoire	4799	6320	1795	1600	2000	2107
Uganda	1935	2862	2797	2850	3200	3633
<u>Vietnam</u>	1006	11631	18200	17500	22000	27500
Indonesia	6884	6557	11380	8250	12730	11449

Source: International Coffee Organization

Overall, coffee consumption volumes have stagnated in traditional markets. Figure 3 shows the per capita and the trend of coffee consumption in different types markets. Average consumption in the United States from 1990 to 2012 was 19.7 million bags, but the total consumption in 2012 was about 22.2 million bags, accounting for 15.7% of world consumption. The other leading countries are Germany (9.5 million bags), Japan (6.5 million), France (5.4 million) and Italy (5.2 million). The average annual growth rate for consumption by all importing countries was 1.5% for the period 1990 to 2012, compared to 1.7% for the period 1964 to 1989.

How have roasters responded to the above declining average annual growth? They are implementing product differentiation strategies to enhance consumption and profits. As a result, homogeneous commodities are transformed into differentiated goods so that unique, heterogeneous products are offered to consumers (Alamo and Malaga 2012). Coffee importing countries have adjusted faster than producing countries into this new era for the coffee industry.

Product differentiation leading to differences in prices and market shares is explained by theories of monopolistic competition (Chamberlin, 1934) and “love for variety” (Dixit and Stieglitz, 1977). Those theories suggest that if a firm produces a product that is distinct from others of the same type and if consumers are better off with added varieties, market power results allowing the firm to set the price that will determine its market share (Rakotoarisoa et al, 2003). The market for specialty coffee has expanded and remains promising. As a result, “latte revolution” has been occurred as introduced at the beginning of the chapter.

“Americans are becoming increasingly particular about what kind of coffee they will drink” according to the Wall Street Journal (April 19, 2002). Coffee sales account for about 5% of Krispy Kreme’s revenues, while its rival, Dunkin’ Donuts, generates more than 40% of its sales from coffee by Wall Street Journal (September 24, 2002). You can buy good coffee beans in grocery stores and department stores (even Godiva is selling coffee beans). Instant coffee is used in cooking. Coffee represents less than 10% of stores operating costs at Starbucks retail stores (Jargon 2013). “Nestlé is fighting with a tough consumer environment as weak demand in Europe and North America offsets growth in emerging countries.”

However, consumption in emerging markets and exporting countries has been growing rapidly with strong potential for future growth. Emerging markets had an average annual growth rate of 4.6% from 2011 to 2014, which is higher than traditional markets as Table 5 shows. “Consumer confidence is low in developed markets. In Europe and North America, Nestlé reported volume growth slowed to 2.8% from 4.9%. The Asia-Oceania-Africa region markets performed well with 11.4% organic sales growth. China has double digit sales growth by strong sales increases of Nescafe and the impact of the two large acquisitions in 2011 (Revill 2012).”

Although tea is still the traditional drink in many Asian countries, coffee consumption has been increasing steadily. In China, consumption has been increasing at a yearly rate of 13% to reach around 1.1 million bags in 2012, even though per capita consumption is just 25 grams. Soluble and prepared drinks are more popular in China. South Korean consumption has grown 2.6% annually over the last ten years, with a strong preference for Robusta coffees (Feleke and Walters 2005).

Coffee is more of a luxury good in lower income countries rather than a necessity (as in traditional importing countries). As incomes rise, consumption of coffee will likely become more prevalent (ICO 2014). Starbucks is aiming to double the number of stores in China and Thailand (Hookway 2013). Starbucks gets more complaints about crowding in their Asian-Pacific stores, rather than pricing (Chu 2013). Brands such as Nescafe 3-in-1 instant coffee mix have appealed to price-conscious consumers (Revill 2012). Dunkin Doughnuts has signed a deal to take its doughnut chain to Vietnam (Chaudhuri

2013). Starbucks also has been sourcing coffee from Vietnam (Chaudhuri 2013). “The success of instant coffee in Asia-Pacific stems from its appeal to new drinking coffee converts; it’s convenient and easy to prepare, which is essential as most Asian households lack a coffee machine (Rai 2013).” Brazil is the world second biggest coffee consuming country after the United States and its per capita consumption rate (6.1kg) is also high.

Table 5 World coffee consumption (thousand bags)

Calendar years	2011	2012	2013	2014	Average
World Total	139 415	143 004	147 339	14 926	2.3%
Exporting countries	42 794	44 222	44 992	46 201	2.6%
Traditional markets	75 910	76 509	79 026	79 387	1.5%
Emerging markets	20 711	22 273	23 320	23 677	4.6%

Source: ICO monthly coffee market report in March (2015)

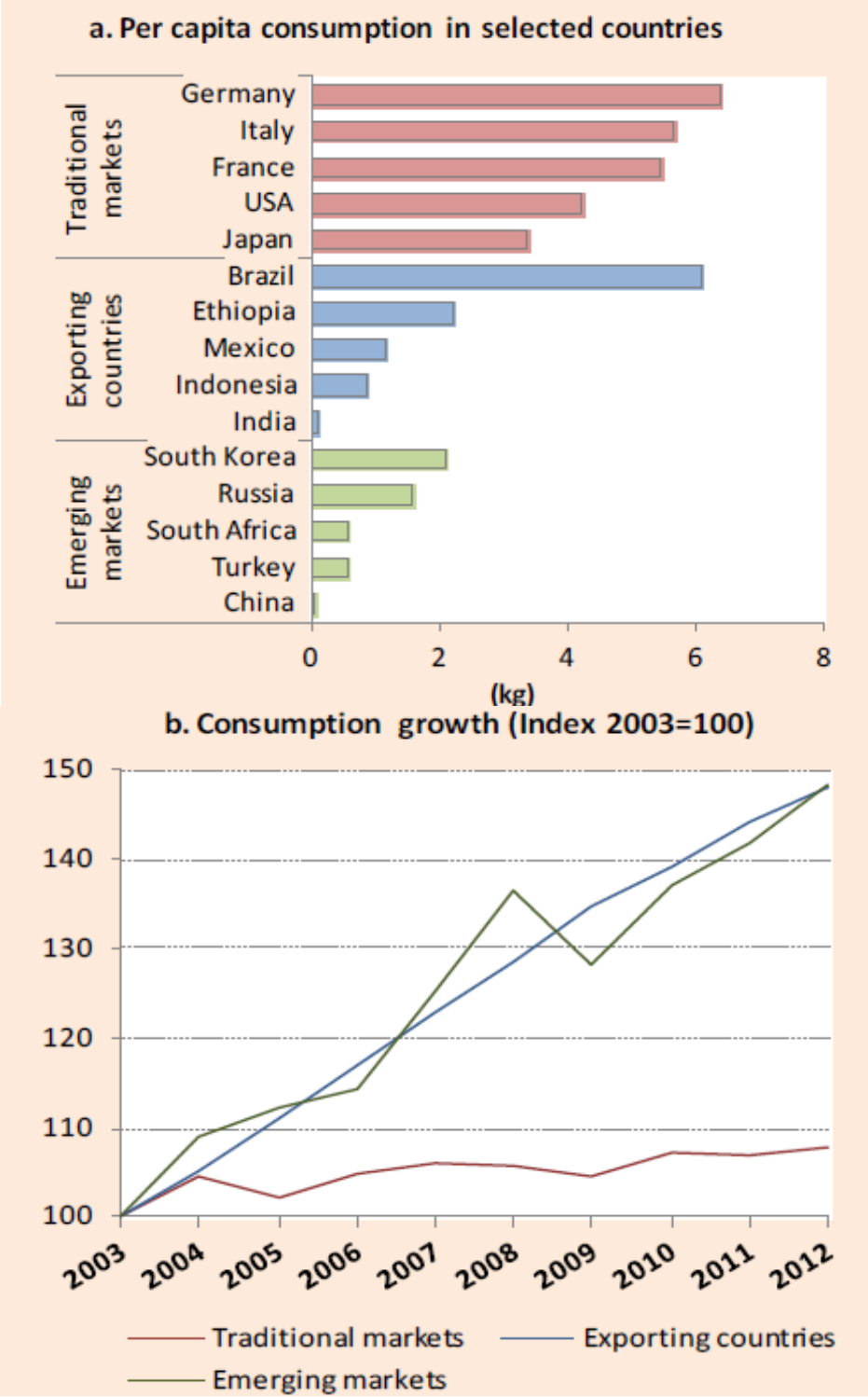


Figure 4 Consumption trends comparison
 Source: ICO 2014

1.7 Coffee Prices

Since coffee changes many hands as it moves from whole green bean to coffee cup, different price levels are developed along the value chain. Table 6 briefly shows prices related to the coffee value chain. This study starts with farm-gate price, which is also called producer price or price paid to growers throughout the paper.

Table 6 Prices related to coffee value chain

Farmers pick coffee cherries, receiving a farm-gate price
The beans go to an intermediary for export, reflected in fob prices
They are shipped to importing countries, landed at cif prices
Importers then sell the beans at wholesale prices
Roasters process the beans and sell them at factory gate prices
Retailers sell the coffee to consumers at retail prices

Figure 4 shows that producer price is characterized by upward and downward movements, which is mainly characterized by instability, cyclical phenomena and declining trend. The overall declining trend after 1990s is mainly caused by oversupply and stagnate demand. First, the release of the inventories from coffee producing countries after the collapse of the International Coffee Agreement. Second, the increased coffee production from Brazil and the entry of Vietnam to the market contribute to the accounts for more than 10% world coffee production today compare to less 0.1% of world production in 1980s. Meantime, the demand side is dominated by stagnancy of consumption growth (Gilbert 2006).

The upward movements of producer price mostly resulted from agricultural, climatic and environmental risks. Weather has been a big factor in explaining the price volatility. Frost and drought occur periodically. For example, producer prices increased during 1994 - 1997 because of severe frost and drought in 1994 in Brazil. Other years such as 1999,

2003 and 2005 had a light drought, 2000 frost in Brazil. The upward movements of producer price from 2008 to 2012 due to the coffee cherry borer and rust in Colombia. In addition, producer prices are paid by local currency and converted to US cents/lb, so exchange rates could also have an effect on the fluctuation of the prices (Feleke and Walters 2005).

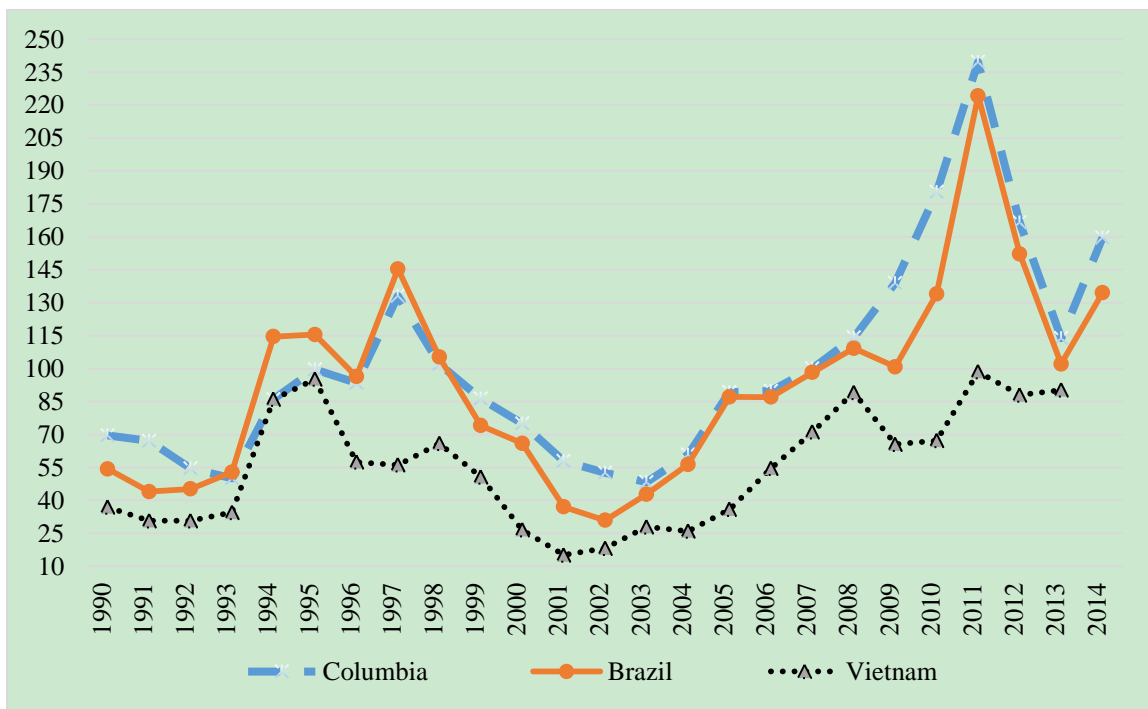


Figure 5 Annual coffee price paid to growers (US cents/lb)
Source: International Coffee Organization

Figure 5 also shows that producers from Colombia receive higher price than producers from Brazil and Vietnam, which indicates the coffee quality ranks among the three countries.

1.8 Rising costs

To understand the coffee crisis more, we also need to consider production costs for different types of coffee since coffee is a heterogeneous commodity (Manderscheid 1968; Kaplinsky and Fitter 2001; Ponte, 2002; Ghoshray 2009). Production costs are different across countries as showed in Figure 5. However, from the producers' perspective in Figure 6, the price difference between producer price and production costs illustrates the "coffee crisis." Sometimes producers cannot cover their production costs. Only Colombia Arabica producers can cover their production cost, which is probably due to both physical and nonphysical product differentiation (this will be discussed more by comparing marketing strategies).

Increasing production costs also contribute to price volatility and severely affect coffee producers' ability to farm sustainably (ICO 2014). Coffee production costs include labor, fertilizers, and phytosanitary products such as pesticides. Coffee is a labor-intensive crop, with little mechanization in many producing countries. Labor is a big problem in producing countries because of increasing urban wages, lack of young workers, and the aging agricultural population (ICO 2014). In coffee farming, nitrogen, potassium and phosphates are used to enrich soils and improve yields. However, prices of nitrogen, potassium and phosphates have increased by 301%, 275%, and 325%, respectively from 2000 to 2012.

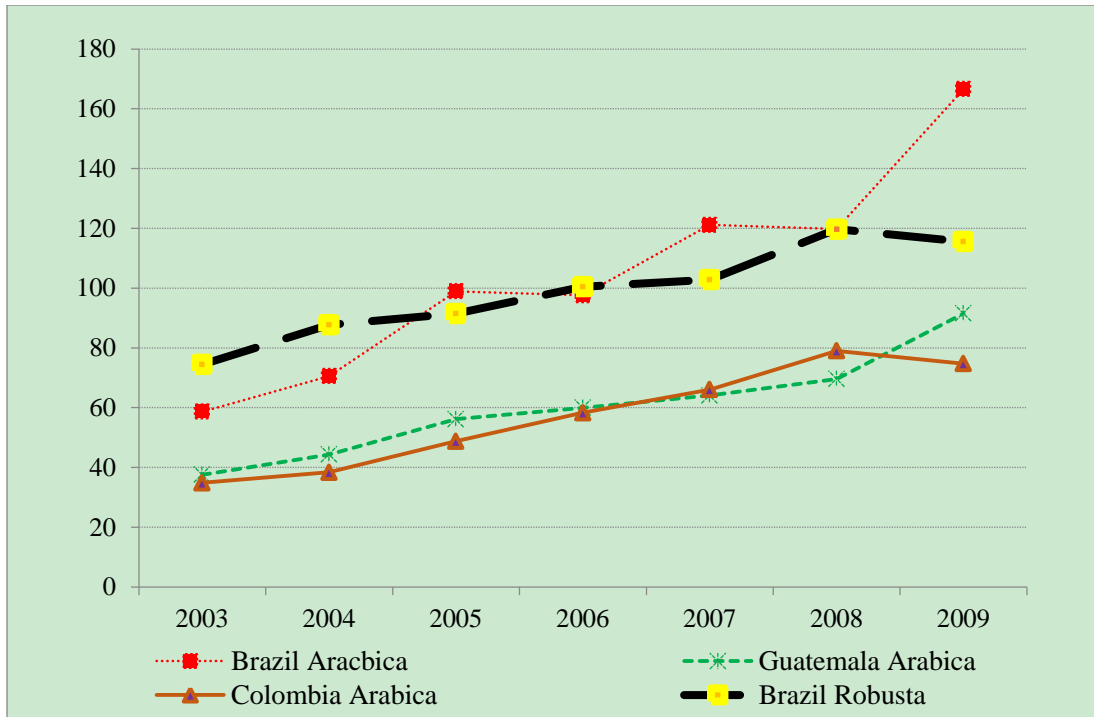


Figure 6 Production costs of selected coffee beans (US cents/lb)
Data Source: International Coffee Organization

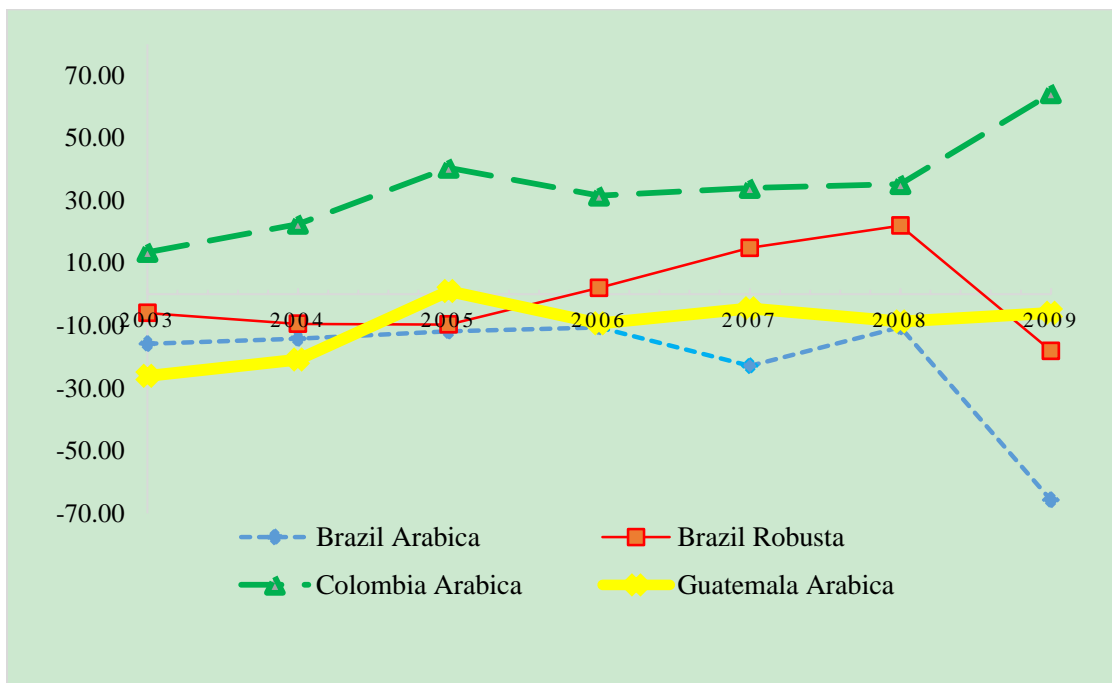


Figure 7 Difference between Producer Price and Production Cost (US cents/lb)
Data Source: International Coffee Organization and Author's calculation

Based on the review of this section, the second paper conducts a price analysis on comparing low and high quality coffee beans.

1.9 Nonphysical Differentiation Process

Green coffee is a semi-processed raw material that is used to make only a few final products-roasted, brewed, or instant coffee for final consumption. Nonphysical differentiation of coffee can be achieved through marketing strategies such as brand, blends, country of origin, and consumer perception. Table 7 lists how each participant in the market gains from each marketing strategy.

Table 7 Four marketing strategies of product differentiation

	Advantages to consumers	Advantages to roasters and retailers	Advantages to growers	Delivered by
Brands	Consistency of product Guarantee of minimum quality Identification with marketing image	Compensates for uneven quality and availability of beans	Increases final demand for coffee	Selection of beans Roasting process Advertising spend
Blends	Balances taste of different beans	Allows cost minimization due to bean substitution	None, unless blends are country-specific	Selection of beans
Country of origin	Allows for nuanced appreciation of varieties of coffee	Little, since identifies customer with the farmer, not the roaster	Very high for qualifying farmers	Species, cultivars; climate and altitude; soil; cultivation, harvesting and ex-farm processing Marketing
Consumer perception	Allows for nuanced appreciation of varieties of coffee	A potential disadvantage since poor preparation can undermine coffee quality	A potential disadvantage may undermine coffee quality	Nature of inputs Practices in brewing

Source: Fitter and Kaplinsky (2001)

The above table shows that each participant gains from product differentiation in coffee market through different ways. Consumers gain from the consistency of coffee brands, intrinsic value of specific coffee origin, and the varied choices.

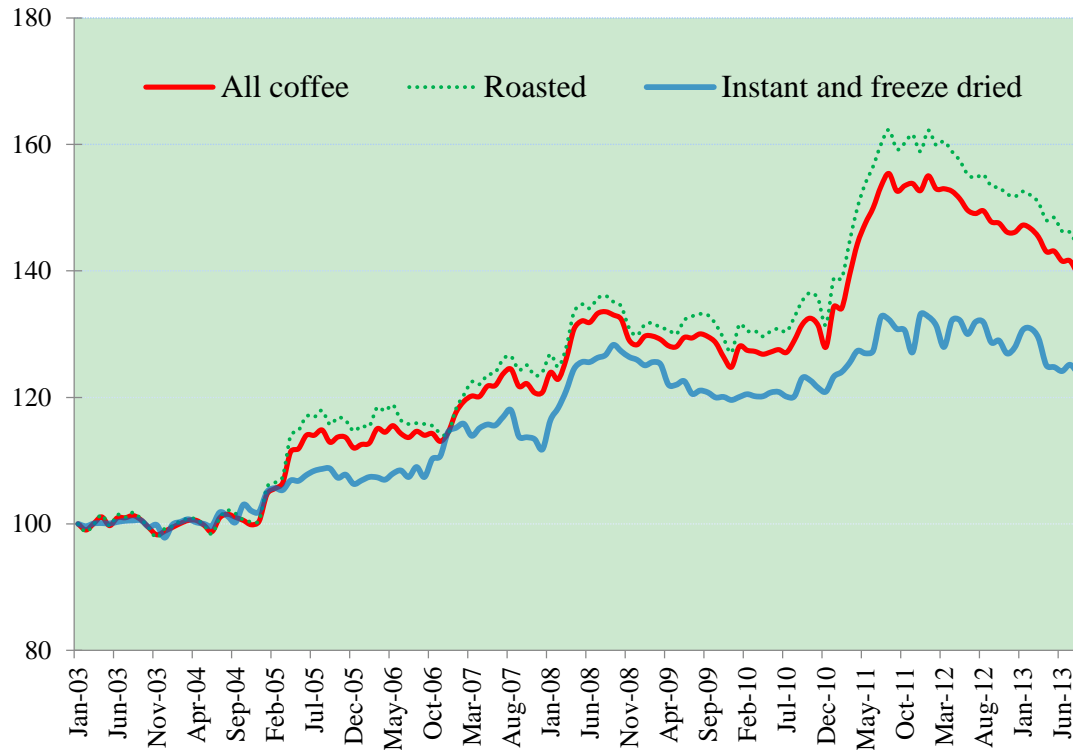


Figure 8 Consumer price indexes for coffee, not seasonally adjusted

Source: U.S. Bureau of Labor Statistics

Roasters gain from brands and blends, these strategies transfer a specific taste for consumers while diluting the power of specific coffee beans, in order to maintain the stability of supply and minimize cost for substitute coffee beans. Many manufacturers blend coffees from different origins to maintain a consistent taste across crop years. The blends typically use Arabica for flavor with Robusta as filler, the relative proportions of the two determining the overall cost of the blend (Gilbert 2007). Brand may increase demand, but it is still uncertain how producers benefit from it.

Studies show retailers gain more profit from specialty coffee chains than in conventional coffee chains (Calo and Wise 2005; Daviron and Stefano 2005). For example, low Arabica coffee prices in 2013 prompted Starbucks to follow competitors in cutting the

price of the beans it sold in groceries to \$8.99 from \$9.99 for a 12-oz bag; but the company kept prices stable for single-serve coffee (Fancis 2014 WSJ). Moreover, coffee beans make up only a small portion of price in coffee shops, coffee represents just 8% to 10% of the café operating expenses in Starbucks (Wexler 2014 WSJ).

In the retail level, the price of coffee with recognized origin is often double or triple the price for regular average coffee. Big retail has shifted the balance of power within the coffee industry from producers toward buyers. Retailers such as Costco, Starbucks, McDonald's, Walmart and Dunkin' Donuts are driving the market for higher grade specialty coffee (Elder, Lister and Dauvergne 2014).

How about coffee producers? coffee farmers gain from the degree of consumers' perception or recognition for specific coffee beans provided by cultivars, soils, farming and processing practices (Fitter and Kaplinsky 2001). From coffee producers' perspective, country of origin is how they can distinguish their products from other coffee producing countries because of the climatic and geographical reasons.

Product differentiation based on geographical origin has been a response to rising consumer demand for diversification and to the coffee crisis in producing countries. Increasing product differentiation based on geographical origin can be observed in the specialty coffee market (Kaplinsky and Fitter 2001; Lewin et al 2004). The comparison between fine wines and single-origin coffees is often made in the literature (Lewin et al. 2004; Kaplinki and Fitter 2001; Daviron and Ponte 2005).

Country of origin can be considered as a symbolic quality characteristic, which is normally associated with a particular production area, production system or social context. For example, the Jamaicans describe their Blue Mountain coffee thus "Toward

the eastern end of the beautiful island of Jamaica runs the majestic range of hills known as the Blue Mountains... the terrain, the rainfall pattern, the Blue Mountain mist, and the overall conditions are blessed by God to be perfectly suited for the cultivation of the world's most distinguished and delicious coffee (Niederhauser et al. 2008). ”

Single-origin coffee is one strategy for coffee producing countries to cope with unstable and declining coffee prices (Schübler 2009). Geographical indications of origin (GIs) is a strategy of product differentiation in specialty coffee markets, this approach is similar to that of wine in France and Italy. The European Union has created labels known as PDO (Protected Designation of Origin) and PGI (Protected Geographical Indication) to promote and protect traditional food products (Giraud 2002). Producers or processors of quality products can apply for either a protected designation of origin (PDO) or a protected geographical indication (PGI). Implicit in both is the assumption that the product quality is enhanced through its association with that specific place or region. The key distinction between PDOs and PGIs is that the geographical link must occur in all stages of production, processing and preparation for a PDO and at least one for a PGI (Ilbery and Kneafsey 2000).

In the United States, geographical indications are not recognized as a separate class of intellectual property. It is protected under the existing US trademark law. For example, bourbon, Wisconsin real cheese, 100% Kona coffee, and Vidalia onions have U.S. trademark protection based on origin. GIs in the US and European markets. For example, “Café de Colombia” was registered as a Protected Geographical Indication (PGI) under Council Regulation (EC) No 510/2006 in September 2007. The Ethiopian government considers trademarks as the better way of protecting its coffee GIs (Teuber 2007). Both

PGI and trademarks rely on the same economic rationales, the protection of goodwill against free-riding by third-parties and the reduction of consumer search costs. Data from US online retail in Figure 9 shows that single-origin coffees receive significantly higher retail prices, with 100% Kona coffee from Hawaii and Jamaican Blue Mountain coffee being the most expensive ones (Teuber 2007). Results from hedonic pricing models for single-origin coffees show that country of origin is an important determinant of prices paid by importers and roasters (Teuber 2007).

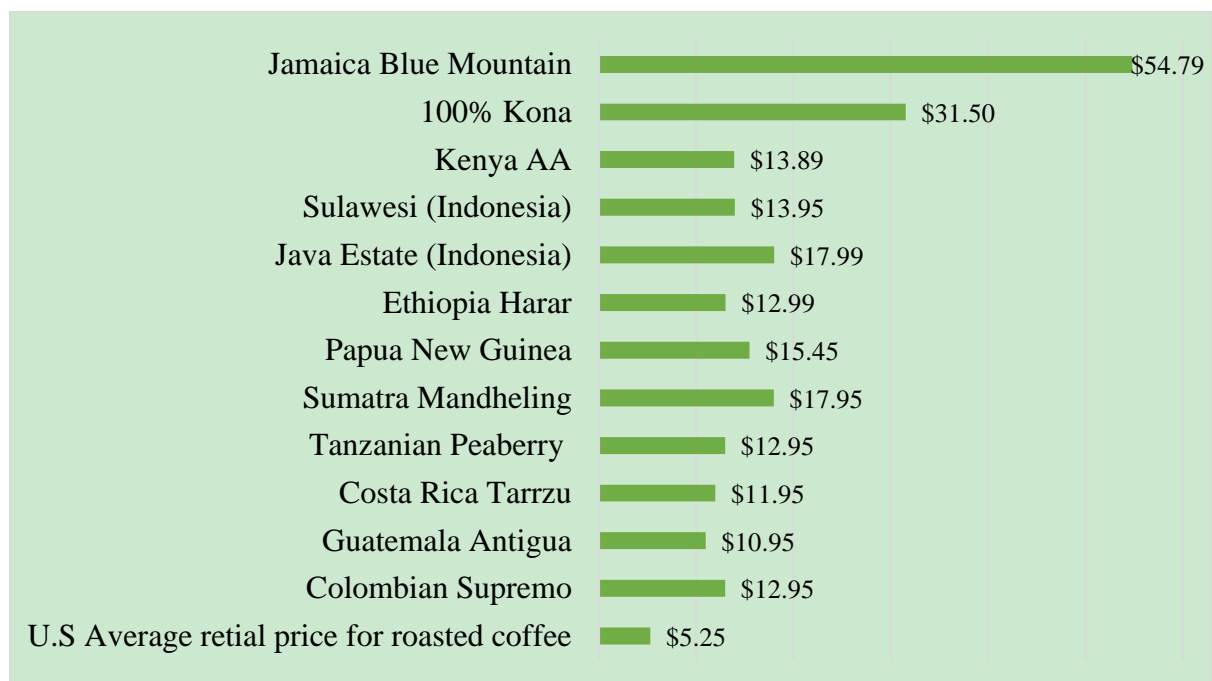


Figure 9 Retail prices of selected brands (2015)
Data Source: Bureau of Labor Statistics and Amazon.com

As is the case with wines, there are many traits that determine quality, but because of personal preferences there is no one particular coffee that has the best inherent quality. It is these different preferences that open up the possibilities for carving out niche markets for specialty differentiated products that cater to the personal preferences of individual consumers (Niederhauser et al. 2008).

In summary, as Figure 10 shows that the more coffee taste is defined by its intrinsic value such as country of origin, the more benefit producers gain. On the contrary, the more coffee taste is defined by the brand of the blends or advertising, the less gain goes to producers.

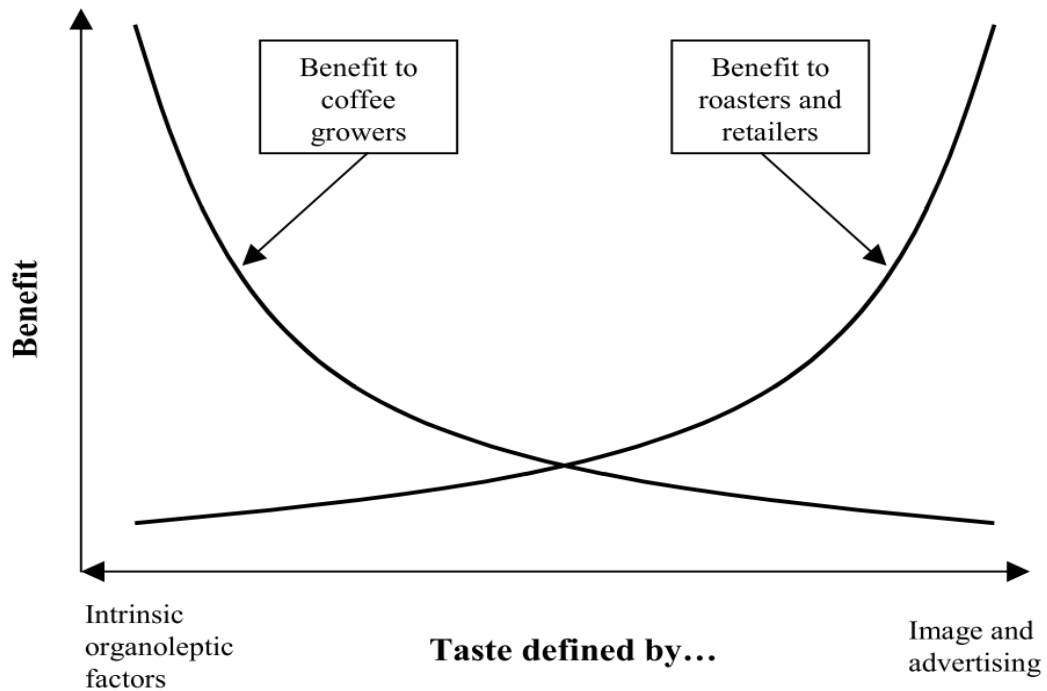


Figure 10 Relationship between benefit and taste defined by different factors

The second empirical analysis, which is the third paper, will focus more on high quality coffee market.

CHAPTER TWO

THE DYNAMICS OF PRICE TRANSMISSION IN THE PRESENCE OF A MAJOR QUALITY DIFFERENTIAL: THE CASE OF COLOMBIAN MILDS AND VIETNAMESE ROBUSTA COFFEE BEANS

2.1 Introduction

Colombian Milds and Vietnamese Robusta are selected as two good choices for analyzing the price links between domestic and the world markets for their quality-differentiated types. As in the previous chapter mentioned, Colombian Milds has a richer taste and stronger aroma than other types (Gonzalez-Perez and Gutierrez-Viana, 2012). Arabica requires more moisture, richer soil, and more direct sunlight than Robusta. Arabica is a much harder and higher quality bean. In the last two decades, the marketing strategy for Colombian Milds from Colombia primarily relied on trademark and origin indication protection to increase market share and better protect its reputation (Schüßler, 2009). Robusta from Vietnam is a type of low quality coffee bean.

The previous paper also reviews that the essential reason behind coffee paradox is the disparity of the product differentiation process. The major causes of the coffee paradox are the strong demand for high quality coffee beans, the oversupply of low quality coffee beans, and the asymmetric price transmission (Schüßler, 2009). This research reported herein examines the markets for low-quality Robusta coffee beans, mostly produced in Vietnam and compares it with high-quality Colombian Milds coffee beans from Colombia.

The extent of price transmission among farm-gate, wholesale, and retail market prices can partly explain the paradox and provide insights for policy makers (Vavra and Goodwin, 2005). Bettendorf and Verboven (2000) found weak transmission of coffee prices to retailers in the Netherlands because coffee bean prices had a relatively small share of the total product cost. Delille (2008) concluded that the reduction of world coffee prices was transmitted less rapidly than increases in retail prices in Belgium.

Although several studies have investigated price transmission in coffee markets, it is still not possible to draw robust conclusions. Aguiar and Santana (2002) argue that the price transmission results from previous studies cannot be applied to other product or other periods. They showed that price increases were more rapidly and fully transmitted compared to price decreases by analyzing the price transmission mechanism for coffee beans in Brazil. Their study also concluded that neither product storability (e.g. perishable fruits or storable beans), nor market concentration was required for an intense transmission process.

The first chapter also explains that why it is not accurate to take coffee as a homogenous commodity due to the variable profitability of different species and varieties (Abaelu and Manderscheid, 1968). The price signals from the world market to domestic growers have improved after the coffee industry reforms of the late 1980s and early 1990s. Domestic prices adjust faster today to fluctuations from world prices, but the world price changes are still asymmetrically transmitted to domestic markets (Krivonos, 2004).

Moreover, an empirical comparison of studies has rarely been done across countries in the area of price transmission. This paper investigates the differences in the long-run relationships between grower prices and world prices of higher and lower quality coffee beans. It also examines the differences in market integration for Colombian Milds and Vietnamese Robusta. The long-run price relationships for both types reflect the degree of market integration. Next, the speed of the price adjustment for the two varieties is compared when they deviate from the long-run equilibrium. The short-run price transmission for the high and low quality coffee beans can explain how the world and grower prices react differently to the deviation from the long-run equilibrium. The results show that the short-run price transmission is asymmetric and the long-run relationships are significant for both types.

2.1 Data Description

In this study, Colombian Milds and Vietnamese Robusta represent high and low quality coffee beans, respectively. Both grower and world coffee prices for Colombian Milds and Vietnamese Robusta are captured as monthly data from January 1990 through December 2012, obtained from the ICO (the period from June 2005 to January 2006 was excluded because the Vietnam grower price was missing for that period). Grower price is the farm-gate price reported to the ICO by the national coffee authorities and constitutes all grades purchased from the growers (ICO 2012). The world price is calculated by the ICO, which provides an overall benchmark for the price of green coffee of all major origins and types received for row beans. The advantage of using the world price instead of the retail price

is to capture the price links of the green coffee beans before going to the retail markets where product differentiation takes hold.

A description of the variables is shown in Table 1. The mean of the grower price for Colombian Milds is higher than that of the world price for Vietnamese Robusta, demonstrating the price difference between high quality and low quality coffee beans.

Table 1 Descriptive statistics of coffee prices in the empirical model (US cents/lb)

	World Price	Colombian Milds Grower Price	Vietnamese Robusta Grower Price
Observations	268	268	268
Mean	131.567	98.3	54.427
SD	60.059	48.505	27.245
Maximum	318.5	268.52	126.94
Minimum	56.18	44.57	4.41

2.2 Empirical Methodology

The traditional definition of price transmission refers to a process by which upstream prices affect downstream prices. Prices in one market can be transmitted symmetrically or asymmetrically to other markets (Greb, von Cramon-Taubadel, Krivobokova, and Munk, 2013; Von Cramon-Taubadel, 1998). Asymmetric price transmission could also refer to the speed of price adjustment towards the long-run equilibrium (Kang and Kennedy, 2009; Saghaian, Ozertan, and Spaulding, 2008). Price transmission is incomplete in the short-run equilibrium if price changes are not passed-through instantaneously and completely. Most prior studies have applied some variation of a model originally introduced by Wolfram (1971), which was later modified by Houck (1977), and Ward (1982). Von Cramon-Taubadel (1998) then modified the model again mainly because previous models ignored the stationarity of time-series data.

Study of price transmission mechanism goes back to Keynesian economics on the process of wage and prices adjustment over time (Gómez and Koerner 2009). Two branches of economics literatures lay the foundation of price transmission. One branch views price transmission as the consequence of frictions in price setting at the microeconomic level, for instance, the cost of price adjustment and staggered timing of price changes. Another branch regards it as the result of imperfect competition, including demand externalities and coordination failures(Gómez and Koerner 2009) .

To specify an appropriate model, it is necessary to test the stationarity of each variable. This is because time-series values for the mean, the standard deviation, and the covariance are required to be invariant over time (Enders, 2004). Otherwise, the Ordinary Least Squares (OLS) regression is no longer efficient, the standard errors are understated, and the OLS estimates are biased and inconsistent (Enders, 2004). The Augmented Dicker Fuller (ADF) test was conducted for stationarity, with the null hypothesis that the variables are stationary. The ADF test is based on the t-ratio of the parameters in the equation 1:

$$(1) \quad \Delta X_t = k + \phi t + \theta_i X_{t-i} + \sum_{i=1}^n \varphi_i \Delta X_{t-i} + \varepsilon_t$$

where X is the variable of interest, Δ is the first difference operator, t captures the time trend, ε_t is the random error term, and n is the maximum lag length. The optimal lag length is chosen according to the Akaike Information Criterion (AIC) and the Schwartz Bayesian Criterion (SBC).

Based on the stationarity test, co-integration may exist. The Engle-Granger method and Johansen test are the methods used for testing cointegration. Johansen's test, which is based on the maximum likelihood estimation, is more powerful than the Engle-Granger criterion (Enders, 2004). The Johansen cointegration test is designed to determine both the existence and the number of cointegrated vectors. The null hypothesis is that the two series are not cointegrated. Johansen developed two likelihood ratio tests: the Trace test and the maximum eigenvalue test. The trace test is more reliable in small samples (Enders, 2004). We start by testing the null hypothesis, which is $r=0$. If it is rejected, the test for $r=1$ is performed. When a test is not rejected, the testing stops and that value of r from the last test is the estimated number of cointegrating vectors (Enders, 2004).

The results of the Johansen test conclude whether an Error Correction Model (ECM) is appropriate for capturing both the long-run and short-run relationships between the price series. An error-correction model describes how two variables behave in the short-run equilibrium within their long-run equilibrium (Enders, 2004). It is a dynamic model in which the change of the variables in any period is related to the previous gap from the long-run equilibrium. Intuitively, if two variables have a long-run relationship, there must be some force that pulls the equilibrium error back towards zero. Generally, an ECM takes the form (Enders, 2004):

$$(2) \quad \begin{pmatrix} \Delta p_{i,t} \\ \Delta p_{j,t} \end{pmatrix} = \begin{pmatrix} \alpha_1 \\ \alpha_2 \end{pmatrix} + \begin{pmatrix} \alpha_i \\ \alpha_j \end{pmatrix} (p_{i,t-1} - \beta p_{j,t-1}) + \beta_2 \begin{pmatrix} \Delta p_{i,t-1} \\ \Delta p_{j,t-1} \end{pmatrix} + \dots + \beta_k \begin{pmatrix} \Delta p_{i,t-k} \\ \Delta p_{j,t-k} \end{pmatrix} + \begin{pmatrix} \varepsilon_{it} \\ \varepsilon_{jt} \end{pmatrix}$$

where ε_{it} and ε_{jt} are white-noise disturbances and $\Delta p_{i,t}$ and $\Delta p_{j,t}$ represent the first difference of prices i and j , respectively. The term in the fourth set of parentheses is the error correction term, reflecting the errors or any divergence from the equilibrium. β is the cointegrating parameter that characterizes the long-run equilibrium relationship

between the two prices if the levels of $p_{i,t}$ and $p_{j,t}$ are cointegrated. The terms β_2 and β_k are lag polynomials. Our particular interest is β , which is the coefficient of long-run equilibrium and the speeds of adjustment coefficients, α_i and α_j , which measure the extent of corrections of the errors in a disequilibrium situation.

The long-run relationship is expected to be significant since the coffee industry reforms increased the share of grower price in the world price of coffee (Krivonos, 2004). Furthermore, the causality between the world price and grower price for both varieties is investigated. An important implication of cointegration is that causality exists in at least one direction (Enders, 2004). Before the model is specified, a causality test needs to be conducted with the null hypothesis that the world price does not Granger-cause the grower price or vice-versa. Based on the results on the direction of causality, the current study focuses on the error correction model.

The variables of interest in this study are: world price of Colombian Milds (wpc), grower price of Colombian Milds (gpc), world price of Vietnamese Robusta (wpv), and grower price of Vietnamese Robusta (gpv). The fourth set of parentheses in each equation is the error correction term, where β_{11} and β_{21} are the coefficients of the long-run relationship between the world price and grower price for Colombian Milds and Vietnamese Robusta. The short-run parameters α_{11} , α_{11}' , α_{21} , and α_{21}' represent how each variable responds to deviation from the long-run equilibrium. The model formulation is:

$$(3) \Delta wpc_t = \alpha_{10} + \alpha_{11} (wpc_{t-1} - \beta_{11} gpc_{t-1}) + \beta_{12}(L)\Delta wpc_{t-1} + \beta_{13}(L)\Delta gpc_{t-1} + \varepsilon_{1t}$$

$$(4) \Delta gpc_t = \alpha_{10}' + \alpha_{11}' (wpc_{t-1} - \beta_{11} gpc_{t-1}) + \beta_{12}'(L)\Delta wpc_{t-1} + \beta_{13}'(L)\Delta gpc_{t-1} + \varepsilon_{1t}'$$

$$(5) \quad \Delta wpv_t = \alpha_{20} + \alpha_{21} (wpv_{t-1} - \beta_{21} gpv_{t-1}) + \beta_{22}(L)\Delta wpv_{t-1} + \beta_{23}(L)\Delta gpv_{t-1} + \varepsilon_{2t}$$

$$(6) \quad \Delta gpv_t = \alpha_{20} + \alpha_{21}' (wpv_{t-1} - \beta_{21} gpv_{t-1}) + \beta_{22}(L)'\Delta wpv_{t-1} + \beta_{23}(L)'\Delta gpv_{t-1} + \varepsilon_{2t}'$$

2.3 Empirical Results and Discussion

Table 2 reports the results of the ADF test for the variables. The second column summarizes the ADF test results for the levels, while the third column shows the results for the first-difference of the variables. All variables are non-stationary at initial levels but become stationary after first-differencing.

Table 2 Augmented Dickey-Fuller (ADF) test results

Variables	Test Results for Variables in Levels	Test Results for Variables after First-Differencing
Colombian Arabica		
World Price	-1.901	-10.167 ***
Grower Price	-1.776	-8.872***
Vietnamese Robusta		
World price	-1.761	-7.349***
Grower Price	-2.122	-10.875***

Note: *** indicates the significant level at less than 1%.

All results are absolute value and compared to MacKinnon (1991) critical value.

Table 3 presents the results of cointegration tests of the world price and the grower price for Colombian Milds and Vietnamese Robusta. Rank is equal to one for both varieties, which means a long-run relationship exists between the two prices for each type. It indicates that world price and grower price move closely together in the long run, consistent with our expectations.

Table 3 Johansen test results for the world and grower Prices

Null Hypothesis	Trace Statistic	5% Critical Value ^b	Eigenvalue
Colombian Arabica			
r ^a =0	25.604	15.41	N/A
r=1	2.169	3.76	0.085
Vietnamese Robusta			
r=0	37.784	15.41	N/A
r=1	2.86	3.76	0.123

Note: ^a the value of r indicates the cointegrating rank.

^b the criterion for determining the rank.

Table 4 reports that the causality is unidirectional: the grower price Granger-causes the world price for both Vietnamese Robusta and Colombian Milds. Therefore prices are determined in Colombia and Vietnam, and those prices are passed forward to international markets.

Table 4 Results of Granger Causality Wald test for the world and grower prices

Null Hypothesis	X ²	Prob > X ²	Results
World price does not Granger-cause Grower price for Robusta	5.114	0.164	Fail to reject
Grower price does not Granger-cause world price for Robusta	94.358	0.000***	Reject
World price does not Granger-cause grower price for Colombian Arabica	4.188	0.242	Fail to reject
Grower price does not Granger-cause world price for Colombian Arabica	26.79	0.000***	Reject

Note: ***indicates significant level at less than 1%.

Although the direction of causality is the same for Vietnamese Robusta and Colombian Milds, the grower price causes the world price in different ways. For Colombian Milds, the National Federation of Colombia (NFC) coffee growers has built the Colombian Milds' reputation around the world to a prominent position. The NFC has also adopted a strict quality control scheme to assure premium coffee beans. Fluctuations from the grower price are more likely to pass forward to the world price. However, the fluctuations from the world market are likely absorbed by the NFC first. For instance, the NFC purchases coffee at harvest time and protects farmers if they are facing prices below the threshold.

The grower price of Vietnamese Robusta causes the world price due to the rapid expansion of plantations. As the world's second largest coffee producing country, the glut in the coffee industry is largely caused by expanded production in Vietnam. These changes in coffee production impact the world market and this expanded production is pushed onto the market, resulting in low world prices.

Table 5 summarizes the error correction model results. All the variables are in logarithmic format, so the coefficients are elasticities. The long-run equilibrium coefficient is statistically significant for both types. In the long run, 94% of the change in grower price is passed forward for Colombian Milds and 93% of the change in grower price for Vietnamese Robusta. The long run coefficients indicate that domestic market and international market are integrated well for both Colombian Milds and Vietnamese Robusta. Colombia has been a major exporter of coffee since the early 20th century.

Vietnam has emerged as the second largest producer in 1990s(Gonzalez-Perez and Gutierrez-Viana, 2012).

Table 5 Parameter Estimates for the long-run equilibrium relationships

Parameter Estimates	Colombian Milds	Vietnamese Robusta
Long-run Equilibrium Relationship	0.940** (β_{11})	0.930**(β_{21})
The Speed of World Price Adjustment	0.057 (α_{11})	-0.061**(α_{21})
The Speed of Grower Price Adjustment	-0.089** (α_{11}')	-0.266**(α_{21}')
Parameter of World Price Lag(1)	0.161**	0.148**
Parameter of World Price Lag(2)	-0.105	-0.054
Parameter of Grower Price Lag(1)	-0.128	0.100***
Parameter of Grower Price Lag(2)	-0.020	0.065**
Parameter of Grower Price Lag(3)	-0.001	0.082***

Note: *** refers to significant level at less than 1%; ** indicates 5 % significance level.

The reactions of the world price and grower price of both types to their lagged disequilibrium terms are captured by the short-run adjustment coefficient α_{11} , α_{11}' , α_{21} and α_{21}' . The magnitude of α_{11} , α_{11}' , α_{21} , and α_{21}' captures the speeds of adjustment toward the equilibrium. The short run coefficients have a negative sign as we expected. For Colombian Milds, only the grower price responds to the error correction term and no statistical evidence indicates that the world price of Colombian Milds reacts when the system moves out of long-run equilibrium. The results imply that only grower

price responds to shocks but the world price does not, which is asymmetric transmission for Colombian Milds.

For Vietnamese Robusta, both the grower price and the world price respond to deviations from the long-run equilibrium. The world price corrects about 6.1% of the disequilibrium error while the grower price adjusts by about 26.6% of the deviation. The grower price corrects more of the disequilibrium than the world price since the causality direction is from the grower price to the world price. Due to the glut of a low-quality coffee in the market, growers are in a situation where they must accept the lower price offered by exporters and roasters. Roasters use blending to manage the variability of coffee prices, and Vietnamese Robusta is used mostly in blends as a filler to reduce the cost of the blend. Sometimes roasters change coffee shares to stabilize the value of the final product. Unexpected shocks happen more frequently on the supply side (drought, flood, leaf rust, etc.) and farmers cannot transfer those shocks easily. However roasters, importers, or big buyers have more means to transfer shocks to the consumers on the demand side by applying marketing strategies such as promotion and advertising than producers in the supply side. The role Vietnamese Robusta plays in the coffee market indicates that it is difficult for Robusta suppliers to gain market power.

Both grower prices for Colombian Milds and Vietnamese Robusta are reacting to shocks in the coffee market, but the speed of adjustment of Vietnamese coffee producer price is faster than the Colombian producer price adjustment. In other words, the grower price for Vietnamese Robusta bears fluctuations more than the Colombian coffee grower price.

This is because there is no effective producer organization to stand for farmers like the NFC.

Summary and Conclusions

We identified the price links between the grower price and the world price for Colombian Milds and Vietnamese Robusta, focusing on both the long-run relationships and short-run adjustments. This study applied an Error Correction Model. The long-run relationships between the world price and grower price were significant for both types of coffee. The domestic market and international market are integrated well for both Colombian Milds and Vietnamese Robusta. The results also showed that Granger causality is the same for both types of coffee, from growers to global markets, implying that prices are determined at the farm-gate level, and then passed forward to international markets.

The short-run price transmission was asymmetric for both coffee types from the perspective of adjustments toward equilibrium, but the speed of adjustment for Vietnamese Robusta was higher than the Colombian Milds.

A partial solution for both countries' policy makers is to stimulate domestic coffee consumption. In 2010, the National Federation of Colombian (NFC) coffee growers and local roasters set a goal to increase domestic consumption by 30 percent over the next six years. In fact, a large portion of Colombians have been drinking imported low quality coffee, while the Vietnamese still purchase more tea than coffee. It will probably take a

longer time to stimulate domestic consumption in its tea-based culture (Gonzalez-Perez and Gutierrez-Viana, 2012).

Vietnamese Robusta has a competitive advantage in lower production costs and Colombian Milds is more competitive in quality and reputation in specialty markets. Policy makers in these two countries should set their target market differently. Colombia policy makers could concentrate more on maintaining its reputation internationally and explore new niche markets (fair trade, organic, etc.) for Colombian Milds. The Vietnamese government should reduce the oversupply gradually. The glut of Robusta is not only driving its own price down but it is also dragging down the price of other coffee beans because roasters often mix Robusta with other coffee beans to minimize their costs. A strategy of cutting Robusta coffee trees without a cartel arrangement never works. Other countries will fill the void. Previous efforts of replacing Robusta with Arabica trees may not succeed as they will have to compete with other well-known Arabica-producing countries such as Colombia, Ethiopia, etc. Stimulating domestic consumption of Robusta coffee is more practical policy suggestion for Vietnamese policy makers.

Policy makers can also learn from each other's strategies. For example, marketing strategies for high quality Colombian Milds may also be applicable for special quality coffee grown in Vietnam for a small high value specialty market. Vietnamese farmers may also consider forming an organization like the NFC that has served Colombian coffee farmers well.

Improvements in this study to better understand quality-differentiated coffee markets would need to account for structural changes which may highly influence the price transmission for the data period. There is also little information and empirical evidence on the substitution effects among different coffee types. More research is needed to address these issues in coffee markets and coffee-producing countries.

CHAPTER THREE

MARKET POWER IN HIGH QUALITY COFFEE MARKET

3.1 Introduction

Chapter one also indicates that the coffee sold by producers and the coffee drunk by consumers are two very different products. Coffee beans pass through different entities in the global coffee market before consumption (Daviron and Ponte, 2005). Asymmetric price adjustment and market power are possible explanations for the existence of the “coffee paradox” between the upstream and downstream coffee prices. This study is based on the results of price adjustment in the second chapter to identify whether market power exists in the high quality green coffee market.

The coffee market is characterized as an oligopsony, where a few large companies such as Starbucks, Kraft Foods, Proctor and Gamble, and Nestlé dominate the coffee industry. The largest share of the total value added created within the coffee value-chain is in the importing countries (Daviron and Ponte, 2005). Labor costs, packaging costs, and processing costs are also important potential determinants of coffee prices. Income generated in the coffee chain is mostly retained in consumer countries, while net returns to producers have been declining since the 1990s (Ponte, 2002).

Vogelvang (1992) investigated the long-run relationship between the indicator prices of major varieties of coffee defined by the ICO, using Johansen co-integration tests. The results showed that prices of washed Arabica coffee (Colombian Milds) and other

Arabicas were co-integrated. Also, Robusta and Arabica coffee prices were found to be co-integrated.

Milas, Otero, and Panagiotidis (2004) examined the relationships among four different varieties of coffees: unwashed Arabicas, Colombian Milds, other Mild Arabicas, and Robusta. They identified two cointegrating relationships affecting the long-run dynamics of the four types of coffee prices. Their results showed that the short-run adjustment was faster when prices were high compared to when prices were low. Krivonos (2004) showed that the transmission of price signals from world markets to coffee growers worked quite well after the implementation of coffee sector reforms in the late 1980s and early 1990s. All the above studies emphasize that, for price analysis, it is necessary to focus on a specific coffee type.

The objective of this study is to test the presence of market power in the coffee market based on the results from the chapter two. The empirical analysis is couched in a vector error correction model and a theoretical framework is adopted to test the existence of market power. Since the vector error correction model has been conducted in the second paper, this paper will focus more on the test of the market power.

Moreover, this article focuses especially on Colombian Milds coffee, which is noted for its high quality and is mostly produced in Colombia. Colombian Milds is the highest quality “washed” type of Arabica coffee beans. It has a richer taste and stronger aroma than other types (Gonzalez-Perez and Gutierrez-Viana, 2012).

In addition, In order to explore the difference in price adjustment between the upstream and downstream prices of Colombian Milds coffee, the downstream coffee price (designated “world price” in the remainder of this paper), is calculated based on the daily spot prices of different subdivisions of coffee types. The upstream price is that which is paid to coffee farmers. The results of this study show that the price adjustment is asymmetric. Although these results do not preclude the existence of oligopsony power, they indicate one should look for market power in consumer markets.

The rest of this article is organized as follows: The next section covers a theoretical framework for a test of market power in the Colombian Milds coffee market. This is followed by a description of the data used in the analysis. The subsequent section presents a vector error correction model which is combined with the theoretical market power framework for the price analysis. Finally, the results and conclusions of this study are presented.

3.2 A Theoretical Market Power Framework

Economic theory suggests that profit-maximizing firms in competitive markets adjust their price symmetrically to input cost decreases or increases. Downstream prices include the upstream prices plus any margins at each level (Dahl and Hammond, 1977). In the absence of external shocks, an economic equilibrium relationship among the prices exists. External shocks to downstream or upstream prices trigger short- and long-run adjustments towards the long-run equilibrium. In the real world, however, farmers at the beginning of the value chain and consumers at the other end are much less concentrated than the processors and retailers in the intermediate stages of the marketing chain. This

leads to asymmetric bargaining power among the market participants (Falkowski, 2010; Kinnucan and Forker, 1987; Miller and Hayenga, 2001). A test developed by Lloyd et al. (2003) was employed to investigate how imperfect competition and market power affect the price spread in vertically linked markets. Their results showed that the null of perfect competition could be rejected in most of the products they investigated.

The price spread model in a competitive industry is represented as follows:

$$(1) \quad WP = PP + M$$

where WP and PP are world and producer prices, respectively, and M represents the marketing costs. The price spread model with exogenous shifters is shown as:

$$(2) \quad WP = \gamma_0 + \gamma_1 PP + \gamma_2 M + \gamma_3 D + \gamma_4 S$$

where D and S are the exogenous demand and supply shifters, respectively. γ_i ($i=0, 1, 2, 3, 4$) are coefficients in the equation (2). The expected signs for the coefficients are $\gamma_1 > 0$, $\gamma_2 > 0$, $\gamma_3 > 0$, and $\gamma_4 < 0$. Lloyd et al. (2009) point out that demand shifters increase the retail producer price spread while supply shifters decrease it. Therefore, γ_3 is expected to be positive and γ_4 negative. Expected signs for γ_1 and γ_2 are positive since they contribute positively to the retail price without being influenced by market power.

A few applications of the Lloyd et al. analysis to agricultural products have been examined. Falkowski (2010) tested for market power in the Polish milk sector and found that the behavior of prices is consistent with the use of market power by the downstream sector. Liu (2012) suggested that the spread between producer and retail prices was not consistent with perfectly competitive behavior and thus might be caused by the

oligopsony power in Finnish food retailing. Cavicchioli (2010) found the existence of market power in the Italian fluid milk supply chain over the period of 1996 to 2008. A similar test was also used by Kinnucan and Tadjion (2014) for the U.S. beef and pork sectors. The hypothesis of competitive market clearing was rejected for pork, but not for beef. In this research, we combine the coffee price adjustment analysis with the new test for the existence of market power and imperfect competition to study the Colombian Milds coffee market.

Market shocks affect price formation and further impact the price spread. In a perfectly competitive case, the downstream and upstream price spread is dependent on all sorts of marketing costs including transportation, management and labor costs, advertising, menu costs, and related taxes. The exogenous shifters may affect either producer or world prices separately, but they should not influence the formation of the price spread in a perfectly competitive market. This study applies this framework in the context of a Vector Error Correction Model.

3.2 Data Description

This study uses 276 monthly observations for producer and world prices for Colombian Milds as well as marketing costs, and demand and supply shifters for the January 1990 to December 2012 time period. Producer price is the farm-gate price reported to the ICO by the national coffee authorities and constitutes all grades purchased from the growers (ICO, 2012). The world price is calculated by the ICO, which provides an overall benchmark

for the price of green coffee of all major origins and varieties received for raw coffee beans.

The motivation for using the world price instead of retail price is to capture the price link of the green coffee before it goes to the retail market. The greater the amount of transformation and the greater the additions to the farm product in the final consumer product, the more difficult it becomes to identify and measure the margins for individual farm products (Dahl and Hammond, 1977). For example, white bread may include wheat flour, eggs, sugar, and vegetable oil. Similarly, coffee sold at the retail level is not identical to that sold at the farm level, especially for high quality coffee. Therefore, we use green coffee beans which are subject to the smallest degree of processing by the post-farm chain and thus potentially investigate the existence of oligopsony power. Figure 3 shows that the producer price moves together with the world price, and they decline more frequently than they increase. Both Fałkowski (2010) and Lloyd et al. (2009) used an index of wage costs for the agri-food manufacturing industry as a proxy for the marketing costs. Similarly, the manufacturing industry real wage index is a proxy for the marketing costs of coffee (M) in this study.

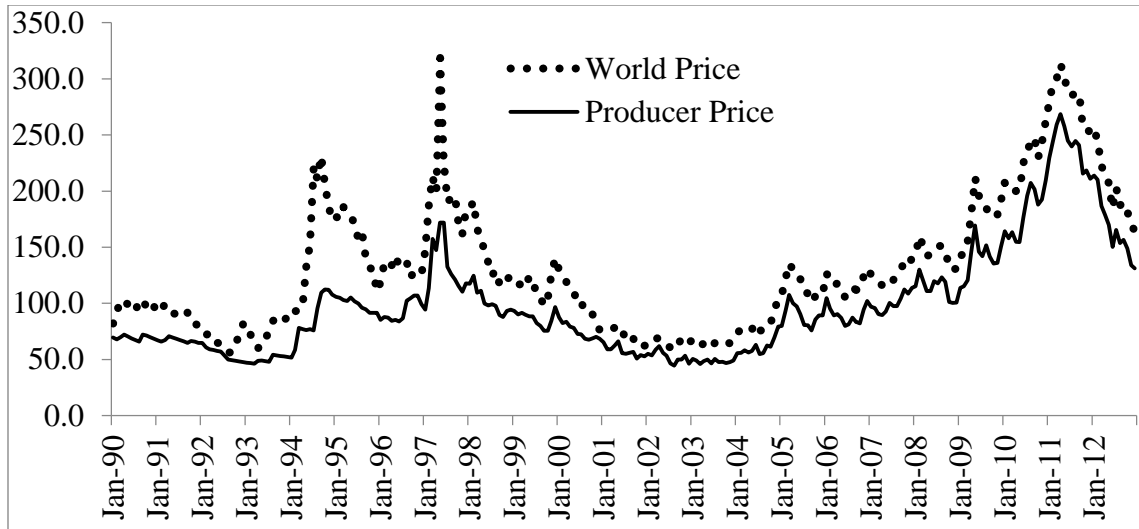


Figure 11 World and producer prices of Colombian Milds

Source: International Coffee Organization

To fill the missing data from August to September 2007, we used the average value of 2007 and then completed the missing data from December 2007 to November 2008 with the mean values of 2007.

The demand shifter is represented by the food retail price index. The consumer purchase index for U.S. ground coffee is used for the demand shifter because the United States is the main market for Colombian Milds coffee, accounting for 54% of Colombian Milds exports in 2013 (ICO, 2013). The supply shifter is approximated by the price index of all goods and services. The real monthly trade-weighted exchange rate for coffee is used for the supply shifter because coffee is mostly a traded cash crop between producer and consumer countries. More details about the actual data are provided in Table 1. Figures 4, 5, and 6 show the details of the marketing costs and the exogenous demand and supply shifters, respectively.

Table 1 Data definitions and sources

Label	Variable	Source	Missing Data
WP	World Price	International Coffee Organization	
PP	Producer Price	International Coffee Organization	
M	Manufacturing Industry Real Wage Index	National Administrative Department of Statistics, Colombia	
D	Consumer Purchase Index for the U.S Ground Coffee	Bureau of Labor Statistics, U.S. Department of Labor	Aug-Sep.2007 Dec.2007- Nov.2008; Sep- Dec.2012
S	Real Monthly Trade Weight Exchange Rate for Coffee	U.S. Department of Agriculture	

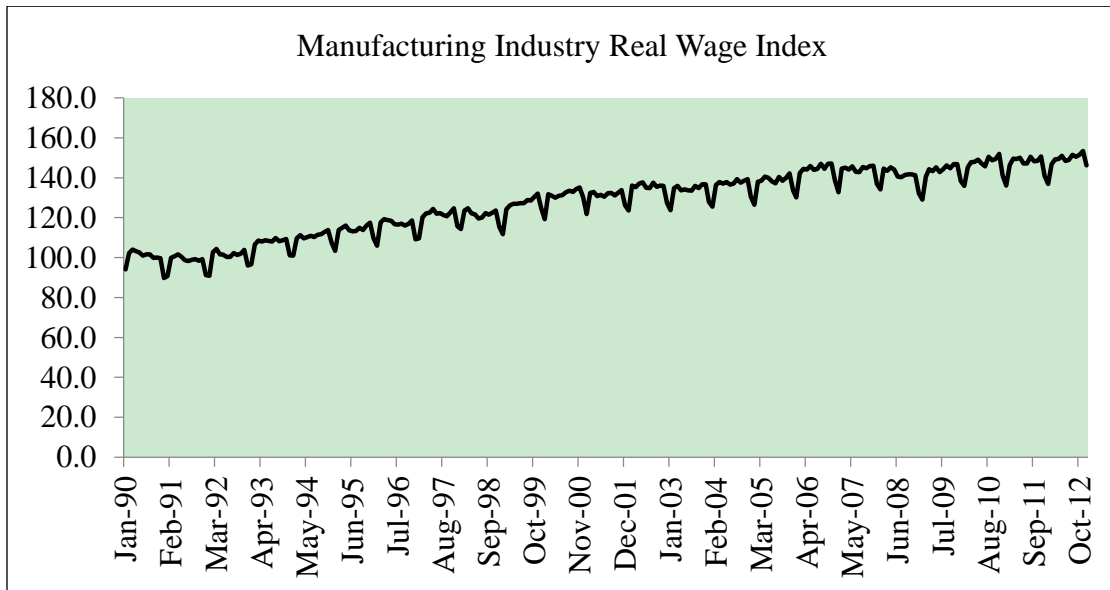


Figure 2 The marketing costs

Source: National Administrative Department of Statistics, Colombia

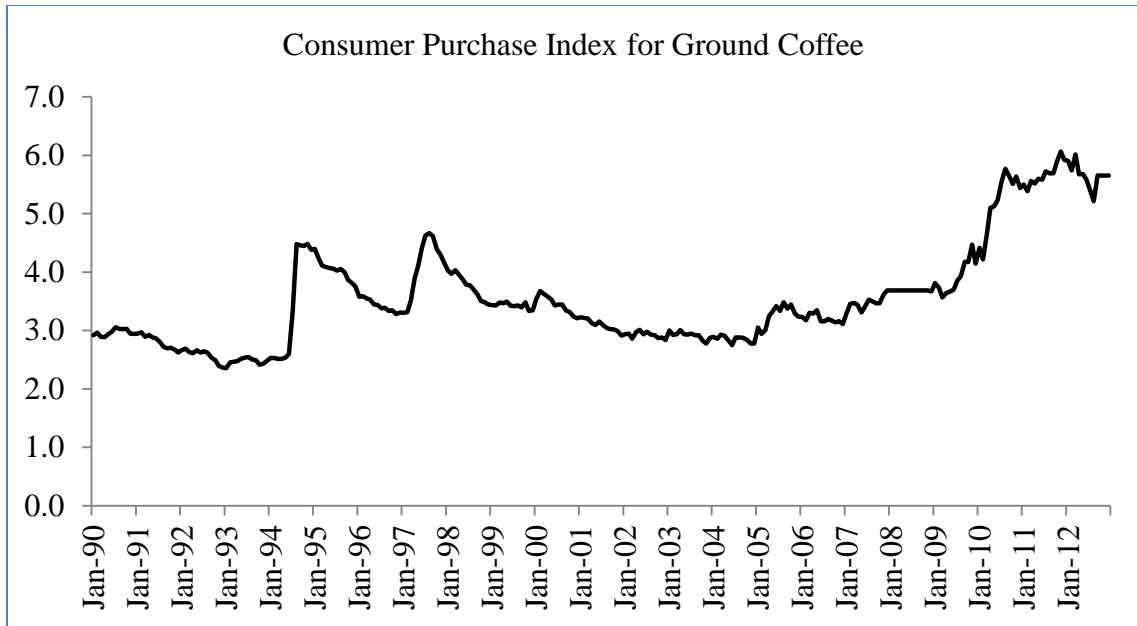


Figure 3 The demand shifter
 Source: Bureau of Labor Statistics, U.S. Department of Labor

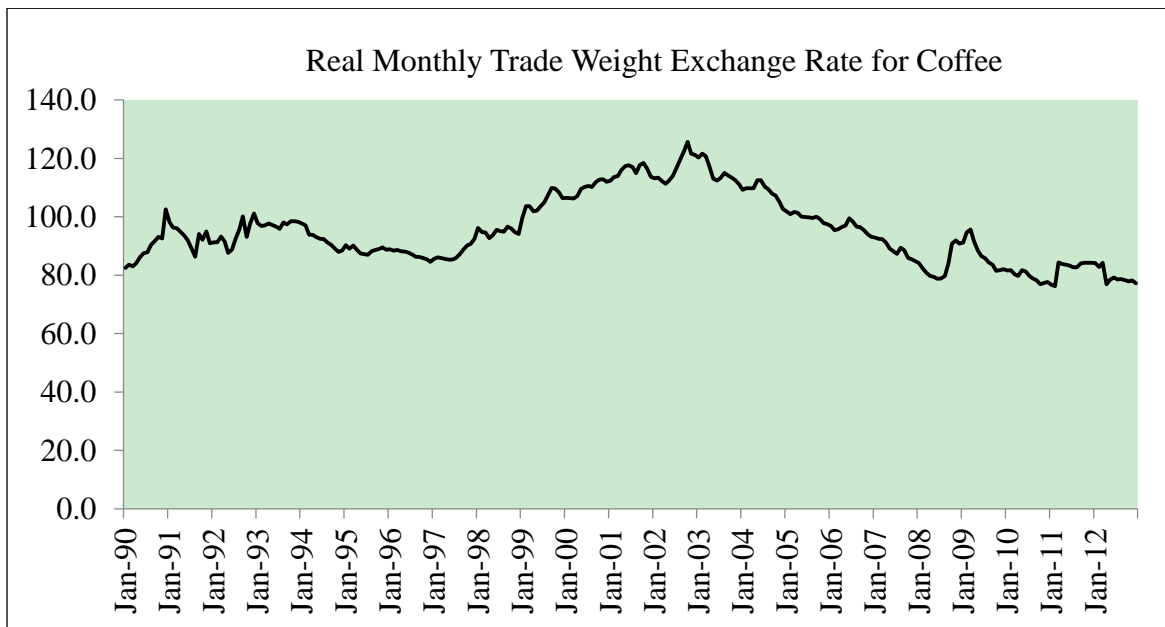


Figure 4 The supply shifter
 Source: U.S. Department of Agriculture

Interestingly, the marketing costs trend is upward and increasing over time, which is consistent with the increasing production costs in the coffee market (ICO, 2012). The descriptive statistics are reported in Table 2.

Table 2 Descriptive statistics for the variables, 1990-2012

Variables	Mean	Std.Dev.	Max	Min	Total
World Price	130.98	59.29	318.5	56.18	276
Producer Price	97.97	47.85	268.52	44.57	276
Marketing Costs	127.32	16.49	153.46	89.82	276
Demand Shifter	3.58	0.90	2.35	6.07	276
Supply Shifter	95.32	11.72	76.2	125.6	276

3.3 Empirical Results

The ADF test was applied to check the stationarity of all the variables in the model. Lag length was selected based on the Akaike Information Criterion (AIC) and Schwartz Bayesian Criterion (SBC). The results in Table 3 show that all variables are non-stationary at levels but, when first-differenced, all the variables are stationary or I (1).

Table 3 Augmented Dickey-Fuller (ADF) test results

Variables	Levels		First Differences	
	Lag	ADF	Lag	ADF
WP	6(trend)	-1.79	4	-8.37***
PP	2(trend)	-1.86	1	-11.66***
M	12(drift)	-2.05	12	-3.63***
D	2	-1.27	1	-9.45***
S	1	-1.22	1	-11.54***

*** $p < 0.01$

Then the Johansen test was conducted to determine the number of cointegrating equations. The first cointegration test is conducted for the producer price, world price, and marketing costs, presented in the theoretical equation (1). The second cointegration test is based on equation (2), which includes the producer and world prices, marketing costs, and demand and supply shifters. As reported in Table 4, the trace statistics indicate that there is a single cointegration relationship between the producer price, world price, and marketing costs, but there are two cointegration relationships between the five variables (producer price, world price, marketing costs, and demand and supply shifters).

Table 4 Johansen's test of the world price and producer price for Colombian Milds

Assumptions	Null Hypothesis	Trace Statistic	5% Critical Value	Eigenvalue
Perfect competitive	r=1*	8.572	15.41	0.104
	r=2	1.951	3.76	0.024
Imperfect competitive	r=1	64.13	47.21	0.19
	r=2*	24.66	29.68	0.136
	r=3	8.706	15.41	0.055
	r=4	1.847	3.76	0.025

* denotes the number of rank for each scenario

The existence of cointegration indicates that Granger causality should exist at least in one direction (Enders, 2004). The causality refers to the direction of price movements along the supply chain. According to the price determination theory, downstream price changes usually determine upstream price changes. That is, price transmission flows downward along the supply chain. However, the empirical results from Table 5 show that a null hypothesis in that producer price does not Granger-cause world price. This implies that the causality is unidirectional, from the world price to producer price, which is an indication that producers are price takers.

Table 5 Results of Granger Causality test for the world price and producer price

Null Hypothesis	X ²	Prob>X ²	Results
Grower price does not Granger-cause world price for Colombian Milds	3.12	0.078	Fail to reject
World price does not Granger-cause grower price for Colombian Milds	15.14	0.00	Reject

Based on the results of the Johansen test and the Granger causality test, the VECM is estimated. The results are summarized in Table 6 for the long-run relationships and in Table 7 for the short-run speeds of adjustments.

Table 6 The long-run relationships under perfect and imperfect competitive markets

Assumption	WP	PP	M	D	S
Perfect competitive	1	-1.032*** (22.01)	0.479*** (3.13)		
Imperfect Competitive	1		0.784** (2.53)	-1.844*** (-7.91)	0.25 (0.68)
		1	-0.122 (-0.47)	-1.439*** (-7.44)	0.84*** (2.76)

p<0.05, * <0.01, *t*-values in brackets

The long-run relationship of the world price, producer price, and marketing costs with the producer price normalized is

$$(5) \quad \ln PP = 0.968^{***} \ln WP + 0.463^{***} \ln M$$

The prices are influenced by the extent of any deviation from the long-run equilibrium. Then at least one of the prices must respond to the magnitude of the disequilibrium. The producer price corrects 14.1% of the previous period's deviation for the long-run equilibrium. We can conclude that the producer price and the world price respond to the disequilibrium asymmetrically.

Two long-run equilibriums are identified under the null hypothesis of perfectly competitive market conditions. The two cointegrating equations are presented as

$$(6) \quad \ln WP = -0.784^{***} \ln M + 1.884^{***} \ln D$$

$$(7) \quad \ln PP = -0.84^{***} \ln S + 1.439^{***} \ln D$$

Table 7 The empirical estimates of the speeds of adjustment

		Perfect competitive	Imperfect competitive	
Speed of Adjustment	PP	0.141*** (3.32)	0.165*** (3.54)	-0.207*** (-3.77)
	WP	-0.071 (-1.43)	-0.008 (-0.15)	0.044 (0.68)
	M	-0.015 (-0.82)	-0.035 (-1.69)	0.039 (1.60)
	D		0.064*** (3.11)	0.001 (0.07)
	S		-0.021 (-1.49)	0.014 (0.84)

p<0.05, * <0.01, *t*-values in brackets

The world price moves together with the marketing costs and the demand shifter in the long run. In the short run, the producer price still responds to the disequilibrium of equation (6). In equation (7), the producer price is cointegrated with the supply and demand shifters in the long run and the short-run speed of adjustment is 16.5%, which is the ratio of deviation from equilibrium corrected by the producer price. The world price has no response.

Moreover, the coefficients of the demand shifter in equation (6) and (7) are statistically significant. The supply shifter is also statistically significant with an expected negative sign. According to the theoretical model, the null hypothesis of perfect competition is rejected and we can conclude that market power and imperfect competition exist in the Colombian Milds coffee market. Intuitively, a shift in demand function will increase both

producer price and the world price while a shift in supply will cause the price spread to narrow.

Summary and Conclusions

The goal of this study was to explore the “coffee paradox” that exists between the producer price and world price of Colombian Milds. A theoretical framework for testing the null hypothesis of perfect competition and a vector error correction model from the second chapter were adopted to test the potential existence of market power. The null hypothesis of perfectly competitive market clearing was rejected for Colombian Milds. In a perfectly competitive market, the world price, producer price, and marketing costs reach a long-run equilibrium. The estimation of the producer price, world price, and marketing costs were consistent with the theoretical model. The world price moves together with marketing costs and the demand shifter in the long run. The producer price is cointegrated with demand and supply shifters. This implies that market power may affect the long-run relationship between the world price and the producer price. The demand shifter is cointegrated with both the producer price and the world price, while the supply shifter is only cointegrated with the producer price. The analysis provides arguments on linking price adjustments with noncompetitive market structures.

However, there could be other explanations for these results. Product heterogeneity may affect the speed of transmission. In the past three decades, consumers’ loyalties to a certain brand, preferences for country of origin, and environmental concerns have affected demand for specialty coffees. Adjustments or menu costs may play more

important roles than market power for asymmetric price transmission (Zachariasse and Bunte, 2003). In addition, long-term contracts may limit the speed of price transmission.

The asymmetric price adjustment indicates that producer price responds more to fluctuations in the supply chain than the world price. This, in turn, has an impact on farmers' production decisions and their ability to adjust to shocks from both downstream sectors and unexpected natural shocks on the supply side. Moreover, consumers who pay a high price for premium coffee cannot fully benefit from a decrease in farm-gate prices and farmers cannot get the benefit of higher downstream prices. This provides explanations for why coffee-consuming countries experience the "coffee boom" while coffee-producing countries suffer from the "coffee crisis."

Theoretically, downstream prices contain upstream prices plus marketing costs, but it does not imply causality. For Colombian Milds, it is the world price that causes the producer price and not vice versa, indicating that producers are price takers. Moreover, when the demand and supply shifters enter the model, the two prices are no longer cointegrated, which implies that the demand and supply shifters influence changes in coffee prices significantly.

The more heterogeneous a product like coffee is, the more space for marketing and value-added activities along the supply chain. An extension of this study would be to test whether the results change with alternative proxies for the shifters. Alternative proxies for demand and supply shifters could dominant price adjustment and influence the results.

The existence of producer organization is a response to the potential buyer power. Winfree and McCluskey (2005) found that producer organizations help build up a collective reputation for regions or specialty products. The Colombian coffee industry is characterized by a high degree of National Federation of Colombia (NFC) intervention. The NFC sets strict quality control schemes to assure premium coffee beans. The NFC mostly benefits the producers, unlike government bureaucrats or exporters in other coffee producing countries (Krivonos, 2004). The NFC can help earn a negotiating position for the domestic producers and lower the bargaining position held by the large buyers. Also, other coffee producing countries can start building similar producer organizations to balance the bargaining market power of the buyers along the coffee supply chain. However, the results of this study show that producers still has a long way to go to organize and increase their benefits from the coffee value chain.

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2. **Li, XL.**, and Saghaian, S. 2015. "Price Adjustment and Market Power in the Colombian Milds Coffee Market." *Journal of Agribusiness*

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1. Applied Microeconomics: Consumption, Production and Markets by Dr. David L. Debertin

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