

A STUDY OF THE ECONOMIC EFFECTS OF IMPOSING FAIR TRADE COFFEE
CONSUMPTION IN SAN FRANCISCO

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ABSTRACT

Noting the rising sales of eco-friendly and fairly traded goods in the United States, this study examines the effects of implementing a policy that would limit the supply of non-fair-trade coffee in San Francisco. The goal of this policy would be to increase the sales of the fair-trade coffee market in the United States, and benefit fair-trade coffee growers by mandating the sale of fair-trade coffee in San Francisco. This study focuses on the economic effects of the policy on consumers and producers of fair-trade coffee, regular coffee, tea, and soda.

“Fair trade” began at the end of World War II and was linked to religious organizations that wanted to provide relief for refugees and other impoverished groups. This relief was provided by selling handicrafts and other goods in northern markets at prices that afford high rates of return for the impoverished producers in the developing world. Over time, seventeen different fair-trade labeling organizations have been created that monitor and certify fair-trade products and requirements. Requirements for coffee growers to attain a fair-trade certification state that growers must follow the principles of democratic organization, not utilize child labor, recognize trade unions for laborers, and support environmental sustainability. The fair-trade movement is gaining momentum in recent years, with sales growing more than twenty percent annually since 2000 and over forty percent between 2002 and 2003.

Product demand and supply were specified as functions of various price elasticities for related markets: fair-trade coffee, regular coffee, tea and soda. This model was used to estimate the percentage changes in quantity and price for each market caused by a policy that restricts the supply of non-fair-trade coffee to 10 percent of its initial quantity. This policy would result in an increase in the price of fair-trade coffee from \$1.26 per pound to \$3.31 per pound in the city of

San Francisco as well as an increase in supply from 512,922 pounds per year to 2,190,179 pounds per year. This policy would increase the national consumption of fair-trade coffee by 1.9 percent but it would leave consumers with high prices for tea, soda and non-fair-trade coffee. Overall this study provides a roadmap for similar analyses of market equilibriums as well as rough predictions for changes in prices and quantities for these commodities as a result of such a policy.

TABLE OF CONTENTS

Chapter	Page
I. INTRODUCTION.....	1
Statement of the Problem.....	2
Hypotheses.....	2
Objectives.....	3
Justification.....	3
II. REVIEW OF THE LITERATURE.....	5
Overview of Fair Trade.....	5
The World Coffee Market	6
History of Fair Trade.....	7
Labeling.....	8
Fair-Trade Coffee.....	9
Economic Analysis and Market Equilibrium.....	10
III. METHODOLOGY.....	15
Procedures for Data Collection.....	15
Procedures for Data Analysis.....	17
Assumptions.....	23
Limitations.....	23
IV. DEVELOPMENT OF THE STUDY.....	25
Data.....	25
Analysis.....	28
V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS.....	38
Summary.....	38
Conclusions.....	39
Recommendations.....	40
References Cited.....	42
APPENDIX.....	45

LIST OF TABLES

Table		Page
1	World Coffee Imports from 1996 to 2000.....	7
2	World Coffee Prices from 1996 to 2000.....	8
3	World Coffee Export and Production Quantities from 1996 to 2000.....	8
4	Major Fair-Trade Organizations.....	9
5	Symbol Descriptions and Values Used for Analysis.....	18
6	Matrix Spreadsheet with Formulas Shown for Clarity.....	27
7	Sets of Elasticity Values Analyzed.....	29
8	Comparison of Most Likely Data Set and Additional Scenarios.....	30
9	Effects on Price and Quantity Changes from Increases in Magnitude of Variables.....	32
10	Baseline Values Used to Determine Variable Effects on Percentage Changes.....	33

LIST OF FIGURES

Figure		Page
1	Market for Fair-trade Coffee in San Francisco.....	45
2	Market for Regular Coffee in San Francisco.....	45
3	Market for Tea in San Francisco.....	45
4	Market for Soda in San Francisco.....	45
5	Effect of policy on Fair-Trade Coffee Market in San Francisco.....	46
6	Effect of policy on Regular Coffee Market in San Francisco.....	46
7	Effect of policy on Tea Market in San Francisco.....	46
8	Effect of policy on Soda Market in San Francisco.....	46

Chapter 1

INTRODUCTION

Throughout the past fifty years, Non-Governmental Organizations (NGOs) and eco-friendly groups have grown in number and influence in the global agricultural community. The coffee industry has also grown over time, providing numerous jobs and driving markets around the world. Coffee has become one of the most traded commodities in the world, but is notorious for its volatility in price, which puts farmers at risk when prices drop.

Notably, the fair-trade labeling movement has grown over the years in an attempt to protect farmers against coffee's unpredictable price fluctuations. Selling coffee with a fair-trade label ensures that farmers will receive a guaranteed price for their product. The growth of the fair-trade movement over the years has been attributed to ethical considerations characteristic of fair-trade products, such as: health, environmental protection, and social justice (Calo and Wise 2005). Additionally, there has been a growing movement among consumers in the United States towards ethically grown and traded coffee (Loureiro and Lotade 2005). While the fair-trade coffee market only accounts for one percent of global sales, the rapid increase in fair-trade products represents a strong potential for growth in demand and possibly strong political support as well (Calo and Wise 2005).

Recent trends among American consumers shows that some changes in government policy are very consumer-driven, for instance the inclusion of calorie statistics on fast food menus is an increasingly common regulation in the United States that is driven by consumers

(Newsweek 2008). If this trend in consumer-driven policies continues, there is a possibility for government-mandated policies in the future.

Problem Statement

What would the economic implications be for fair-trade coffee producers and consumers if the city of San Francisco required all coffee sold within the city limits to be fair-trade certified?

Hypotheses

The effects of this commodity restriction will be evaluated using economic market simulations for coffee, fair-trade coffee, and substitutes. The analysis will provide estimates of price and quantity changes caused by the policy. Expected effects include a decrease in coffee consumption in San Francisco. The estimated resulting price for the fair-trade coffee will be higher than the average price for regular coffee after a one-year period, which will cost consumers in San Francisco.

The sales of fair-trade coffee will increase, along with profits for producers. The overall impact to the global market of fair-trade coffee will be miniscule over a one-year period, with less than a one percent increase in the United States fair-trade market.

Supply will be relatively inelastic in the short run since the small market size will require additional producers to attain certification in order to meet the demand for fair-trade coffee. In the long run, the supply curve will become more elastic as producers attain fair-trade

certifications to meet the increase in demand. The initial price for fair-trade coffee will be approximately \$4.00 per pound as there is a potential for a shortage in supply, over time the price should decrease to approximately \$2.50 per pound as producers increase production to meet consumer demand.

Objectives

1. To assess the economic effects of restricting the sale of coffee in San Francisco to fair-trade certified coffee.
2. To project the increase in sales of fair-trade coffee resulting from the restriction over a one-year period.
3. To provide information for potential future policy makers considering the viability of similar policies.

Justification

Over ninety percent of the world's coffee is produced in developing nations, with some countries depending upon coffee for over fifty percent of their exports. The majority of coffee consumers are industrialized countries such as the United States, the European Union and Japan (Feleke and Walters 2005). With the growth of the fair-trade movement in recent years as an ethical solution to the difficult economic situations encountered by growers, the fair-trade markets have grown twenty percent annually since 2000 (Calo and Wise 2005).

As consumer, development, and agricultural producer groups are initiating a rise in such sustainable coffees, it is advantageous to look into the future and determine the implications of possible policies that could be put into effect by policy makers to benefit growers of fairly traded

products (Calo and Wise 2005). The results of this study will provide policy makers at both state and local levels an outline towards determining the feasibility and implications of such policies. The effects of such decisions stand to influence people who reside in the controlled areas and may have far-reaching effects depending upon the scope of policies, both geographically and legally. In terms of San Francisco, it will affect an estimated 808,976 people who reside inside the city (U.S. Census Bureau 2008). In addition, the city of San Francisco draws more than 16.4 million tourists and generates over \$8.52 billion in revenue annually (San Francisco Conventions and Visitors Bureau 2009). Meanwhile, ethical products are growing in activism and consumption in the United States (Rice 2001). Being that San Francisco is a progressive city that prides itself on equality and social justice it is an example of a potential location for such a policy to take root.

Chapter 2

REVIEW OF THE LITERATURE

Overview of Fair-trade

Many people view the recent emergence of “organic” and “fairly traded” products as an important attempt to address the pervasive poverty of small agricultural producers throughout the world. The most developed of these new markets is the coffee market, which offers certifications promising producers a higher price for their products. Globally, there are twenty to twenty-five million producers that suffer from fluctuations in coffee prices and stand to gain from the growth of specialty coffee markets such as fair trade (Calo and Wise 2005).

Fair trade has undergone significant changes since the end of World War II. From its beginnings with various religious organizations as a form of charity, the fair-trade movement has become a globally recognized label that is no longer dependent upon charity (Fridell 2004). While the specialty coffee market accounts for only one percent of global sales and two percent of specialty sales, the specialty market, which includes fair-trade coffee, has been the fastest growing sector of the global coffee market, expanding at a rate of five to ten percent annually (Calo and Wise 2005). As far as the future is concerned, there is still possibility for action from grass-roots movements. With the history of a Non-Governmental Organization (NGO) such as Global Exchange, a San Francisco based human rights group responsible for pressuring

Starbucks Coffee to purchase small amounts of fair-trade coffee, there is room for progress in the fair-trade market (Fridell 2004).

There is a chance that such a group could organize a movement in San Francisco that would encourage a company such as Starbucks Coffee to solely market fair-trade coffee. In a city with an estimated 808,976 people living as residents and another 16.4 million visitors every year, such a movement would impact the global market for fair-trade coffee (US Census Bureau 2000; San Francisco Conventions and Visitors Bureau 2009).

The World Coffee Market

Coffee is mainly produced by the developing world; in fact, ninety percent of the world's coffee is grown by developing nations. Some of these nations, such as Rwanda and Burundi, receive over fifty percent of their export value from coffee (Feleke and Walters 2005). Almost all coffee traded is green unroasted coffee imported by the United States, Japan, and the European Union, among others (see Table 1).

Table 1. World Coffee Imports from 1996 to 2000

Coffee imports¹			
	1996-98	1999	2000
	Average		
	<i>'000 tonnes</i>		
World total²	4 475	4 755	4 818
United States	1 217	1 367	1 430
Canada	137	138	139
EC	2 731	2 820	2 803
Poland	117	106	106
Russia Federation	88	77	77
Algeria	82	71	71
Korea, Rep.	60	65	65
Japan	365	397	419
Australia	48	54	55

Source: Food and Agriculture Organization of the United Nations, 2002.

Notes: ¹ Green beans only.

² Excluding quantities subsequently re-exported.

With producing countries accounting for only twenty-five percent of the demand, it is overwhelmingly industrialized nations that consume coffee. In recent years, coffee prices have fluctuated and dropped drastically, and only recently have they returned to normal levels (Feleke and Walters 2005). Coffee prices are historically volatile mainly because of weather shocks; however, the changes in price affect the lives of the twenty to twenty-five million families in more than fifty developing countries. Since the 1970's coffee prices for Arabica coffees have decreased by three percent annually (Lewin, Giovannucci, and Varangis 2004). Information from the Food and Agriculture Organization of the United Nations (FAO) confirms that while coffee production and exports increased between 1996 and 2002, the price for coffee dropped (see Tables 2 and 3).

Table 2. World Coffee Prices from 1996 to 2000

Coffee prices¹				
	1996-98	1999	2000	2001*
	Average			
	<i>US cents/lb</i>			
Brazilian natural Arabicas ²	136.13	88.84	79.86	52.34
Colombian milds Arabicas ²	157.66	116.45	102.6	73.74
Other milds Arabicas ³	148.83	103.9	87.07	63.18
Robustas ⁴	81.11	67.53	41.41	28.25
ICO Composite price	114.98	85.72	64.25	45.96

Source: Food and Agriculture Organization of the United Nations, 2002.

Notes: ¹ ICO indicator price.

² New York Market.

³ Weighted average of New York and Bremen/Hamburg markets.

⁴ Weighted average of New York and Le Havre/Marseilles markets.

* January-October average.

Table 3. World Coffee Export and Production Quantities from 1996 to 2000

Coffee exports¹				Coffee production¹			
	1996-98	1999	2000		1996-98	1999	2000
	Average				Average		
	<i>'000 tonnes</i>				<i>'000 tonnes</i>		
World total	4 737	5 113	5 334	World total	6 095	6 878	6 630
Brazil	1 006	1 388	1 082	Brazil	1 699	1 941	1 920
Colombia	655	600	551	Colombia	684	560	720
Guatemala	235	281	291	Guatemala	273	312	270
Mexico	251	261	318	Mexico	308	387	270
Côte d'Ivoire	219	132	355	Côte d'Ivoire	205	354	190
Ethiopia	115	109	119	Ethiopia	179	210	221
Kenya	78	67	79	Kenya	66	90	101
Uganda	229	230	151	Uganda	203	186	192
Indonesia	356	304	312	Indonesia	490	326	400
Viet Nam	328	465	696	Viet Nam	391	699	700

Source: Food and Agriculture Organization of the United Nations, 2002.

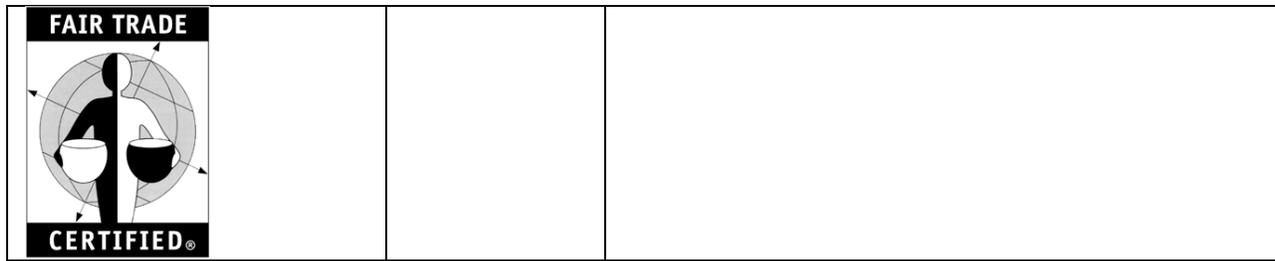
Notes: ¹ Production of green beans in crop year beginning in the year shown.

History of Fair Trade

The beginnings of fair trade at the end of World War II are linked to religious organizations that wanted to provide relief for refugees and other impoverished groups by selling handicrafts and other goods in northern markets. These trade organizations, referred to as Alternate Trade Organizations (ATOs), afforded high rates of return for the impoverished producers in the developing world (TransFair USA, 2009). Currently, the number of producers involved in fair trade number over 800,000 in forty-five different countries and it is reported that twenty-five percent of people in the United States have heard of fair trade (Romberger 2008, Cusenza 2006). In 2004, there were an estimated seventeen different fair-trade labeling organizations in the world, the largest being the Fair-Trade Labeling Organizations International (FLO). The FLO is an international umbrella organization that sets the standards for all fair trade products (Romberger 2008) (see Table 4). Currently, large coffee producers such as Starbucks Coffee are answering consumer demand by offering fair-trade coffee and seeking to increase their purchases of fair-trade coffee (Starbucks Corporation, 2008).

Table 4. Major Fair-Trade Organizations

Group	Headquarters	Purpose
Fair Trade Labeling Organizations International 	Bonn, Germany	Composed of 24 different organizations that are working together to secure a better deal for producers. They set international fair trade standards and support fair trade producers.
FLO-CERT	Bonn, Germany	Functions as the certification body for the FLO. Global organization that represents close to 2000 clients in 70 countries.
TransFair USA	Oakland, California	One of the 24 members of the FLO. Represents the only third-party certifier of Fair Trade products in the United States.



Sources: Fair Trade Labeling Organizations International, 2010;
TransFair USA, 2010;
FLO-CERT, 2010.

Labeling

Recent research shows that consumers in the United States are willing to pay for commodities that carry different labels such as organic or eco-friendly (Loureiro and Lotade 2005). The marketing of fair trade products is similar to that of organic; a product is considered fair trade if it is certified by an outside organization that ensures that the goods are grown in a certain manner and sold at a minimum guaranteed price. The products are then labeled with a seal that distinguishes them as “fair trade” (Fridell 2004; Buller 2006).

The general requirements for coffee growers to attain a fair-trade certification demand that growers follow the principles of democratic organization, not utilize child labor, recognize trade unions for laborers, and support environmental sustainability (Fridell 2004). With an increase in the market for specialty coffees, there is a growing need to maintain proper certification in order to prevent indiscriminate use of labels that could erode consumer confidence. Issues can also arise from a market that is flooded by labeled coffees. With the increase in variations of labeled coffees, such as organic, eco-friendly, shade-grown coffee, and Geographic Indicators of Origin (GIO) the value of fair-trade coffee could conceivably drop in

value and deter from the environmental and social goals of these very markets (Lewin, Giovannucci, and Varangis 2004).

Fortunately, for labels such as fair trade, there are numerous practices in place that the FLO enforces to provide transparency to consumers. A non-profit organization called Greener Choices provides evaluations of eco-labels such as fair trade, allowing consumers to view the requirements and certification performance from a third-party organization, giving them added assurance that the fair trade label is closely regulated (Consumer Reports 2009).

Fair-Trade Coffee

“Fairly traded” products are viewed as a niche market that has emerged in history to address the issue of chronic poverty suffered by small-scale agricultural producers in developing countries. Supporters of fair trade seek to ensure growers a fair price for their products if they adhere to certain certification requirements. This movement has gained momentum in recent years, growing more than twenty percent annually since 2000 and over forty percent between 2002 and 2003 (Calo and Wise 2005).

Globally in 2000, thirty-one million pounds of roasted coffee were exported with a fair-trade label, with a guaranteed price of \$1.26 per pound for Arabica (Raynolds 2002). Small-scale coffee producers are estimated to number twenty to twenty-five million who are mostly located in the developing world. For these producers, fair-trade certification provides relief from low coffee prices (Calo and Wise 2005). In the United States, the total amount of fair-trade coffee imports amounted to 4,600 metric tons in 2002 with about eighty-three percent of it organic as well (Lewin, Giovannucci, and Varangis 2004). With more than twenty-four producer

countries constituting around 600,000 producers, the fair-trade coffee market has the capacity to produce more than 100,000 metric tons of coffee (Lewin, Giovannucci, and Varangis 2004).

Currently, there is no data for the total land area that is devoted to fair-trade coffee (Rice 2001).

A positive aspect of fair-trade labeling for growers is the guarantee of a minimum price for their coffee. For example, when the export price for conventional coffee is \$0.50 per pound, the minimum payment for fair-trade coffee is fixed at \$1.26 per pound (Calo and Wise 2005). If the world price for conventional coffee rises above this minimum then the fair-trade premium is \$0.05 per pound (Lewin, Giovannucci, and Varangis 2004). For those able to sell their product on the fair-trade market, attaining a fair-trade labeling certification is very rewarding and has been a lifeline for many producers. Fair-trade labeling provides farmers with a support structure in a situation where the supply of coffee has generally outrun the demand for it (Calo and Wise 2005).

Some critiques of the fair-trade coffee market warn a weakening in social and environmental benefits can occur if the market cannot absorb a large increase in demand. The small size of the market limits its ability to respond to even minor changes in supply and demand without greatly affecting prices. Additionally, large buyers claim that there is a limited supply, which presents a problem if they should decide to make a stronger commitment to fair-trade coffee (Lewin, Giovannucci, and Varangis 2004).

Economic Analysis and Market Equilibriums

Producers throughout the world attempt to meet the demand for their products and maximize their profits. In agricultural markets, climate, weather, tastes and preferences can

greatly affect the supply and demand of a product and consequently price. Alternatively, policy changes can influence market equilibriums.

Common examples of a shock to supply in a market include good or bad weather, which would in turn increase or decrease the overall supply of a good. In the case of San Francisco, a policy that restricts the supply of a product acts as a supply shock. Demand shocks are simply changes in variables that influence a consumer's desire or willingness to pay for a product, such as perception and tastes and preferences. Any positive increase directly influences the demand while anything detrimental decreases the demand. Every market has an equilibrium point where the supply and demand curves intersect. At the point of equilibrium the quantity demanded equals the quantity supplied.

Since the equilibrium for every market is set at the point where the supply and demand curves intersect, any change in the supply or demand curves results in a new market equilibrium. As the supply curve shifts to the right there is an increase in supply which is tied with a decrease in the price of the product and an increase in the quantity demanded. Likewise, a decrease in supply leads to an increase in price and a decrease in the quantity demanded as the supply curve shifts to the left.

Market equilibriums respond differently in response to shifts in demand. When the demand for a good increases the price increases along with the quantity purchased as the demand curve shifts to the right. A decrease in demand results in a decrease in price and quantity demanded as the demand curve shifts to the left (Norwood and Lusk 2008).

A researcher does not need the exact supply and demand curves in order to predict the changes in price and quantity caused by demand or supply shifts. In economics, one needs elasticity estimates in order to forecast price and quantity changes from previous or existing

estimates of the supply and demand curves. By constructing an equilibrium displacement model, a researcher can accurately calculate changes with a variety of outside events (Norwood and Lusk 2008). Instead of attempting to calculate the entirely new demand and supply curves and graphing their point of intersection, a researcher can use the known fact that the point of equilibrium will always be where the quantity demanded is equal to the quantity supplied. Knowing this a researcher needs to specify equations for quantity supplied and quantity demanded, and set them equal to each other.

This type of equilibrium displacement model was used by James and Alston (2002) to compare the influence of various taxes on market equilibriums of Australian wine. James and Alston (2002) researched the influence of both ad valorem and per-unit taxes on the quality of Australian wine, using a matrix model they described the theoretical price, quantity, and quality effects due to these policies. Their research demonstrated the distortions that such taxes can have on quality premiums and the overall quality of the wine produced.

Equilibrium displacement models have also been used to estimate the influence of exogenous shocks that cause changes in market equilibriums. Crespi and Sexton analyzed the influence of the exogenous shock of advertising on the overall demand for almonds in the United States. They found that there was a direct correlation between the advertisements and the increase in demand. In order to explain the influence that the advertisement had on the demand for almonds they simulated the effect. They estimated a coefficient that described the increase in consumption, which would in turn shift the demand curve to the right and thereby increase the price of almonds and setting a new market equilibrium (Crespi and Sexton 2001).

An example of policy controls effecting market equilibriums can be seen in the almond industry in the United States. In the United States, marketing orders are emplaced in an attempt

to control the supply, demand and prices within a particular market (Crespi and Chacón-Cascante 2004). In the case of the Almond Board of California (ABC), producers elect growers who regulate the supply of almonds in an attempt to stabilize their market and maintain high prices for their product by withholding reserves from the market to prevent oversupply. In order to do this they need to calculate the changes in quantity demanded by supply and demand curves for their market (Crespi and Chacón-Cascante 2004).

Mandating that all of the coffee sold in a market be fair-trade certified is equivalent to restricting the supply of “regular” coffee. Since fair-trade and regular coffee are substitutes, there will be resulting changes in both markets. Not all consumers in San Francisco will drink fair-trade coffee after the policy is in place. The supply of the restricted commodity will decrease but not disappear completely, as there will be consumers who seek other means of attaining a substitute by shopping online or buying their coffee outside of San Francisco. The demand elasticity of coffee will determine the change in the price of coffee (Norwood and Lusk 2008).

As a result of the policy restricting regular coffee in San Francisco, the supply of regular coffee will be shifted to the left and be restricted at a certain level. As a result of the high cross price elasticity between regular coffee and fair-trade coffee, the demand curve for fair-trade coffee will shift to the right, and the market for fair-trade coffee will change to a new market equilibrium. Combined with estimates of the elasticity of supply for fair-trade coffee that takes into account the producer capacities in the long- and short-term, the new quantity demanded and price of fair-trade coffee can be calculated.

Chapter 3

METHODOLOGY

Procedures for Data Collection

Assuming that the city of San Francisco did create a policy that restricted the supply of regular coffee, it would serve as an example for the implementation of similar policies elsewhere. The scope of the study will focus on the potential impact on the sales of fair-trade coffee and coffee consumers in San Francisco. The information required for populations, price and consumption data, and elasticity values will be drawn from the United States population in general. In order to evaluate the effect of this policy on the fair-trade market, the researcher will need to evaluate the effect that the policy will have on the substitutes of regular coffee, soda and tea. Before the researcher can analyze the changes in market equilibriums, the starting price and consumption data must be established for each commodity. In order for beginning price and quantity values to be established the market size must also be determined from population statistics. After starting points have been established for each market, elasticity estimates will be needed to predict shifts in market equilibriums.

One will need to analyze each of the four markets of regular coffee, fair-trade coffee, tea and soda. Information regarding the market sizes of fair-trade coffee within the overall coffee market are needed and can be found from the 2004 World Bank report titled “Agriculture and Rural Development Discussion Paper 3: Coffee Markets, New Paradigms in Global Supply and

Demand,” or other scholarly journals detailing the fair-trade and regular coffee market. Actual fair-trade coffee market prices and consumption data in United States will be needed along with consumption and price data for regular coffee, tea and soda. This data is easily attained through numerous sources such as the FLO, Transfair USA and the United States Department of Agriculture’s Economic Research Service (ERS). Figures for prices can also be taken from the International Coffee Organization (ICO) and figures for consumption can be taken from the Federation of American Scientists (FAS), the Bureau of Labor Statistics (BLS), as well as the ICO.

In order to calculate the amount of fair-trade coffee currently sold in the city of San Francisco, data from Starbucks Coffee Company available in their 2007 Coffee Consumer Report detailing the percentage of total coffee sold being fair-trade certified will serve as an estimate for the city of San Francisco (Starbucks Corporation 2008). Since Starbucks Coffee is referenced by researchers as contributing the most to the fair-trade coffee market, it will serve as the base level for San Francisco fair-trade coffee consumption. From this information, one would need to calculate the amount of fair-trade coffee that is consumed prior to the restriction in San Francisco in order to calculate the overall increase in consumption. The six percent statistic from Starbucks describing the percentage of total coffee purchased being “fair-trade certified” will be applied to the overall total coffee consumption of San Francisco and will represent the total amount of fair-trade coffee assumed to be consumed prior to the restriction.

Information that a researcher will need to gather in order to calculate final price and quantity data for each market will include the population size of the city of San Francisco, and the number of visitors to the city. Statistical information regarding the per capita consumption trends for each market as well as average price will be used with the population statistics in

attaining final figures. One would gather this data regarding population and visitors from the San Francisco Conventions and Visitors Bureau's 2009 "San Francisco Fact Sheet" and the United States Census Bureau's 2008 population estimates. Using this information, the researcher will be able to show the consumption of coffee in pounds per year, and the price per pound.

In order to analyze the change in market equilibrium, the researcher also will need to find information detailing the elasticity of demand, supply and cross-price elasticity for various substitutes such as regular coffee, tea, and soda. Values for these products will be needed to determine the number of people that decide to consume substitutes in response to the policy implementation as well as the new market equilibrium for the fair-trade coffee market in San Francisco. One can collect this data if available from the ERS.

Procedures for Data Analysis

With the information that is collected, the researcher would calculate the overall increase in fair-trade coffee sold in pounds and the resulting increase in price in both the short-run and longer-run. Considering that fair-trade coffee in San Francisco has several substitutes, the researcher should take into account regular coffee, tea and soda as possible substitutes that consumers will turn towards once the regular coffee restrictions take effect. The initial prices and quantities for each market seen in Figures 1 through 4 and Table 6 are calculated through finding the per-capita consumption and average prices similar to the methods used to calculate the fair-trade coffee market.

Calculating New Market Equilibriums

The next step is to determine the effects of the exogenous shock to these markets caused by the creation of this coffee policy. By predicting market equilibriums, the researcher will identify several possible changes in sales of fair-trade coffee, regular coffee, tea and soda. During the analysis of the changes in market equilibriums all other demand shifters besides those specified will be held constant or “ceteris paribus.” Demand and Supply functions can be specified with the equations that follow. Definitions for the variables and the symbols used to represent them are included in Table 6. Also included are values used for demand and supply elasticities, all other values represent the most likely data set.

Table 5. Symbol Descriptions and Values Used for Analysis

Symbol	Definition	Value	Symbol	Definition	Value
Q_{FT}^D	Quantity demanded of fair-trade coffee	512,972.53 lbs./yr.	Q_C^D	Quantity demanded of regular coffee	8,035,786.33 lbs./yr.
Q_{FT}^S	Quantity supplied of fair-trade coffee	512,972.53 lbs./yr.	Q_C^S	Quantity supplied of regular coffee	8,035,786.33 lbs./yr.
P_{FT}	Price of fair-trade coffee	\$1.26/lb.	P_C	Price of regular coffee	\$.4596/lbs.
E_{FT}^D	Elasticity of demand for fair-trade coffee	-1.20	E_C^D	Elasticity of demand for regular coffee	-.03
$\% \Delta P_{FT}$	Percent change in price of fair-trade coffee		$\% \Delta P_C$	Percent change in price of regular coffee	
$\% \Delta Q_{FT}^D$	Percent change in quantity demanded for fair-trade coffee		$\% \Delta Q_C^D$	Percent change in quantity demanded for regular coffee	
$\% \Delta Q_{FT}^S$	Percent change in quantity supplied for fair-trade coffee		$\% \Delta Q_C^S$	Percent change in quantity supplied for regular coffee	
E_{FT}^S	Elasticity of supply for fair-trade coffee	2.00	Φ_C	Represents exogenous shock of the policy to the coffee market.	-.90
$E_{FT,C}^D$	Elasticity of demand for fair-trade coffee with respect to regular coffee	1.10			
$E_{FT,T}^D$	Elasticity of demand for fair-trade coffee with respect to tea	0.50			
$E_{FT,S}^D$	Elasticity of demand for fair-trade coffee with respect to soda	0.35			
Symbol	Definition	Value	Symbol	Definition	Value
Q_T^D	Quantity demanded of tea	797,726.23 lbs./yr.	Q_S^D	Quantity demanded of soda	43,469,083.21 Gallons/yr.
Q_T^S	Quantity supplied of tea	797,726.23 lbs./yr.	Q_S^S	Quantity supplied of soda	43,469,083.21 Gallons/yr.
P_T	Price of tea	\$3.50/lbs.	P_S	Price of soda	\$2.45 / Gallon
E_T^D	Elasticity of demand for tea	-0.75	E_S^D	Elasticity of demand for soda	-0.75
$\% \Delta P_T$	Percent change in Price of tea		$\% \Delta P_S$	Percent change in Price of soda	
$\% \Delta Q_T^D$	Percent change in quantity demanded for tea		$\% \Delta Q_S^D$	Percent change in quantity demanded for soda	
$\% \Delta Q_T^S$	Percent change in quantity supplied for tea		$\% \Delta Q_S^S$	Percent change in quantity supplied for soda	
E_T^S	Elasticity of supply for tea	0.25	E_S^S	Elasticity of supply for soda	1.00
$E_{T,C}^D$	Elasticity of demand for tea with respect to regular coffee	0.50	$E_{S,FT}^D$	Elasticity of demand for soda with respect to fair-trade coffee	0.35

$E_{T,FT}^D$	Elasticity of demand for tea with respect to fair-trade coffee	0.50	$E_{S,T}^D$	Elasticity of demand for soda with respect to tea	0.35
$E_{T,S}^D$	Elasticity of demand for tea with respect to soda	0.35	$E_{S,C}^D$	Elasticity of demand for soda with respect to regular coffee	0.35

Notes: 1) Prices and Quantity values are represented (beginning value).

The Demand for fair-trade coffee is specified as:

$$(1) \text{ Demand } Q_{FT}^D = f(P_{FT}, P_C, P_T, P_S, \text{Income})$$

Where quantity demanded (Q_{FT}^D) of fair-trade coffee is a function of the prices of fair-trade coffee, regular coffee, tea, soda, and income. This equation will be respecified in percentage change terms to include elasticity values and exclude income as a variable that influences quantity since it is implicitly being held constant. The quantity supplied of fair-trade coffee (Q_{FT}^S) is a function of the price of fair-trade coffee, weather and technology.

$$(2) \text{ Supply } Q_{FT}^S = g(P_{FT}, \text{Weather}, \text{Technology})$$

In order to find the market-clearing condition or market equilibrium of fair-trade coffee where quantity demanded is equal to quantity supplied, both equations must be made equal to each other:

$$(3) \text{ Market-Clearing condition } Q_{FT}^D = Q_{FT}^S$$

The own-price elasticity of demand, elasticity of supply and cross price elasticity of these commodities can be represented with the following equations:

$$\text{Own-Price Elasticity of demand of fair-trade coffee: } E_{FT}^D = \frac{\% \Delta Q_{FT}^D}{\% \Delta P_{FT}}$$

$$\text{Elasticity of Supply of fair-trade coffee: } E_{FT}^S = \frac{\% \Delta Q_{FT}^S}{\% \Delta P_{FT}}$$

Cross-Price Elasticity of fair-trade coffee with respect to the price of regular coffee:

$$E_{FT,C}^D = \frac{\% \Delta Q_{FT}^D}{\% \Delta P_C}$$

All elasticities are formally defined in Table 6.

In order to find the changes in the market equilibrium for each of the four markets the researcher must calculate the percentage change in quantity demanded and quantity supplied, utilizing own price elasticity values, supply elasticity values as well as the cross price elasticity values. The following depicts the equations necessary to calculate the change in the market equilibrium.

Equation 4 is a different way of expressing equation 1. Equation 1 is an outline of the factors that influence the demand for a product. Here in equation 4 where the researcher is trying to find the percentage change in quantity, the variables in equation 1 are replaced with the cross price and own price elasticity equations and percentage changes in the variables are included in the model. These equations measure the percentage change in quantity that results from changes in price for each commodity in relation to the related elasticity value. Since results are measured *ceteris paribus* the variable of income from equation 1 is not included in equation 4.

The change in quantity demanded of fair-trade coffee is described by:

$$(4): \% \Delta Q_{FT}^D = (E_{FT}^D \cdot \% \Delta P_{FT}) + (E_{FT,C}^D \cdot \% \Delta P_C) + (E_{FT,T}^D \cdot \% \Delta P_T) + (E_{FT,S}^D \cdot \% \Delta P_S),$$

where the change in quantity demanded is a function of the own-price elasticity of fair-trade coffee plus the cross-price elasticity of soda, tea, and regular coffee, and the percentage change in each of the four prices. The change in quantity supplied of fair-trade coffee is described by:

$$(5): \% \Delta Q_{FT}^S = E_{FT}^S \cdot \% \Delta P_{FT}$$

In this equation the change in the quantity supplied of fair-trade coffee is a function of the elasticity of supply of fair-trade coffee and the change in the price of fair-trade coffee. Here as well, the difference between equation 5 and equation 2 is the inclusion of the elasticity value, as it and the percent change in price influence the percent change in quantity. Similarly the

variables of weather and technology are assumed to be constant, and are excluded from equation 5. The market equilibrium of fair-trade coffee is described by:

$$(6): \% \Delta Q_{FT}^D = \% \Delta Q_{FT}^S$$

The previous calculations would need to be performed for each market (Figures 1-4) in order to determine the changes (Figures 5-8) to the markets with the following equations (7-14).

The market for tea is described by:

$$(7): \% \Delta Q_T^D = (E_T^D \cdot \% \Delta P_T) + (E_{T,FT}^D \cdot \% \Delta P_{FT}) + (E_{T,C}^D \cdot \% \Delta P_C) + (E_{T,S}^D \cdot \% \Delta P_S)$$

$$(8): \% \Delta Q_T^S = E_T^S \cdot \% \Delta P_T$$

$$(9): \% \Delta Q_T^D = \% \Delta Q_T^S$$

The market for soda is described by:

$$(10): \% \Delta Q_S^D = (E_S^D \cdot \% \Delta P_S) + (E_{S,FT}^D \cdot \% \Delta P_{FT}) + (E_{S,C}^D \cdot \% \Delta P_C) + (E_{S,T}^D \cdot \% \Delta P_T)$$

$$(11): \% \Delta Q_S^S = E_S^S \cdot \% \Delta P_S$$

$$(12): \% \Delta Q_S^D = \% \Delta Q_S^S$$

The market for regular coffee is described by:

$$(13): \% \Delta Q_C = \Phi_C (\Phi_C < 0)$$

$$(14): \% \Delta P_C = \Phi_C / E_C^D$$

When calculating the change in quantity supplied of regular coffee the researcher uses variable Φ_C to simulate the exogenous shock on the market causing both a decrease in supply and an increase in price for regular coffee affecting the related markets of fair-trade coffee, tea and soda through price effects. The Φ_C value is the driving variable in the analysis. This value represents the implementation of the fair-trade coffee policy in San Francisco restricting the sale

of regular coffee. This value is a result of calculating the percent change in quantity supplied of regular coffee: $\Phi_C = \frac{Q_C^1 - Q_C^2}{\frac{1}{2}(Q_C^1 + Q_C^2)}$. An example value of -.9 for Φ_C here describes that there has been a 90% decrease in the regular coffee supply in San Francisco (see Figure 6). This change in quantity supplied of regular coffee is the driving force behind the changes in the markets of fair-trade coffee, tea and soda.

Based on the specification of Φ_C the prices and quantities for each market will change. The changes in the price and quantity of each market depends upon the own, cross and supply elasticity values for each commodity. Assuming certain values for these elasticities, the changes in price and quantity can be calculated for each market (see Figures 5 through 8 and equations 4 through 14).

The amount of consumers turning to tea or soda can be subtracted from the total amount remaining that will drink fair-trade coffee. Assuming a change in the demand for fair-trade coffee, the elasticity of supply for fair-trade coffee will be specified for different time horizons to reflect that over time, producers become certified and increase the production of fair-trade coffee to meet demand (see Figure 5). The estimated sets of elasticity values for the short-run and mid-run will be used to calculate the new market equilibriums for the fair-trade coffee market.

From these estimated sets of elasticity values, the resulting changes in quantity and price for fair-trade coffee will be used to calculate additional information. Additional revenue to producers, and increase in consumption of fair-trade coffee can be calculated. In addition, the certification timeframe for additional fair-trade acreage will affect each of these figures, requiring that information be focused on the results after the elasticity of supply has reached the mid-term. One will need to compare the increase in demand for fair-trade coffee against the

national market in the United States in order to determine the overall effect from the restrictions in San Francisco.

The overall increase in the market size of fair-trade coffee will be compared to the national consumption of fair-trade coffee in order to determine if the increase in consumption is greater than the hypothesized one percent. If the increase in the market is less than one percent in national consumption of fair-trade coffee, then the policy that San Francisco would impose would not achieve any significant gains in consumption the national fair-trade coffee market.

Assumptions

This study assumes linear supply and demand curves. It is assumed that there will be an increase in the demand for fair-trade coffee and economic models are assumed to be “ceteris paribus.” There will be several assumptions as to the elasticity of supply for fair-trade coffee over different periods of time. The substitutes of regular coffee, tea, and soda will represent all of the possible substitutes in the marketplace. The national statistics and data gathered are assumed to represent the city of San Francisco. All coffee prices are for Arabica coffee and are expressed in United States Dollars (USD/\$).

Limitations

The methodology developed will be meaningful to researchers looking for a framework to determine the effect of such a policy in their area. However, the findings in this paper are

significant solely for San Francisco since the findings will be based on the population and tourism statistics for the city of San Francisco.

Chapter 4

DEVELOPMENT OF THE STUDY

Data

Raw data was compiled to calculate the initial starting points for each market equilibrium in San Francisco. Data collected for the consumption of regular coffee from the ERS detailed that 9.6 pounds of coffee are consumed per capita each year in the United States (Economic Research Service 2009a). This means that the average American consumes 0.03 pounds of coffee every day. In order to calculate the consumption in the city of San Francisco, this average consumption per day needs to be applied to the average daily population in San Francisco. Since there are very few elasticity estimates available for application in this study values were specified in order for sensitivity analysis to be conducted.

According to the U.S. Census Bureau (USCB) the population of San Francisco is 845,559 people (U.S. Census Bureau 2008). Similarly, according to the San Francisco Convention and Visitors Bureau (SFCVB), there are on average 16.4 million tourists that visit San Francisco each year (San Francisco Conventions and Visitors Bureau 2009). Assuming an average flow of tourists in San Francisco there would be a daily tourist population in San Francisco of approximately 44,931 people. The resulting daily population of 890,490 people was multiplied with the average consumption of coffee at 0.03 pounds per day and resulted in a daily

consumption of 23,421.12 pounds per day or a total consumption of 8,548,708 pounds of both fair-trade and regular coffee per year.

Using this information the quantity supplied, also quantity demanded, of fair-trade coffee in San Francisco was calculated. Assuming that an average six percent of total coffee sold in San Francisco is fair-trade certified (Starbucks Corporation 2008); the resulting amount of fair-trade coffee consumed per year in San Francisco was calculated to be 512,922 pounds per year. The initial price level for the fair-trade coffee market was taken from the raw price floor for fair-trade coffee which for the past several years has remained at \$1.26 per pound (TransFair USA 2010).

The market equilibrium for regular coffee was found by taking the amount of total coffee consumed in San Francisco less the amount of fair-trade coffee resulting in an annual consumption of 8,035,786 pounds. The price for regular coffee was taken from the International Coffee Organization composite price for 2001, at 45.96 cents per pound (Food and Agriculture Organization of the United Nations 2002).

The consumption value for the tea market was calculated in a similar way to that of coffee in San Francisco. According to the ERS, the per capita consumption of tea in the United States is 0.9 lbs./yr., translating into 0.002454 lbs./person/day (Economic Research Service 2009a). Using the same daily population of 890,490 people, a yearly consumption of 797,726.23 pounds of tea was calculated for the beginning quantity in the tea market. The average price of tea was found from the FAO and converted to be \$3.50 per pound. as the initial price for the tea market (Food and Agriculture Organization of the United Nations 2002).

In terms of the soda market, the same method was utilized to calculate the initial quantity value with information from the ERS, with a per capita consumption of 48.81 gal/yr. (Economic

Research Service 2009b). The resulting consumption of soda was calculated to be 43,469,083 gallons per year. The initial price level for the soda market came from the ERS at an estimated \$2.45 per gallon (Economic Research Service 2009b).

These initial data points served as a baseline for the analysis, once they were established it was necessary to set-up the equations from chapter 3 in a way that would describe the changes in quantity and price in percent values. In order to completely integrate these economic equations a matrix was constructed using Microsoft Excel that allowed for the variables of exogenous shock and the various elasticity values to be included and immediate results viewed (see Table 6). Equations 4, 5, 13, 14, 7, 8, 10, and 11 (ordered top to bottom in the variable matrix) are each included as rows in the coefficient matrix. The coefficients and the exogenous shock vector are used to solve for the quantity and price changes (component C in Table 6). Equations 6, 9, and 12 are incorporated in the quantity and price matrix while the exogenous shocks to the system are included in the exogenous shock matrix (component D in Table 6).

Table 6. Matrix Spreadsheet with Formulas Shown for Clarity

(A)					(B)				(C)				(D)
Equations:	% ΔQ_{FT}	% ΔQ_C	% ΔQ_T	% ΔQ_S	% ΔP_{FT}	% ΔP_C	% ΔP_T	% ΔP_S					
4	-1	0	0	0	E_{FT}^D	$E_{FT,C}^D$	$E_{FT,T}^D$	$E_{FT,S}^D$		% ΔQ_{FT}			0
5	-1	0	0	0	E_C^D	0	0	0		% ΔQ_C			0
13	0	1	0	0	0	0	0	0		% ΔQ_T			$-\Phi_C$
14	0	0	0	0	0	1	0	0		% ΔQ_S	-		Φ_C / E_C^D
7	0	0	-1	0	E_{FT}^D	$E_{C,C}^D$	E_T^D	E_S^D		% ΔP_{FT}			0
8	0	0	-1	0	0	0	E_C^D	0		% ΔP_C			0
10	0	0	0	-1	E_{FT}^D	$E_{S,C}^D$	$E_{S,T}^D$	E_S^D		% ΔP_T			0
11	0	0	0	-1	0	0	0	E_S^D		% ΔP_S			0

- Notes: (1) Equation numbers
 (2) Variable matrix
 (3) Price and quantity matrix (incorporating the assumption that quantity demanded and quantity supplied are equal)
 (4) Exogenous shock matrix

Analysis

After analyzing the influence that each variable had on the market simulation, sets of theorized elasticity values were created (see Table 7). The “most likely” data set represents the assumed values for variables should a policy restricting the supply of regular coffee be put into effect in San Francisco. In the case of the most likely scenario, Φ_C is simulating a decrease of 90% in the supply of regular coffee. The own-price elasticity values for the commodities are set assuming that fair-trade coffee will have the most elastic demand followed by soda and tea with regular coffee having the most inelastic demand out of the four.

In the most likely scenario, it is assumed that fair-trade coffee will have a higher cross-price elasticity value with respect to regular coffee compared to that of soda in regards to regular coffee and tea with regards to regular coffee. Of these three values, soda will have the lowest value of the three in relation to regular coffee (*i. e.*, $E_{FT,C}^D > E_{FT,T}^D > E_{FT,S}^D$). Both soda and tea are given the same level of substitutability with regard to fair-trade coffee in their relations to regular coffee, given the similarities between both fair-trade coffee and regular coffee (*i. e.*, $E_{S,C}^D = E_{T,C}^D$). The cross-price elasticity values of soda in relation to tea ($E_{S,T}^D$), regular coffee ($E_{S,C}^D$) and fair-trade coffee ($E_{S,FT}^D$) are low, assuming that the only similarity between them is caffeine making them less substitutable.

The elasticity of supply for fair-trade coffee (E_{FT}^S) is very high, assuming that producers were ready, willing and able to fill in the extra demand in San Francisco. The supply elasticity for tea (E_T^S) is relatively low in comparison to soda (E_S^S) due to the relative ease of soda production.

The results of the most likely scenario in Table 7 indicate that the quantity supplied of fair-trade coffee will increase by 327% with an increase in price of 163%. The quantity supplied of regular coffee will decrease by 90% with a resulting increase in price of 300%. The change in quantity supplied of tea will increase by 71% with a much larger increase of 284% in price due to the low supply elasticity. In the soda market the quantity supplied will increase by 149% with a price increase of 149% as well. The alternate four scenarios were constructed in order to theorize responses to the implementation of this policy that are possible as well.

Table 7. Sets of Elasticity Values Analyzed

		Most likely	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Med-run	Long-run
Φ_C	=	-0.90	-0.90	-0.90	-0.90	-0.90	-0.90	-0.90
E_{FT}^D	=	-1.20	-2.00	-2.00	-0.95	-1.20	-1.20	-1.20
$E_{FT,C}^D$	=	1.10	0.60	0.75	1.10	1.10	1.10	1.10
$E_{FT,T}^D$	=	0.50	0.50	0.50	0.50	0.50	0.50	0.50
$E_{FT,S}^D$	=	0.35	0.35	0.50	0.35	0.35	0.35	0.35
E_{FT}^S	=	2.00	2.00	2.00	2.00	2.00	2.50	3.00
E_C^D	=	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30
$E_{T,FT}^D$	=	0.50	0.50	0.50	0.50	0.50	0.50	0.50
$E_{T,C}^D$	=	0.50	0.70	0.50	0.50	0.70	0.50	0.50
E_T^D	=	-0.75	-0.75	-0.75	-0.50	-0.75	-0.75	-0.75
$E_{T,S}^D$	=	0.35	0.35	0.50	0.35	0.35	0.35	0.35
E_T^S	=	0.25	0.25	0.25	0.25	0.25	0.25	0.25
$E_{S,FT}^D$	=	0.35	0.35	0.50	0.35	0.35	0.35	0.35
$E_{S,C}^D$	=	0.35	0.70	0.50	0.35	0.70	0.35	0.35
$E_{S,T}^D$	=	0.35	0.35	0.50	0.35	0.35	0.35	0.35
E_S^D	=	-0.75	-0.75	-0.75	-0.50	-0.75	-0.75	-0.75
E_S^S	=	1.00	1.00	1.00	1.00	1.00	1.00	1.00
$\% \Delta Q_{FT}$	=	3.278	2.103	2.444	4.287	3.787	3.473	3.617
$\% \Delta Q_C$	=	-0.900	-0.900	-0.900	-0.900	-0.900	-0.900	-0.900
$\% \Delta Q_T$	=	0.711	0.839	0.792	1.119	0.968	0.673	0.644
$\% \Delta Q_S$	=	1.497	2.081	2.111	2.245	2.353	1.416	1.357
$\% \Delta P_{FT}$	=	1.639	1.051	1.222	2.144	1.893	1.389	1.206
$\% \Delta P_C$	=	3.000	3.000	3.000	3.000	3.000	3.000	3.000
$\% \Delta P_T$	=	2.843	3.354	3.167	4.477	3.870	2.690	2.578
$\% \Delta P_S$	=	1.497	2.081	2.111	2.245	2.353	1.416	1.357

Notes: ¹ Colors represent magnitude and value, red represents negative values for percentage change and solid red represents altered cells, while green represents high positive values.

Alternate Scenario Comparison

In scenario 1 of Table 7 and 8 the cross-price elasticity values of each commodity are changed in their relation to regular coffee along with the own-price elasticity of fair-trade coffee. This scenario simulates what could result if consumers in San Francisco viewed the restriction of regular coffee in an unhappy manner and avoided purchasing fair-trade coffee in protest. The own-price elasticity of fair-trade coffee was increased from -1.2 to -2 and fair-trade coffee was given a lower cross-price elasticity value in relation to regular coffee than tea and soda. The effect of this scenario resulted in an increase in the quantity supplied of fair-trade coffee that was 117% less than the most likely scenario and an increase in price of fair-trade coffee that was 58% less than the most likely scenario (see Table 8).

Table 8. Comparison of Most Likely Data Set and Additional Scenarios.

		Most Likely Baseline Percentage Change	Percent Difference 1					
			ML v. 1	ML v.2	ML v. 3	ML v. 4	MLv. med-run	MLv. long-run
$\% \Delta Q_{FF}$	=	3.278	-1.176	-0.834	1.009	0.508	0.195	0.338
$\% \Delta Q_C$	=	-0.900	0.000	0.000	0.000	0.000	0.000	0.000
$\% \Delta Q_T$	=	0.711	0.128	0.081	0.408	0.257	-0.038	-0.066
$\% \Delta Q_S$	=	1.497	0.585	0.615	0.748	0.856	-0.081	-0.140
$\% \Delta P_{FF}$	=	1.639	-0.588	-0.417	0.505	0.254	-0.250	-0.434
$\% \Delta P_C$	=	3.000	0.000	0.000	0.000	0.000	0.000	0.000
$\% \Delta P_T$	=	2.843	0.511	0.323	1.633	1.027	-0.153	-0.266
$\% \Delta P_S$	=	1.497	0.585	0.615	0.748	0.856	-0.081	-0.140

Notes: ¹ Column represents the difference in the percentage changes between the most likely data set and scenario specified.

² Colors represent magnitude and value, red represents negative values while green represents high positive values.

Scenario 2 uses a smaller cross-price elasticity value between fair-trade coffee and regular coffee while increasing the cross-price elasticity values between soda and every other commodity. In addition, a larger own-price elasticity of fair-trade coffee is used. This simulation

depicts a possibility where consumers decide to switch to a cheaper product, tea and soda. The effect of this scenario resulted in an increase in quantity supplied of fair-trade coffee that was 83% less than the most likely scenario and an increase in price of fair-trade coffee that was 41% less than the most likely scenario (see Tables 7 and 8).

In scenario 3 the own-price elasticity values for tea, soda and fair-trade coffee are more inelastic than the most likely scenario, reflecting that consumers purchase caffeine products out of anticipation of additional policy restrictions. As might be assumed, this scenario resulted in an increase in quantity supplied of fair-trade coffee that was 100% more than the most likely scenario and an increase in price of fair-trade coffee that was 50% more than the most likely scenario (see Tables 7 and 8).

Scenario 4 uses larger cross-price elasticity values between tea and soda in relation to regular coffee that creates a bigger overall increase in each market. This scenario resulted in an increase in the quantity supplied of fair-trade coffee that was 50% more than the most likely scenario and an increase in price of fair-trade coffee that was 25% more than the most likely scenario (see Tables 7 and 8).

The medium and long run scenarios demonstrate what will occur when the elasticity of supply for fair-trade coffee increases. The quantity of fair-trade coffee increases to meet the demand in San Francisco for coffee. Similarly, the quantities of tea and soda decrease while the prices for soda, tea and fair-trade coffee decrease as well (see Tables 7 and 8).

Sensitivity Analysis

The driving variable of the matrix is Φ_C , which represents the percent change in the amount of coffee that is supplied to the San Francisco market. Φ_C is seen in the third and fourth rows influencing the change in quantity of regular coffee as well as the change in price of coffee. From this Φ_C value the resulting changes in supply and demand are influenced by the various elasticity values. The greater the supply restriction to the regular coffee market, or higher the Φ_C value, the greater the capacity for change in the surrounding markets (see Table 9).

Table 9. Effects on Price and Quantity Changes from Increases in Magnitude of Variables

		Effect on amount of percentage change								
		$\% \Delta Q_{FT}$	$\% \Delta Q_C$	$\% \Delta Q_T$	$\% \Delta Q_S$	$\% \Delta P_{FT}$	$\% \Delta P_C$	$\% \Delta P_T$	$\% \Delta P_S$	
Increase In	Φ_C	-0.9	--	--	--	--	--	--	--	--
Increase In	E_{FT}^D	-1.2	-	=	+	-	-	=	-	-
Increase In	$E_{FT,C}^D$	0.25	++	=	+	+	++	=	+	+
Increase In	$E_{FT,T}^D$	0.25	+	=	+	+	+	=	+	+
Increase In	$E_{FT,S}^D$	0.25	+	=	+	+	+	=	+	+
Increase In	E_{FT}^S	2	+	=	-	-	-	=	-	-
Increase In	E_C^D	-0.3	--	=	--	--	--	--	--	--
Increase In	$E_{FT,C}^D$	0.25	+	=	+	+	+	=	+	+
Increase In	$E_{FT,C}^D$	0.25	+	=	+	+	+	=	+	+
Increase In	E_T^D	-1	-	=	-	-	-	=	--	-
Increase In	$E_{T,S}^D$	0.25	+	=	+	+	+	=	+	+
Increase In	E_T^S	0.25	-	=	+	-	-	=	-	-
Increase In	$E_{FT,S}^D$	0.25	+	=	+	+	+	=	+	+
Increase In	$E_{S,C}^D$	0.25	+	=	+	++	+	=	+	++
Increase In	$E_{S,T}^D$	0.25	+	=	+	+	+	=	+	+
Increase In	E_S^D	-1	-	=	-	-	-	=	-	-
Increase In	E_S^S	0.5	-	=	-	+	-	=	-	-

Notes: ¹ ++ and -- represent major influencers of the final percentage changes, while + and -

To begin analyzing the influence of various changes in elasticity values, the following baseline values were used as rough beginning points with their respective changes in prices and quantities (see Table 10). In order for accurate analysis, care needed to be taken to ensure that a stability condition was followed, ensuring that the absolute value for the own-price elasticity of a

commodity was always greater than the absolute value of the various cross-price elasticity values for the commodity.

Table 10. Baseline Values Used to Determine Variable Effects on Percentage Changes

Symbol	Definition	Value	Symbol	Definition	Value
E_{FT}^D	Elasticity of demand for fair-trade coffee	-1.20	E_C^D	Elasticity of demand for regular coffee	-.03
$\% \Delta P_{FT}$	Percent change in price of fair-trade coffee	35%	$\% \Delta P_C$	Percent change in price of regular coffee	300%
$\% \Delta Q_{FT}^D$	Percent change in quantity demanded for fair-trade coffee	70%	$\% \Delta Q_C^D$	Percent change in quantity demanded for regular coffee	-90%
$\% \Delta Q_{FT}^S$	Percent change in quantity supplied for fair-trade coffee	70%	$\% \Delta Q_C^S$	Percent change in quantity supplied for regular coffee	-90%
E_{FT}^S	Elasticity of supply for fair-trade coffee	2.00	Φ_C	Represents exogenous shock of the policy to the coffee market.	-.90
$E_{FT,C}^D$	Elasticity of demand for fair-trade coffee with respect to regular coffee	.25			
$E_{FT,T}^D$	Elasticity of demand for fair-trade coffee with respect to tea	.25			
$E_{FT,S}^D$	Elasticity of demand for fair-trade coffee with respect to soda	.25			
Symbol	Definition	Value	Symbol	Definition	Value
E_T^D	Elasticity of demand for tea	-1	E_S^D	Elasticity of demand for soda	-1
$\% \Delta P_T$	Percent change in Price of tea	81%	$\% \Delta P_S$	Percent change in Price of soda	69%
$\% \Delta Q_T^D$	Percent change in quantity demanded for tea	20%	$\% \Delta Q_S^D$	Percent change in quantity demanded for soda	35%
$\% \Delta Q_T^S$	Percent change in quantity supplied for tea	20%	$\% \Delta Q_S^S$	Percent change in quantity supplied for soda	35%
E_T^S	Elasticity of supply for tea	.25	E_S^S	Elasticity of supply for soda	.5
$E_{T,C}^D$	Elasticity of demand for tea with respect to regular coffee	.25	$E_{S,FT}^D$	Elasticity of demand for soda with respect to fair-trade coffee	.25
$E_{T,FT}^D$	Elasticity of demand for tea with respect to fair-trade coffee	.25	$E_{S,T}^D$	Elasticity of demand for soda with respect to tea	.25
$E_{T,S}^D$	Elasticity of demand for tea with respect to soda	.25	$E_{S,C}^D$	Elasticity of demand for soda with respect to regular coffee	.25

These baseline variables showed that the 90% decrease in the supply of regular coffee drove an increase in the price (35%) and quantity (70%) of fair-trade coffee due to the high cross-price elasticity value between regular and fair-trade coffee. As anticipated, there was also a 300% increase in the price of regular coffee due to the reduction in supply and relatively elastic demand for coffee.

From this baseline specification, each parameter value was increased in elasticity or magnitude in order to identify the effect that it had on the changes in price and quantity (see Table 8).

Increases in the elasticity of an own-price elasticity value of a commodity resulted in a smaller percentage increase in both the price and quantity of that commodity. For example, making fair-trade coffee more elastic resulted in a smaller percentage increase in both the quantity demanded and price. The same results were found when the own-price elasticity value was increased for both tea and soda. In the case of regular coffee an increase in own-price elasticity resulted in a smaller increase in price, however the change in quantity was fixed due to the Φ_C value (see Table 9).

In the case of fair-trade coffee, when the value for the elasticity of supply was increased, the percentage change in quantity of fair-trade coffee increased as well. However, the changes in the prices and quantities of tea, soda, and even fair-trade coffee were lessened, with no effect on the change in price or quantity for regular coffee. The same results were found when the elasticity of supply was increased for both tea and soda (see Table 9).

Increasing the cross-price elasticity value for fair-trade coffee with respect to any of the other three markets resulted in a much bigger percentage increase in both price and quantity for fair trade-coffee. Also, there were minor increases in the quantities and prices of both tea and soda when the cross-price elasticity increased between fair-trade coffee and any of the other three commodities (see Table 9).

Influential Shifters

Since Φ_C represents the percentage change in the supply of regular coffee in San Francisco, it is the driving force behind the changes in price and quantity in all of the surrounding markets. Any change in Φ_C greatly influenced every change in price and quantity.

When the value of Φ_C was decreased in value from -.9 to -.2 the increases in price and quantity for every market were greatly lessened in comparison to the baseline scenario. Instead of fair-trade coffee increasing in quantity by 70%, the resulting percentage change in quantity was only 15.6%. As a general rule the greater the percentage decrease in supply of regular coffee the greater the percentage increases in price and quantity in the related markets as well as for the price of regular coffee.

The cross-price elasticity values between any of the commodities of fair-trade coffee, tea, and soda in relation to regular coffee had major influence on the increase in price and quantity for that commodity. In a way, the higher the cross-price elasticity of a commodity in relation to regular coffee the greater “share” it would pull from the decrease in supply of regular coffee. For example, when the cross-price elasticity value of soda in relation to regular coffee increased from .25 to .5, the resulting percentage increase in quantity of soda jumped from 35% to 61% and the percentage increase in the price of soda increased from 69% to 122%. There were additional increases in the prices and quantities of other markets; however they were more a second hand result of the increases in the soda market.

The most important cross-price elasticity value was that of fair-trade coffee with respect to the price of regular coffee. A change in this value from .25 to .5 resulted in a percentage increase in quantity of fair-trade coffee from 70% to 119% and an increase in the percentage change in price of fair-trade coffee from 35% to 59%.

Analysis of Hypothesized Results

Further analysis of the most likely data set highlights the implications for the market of San Francisco. The increases in the fair-trade coffee market of 327% for quantity and 163% for price correspond to an increase in price to \$3.31 and an increase in quantity demanded to 2,190,179 pounds of fair-trade coffee per year.

In order to determine if the policy resulted in an increase in the U.S. fair-trade coffee market of more than 1% the amount of fair-trade coffee consumed in the United States needed to be calculated. According to TransFairUSA there were 87,772,966 pounds of certified coffee imported to the United States in 2008. The increase in the quantity of fair-trade coffee in San Francisco went from an estimated 512,922 lbs. to 2,190,179 lbs. This increase represents an increase in quantity consumed of 1.9% for the entire United States fair-trade coffee market, which was higher than the predicted increase of 1%. The increase in the quantity demanded of fair-trade coffee was significant enough to impact the national market.

This increase of 327% in quantity for the fair-trade coffee market in San Francisco also correlates to a 1020% increase in producer revenue, making total producer revenue increase from \$646,282 to \$7,257,815 an increase of \$6,661,533. Also, the resulting price for fair-trade coffee increased in every simulation as well as the medium and long run predictions. The hypothesized new price for fair-trade coffee after the policy implementation was \$4.00 per pound in the short-run and \$2.50 in the long run the analysis found a new price of \$3.31 per pound, which decreased in the medium-run to \$2.64 per pound and finally to \$2.46 per pound. These price results are relatively close to the hypothesized values from initial research.

This policy resulted in a positive impact to the fair-trade coffee market in the United States. The increase in quantity consumed was significant enough to create additional revenue and nearly a two percent increase in the national consumption over the course of one year, solely

through a policy regarding a single United States city. In the circumstances of this study, a policy restricting the sale of non-fair-trade coffee in San Francisco would succeed in its goal of increasing the amount of fair-trade coffee sold in the United States. However, along with the quantity increase in the fair-trade coffee market there also were large increases in the price of substitutes forcing consumers to pay higher prices for everyday products. The price of regular coffee increased in the most likely scenario from \$0.46 per pound to \$1.84 per pound, tea increased from \$3.50 to \$13.44 per pound and soda from \$2.45 per gallon to \$6.10 per gallon.

Chapter 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

During the course of this study, the prospect of implementing a policy that would restrict the sale of all non-fair-trade coffee in the city of San Francisco was analyzed. Data was collected to specify initial market equilibriums in the markets of fair-trade coffee, regular coffee, tea and soda. This data included consumption statistics, prices, market shares and population statistics. Following the calculation of the beginning data points, equations describing the supply, demand and market clearing conditions were used to explain percentage changes in price and quantity for each market with the inclusion of various elasticities. These resulting equations allowed for the calculation of changes in the price and quantity for each market, as well as a way to simulate the exogenous shock that would result from the restriction in supply of regular coffee.

Following this, a matrix spreadsheet was constructed that integrated these equations and calculated percent changes in the quantity and price for each market. The matrix includes specifications of the percent decrease in the regular coffee market, and the cross-price, own-price and supply elasticity values for each commodity. Initial analysis was conducted to demonstrate the influence that each variable had on the changes in price and quantity and assist in estimating most likely values for each variable.

From this point, several sets of elasticity values were used to calculate the effects of the policy in several scenarios. These data sets centered on a most likely scenario, which was compared against several other possible situations including the medium-run and long-run supply considerations for fair-trade coffee.

After analyzing the difference between the data sets, the most likely data set was further analyzed. The results from the most likely data set were compared against earlier hypothesized results and found to be close to the expected results. It was determined that the quantity of fair-trade coffee would greatly increase after the policy took effect, and that the price of fair-trade coffee would spike initially and level off in the long-run. Initial increases in prices and quantities for the fair-trade market saw increases anywhere of 327%. The increase in the quantity of fair-trade coffee resulted in an increase of nearly two percent in the national market as well producer revenue for the market of San Francisco, increasing by over 1000%.

Conclusions

The fair-trade coffee market was predicted to increase to \$3.31 per pound and 2,190,179 pounds per-year in quantity, resulting in higher profits for producers and a small increase in the national consumption of fair-trade coffee. This shows that the policy could achieve the desired goal of increasing the national consumption of fair-trade coffee. However, the resulting increases in the prices of tea and soda would create financial distress among consumers in San Francisco, outweighing the benefits of such a small increase in the national consumption of fair-trade coffee. In addition, restricting consumer's ability to get non-fair-trade coffee where and

when wanted would probably become more of an inconvenience than the perceived social benefit of supporting the global fair-trade market.

Since this research was conducted with linear supply and demand curves assuming no external variables, the significance of the specific prices and quantities that were calculated may not be highly accurate. Additionally, the findings in this paper are significant for San Francisco since the findings were based on population and tourism statistics for the city of San Francisco. The results of this study will provide policy makers at both state and local levels a first step towards determining the feasibility of such policies. Such policy decisions stand to influence people who reside in the controlled areas and may have far-reaching effects depending upon the scope of policies, both geographically and legally. The methodology developed in this study provides a useful framework for future researchers in determining the effect of similar policies or other supply shocks.

Recommendations

For researchers attempting to analyze a similar market with a forced decrease in supply and shifts in market equilibriums, there are several aspects that should be considered. Since there was a lack of usable data from fair-trade producers, future researchers should determine the data needed to analyze their market, and determine the feasibility of their topic before continuing. Accurate information regarding percentage shares of fair-trade coffee consumed in the United States would have allowed for the calculation of accurate beginning equilibrium points. Similarly, current, accurate, elasticity values for the commodities being studied will greatly improve the accuracy of calculated percentage increases. Depending upon the level of

research being conducted, the accurate calculation of the supply and demand curves for each market would give greater credibility to any quantitative result, provided the aforementioned recommendations are achieved.

In regards to the fair-trade market, it would benefit growers more if the minimum price level for fair-trade coffee was raised from the current price floor of \$1.26 per pound that has not been changed in several years, in spite of research showing that the current premiums for fair-trade certification are not sufficient to encourage farmers to attain certifications (Calo and Wise 2005). It would be simpler to increase the overall profit that growers receive on a global scale than to attempt to increase consumption from a city or regional level. In global terms, growers do not need to produce excess quantity and drive down price and quality; they need to receive a sufficient price for a quality product. While the aim of this policy attempting to increase the demand for fair-trade coffee is well placed and serves as an appropriate example on a city-wide level, if such a policy was applied in a global setting, the risk of lessening fair-trade standards runs high with such a drastic increase in demand for fair-trade certified coffee.

Suggestions for Future Research

There are several areas that future researchers could focus their energy. Based on of the limitations of this research, further study that provided accurate data regarding fair-trade production information would be useful. Gathering information regarding the certification timeline and process for growers, as well as statistics regarding the consumption of fair-trade products would assist further research. The legality of implementing such a policy warrants study, along with calculating the costs of implementing and enforcing a similar policy.

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Appendix

Figures

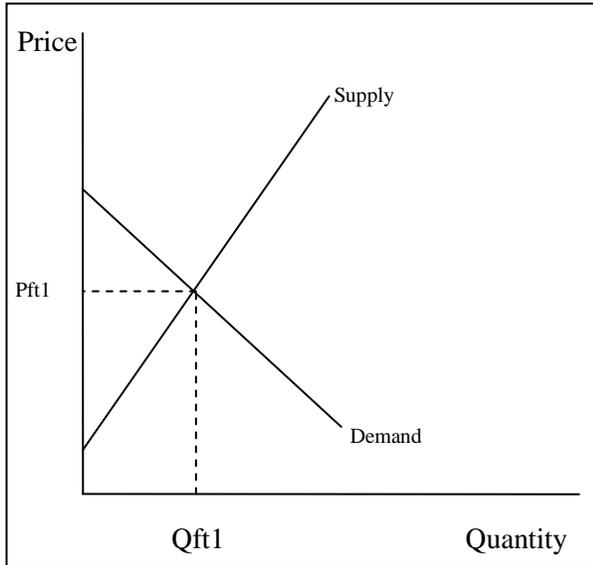


Figure 1. Market for Fair-trade Coffee in San Francisco

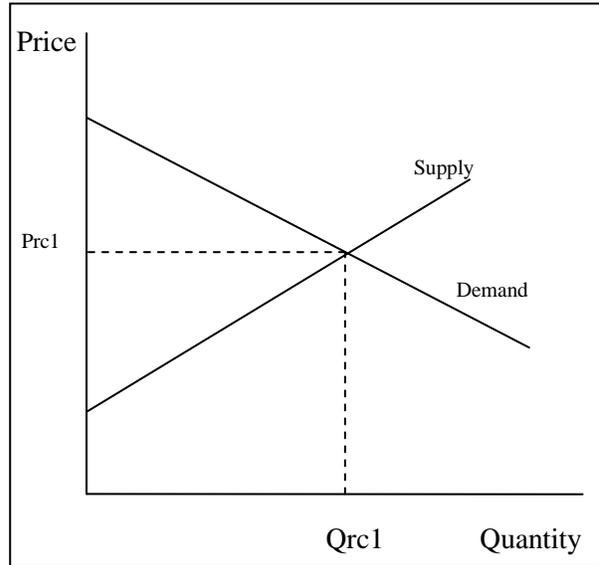


Figure 2. Market for Regular Coffee in San Francisco

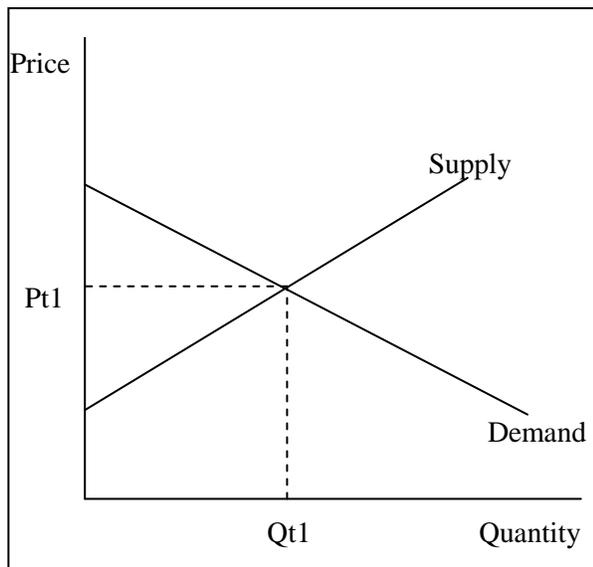


Figure 3. Market for Tea in San Francisco

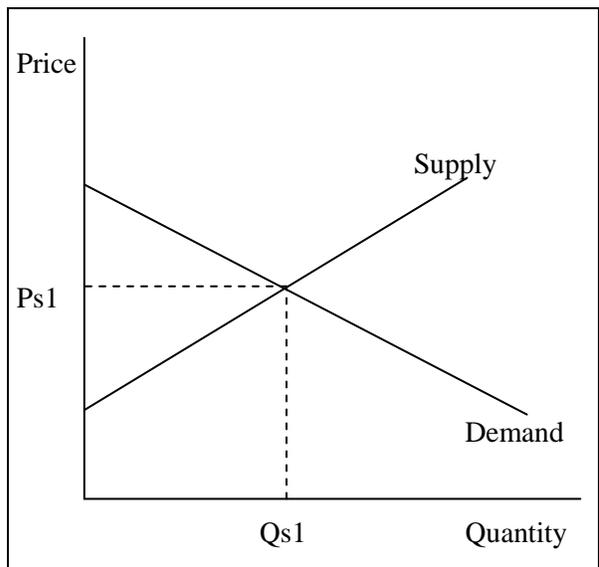


Figure 4. Market for Soda in San Francisco

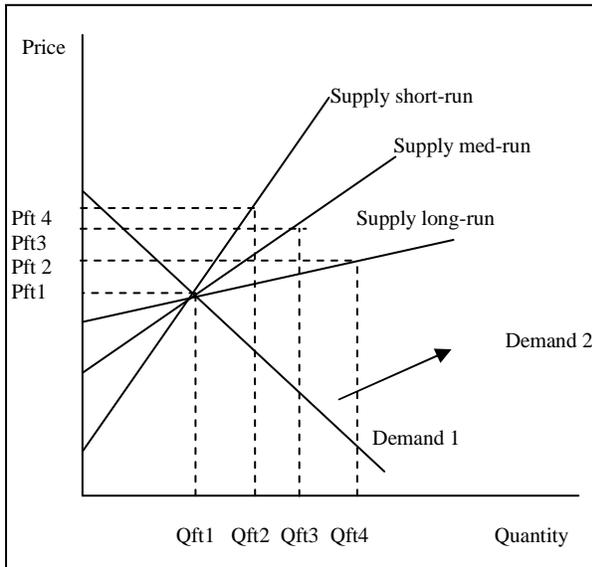


Figure 5. Effect of policy on Fair-trade Coffee Market in San Francisco

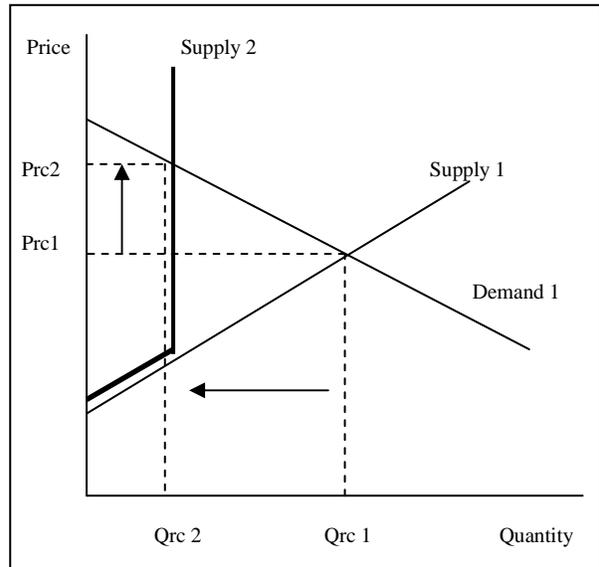


Figure 6. Effect of policy on Regular Coffee Market in San Francisco

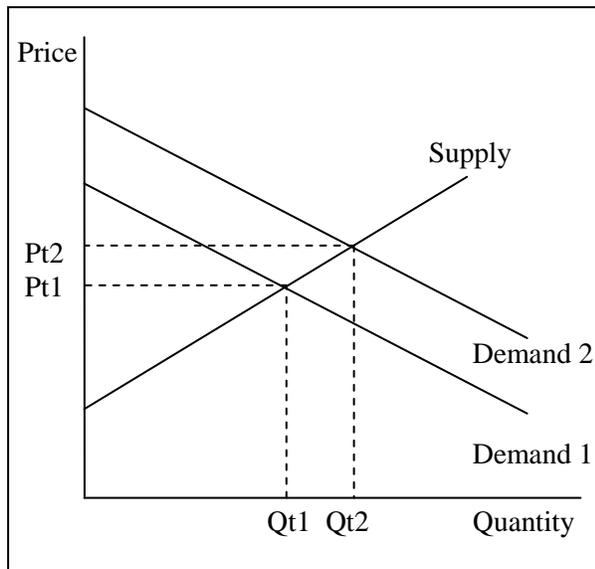


Figure 7. Effect of policy on Tea Market in San Francisco

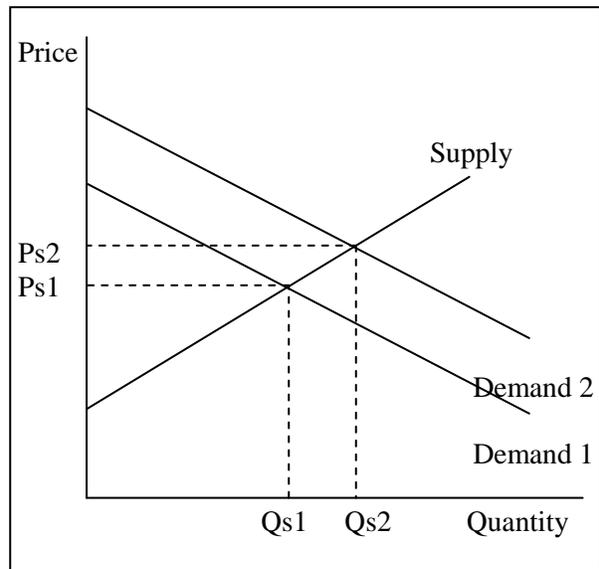


Figure 8. Effect of policy on Soda Market in San Francisco