

# Signaling Change

Studying the effect of price signals on  
disposable hot beverage cup consumption

*An honors thesis in partial  
fulfillment of a Plan of Study major:*

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an Innovative Process

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## Introduction

Every year, American cafés, coffee shops, and fast food restaurants give away over 52 billion disposable paper coffee cups (Grishchenko, 2007). Though they have obvious sanitary and convenience benefits, the production, purchase, and disposal of these cups is costly, pollutive, and requires considerable amounts of water and energy. However, the associated costs are not paid for by those who drive their consumption the most – customers. Instead, they are passed on to the environment, the café itself, and the local government.

Reflecting on this, I realized that there are two ways to interpret this information. One concerns overconsumption, where reducing the abundant use of disposable cups would lessen the burden on these third-parties. Alternatively, a market-based perspective would identify a poor pricing structure as the root of the problem, in which consumers are not paying the true cost of using a disposable cup. If they were to do so, the negative impact on these third-parties would not be so great.

I found that though these two perspectives understand the problem differently, the literature on resource management and economics both point to the same solution – economic-based instruments. Economic and environmental policy research shows that instituting a price on a previously gratuitous product, to be paid by the customer, generates a revenue that can offset the environmental and social damage of using the product; furthermore, behavior modification studies indicate that this imposed price has an effect on the consumption of that product. Based on this information I began to wonder, could this strategy be used to account for and lessen the negative impacts of disposable cups?

To answer this question, I conducted a five-week study at the Tower Café, a small coffee shop and snack bar abutting Tufts University's Tisch Library. During the study the Café adopted a modified pricing structure that instituted a seventeen-cent price on disposable hot beverage cups. As it is beyond the scope of this study to monetize the environmental damage caused by the use of the cups, this price

accounts for the only external cost of which we are certain, the cost of the cup to the Tower Café.

In order to test the practicality and sustainability of the price change, interviews and surveys were conducted to gauge employee and customer reactions, and point-of-sale and inventory data was collected to record any changes on customers' purchasing behavior during these five weeks.

The results of the study show that the seventeen-cent price signal was successful in both accounting for the Tower Café's expenditure on cups, as well as modifying the purchasing behavior of customers. Furthermore, the price change had only positive effects on employees or customers. Although there were certain limitations that complicated the data, overall the study was a success; the manager of the Tower Café has decided to keep the price changes indefinitely and the Director of Dining Services is exploring expanding the pricing structure to other dining establishments on campus.

This thesis supports the literature that consumer-based price signals can significantly influence purchasing behavior while offsetting one of the negative externalities that arise from the consumption of these products. In addition, it establishes cafés and potentially other retail stores as pertinent locations for using price signals to reduce resource consumption.

I would like to sincerely thank Patricia Klos, Director of Dining Services; David Ford, Manager of Tower Café and Brown & Brew; and Jo-Ann Michalak, Director of Tisch Library. Their encouragement, support, and collaboration were essential in making this study possible.

## **Chapter I: Introducing the Disposable Cup**

Before the early 1900s, disposable cups were practically unheard-of. In fact, it was customary for wells, water barrels, and public faucets to have a common dipper that everyone would share and few people thought twice about drinking from the same cup as a stranger (Durocher, 1982; Grishchenko, 2007). A health scare in the early 1900s changed all this. Upon waiting for the train one day in 1909, the Kansas' Commissioner of Health, Samuel Crumbine, M.D., made a shocking observation: passengers with the then-rampant tuberculosis were sharing the same public drinking dippers as the other passengers (Freeman & Golden, 1997). The officer sent a petition to the state government to request their immediate removal and several days later, Kansas became the first state to abolish drinking dippers in public spaces; by 1912 there was a federal ban in all railroad stations (Durocher, 1982; Grishchenko, 2007; Strasser, 1999).

Public health officials nationwide soon teamed up with manufacturers to increase the use of individual throwaway cups (Strasser, 1999). In 1910, the Individual Drinking Cup Company was incorporated, and in 1919, acquired its now-household name, Dixie (Grishchenko, 2007; Strasser, 1999). Though these cups were first met with high resistance – many people were not willing to pay for what was once free – with the flu epidemic in full swing and influenza on the rise, America soon embraced disposable cups as a way of preventing spreading disease (Strasser, 1999). Soon Dixie cups became recognized for their convenience and they proliferated throughout the country, expanding to retail stores, business offices, and, naturally, food service locations (Ibid.).

Today, paper cups have become a staple of American life. We consume approximately 130 billion cups every year – 53.7% of the world's consumption (Grishchenko, 2007). As convenience food services – who give away thirty to forty percent of America's disposable cups – continue to grow, disposable cups proliferate throughout the nation (Ibid.). Starbucks, the largest coffeehouse company in

the world, alone purchased 2.3 billion paper cups in its 2006 fiscal year (CBC News, 2005; Grishchenko, 2007). And the use of disposable cups is rising; according to the Food Service and Packaging Institute, the demand is expected to rise by 4% every year, making the food packaging a \$15 billion industry in 2008 (Grishchenko, 2007).

## **A. Americans' Growing Love Affair with Disposables**

Manufacturing, marketing, and lifestyle changes in the early and mid-twentieth century allowed Americans to adopt disposable products at the rate that they maintain to this day. Technological and chemical advancements during the mid-twentieth century, notably mass production and the development of synthetic alternatives, led to the increased number as well as variation of goods, allowing for cheaper materials and high product turnover (Tammemagi, 1999; McCollough, 2007; Riell, 2005; Young, 1991).

Soon, a new identity was adopted by the American people: that of “consumer” (Tammemagi, 1999). In the late 1920s, manufacturers and designers started incorporating “planned obsolescence” into their products and in the middle of the century, marketing strategies such as “fads” and “corporate design” were being used in full-force to create a constant acquisition and discard of products (Dobers & Strannegård, 2005; Tammemagi, 1999).

Other researchers have shown that disposables have become more popular due to long-term social changes. Americans' shift to a faster-paced lifestyle and increased reliance on on-the-go eating played an important factor in resource consumption (McCollough, 2007; Riell, 2005). McCollough (2006) found that as incomes rise and free time dwindles, Americans are more likely to choose disposables over a product that they can repair. Furthermore, in order to keep up with the changing lifestyles and preferences of American consumers, restaurants and cafés are compelled to serve their

drinks in disposable cups (Alliance for Environmental Innovation, 2000). These reasons, along with their sanitization benefits, have encouraged businesses to use disposable cups to this day.

## **B. The Benefits of Disposable Cups**

It is currently common practice for fast food restaurants and cafés to provide paper cups, as disposables can be appealing – and, in some cases, necessary. The three primary reasons why businesses favor disposable products are sanitation, cost, and, foremost, convenience (Durocher, 1982; Grishchenko, 2007).

### *Keeping it Clean*

Sanitation was the initial reason for the proliferation of the disposable cup and it remains an important factor today. Disposables are exposed to high heat in the manufacturing process, killing bacteria and rendering the products “practically sterile” (Felix, 1990). In addition, they are handled less and only used once; dishes, on the other hand, are more often exposed to bacteria and must be washed and dried properly to have the same level of sanitization (Durocher, 1982; Felix, 1990). Furthermore, a study of thirty restaurants in Fairfax, Virginia reports that many dishwashers do not sufficiently sanitize ceramic dishware (Felix, 1990). Therefore, it can be a challenge for restaurants and cafés to assure that their dishes are as clean as disposables.

In addition, some dining establishments do not have dishwashing capabilities. For example, the Tower Café at Tufts University was not built with the correct water piping to install a dishwasher (Fisher, 2008). As mugs cannot be washed by the Café, it has relied on disposable paper cups to serve its hot beverages.

*Keeping it Cheap*

Although some reports, such as those by Grishchenko (2007) and Durocher (1982), cite cost as a reason for choosing disposables, studies vary on which option is more cost-efficient. Dishwasher, labor, water, and energy costs may push businesses away from reusables initially, but they can save money in the long-run. A study of thirty Starbucks cafés conducted by the Alliance for Environmental Innovation (2000) reports that using just ten reusable mugs a day in lieu of disposable cups saved their cafés an average of \$6,426 a year. In addition, the price of disposables is highly dependent on the fluctuating costs of paper, gasoline, energy, chemicals, and labor (Riell, 2005). In the end, although some reports claim the contrary, price is not a clear motivating reason why businesses should choose disposable cups.

*Keeping it Easy*

A survey conducted by Cohen and Darian (2000) found that the prevailing reason for purchasing the most common disposable goods is convenience. Disposables require no premeditation or cleaning, and do not need to be returned as they can be easily discarded after use. To reiterate the sociological factors mentioned previously, Americans have less free time and earn a higher income than in previous decades and so many choose disposable products over reusables to save time and effort, despite costs (McCollough, 2007; Riell, 2005). The percentage of people choosing to get their drinks “to-go” rather than “for-here” is increasing, and cafés and coffee shops are compelled to meet that demand (Alliance for Environmental Innovation, 2000). Therefore, many businesses feel they have no choice but to provide disposables (Ibid.).

**C. The Costs of Disposable Cups**

Along with these benefits come the costs of production, purchase, and disposal of disposable cups. As

customers do not pay for a cup, these costs are absorbed by the environment, the cafés themselves, and local governments. Although it is beyond the scope of this study to monetize these impacts precisely, the following section generalizes the costs that are incurred by these third parties.

Impacts on the Environment

Pollution and resource consumption occurs at all stages of a disposable cup’s lifecycle, from the harvesting of trees through production and transportation to disposal in a landfill, incinerator, or public area as litter. (See Appendix II for the environmental impacts of a cup throughout its lifecycle.) Several studies give insight into the scale of the environmental impact they cause. The table below outlines the resource consumption of manufacturing and disposing the 2.3 billion cups that Starbucks’ consumed in 2006. (Figures provided by the Environmental Defense Organization’s Paper Calculator.)

ENVIRONMENTAL IMPACT OF STARBUCKS’ COFFEE CUPS (2006)							
Cups Thrown Away	Wood Consumed	Trees Cut Down	Energy Consumed	Equivalent Number of Homes that Could be Powered	Water Used	Equivalent Olympic-sized Swimming Pools	Solid Waste Created*
2.3 billion	136,789 tons	944,211	702 billion BTUs	7,747	569 million gallons	859	36 million lbs.

\*Starbucks’ disposable hot beverage cups are not recyclable (Starbucks Coffee Company, 2007)  
Adapted from a table created by (Starbucks Coffee Company, 2007), based on figures from the Environmental Defense Organization’s Paper Calculator

This study does not include the air and water pollution that is emitted at each of these stages. The financial value of the environmental impact outlined above could be estimated based on the market prices of wood, energy, and water, as well as the costs of environmental abatement.

**THE ENERGY DEBATE.** There has been a long-standing debate over the comparative energy-efficiencies of disposable products and reusable dishware. A study that is frequently cited is one conducted by Martin

Hocking, a professor at The University of Victoria in British Columbia. Hocking (1994) reports that one would have to use a reusable cup as much as 1,000 times in order to justify the higher energy requirement during production. Yet this study omits the impacts of deforestation, transportation, packaging, and disposal; a more complete picture is needed to truly debate the environmental costs of disposable versus reusable cups.

Starbucks teamed up with the Alliance for Environmental Innovation to more accurately compare the two, naming reusable products the more environmentally-friendly option (Alliance for Environmental Innovation, 2000). Their study found that using ceramic mugs in place of disposable cups would reduce resource consumption and pollution to an astounding extent, even including the impacts of manufacturing, use, and dishwashing:

	 <p><b>Reusable ceramic mugs vs. disposable paper cups</b></p>
<b>Break-even point*</b>	70 uses
<b>Water Pollution &amp; Use</b>	Reduced... <ul style="list-style-type: none"> <li>• water pollution by 99%</li> <li>• water use by 64%</li> </ul>
<b>Air Pollution</b>	Reduced... <ul style="list-style-type: none"> <li>• air particulates by 86%</li> <li>• greenhouse gases by 29%</li> </ul>
<b>Solid Waste</b>	<ul style="list-style-type: none"> <li>• Reduced by 86%</li> </ul>

\*break-even point refers to the number of uses of the reusable product required to offset the environmental benefits of its manufacture, compared to the opposing disposable product.  
 (Table based on data from Alliance for Environmental Innovation's report [2000])

The study did not compare paper cups with plastic commuter mugs; however, as the production of plastic is less energy-intensive than ceramic, we can assume that the benefits of plastic mugs are even greater than ceramic ones (Alliance for Environmental Innovation, 2000). These results suggest that reusable mugs are less costly for the environment than disposable cups, and we find that the same

conclusions are also true for businesses.

*Impacts on the Cafés*

As disposable cups bring in no revenue, their purchase, storage, and disposal costs are absorbed by the café. For example, the Tower Café and Brown & Brew spend around \$8,000 annually purchasing their cups (See Appendix XI). Although disposable cups are often seen as a necessity to food business, reusable alternatives can have direct economic benefits. A study conducted at 30 Starbucks stores shows that even using as few as 10 reusable mugs a day in lieu of 10 disposable cups a day can yield the following savings:

<b>Cost</b>	\$6,426
<b>Water</b>	8,155 gal.
<b>Greenhouse Gases</b>	1,130 lbs.
<b>Solid Waste</b>	1,260 lbs.

Based on the data in p.10 of Alliance for Environmental Innovation's study (2000)

As the study included the costs associated with dishwashing and packaging, a business's cost savings would be even higher if customers brought their own commuter mugs.

In addition to these savings, the Alliance of Environmental Innovation cites increased customer satisfaction and enhanced brand equity as the two other primary benefits of using reusable over disposable cups (2000). A fourth may be increased marketing and merchandise; i.e., promoting of commuter mugs allows the business to boost its sales of reusable mugs stamped with its logo.

In addition, a business may experience cost savings associated with garbage removal. Unlike residents, businesses pay for their trash removal, usually per volume (Raab, 1992). And this pick-up is often costly; the Consumer Affairs Department of New York City states that it is normal for a fast-food restaurant to pay a private hauler \$36,000 a year for trash pick-up (Ibid.).

*Impacts on Local Governments and the Public*

Although the impacts are not as significant or as demonstrated, a reduction in the consumption of disposable cups would also theoretically affect local governments, and therefore, ultimately, the public. Bruce Walker, the Solid Waste & Recycling Program Manager of Portland, Oregon, has observed that a noteworthy proportion of waste in public garbage cans is from disposable containers, largely coffee cups (Helfrich & Sanders, 2003). As the city spends over \$200,000 each year collecting garbage from these public cans, a reduction in thrown-away cups would have positive consequences.

If the cups are not disposed of in garbage cans, they can end up as litter. Studies conducted in the United States and Canada have consistently shown that one of the largest percentages of litter was cups, lids, and straws; at one point, in Nova Scotia, they accounted for as much as one third of all the litter in its roadways and ditches (CBC News, 2005; Beck, 2007a; Beck, 2007b; Southeast Environmental Association, 2005). And this litter is costly; the Georgia Department of Transportation claims that an estimated \$14 million is spent yearly on litter clean-up statewide (Georgia County Government, 2006).

Although it is beyond the scope of this study to monetize these impacts precisely, it is clear that disposable cups have considerable costs. However, these costs are not paid for by those who contribute to their consumption the most – customers; instead, they are passed on to the environment, the business, and local governments. As a result, a two-fold effect occurs: first, this contributes to a market failure where the costs of using of a resource are not properly shared with those who benefit from using it. Second, customers have no economic incentive to limit their use of disposable cups, and therefore their overabundant consumption can exacerbate the aforementioned negative impacts. The following chapter is an exploration of these issues and of possible solutions.

## **Chapter II: What is the Issue? Resource Management and Market-Based Perspectives**

Imagine two people considering the costs described in the previous chapter, those absorbed by businesses, the environment, and the public due to consumers' high demand for disposable cups. Person A may believe that the root of the problem is in a flawed pricing structure: customers are not paying the true cost of the cup and so the costs fall onto third-parties. Her solution may be to find a method to correct this market failure, and holds what we can call a "market-based perspective". Person B may regard it as a resource management issue; he may think that the impact on these third-parties would not be so great if Americans reduced the number of cups they consumed. We can label this a "resource management perspective".

Although these two interpretations differ in what they deem to be the underlying problem, the literature suggests that the use of one economic instrument in particular can help solve both issues simultaneously. Economic and environmental policy research shows that instituting a price on a previously gratuitous product, to be paid by the customer, creates a revenue source to be used to offset the environmental and social damage of using the product; furthermore, behavior modification studies indicate that this imposed price has an effect on the consumption of that product (Convery et al., 2007; EPA, 2004; McKenzie-Mohr, 1999; Roseland et al., 1998; Santos & Shaffer, 2004). The following chapter draws two parallel paths: one, the market-based perspective, with a goal of correcting a market failure; and the other, a resource management perspective, which searches for a way to reduce the consumption of products. In the end, we see that the two interpretations converge in their search for a solution – an economic price signal.

## **A. Market-Based Perspective**

Garret Hardin's publication, "The Tragedy of the Commons" (1968), illustrates the classic example of the damage that can occur when individuals, acting in their best interests, share the costs of a resource but not the benefits. Hardin uses an allegory of a band of sheep herders whose flocks share same fenced-in pasture. A herder, upon realizing that he will benefit by maximizing his yield – i.e., increasing the size of his flock – does so; however, the quality and availability of grass degrades with each additional sheep. This degradation impacts all the herders while only one reaps all the benefits. As the other herders catch on, they too add more animals to their flock. Soon, the pasture is overgrazed by the increasing number of sheep, benefitting no one – thus defines the tragedy of the commons.

But why speak of sheep herders, which is frankly a little dated, when we can use a more apt metaphor. The consumption of disposable coffee cups serves as a contemporary example of the tragedy of the commons. A customer orders a drink in a café and receives it in a gratuitous paper cup. Fifteen minutes later, the cup ends up in a trash can – or worse, a roadway ditch – and is no longer her problem. The customer benefits from this transaction because using a disposable cup maximizes the contemporary definition of yield: time and effort saved.

However, as described in Chapter I, businesses, local governments, and the environment bear the costs that accompany the use of disposable cups; economists call these "externalities". In essence, an externality is the cost that is placed on third party when an economic transaction does not account for all of the consequences of that transaction. In this case, as the customer does not pay for the production and disposal costs of using the cup, the burden falls onto businesses, local governments, and the environment.

### Correcting the Market Failure

In his book, *The Economics of Welfare* (1920), the British economist Arthur Pigou proposed a method to correct this market failure. By monetizing externalities, they can be accounted for, or internalized, in the market in the form of a tax, now known as a Pigouvian tax (Pigou, 1920). The goal of this economic device is to ensure that private costs of a resource are consistent with the true social costs of using that resource (Ibid.). A simple example of this would be to tax the customer for their use of a disposable cup, allocating that revenue toward offsetting the costs incurred by businesses, local governments, and the environment.

## **B. Resource Management Perspective**

While a market-based solution is intuitive to correcting a market failure, those of the resource management perspective have several possible paths they could take to achieve their goal. Researchers have explored the efficacy of various approaches to reduce the abundant use of resources – including government regulation, controlling the activities of industries and firms, and grassroots social movements – though the literature is greatly in favor of consumer behavior modification techniques (Roseland, 1998; Durocher, 1982; Kennedy, 2007). Instruments that target end-user consumption are called “demand management” strategies (Roseland, 1998). The theory is that, in a world of abundant resources with a free market, supply will meet or exceed demand; therefore, a logical way to reduce the abundance of a resource is to reduce the demand for it (Ibid.).

### Modifying Behavior

In order to determine an appropriate demand management strategy, we must look into the factors that affect consumer decisions. Much of the literature assumes that customers have only one alternative to

a paper take-away cup – a plastic commuter mug<sup>1</sup> (Durocher, 1982; Grishchenko, 2007; Kennedy, 2007; Young, 1991). Although there exist other solutions, such as bioplastics and biodegradable cups, their positive impact on limiting resource consumption has not yet been established and for a variety of reasons these products are not currently viable for most food service businesses<sup>2</sup> (Foster, 2002; Gardner & Sampat, 1998; Ren, 2003).

However, even if a customer morally values bringing her own mug, studies of modern behavior have shown that there exists a “value-action gap” – a disparity between what Americans think and how they act (Carlson, 2005; Dunlap 2007; Kollmuss & Agyeman, 2002; Marcell, Agyeman & Rappaport, 2004; McKenzie-Mohr & Smith, 1999; McCarty, 2001). In other words, Americans’ behaviors often do not follow their environmental attitudes. The barriers to environmental behavior are multifarious and interwoven, including internal and external factors such as: limited environmental knowledge, cultural paradigms, the stickiness of previous behaviors and habits, political barriers and motivations, and financial restraints, to name a few (Kollmuss & Agyeman, 2002; McKenzie-Mohr & Smith, 1999). Therefore, it is necessary to provide an incentive for favorable behaviors that is large enough to overcome these barriers (Kollmuss & Agyeman, 2002; McCarty, 2001).

### **C. Economic Instruments**

It is here that these two perspectives converge: research shows that economic instruments, such as those that account for negative externalities, can effectively control the overabundant use of resources. Mark Roseland, author of many texts on sustainable community development, defines “economic instruments” as tools that financially reward favorable behavior or financially discourage unfavorable

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<sup>1</sup> We assume that the coffee is the reason for the purchase, not the cup. See III(g): Assumptions.

<sup>2</sup> Briefly, these limitations include: the need for clear and consistent labeling, source and end separation, careful composting operation, higher costs, and the inability to address littering problems and pollution associated with production and transportation (Ren, 2003).

behavior (1996). One can see how similar this is to the goal of a Pigouvian tax, which has the consumer to pay for the costs of a behavior that has negative social or environmental impacts.

Case studies from around the world have shown that strategically pricing a formerly free resource generates revenue to combat the costs of externalities, while discouraging its high consumption. One of the most successful examples is Ireland's plastic bag tax. In 2002, the Irish government imposed a €0.15 (US\$0.13<sup>3</sup>) tax on plastic bags to be paid by shoppers at the point-of-sale<sup>4</sup> (Ireland Ministry for the Environment, 2001). A report by Convery, McDonnell, & Ferreira (2007) states that within two years, there was a 94% reduction in plastic bag consumption and a substantial increase in litter-free areas, as well as overwhelming support for the program from customers and retail stores. In the first year, the revenue generated from the levy was €12 million (US\$10.4 million) – over thirty times the costs of collection. These funds were appropriated to an environmental fund that supports programs to prevent and reduce waste, research on waste management, projects to improve the quality of the local environments, environmental education, and much more (Ireland Ministry for the Environment, 2008).

Another example of internalizing third-party costs is London's Congestion Charging Scheme. In 2003, the city instituted a £5 (US\$8) charge to motorists entering central London. In the first year, congestion within the zone dropped by 30% and overall traffic levels by 16%, and bus travel became more reliable (Santos & Shaffer, 2004). The scheme produced a revenue of £68 million (US\$106 million), which is being used to improve public transportation (Ibid.).

Other studies in the United States also suggest that taxing activities with negative environmental consequences can change Americans' behavior. For example, conventionally U.S. residents do not have a financial incentive to reduce their waste output, which has numerous environmental impacts (Tammemagi, 1999). However, cities across the country have implemented pay-

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<sup>3</sup> Conversions from the Euro to US dollar were done via FXConverter (FXConverter, 2008).

<sup>4</sup> The charge was increased to €0.22 in 2007 (Ireland Ministry for the Environment, 2007).

as-you-throw waste reduction programs, charging residents for each garbage bag they put at the curbside (McKenzie-Mohr & Smith, 1999). San Jose, California, realized a 47% decrease in waste sent to landfill and a 158% increase in recyclables after instituting its pay-per-throw program (Ibid.). Fort Worth, Texas's program reduced municipal solid disposal costs by \$8 million, and the 350% increase in their recycling rate allowed the city to generate \$540,000 in the sale of their recyclables (EPA, 2004). These funds have contributed to initiatives to expand recycling and other waste management initiatives, as well as increase environmental education projects (EPA, 2004; McKenzie-Mohr, 1999)

#### **D. In Conclusion**

Strategic pricing schemes can require customers to pay for the externalities of using a resource, while simultaneously reducing its consumption. The goal of this thesis is to test how applicable such a price signal can be for disposable hot beverage cups. A five-week study was conducted at a café, where a price was placed on cups to be paid by the customer at the time of purchase. In order for the study to be considered successful, the price change was tested for its practicality and sustainability along with its efficacy – i.e., its ability to improve or have no effects on consumer and employee satisfaction as well as on the business's financial bottom line. This thesis reports on one retail store's experience, testing the price signal's viability as a tool for accounting for negative externalities and reducing the consumption of disposable paper cups.

## **Chapter III: Methodology**

The heart of my thesis is to study if placing a price on disposable paper can practically and sustainably internalize the costs of negative externalities while reducing their consumption. To test this supposition, I conducted a short study at the Tower Café, a small coffee and snack bar abutting the Tisch Library at Tufts University. Over the course of five weeks during the 2008 spring semester, a new pricing structure was implemented affecting hot beverages. Before the study, the cost of a hot drink implicitly included the cost of a cup, similar to most cafés; however, during these five weeks, a “hot cup and lid” was listed as a separate menu item with its own price – seventeen cents.

To clarify, in this study I refer to “cost” as the amount paid by the business for a product, and “price” as the amount established by the business to be paid by the customer.

### **A. Economic Rationale**

Various methods were considered to determine the price of the cup, notably a survey approach<sup>5</sup>, used by the Irish government for their plastic bag tax; a mathematical model, like the one developed for London’s Congestion Charging Scheme<sup>6</sup>; and a standard Pigouvian tax<sup>7</sup>. After much consideration, a modified form of the Pigouvian approach was chosen in order to internalize the known externality, the cost of the cup to the Tower Café.

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<sup>5</sup> A survey, or willingness-to-pay, approach determines the price that consumers would be willing to pay for a resource, and then set the price at or above that level (Callan & Thomas, 2006).

<sup>6</sup> See the study conducted by Santos (2004).

<sup>7</sup> The Pigouvian tax attempts to monetizing externalities and account for them in the market in the form of a tax (Pigou, 1920). See Chapter III(d).

*Limitations of the Economic Model*

Certain limitations prevented the use of a direct Pigouvian tax. First, the tax would require the monetization of the negative externalities associated with the production and disposal of cups. This would include all the negative impacts incurred by the environment, business, and local government as described in Chapter I. Furthermore, these impacts would need to be monetized specifically for the Tower Café and Medford, Massachusetts, in order to be accurate. However, these figures are currently unknown, and their laborious calculation would be beyond the scope of this study. Therefore, the price change adopted in this study accounts for the only cost of which we are certain – the cost of the cup to the Tower Café.

Additionally, Tufts Dining Services expressed that it was important that the prices between on-campus dining establishments be kept equivalent to reduce competition between them (Fisher, 2008). Therefore, unlike the Pigouvian model, this study does not create a tax on cups, which would make coffee plus cup prices more expensive at Tower than the Campus Center nearby, but rather subtracts the price of the cup from the price hot beverage and then makes a cup a separate purchase.

*Determining Cup Price*

The Tower Café spends fifteen to twenty cents on a cup, lid, and sleeve, depending on the size. (See Appendix XI.) As each cup size has a different cost, it was necessary to decide whether to have three different prices or a single price. The scenario with a single price was chosen by the Director of Dining Services and the Tower Café Manager so as to facilitate the transition for customers and employees. The three cups costs (15, 17, and 20 cents) were averaged together to form a price of seventeen cents.

EXTERNALIZING CUP COSTS: ONE CUP PRICE (IN US DOLLARS)			
	12 oz.	16 oz.	20 oz.
Pre-Study Hot Beverage (HB) Price	1.54	1.74	2.04
Cost of Cup	0.15	0.17	0.20
Pre-Study HB Price minus 17¢ cup*	<b>1.39</b>	<b>1.57</b>	<b>1.84</b>
Restructured HB Price*	<b>1.39</b>	<b>1.57</b>	<b>1.84</b>
Price of Cup	0.17	0.17	0.17
Price of HB for Mug-Bringer*	<b>1.39</b>	<b>1.57</b>	<b>1.84</b>
Price of HB Buying a Cup	1.56	1.74	2.01
Tower Profit Per Mug Brought	0	0	0
Tower Profit Per Cup Bought	-0.02	0	0.03

\*These prices are equivalent.

The table above shows the price changes as seen by the customer and by the Tower Café. Customers who bought a cup paid approximately the same price as before the study; those who brought their own mug saved seventeen cents. Though buying a small cup resulted in a negative profit of \$0.02 for the Café, it was assumed to be offset by the gain in profits of \$0.03 for each large cup bought. This is significant because it was essential that the Café did not lose profits due to the new pricing structure.

As with the Pigouvian tax, this economic model does not guarantee that the cost of the cups is high enough to motivate behavior change. In other words, it is possible that the cost of the cup may be within the range that customers are willing to pay for a cup. However, in informal discussions, my advisors, several Tufts students and professors, as well as the Director of Dining Services estimated that cup prices based on these costs could reasonably elicit a change in customers' purchasing behavior.

### Previous Incentive Program

Before this study, dining establishments at Tufts University offered a mug discount program; when a customer brought in a mug, she would receive ten cents off the hot beverage purchase. Through this

study, Dining Services realized that the amount of the discount was out-of-date and no longer reflected the true cost of the cup, lid, and sleeve. It therefore does not cover the most obvious negative externality incurred by the Tower Café, the cost of the cup.

The existence of the discount program is noteworthy as it shows that an economic incentive was already in place when the study began. However, participation was notably low: only 3.10% of customers at the Tower Café and 0.37% of customers at Brown & Brew – a larger on-campus café – received the discount, according to data collection from a one-month period in 2007 (see Appendix XII). These results are not uncommon for other cafés as well: in its 2006 fiscal year, Starbucks Coffee reported that only 1.2 percent of customers received a ten-cent discount for bringing in a mug, and that the percentage has been decreasing for the last five years (Starbucks Coffee Company, 2007). This study is designed to account for the negative externalities incurred by the Tower Café and increase the number of mug-bringing customers by using a method that is strongly supported by economic and behavior modification research.

## **B. Tower Café Selection**

Several sites were considered for this study, including four on-campus and two off-campus locations. On-campus locations were preferred as Tufts' Director of Dining Services was particularly supportive of initiatives to reduce resource consumption. The Tower Café was ultimately the best choice due to its location, size, and facilities. As it abuts Tisch Library, the Tower is a well-visited location by Tufts students, faculty, and staff, as well as by prospective students, parents, and visitors to Tufts University. Due to its popularity and convenient location, it has a high volume of regular customers. The Tower is a small café intended as a meeting place or a respite for students during study breaks, and offers a limited menu of hot and cold drinks and several snack foods. The Café serves four kinds of hot drinks (two of

which are the same price) as opposed to the over twenty drinks of varying prices available at Tufts' Brown & Brew, another site that was of consideration. Additionally, the Tower was built with a public sink for customers to conveniently wash their mugs.

### **C. Study Period**

The effect of the new pricing structure on the Tower Café was monitored from Monday 11 February 2008 until Friday 14 March 2008. Adequate preparation, appropriate study length, and compliance to thesis deadlines were the deciding factors in determining the study's start date and duration. The Director of Dining Services, the Manager of the Tower Café, and various advisors recommended a study length of no less than four weeks in order to gather an appropriate range of data. Final approvals and preparation were not completed until early February, and the study commenced as soon as possible, on Monday 11 February. Friday 14 March, five weeks after the anticipated start date, marked the beginning of Spring Break and therefore was an appropriate ending point. This end date also provided an appropriate length of time for analysis and thesis completion.

The first week of the study – Monday 11 February through Friday 15 February – was considered a testing period for the employees, after which revisions were made in marketing materials. Though the study was instituted and data were collected for a total of five weeks, this first week is not included in the final analysis. (See section "F. Data Collection" for details.)

### **D. Approval Procedure**

Approval was needed from multiple members of the Tufts community before the study could be conducted: the Director of Dining Services, the Manager of the Tower Café, and the Manager of Tisch Library. This required drafting proposals, attending various meetings, and a great amount of interaction

with the Manager of the Tower Café.

The authorization process began in November 2007, when a proposal outlining all the components of the study was drafted and sent to the Director of Dining Services. (See Appendix IV for the submitted proposal.) Correspondence continued with Dining Services into December and over winter break, whereupon the study was approved. In early January 2008, the Director presented the proposal to the Manager of the Tisch Library, and consent was achieved in mid-January.

At this point, the preparation process could begin. Multiple meetings were held with Dining Services and the Manager of the Tisch Library to approve marketing materials and to arrange interviews and data collection. During the study period and the weeks preceding, the greatest amount of interaction was with the Manager of the Tower Café and Brown & Brew. His collaboration was integral to the success of the study, taking the effort to change the menu board, arrange the employee training and interviews, and maintain constant communication during and after the study to collect and discuss the quantitative data.

## **E. Marketing**

Minimal marketing was done so as to mimic the normal operations of a café. Informational sheets targeted at customers were placed in front of the register, several announcement signs were posted inside and outside the Café, and the menu board was updated to reflect the new pricing structure. Otherwise, no social marketing or educational components were used.

Educational materials avoided any mention of the benefits of reducing consumption to place the emphasis on the economic disincentive of purchasing a disposable cup. The announcement signs simply noted that the Café had changed their prices, and the menu board reflected the changes noted in Table IIIA. (See Appendices V through VII for copies of marketing materials.)

The headline of the informational sheets was, “The tower café’s 17-cent cup – know what you’re paying for.” This was chosen to emphasize the economic component of the price change. The sheet briefly explained the new pricing structure and answered several basic questions – what kind of mugs were accepted, how much a customer could save, where the price seventeen cents came from, e.g. The only reference to the environment was the last question, “is it true that disposable cups are better for the environment than reusable mugs?” There has been a long-standing debate about the environmental impacts of reusable versus disposable cups, and so, to ensure that customers’ misinformation did not affect the study, a general response was provided clarifying that reusable cups are better for the environment than disposable ones.

Beverages		Pastries
Fair Trade Coffee	12 oz. / 16 oz. / 20 oz. 1.37 / 1.57 / 1.87	Scones
House blend, decaf, French roast, flavors		Chocolate Chip, Blueberry
Tisch Library Travel Mug	1.50	Muffins
Brewed Tea	1.32 / 1.42 / 1.52	Cranberry Nut Orz Chocolate Chip, De
Organic Darjeeling choice estate, Bombay chai, Earl Grey, Breakfast Americana, Chamomile, African rooibos, mint melange, Orange jasmine, green tea tropical		Cookies
Hot Cup and Lid	.17	Chocolate Chip, Cranberry Gran
Brewed Iced Tea/Iced Coffee*	1.70 / 2.09	
Poland Spring Water	1.10	<b>Light Fare</b>
Fountain Soda	.99 / 1.19	Organic Fat Free
Assorted Juice, 10 oz. orange, apple, cranberry	1.25	Yogurt Parfait
Hot Chocolate	1.33	Fresh Fruit *
Oregon Chai	1.33	Sushi California R

The Tower Café menu board during the study.  
Note the slide for the hot cup and lid.

## F. Data Collection

Qualitative data, in the form of surveys and interviews, were collected periodically at the Tower Café over the five-week period to study customer and employee attitudes regarding the price change. Quantitative data, taken from the cash register and inventory reports, were used to determine if there was any change in customers’ purchasing habits. The success of the price signal was determined by these combined data.

Qualitative Data Collection

With the intention of gauging customer and employee reactions to the new pricing structure, I conducted six employee interviews and collected self-recruiting customer surveys during the five-week study. The design of the survey was based on recommendations by Schaeffer and Maynard in their book, *Standardization and Interaction in the Survey Interview* (2001), and also by Floyd J. Fowler in, *Improving Survey Questions: Design and Evaluation* (1995). The interviews were structured after the methodology outlined by Jaber Gubrium and James Holstein in, *Handbook of Interview Research: Context & Method* (2001). Surveys and interview questions are included in Appendices IX & X.

**SURVEYS.** The purpose of a survey is to “conduct measurement by question” (Schaeffer & Maynard, 2001). A four-question survey targeted customers who purchased a hot beverage at the Tower Café, intending to gather and measure the following:

Customers’...

- intended behavior change;
- emotional response to paying separately for a cup; and
- open-ended feedback and suggestions regarding the price change.

As such, questions were designed to measure subjective states, which is the respondents’ “knowledge and perceptions, their feelings, and their judgments” in which there are no right or wrong answers (Fowler, 1995).

In order to present the survey as quick and easy, it was limited to four questions, each targeting a specific goal as mentioned above. There was a mix of closed- and open-ended questions to guide the respondent and then allow her to elucidate on her thoughts (Ibid.). The closed-answer questions gave the option of “Other,” with a space for participants to write their own responses.

Question one was designed to determine customers’ intended behavior change in reaction to the price change, i.e., whether they plan to continue bringing their mug as usual, will try to bring a mug

more often, or will likely buy a cup each time they purchase a hot beverage at the Tower. Question two gauged the customer's emotional reaction to paying for a cup, allowing them to select if they were "happy or pleased" with the new price change (if they liked it), if they were "angry or upset" (if they did not like it), or if they were "apathetic" (if they did not care). The third question was open-ended, allowing respondents to elucidate on why they felt as they indicated in the previous closed-ended question. The fourth and final question was open-response, asking the customer to comment freely on the price change. It was designed to elicit any further comments that she might have had. Wording was carefully chosen as to remove the study organizer's bias. All surveys were anonymous and asked no identifying information, and were pilot-tested on four undergraduate students.

Surveys were printed on small sheets of green paper and placed in front on the register for the entire study. Participants were self-recruiting. A small sign solicited participation only from customers who purchased a hot beverage, and this message was reinforced on the survey itself, asking customers to fill out the survey only if it coincided with a hot beverage purchase. A separate sign indicated that participants should place completed surveys in a small opaque box nearby, which was designed so that customers could not pull out or read other completed surveys.

**INTERVIEWS.** I conducted longitudinal interviews with two of the Tower Café employees on the first, third, and fifth weeks of the study, making six interviews total. The two employees volunteered to be interviewed through communication with the Tower Café Manager. I met with each interviewee independently at the Tower Café, where we spoke for approximately a half-hour per session. The questions were designed to:

- measure employees' comfort with and opinions about the price change;
- determine what impact the price change had on the Café's daily business operations;
- bring to light any notable customer interactions pertinent to the study;
- solicit employees' opinion on any change in customers' purchasing behavior; and

- engage in a discussion about how to improve the program.

The qualitative interviews were “guided conversations,” having an “exploratory character; probing for details and depth of experiences” (Gubrium & Holstein, 2001). As such, interview questions were open-ended and the process was semi-structured in order to allow for this guided conversation. Great attention was placed on the formation and delivery of the questions to eliminate bias.

The interviews were designed to use three types of questions: “(1) main questions that begin and guide the conversation, (2) probes to clarify answers or to request further examples, and (3) follow-up questions” that allow the interviewee to summarize or fill-in any missing points (Ibid.). The interviews consisted of ten to twelve specific questions, and though they were not pre-tested, they were reviewed by two Tufts professors and two staff members for relevance and coherence (Ibid.).

### *Quantitative Data Collection*

To determine the effectiveness of the price change on reducing the number of paper cups sold, primary data were collected by monitoring cup sales during the study’s five-week period (Monday 18 February 2008 through Friday 14 March 2008) as well as the equivalent amount of time exactly one year before (Monday 12 February 2007 to Friday 16 March 2007). In addition, quantitative data were collected from a control study, Brown & Brew, a larger on-campus café supervised by the same manager as the Tower Café, to eliminate the influence of external variables. The price change was not administered at Brown & Brew; however, the café did offer a 10-cent discount if a customer brought in a mug.

Data were collected from the inventory database and cash register (in the form of a Product Mix Report) through a program called Black Board. From the Inventory Report, primary data include the total number of cups used and their cost to the cafés. The following quantities were collected through the Product Mix Report: mug discounts given (pre-study), hot cups sold (during the study), mugs sold, and hot drinks sold. The table below summarizes the sources of the quantitative data, as well as when

they were collected.

DATA SOURCES	
Product Mix Report	Inventory Report
Quantity of... <ul style="list-style-type: none"> <li>Hot beverages purchased</li> <li>Tisch travel mugs purchased</li> <li>Mug discounts given (pre-study)</li> <li>Hot cups purchased (during study)</li> </ul>	<ul style="list-style-type: none"> <li>Number of cups bought</li> <li>Cost of cups bought</li> </ul>
DATA COLLECTION TIME PERIODS	
<b>Pre-study period:</b> 19 Feb 2007 - 16 Mar 2007 <b>Study period:</b> 18 Feb 2008 - 14 Mar 2008	<b>Pre-study period</b> <b>Study period</b> 2006/2007 Academic Year 2007/2008 Academic Year

The number of hot beverages sold minus the number of hot cups sold determined how many hot drinks were purchased without an accompanying cup purchase<sup>8</sup>.

The cash register was reprogrammed to monitor hot cup sales, lowering the prices of the hot beverages by seventeen cents and adding an extra button – Hot cup – to ring up the seventeen-cent hot cup purchase.

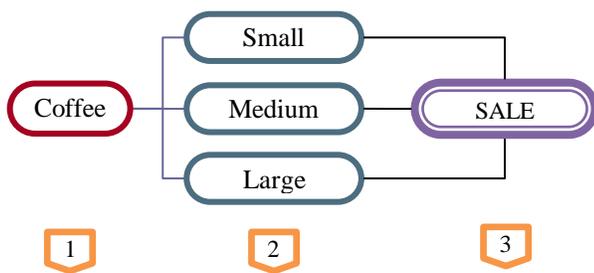
REGISTER PRICES BEFORE THE STUDY			
	12 oz.	16 oz.	20 oz.
Coffee	1.54	1.74	2.04

REGISTER PRICES DURING STUDY			
	12 oz.	16 oz.	20 oz.
Coffee	1.39	1.57	1.84
Hot Cup	0.17	0.17	0.17

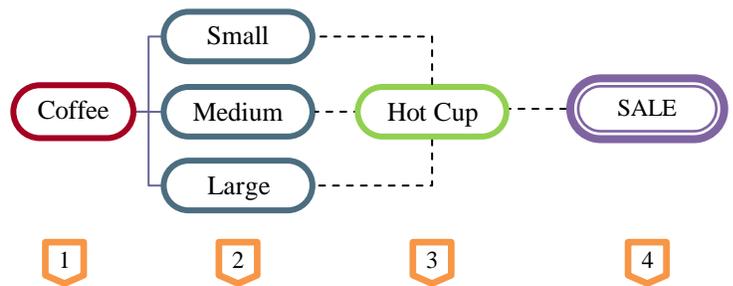
<sup>8</sup> This number does not necessarily indicate how many customers brought in a mug. Please see the Analysis section for more details. Conversely, receiving a mug discount (as was the system before the study and is the system at Brown & Brew), does indicate that the customer brought in a mug.

If a customer wished to purchase a disposable cup, this increased the number of buttons an employee had to hit from three to four.

**Register Buttons Before the Study**



**Register Buttons During the Study**



The re-programmed register at the Tower Café.

The hot cup button was outlined in red by the employees.

## **G. Assumptions**

In order to analyze the data, various assumptions were made in this study. First, we assume that customers who receive a disposable cup do not value the cup in itself as much as the service it provides (Gardner & Sampat, 1998; Kennedy, 2007; Young, 1991). In other words, the coffee is the reason for the purchase, not the cup. It is presupposed that the customers of the control study, Brown & Brew, were not statistically different than those who patronized the Tower Café. Additionally, it was assumed that if a consumer decided to start bringing a mug to the Tower Café during the study, it was a result of the economic incentive and not due to a shift in their attitude as it relates to resource consumption. The effect of this variable was largely eliminated through the data provided by the control study, as is shown in Chapter V: Analysis.

## Chapter IV: Results

The results show that there were two significant changes in customers' consumption behavior during the study period as compared with the year before: both the number of purchases made without a hot cup and commuter mug sales increased. Summaries of the data from the employee interviews, customer surveys, the Product Mix Report and the Inventory Report are included below. The formatting of this section was influenced by *Cooling the Campus* (2004) by Marcell, Agyeman & Rappaport.

### A. Qualitative Data

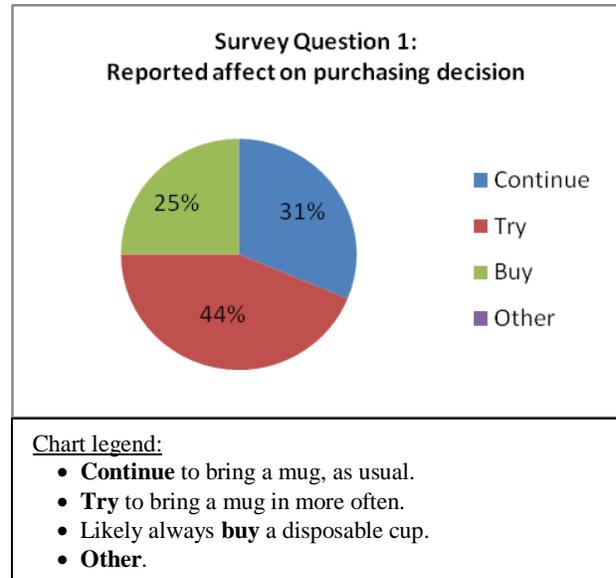
The following is a report of the data from the sixteen customer surveys and six employee interviews conducted over the study period. This data are intended to gauge customer and Tower employee reactions to the new pricing structure.

#### Surveys

A four-question survey was administered during the five-week study period targeted at customers who purchased a hot beverage at the Tower Café. Surveys were placed beside the register and respondents were self-recruiting. The survey was composed of two closed-ended questions to determine how the respondents plan to change their purchasing behavior, as well as to measure their attitudes about the price change. It also contained two open-ended questions to allow respondents to explain their answers. The responses below are sorted by question.

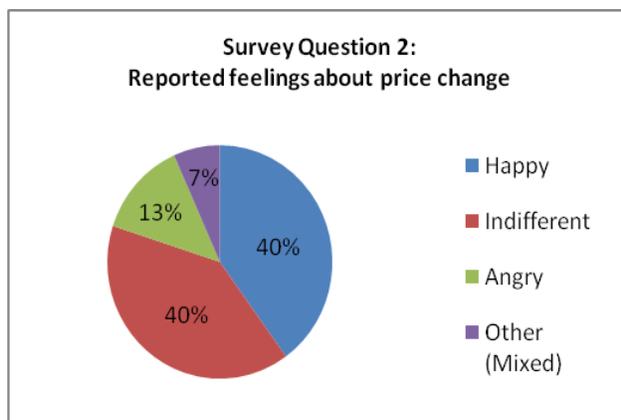
**(1) CHANGE IN CONSUMER HABITS: How does the price of 17¢ per cup affect your purchasing decision?**

Survey participants most frequently selected that they were willing to try to bring their mugs more often as a result of the price change. As the chart to the right shows, approximately 70% of the survey respondents did not usually bring their mug at the time of the survey, but more than half of those customers said that they would try to bring them more often.



**(2) & (3) EMOTIONAL REACTION: How do you feel about the hot drink prices being cheaper, but asked to pay 17¢ for a cup?**

Based on the responses to question two alone, there were an equal number of participants who responded “Happy; I like the new price change” and “Indifferent; I don’t care.” It



would seem of slight concern that 13% responded “Angry or upset; I do not like the new price change,” though, gauging by their explanations in question three, those customers were not against paying the seventeen cents; rather, they did not like the change because they thought that there

were better ways to have an impact. One person who responded “Angry or upset” stated his or her reason because, “seventeen cents is too little.” Another commented that “there are far better ways to decrease [our] env. [environmental] impact.”

**(4) COMMENTS OR SUGGESTIONS.** The responses to question four were sorted under five categories: positive, corrective/offering suggestion, neutral, conflicted, and misinformed, with several comments falling under more than one heading. Most comments fell into the “positive” or “corrective/offering suggestion” categories. The comments under the “positive” heading largely recognized the implications as they relate to resource consumption and applauded the effort:

- “I think this is very green and an overall good thing. I will make every effort to bring a mug.”
- “I always try to bring a mug[.] This would help me remember – also appreciate reduced price!”
- “I think it will cut down on waste and encourage library patrons to use the approved cups.”
- “I think it is fair to separate price of a drink from the cup. ...Thank for you taking the initiative [sic]!”

The majority of the comments under the “corrective/offering suggestion” heading recommended raising the price of the cup or increasing marketing and educational materials:

- “I would even raise a price to \$.30 or .50 to make it more substantial and to incentivite [sic] ppl more. I would do a little more educ. regarding the reasons for changing the price – this [is] a chance to educate people/students about real costs and the meaning of their purchasing decision. For example, on the sign announcing the price change – you can include reasons for doing so.”
- “The ¢17 should increase so that more people start bringing mugs. I think it's a great idea, but ¢17 seems too little.”
- “There are far better ways to decrease [our] env. impact, like getting a one-at-a-time napkin dispenser. ...Who gives a survey over 17¢ anyway?”

Other comments showed that some customers were misinformed about the services and prices at the Tower Café. For example, one respondent did not know that commuter mugs were available for sale at the Café. Surprisingly, only one participant cited inconvenience as the obstacle to avoiding buying a hot cup: “I'm glad the prices are cheaper, but it's hard to remember to carry my mug w/ me, since my hot bev. [beverage] purchases aren't typically pre-meditated... so it's frustrating when I want to get a drink, but don't have my mug.” If other respondents felt that this was a concern, it was not expressed in their responses.

Interviews

Longitudinal interviews were conducted with two of the Tower Café employees on the first, third, and fifth weeks of the study. These six interviews were conducted by myself with one employee at a time, and allowed these employees to engage in a guided discussion about the price change. Their responses are categorized under five areas of focus: employee attitudes, business operations, customer attitudes, customer behavior change, and miscellaneous.

The employees were de-identified so are referred to as Employee 1 and Employee 2. At the time of the study, Employee 1 had been a Tower Café employee for five years and worked full-time at 40 hours a week, all day-shifts. Employee 2 was a student who had worked for the Tower part-time for 3.5 years, usually night and weekend shifts, for 8 hours a week.

**EMPLOYEE ATTITUDES.** Initially, the employees expressed either a positive or apathetic sentiment toward the price change. Employee 1 commented, “It makes no difference to me.” “It’s a good idea,” said Employee 2. “It makes sense.” In the second interview, Employee 2 mentioned the fairness of the price change: “we [the Tower Café] have to pay [for a cup, so] customers should too.” During the third interview, in the last week, Employee 1 summarized why she ended up liking the price change: first, more customers could get hot water for free; second, coffee was cheaper for customers; third, the study makes it clearer for customers why they have to pay for a cup, as before the study there was no set price. This employee commented that she was happy as long as the customers were happy.

Both employees consistently responded that they would recommend that the Tower Café keep the price change indefinitely, and that they would recommend the price change to other cafés, especially Brown & Brew. “It doesn’t make sense that we go back,” commented Employee 2 in the first week. In the second interview she said, “It’s not hurting anyone. If it’s working – awesome. I don’t see why anyone wouldn’t do it.”

**BUSINESS OPERATIONS.** After the first week – and consistently throughout the three interviews – neither employee reported a significant change to daily business operations. Employee 1 commented that the price change did not make a difference at all to their work behind the counter. “It’s simple to have,” she remarked in the first week. Employee 2 independently echoed these sentiments: “It’s just a matter of hitting one more button,” she said. “It’s not that hard.” During the first interview, she imagined how the price change might have an impact on her work. “If the word gets out, customers might end up bringing their own mug more often than not, then we’d be selling fewer cups and lids. It would be nice not to put out as many cups and lids – that’s really annoying.”

**CUSTOMER ATTITUDES.** During the entire study period, the employee interviewees only mentioned one negative customer incident that was associated with the price change. There was a customer who did not understand why he had to pay for a cup and got quite frustrated. The employee responded by explaining that it was part of their environmental mission.

Otherwise, customers’ responses to the price change were positive, inquisitive, or apathetic. As Employee 2 said after the first week, “No one said anything. I don’t think they have noticed things had changed.” In later interviews, she remarked that sometimes she would get questions; customers would be confused and think that they were getting charged more. Except the instance mentioned above, Employee 2 said that customers’ questions did not amount to anything more than that – questions; the customers “can’t be bothered and keep going.”

Employee 1, who worked day shifts, did think people had noticed the price change, but “nobody complained, nobody minds.” In the first week, after she was asked if she anticipated a change in customers’ attitudes, she said that it was possible that people would change their minds and not like the prices this way, “but I don’t think so.”

**CUSTOMER BEHAVIOR CHANGE.** Each employee had a different interpretation of how the price change affected customers' purchasing behavior. Employee 2 consistently thought that there was little to no change: "I don't think many more people are bringing in mugs," and of those who are, they "are not bringing in mugs to save money." She mentioned that people who do bring in mugs bring in their own tea and coffee as well, and since the Tower Café does not charge customers for hot water if they bring in their own mug, it is as though customers are getting a free drink. In response to how effective she thought the price change was, she replied in the concluding interview, "not very effective." She also commented that she works nights, and that perhaps fewer people bring their mugs at night as opposed to during the day.

Employee 1 had a different interpretation. She estimated that there was "a medium change"; before the study, 10% of customers brought their own mug, and 30% did by the fifth week. She also commented that customers were purchasing more commuter mugs than before the study.

**SUGGESTIONS.** Although Employee 1 had no suggestions, Employee 2 described the price change as a work in progress – "there's still more that can be done." She had two specific comments on what she would change: increase advertizing in and outside of the café and increase the price of the cup, but only if it were economically justifiable. "It has to be based in fact; [we] have to be able to tell people why... [the price] can't be random." She was unsure about how customers would react to a higher price, however. "People might get mad. Maybe they'd bring in their own mug, but probably 75% would pay more and 25% would get smart and bring in a cup."

**EMPLOYEE ERROR.** After the first week of the study, the Tower Café manager expressed a concern that

employees were either hitting the “Misc” (miscellaneous) button<sup>9</sup> instead of ringing up a cup, or simply forgetting to hit the “hot cup” button. After independently asking both employees whether they believed either of these cases happened often, both responded “no”. “[It’s] never happened with me,” said Employee 1. “Maybe with the [student employees]. If it happens, I think it would happen with the student workers.” Employee 2, a student worker, responded that she honestly did not know if employees used the Misc button in lieu of the pre-set buttons, but she had never heard of employees doing it before. She also mentioned that she was confident that employees were remembering to hit the “hot cup” button, but she could not be certain.

## B. Quantitative Data

Quantitative data were collected from two sources, the Product Mix Report and the Inventory Report, for two time periods: during the study (18 February 2008 through 14 March 2008 – “study period”) and exactly one year before the study (19 February 2007 through 16 March 2007 – “pre-study period”)<sup>10</sup>. The table below, taken from the Methodology section, summarizes the sources of the data as well as when they were collected.

DATA SOURCES	
Product Mix Report	Inventory Report
Quantity of... <ul style="list-style-type: none"> <li>• Hot beverages purchased</li> <li>• Tisch travel mugs purchased</li> <li>• Mug discounts given (pre-study)</li> <li>• Hot cups purchased (during study)</li> </ul>	<ul style="list-style-type: none"> <li>• Number of cups bought</li> <li>• Cost of cups bought</li> </ul>
DATA COLLECTION TIME PERIODS	
<b>Pre-study period:</b> 19 Feb 2007 - 16 Mar 2007 <b>Study period:</b> 18 Feb 2008 - 14 Mar 2008	<b>Pre-study period</b> <b>Study period</b> <b>2006/2007 Academic Year</b> <b>2007/2008 Academic Year</b>

<sup>9</sup> The Miscellaneous button allows cashiers to ring up the price of a product manually.

<sup>10</sup> While the study was conducted from 11 February 2008 through 14 March 2008, the first week was considered a trial week, and so the data were omitted from the analysis. Please see the Methodology section for details.

Product Mix Report

The Product Mix Report contains sales information for all products rung up at the cash register and can be collected for any given period of time. Through this report, data were gathered on the quantity of hot beverages, Tisch travel mugs, and hot cups purchased, as well as, before the study, the number of mug discounts.

As mentioned in Chapter III: Methodology, the data collected during the study period indicate how many hot beverage purchases were made without the accompanying purchase of a hot cup, and *not* how many customers brought in a mug. Not purchasing a cup does not infer that a customer brought in a mug. However, receiving a mug discount (as was the system before the study), does indicate that the customer brought in a mug.

**TOWER CAFÉ.** The table below shows aggregated data from both the pre-study and study periods at the Tower Café.

PRE-STUDY PERIOD		STUDY PERIOD	
<u>Feb 19, 2007 - Mar 16, 2007</u>		<u>Feb 18, 2008 - Mar 14, 2008</u>	
<u>Item</u>	<u>Sales</u>	<u>Item</u>	<u>Sales</u>
10¢ Discount	192	Hot cup	5,873
Hot beverages*	6,235	Hot beverages*	6,390
Purchases made without a cup	192 3.08%	Purchases made without a cup	517 8.09%
Factor difference	2.69		
Percent change	162.66%		

\*Hot beverage totals include coffee, hot chocolate, tea, and, in 2008, chai, which was not a purchase item in 2007.

PRE-STUDY PERIOD		STUDY PERIOD	
Tisch travel mug	9	Tisch travel mug	21
Percent change	133.33%		

If a customer brings her or his own mug and requests hot water, employees do not ring it up. Therefore hot water purchases made along with a cup purchase were not included<sup>11</sup>. Additionally, seven discounts were given for non-hot beverage drinks and therefore were subtracted from the total number of discounts in order to keep the data consistent<sup>12</sup>.

During the study period, 8.09% of purchases were not accompanied by the purchase of a hot cup at the Tower Café. Almost exactly a year earlier, 3.08% of purchases received a mug discount. This implies that 2.63 times more purchases were made without a hot cup during the study period than a year before. Additionally, 133.33% more travel mug purchases were made during the study than a year before.

**BROWN & BREW.** Data were also collected from Brown & Brew, a larger, on-campus café where the price change did not occur but a mug discount program was in place. The data were used as a control study for external variables that might affect the results, such as increased environmental awareness. (See Chapter V: Study Limitations for details.) Aggregated sales data from the two time periods are as follows:

PRE-STUDY PERIOD		STUDY PERIOD	
Feb 19, 2007 - Mar 16, 2007		Feb 18, 2008 - Mar 14, 2008	
10¢ Discount	27	10¢ Discount	22
Hot beverages*	7,300	Hot beverages*	6,436
Purchases made without a cup	0.37%	Purchases made without a cup	0.34%

\* The hot beverage totals include coffee, tea, chai, hot chocolate, steamed milk, and specialty drinks, and, in 2007, cider (which was not a separate purchase item in 2008).

<sup>11</sup> The percentage of mugs bought for the study period was found through the following equation:

$$\frac{(\# \text{ hot beverages purchased}) - (\# \text{ hot cups purchased})}{\# \text{ hot beverages purchased}}$$

Since there is no record of the number of times customers brought in their mugs for hot water, all hot water data must be excluded.

<sup>12</sup> The percentage of mugs bought was found through the following equation:

$$\frac{\# \text{ discounts for hot beverages}}{\# \text{ hot beverages purchased}}$$

Therefore all discounts given for non-hot beverage purchases were excluded.

Again, hot water purchases were excluded. Additionally, two discounts were given for non-hot beverage drinks in 2008, and therefore these were subtracted from the total number of discounts. Brown & Brew does not track its travel mug purchases.

According to the data above, 0.37% of purchases during the pre-study period were purchased with a mug discount. During the study period, 0.34% of purchases were bought with a discount. This signifies that at Brown & Brew, there was not a significant change in the number of people who received a mug discount in the study period as compared to the year before.

### *Inventory Report*

The Inventory Report provides information on how many cases of cups were purchased during a specific period. Due to the nature of the program that creates the report, data could not be collected for the specific four-week period of the study. Instead, data from the closest time period available was used. The data gathered were during four time periods: the entire 2006/2007 academic year; the 2007/2008 academic year up until 8 April 2008; 31 January to 27 March 2007 (roughly a year before the study); and 30 January to 25 March 2008 (roughly the dates of the study). Data were collected on the cost and amount of cups bought by both the Tower Café and Brown & Brew.

As the data on the 2007/2008 academic year is not complete (it only accounts for 316 days), in order to make the data comparable to the 363 days of the 2006-2007 academic year, the 2007-2008 figures were multiplied by the factor difference, 1.149. In referring to data from the 2007/2009 year, the rounded-up day-equivalents are used in lieu of the raw data.

<b>Inventory Report: Tower Café (by Academic Year)</b>			
		<u>2006/2007</u>	<u>2007/2008 (Day Equivalent)</u>
		<u>Cups</u>	<u>Cups</u>
<b>Number Cups Used</b>	<u>Small (12oz)</u>	21,500	18,954
	<u>Medium (16oz)</u>	19,500	0
	<u>Jumbo (20oz)</u>	5,375	4,020
	<b>Total</b>	<b>46,375</b>	<b>22,975</b>
<b>Cost</b>	<u>Small (12oz)</u>	\$2,000.79	\$1,763.87
	<u>Medium (16oz)</u>	\$2,236.65	\$0.00
	<u>Jumbo (20oz)</u>	\$727.02	\$543.82
	<b>Total</b>	<b>\$4,964.46</b>	<b>\$2,307.69</b>

<b>Inventory Report: Tower Café (by approximated study period equivalent)</b>			
		<u>Approx. One Year Before</u>	<u>Approx. Study Period</u>
		<u>Cups</u>	<u>Cups</u>
<b>Number Cups Used</b>	<u>Small (12oz)</u>	5,500	5,000
	<u>Medium (16oz)</u>	3,250	4,750
	<u>Jumbo (20oz)</u>	1,375	1,000
	<b>Total</b>	<b>10,125</b>	<b>10,750</b>
<b>Cost</b>	<u>Small (12oz)</u>	\$511.83	\$465.30
	<u>Medium (16oz)</u>	\$372.78	\$544.83
	<u>Jumbo (20oz)</u>	\$185.98	\$135.26
	<b>Total</b>	<b>\$1,070.59</b>	<b>\$1,145.39</b>

The data above shows that there is a significant difference in cup purchases between the 2006/2007 and the subsequent 2007/2008 academic years at the Tower Café — an overall factor of approximately two. However, this difference is not reflected in the one-month reports that symbolize the study and pre-study periods. The Inventory Report for Brown & Brew has similar findings. (See Appendix XI).

## **Chapter V: Study Limitations**

Due to the small sample size and limited timeframe, this study was not expected to produce statistically significant data. The surveys and interviews were developed to highlight customers and employees' basic reactions to instituting a price on a disposable cup. Similarly, the quantitative data provides a general insight into changes in customers' purchasing habits.

Moreover, there were several factors that complicated the data. The presence of external variables, deficient data, and unique features of the Tower Café, as outlined in the following section, limit the analysis of the data.

### **A. Alternative Explanations**

External variables existed that may have skewed quantitative data. There are three primary alternative explanations for the decrease in hot cup purchases and increase in mug sales: employee error, environmental awareness, and Tufts' gift of free mugs to the 2007 freshman class. In the end, the Brown & Brew control data were able to eliminate all but one of these alternative explanations.

**EMPLOYEE ERROR.** In order to ring up the cup as a separate purchase, employees were asked to hit a new button – “Hot cup.” As illustrated in Chapter III: Methodology, this required employees to press four buttons instead of three. In the first trial week, the manager noted that employees may be forgetting to hit this button and therefore not charge customers for a hot cup. In response, there was an employee meeting and an email was sent out as a reminder about the price change. Data from the Inventory Report was intended to reveal whether or not the actual amount of cups used deviated from past years, however, as explained below, the Inventory Report was excluded from the data analysis. While the

study was not able to control this data, there is no evidence beyond speculation that employee error exists.

**UNRELATED EXTERNAL RESOURCE MANAGEMENT AWARENESS.** Customers' heightened environmental awareness from outside influences may have encouraged them to bring in mugs independently from the price change.

**MUG GIVEAWAY.** Regarding the increase in Tisch mug purchases at the Tower Café, the freshman class of 2006/2007 received mugs free from the university; therefore, it is possible that these freshmen students may have been less likely to purchase a mug in 2007 than in 2008. It was anticipated that mug purchases at the Tower Café would to be compared with those at Brown & Brew during the same period, however that data was unavailable. (See below.)

## **B. Data Weakness**

The study lacks data on the change, if any, in the number of mugs bought at Brown & Brew and how many cups were used during the study period versus the pre-study period, from the Inventory Report. Data on the number of mugs purchased at Brown & Brew are not available because mug purchases are not specifically recorded on the cash register. Regarding the Inventory Report, the complications surrounding this data render it unreliable for analysis.

Although there is substantial data from the Inventory Report, the results are too ambiguous to be used in this study. The Report shows that there are nearly two times as many cups used in the 2006/2007 academic year than the subsequent 2007/2008 academic year at the Tower Café and Brown & Brew. (See table below.) The manager speculated that the most likely explanation for why this great

fluctuation occurred was that Tufts changed the design of its cups in early 2007. The cafés purchased a great number of these cups during that academic year, creating a surplus of the old cups the following 2007/2008 year, especially of the 16oz size.

<b>INVENTORY REPORT SUMMARY: TOWER CAFÉ</b>				
	<u>2006/2007</u> <u>Academic Year</u>	<u>2007/2008</u> <u>Academic Year</u> <u>(Day Equivalent)</u>	<u>Approx. One Year</u> <u>Before Study</u>	<u>Approx. Study</u> <u>Period</u>
<b>Number of Cups Used</b>	46,375	22,975	10,125	10,750

This significant difference in cups purchased complicates the data beyond control or remediation. Furthermore, although the data from the two approximate study periods are comparable, the dates do not fit the study dates precisely, rendering conclusions about the price change based on this data inaccurate and unfounded. It is for these reasons that the Inventory Report must be excluded from the quantitative analysis.

### **C. Applicability of the Results**

There are several reasons why the results achieved at the Tower Café may not be experienced at other cafés: Tufts' heightened awareness of resource management issues, the presence of a sink, the low price of commuter mugs at the Tower Café, Tisch Library's beverage container regulation, and the Points purchasing option.

**ENVIRONMENTAL AWARENESS.** Tufts University is considered one of the most environmentally-progressive schools in the nation<sup>13</sup>. As a majority of Tower customers are students or faculty, it is likely, though not incontestable, that they have a greater awareness of resource consumption than the average café customer and therefore more receptive to behavior that reduces their use of resources.

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<sup>13</sup> In 2007, Tufts University was named number nine out of North America's fifteen most "green" colleges and universities by Grist Magazine (Grist 2007)

**PRESENCE OF A PUBLIC SINK.** The Tower Café was built with a public sink so that customers could wash their commuter mugs. While many cafés do not make their sinks public, they do have sinks located in their restroom.

**MUG PRICE.** At the Tower Café, mugs are sold at-cost, for \$1.50; to put this in perspective, Starbucks' commuter mugs start at \$10.95. The mugs' uncharacteristically low price may act as an economic incentive to further decrease customers' barriers to choosing a mug over a disposable cup.

**TISCH LIBRARY REGULATION.** Hot drinks can only be brought into the Tufts Library if contained in a commuter mug; disposable cups and ceramic mugs are not permitted. As Tower abuts the library, this too may act an incentive for customers to purchase or bring commuter mugs to the Tower Café.

**POINTS PURCHASING SYSTEM.** Tufts University has a Points Plus system (commonly referred to as "Points") that allows students to make on-campus purchases using their identification cards. At the Tower Café, students can buy drinks, food, and cups on Points and they are not charged tax. It is common for Points to accompany meal plans, which are often paid for by parents, and Points can generally only be used at on-campus locations. Therefore, it is possible that students use Points differently than they would use cash. In fact, in an interview, Employee 2 suggested that students use Points more freely than cash.

Data were not collected on how many total purchases were made with Points versus cash, nor which payment method was more often used by mug-bringing customers, and so there is no conclusive evidence on the effects of using Points as opposed to cash. However, if it could be verified that Tower customers do largely use Points, and that students do not use Points with the same consideration as cash, it could be shown that students would not be as affected by the 17-cent price incentive as the average café customer would. If this is so, the price change would be more effective in a café where no such purchasing system was instituted.

## **Chapter VI: Analysis**

Despite these limitations, a strong argument can be made for the significance of the study. The qualitative and control data lessen or eliminate the plausibility of several of the alternative explanations mentioned above. The following analysis ties together both forms of data to create a compelling argument in favor of instituting this alternative pricing structure at dining establishments.

### **A. Employee and Customer Attitudes**

The responses from the survey participants and employee interviewees imply that there is moderate approval for adding a price to a disposable cup. The evidence suggests that there was no significant disfavor of the price change from either customers or the Tower staff; rather, the surveys indicate – and the interviews support – that customers on the whole seemed either pleased or indifferent by the change. Any dissatisfaction from employees or customers took the form of a suggestion – the cup price should be increased or there should be more customer education, e.g.

In addition, although the marketing material did not mention the environment, customers and employees noticed and applauded the resource management benefits of the study. This could imply a heightened understanding of issues related to resource consumption by both staff and customers. Finally, employees consistently responded that they would like to keep the price change, and that they would recommend that it be adopted by other cafés.

### **B. Increase of Purchases Made without a Disposable Cup**

The control study data from Brown & Brew allow for a direct comparison between customer cup purchases during the study and pre-study periods. While there was a percent change of 162.66%

between the two time periods for the Tower Café, Brown & Brew experienced a negative 8.11% change (see table below). In other words, during the study, purchases made without a cup increased almost three-fold at the Tower Café while remaining roughly the same at Brown & Brew.

PURCHASES MADE WITHOUT A CUP		
	Tower Café	Brown & Brew
Year before study (2007)	3.08%	0.37%
Study period (2008)	8.09%	0.34%
Factor difference	2.63	0.92
Percent change	162.66%	-8.11%

This is very telling. Assuming that there is no significant difference between the preferences of customers at the two cafés, one of the alternative explanations for these results – customers’ heightened awareness of resource consumption– would have affected cup usage at both cafés. However, this was not the case. The Brown & Brew control data discounts this explanation – and any other external influences – as reasons for the decrease in cup purchases at the Tower Café.

The remaining alternative cause – that employees had been forgetting to hit the “hot cup” button – cannot be disproved with the current quantitative information. It was anticipated that the Inventory Report would provide data on the change in cups used, however as mentioned in Chapter V: Study Limitations, the Inventory Report data is unreliable.

Even so, the employee interviews support that the price change is the cause for the decrease of cup purchases, not employee error. Both employees were hesitant to believe that workers were forgetting to push the “hot cup” button: “[It’s] never happened with me,” said Employee 1, and Employee 2 independently agreed, expressing a similar level of doubt. Again, there is no evidence that employee error exists beyond speculation.

Furthermore, Employee 1 estimated that the percentage of mug-bringing customers rose by a factor of three during the study – a figure strikingly similar to the results found in the quantitative data.

Although Employee 2 did not notice the same increase, she noted that she works half as often as Employee 1 and holds night shifts, a time when it was possible that fewer customers brought mugs.

### **C. Increase in Commuter Mug Sales**

Although the Tower Café experienced more than a two-fold increase in the number of commuter mugs sold during the study than during the same period in the previous year, it is unknown if the control café, Brown & Brew, experienced a similar trend. Therefore, this boost in sales cannot definitively be attributed to the price change. However, employee interview responses support the study's hypothesis; unsolicited, Employee 1 cited increased mug sales as one of the benefits of the new pricing structure.

## **Chapter VII: Conclusion**

In the spring semester of 2008, a five-week study was conducted at the Tower Café that instituted a price on disposable hot beverage cups, to be paid by the customer at point-of-sale. The effects of this economic instrument have been dramatic. Purchases made without a cup increased almost three-fold and commuter mug sales rose of over 133% during the study period, as compared with the year before. In addition, the results indicate that the Tower Café experienced a rise in employee and customer satisfaction, and there was an increase in customer and employee awareness of resource consumption, an unintended consequence.

This thesis makes three primary contributions: first, the study supports the literature that consumer-based price signals can significantly influence purchasing behavior. Second, this pricing scheme can effectively offset for one of the negative externalities that arise from the consumption of these products – the cost of the cups to the Tower Café. Third, it establishes cafés, and potentially other retail stores, as pertinent locations for using price signals to reduce resource consumption.

The economic model exercised in this study can be used for other products and resources that are currently provided to customers free of charge – napkins, sugar and ketchup packets, carry-out containers, e.g. No economic incentive currently exists to encourage the moderate consumption of these products. As they are distributed by a retail store, where a purchasing system is already in place one could expect to find results similar to this study. The one consideration would be to ensure that the cost of the product is high enough to elicit behavior change<sup>14</sup>.

As a testament to the overall success of the price signal, the manager of the Tower Café decided to continue the study's pricing structure indefinitely, and the Director of Dining Services is exploring bringing it to other on-campus dining establishments. In doing so, Tufts Dining Services will act as a model for other cafés, off-setting their disposable cup costs and reducing resource consumption.

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<sup>14</sup> A survey approach to determine the price for the Irish plastic bag levy (Convery, McDonnell, & Ferreira, 2007).

## Chapter VIII: Recommendations

### A. To Managers and Owners of Dining Establishments

For those who wish to institute the pricing structure used in this study in their dining establishment, there are several steps that should be taken to ensure positive results.

Education and advertisement. First, it is recommended that managers actively pursue advertizing the price change and educating customers in order to increase awareness and dispel any confusion. The study revealed that employees and survey respondents believed that the price change could have been more successful if a greater number of customers were aware of the change. One way of making the price signal more explicit is to place on the menu board one price for the hot beverage with the cup, and one price for the same hot beverage without a cup (when the customer brings in a mug).

Furthermore, survey respondents suggested that customers would have benefited from a clearer explanation of the reasons behind the price change and its impacts on resource consumption.

Provide options. It is necessary to provide customers an easy and relatively inexpensive option to disposable cups. This can be done by either providing reusable mugs for in-house dining or selling commuter mugs at a low price. (The Tower Café sold more than twice as many mugs as the year before, but note that their mugs were sold at-cost for \$1.50.)

Employee training. It is also recommended to engage in employee training for two reasons. First, employees must be able to relay to customers the details of the price change (including the benefits and origin of the cup price). Additionally, according to the interviewed Tower employees, though it is not difficult to ring up the hot cup as a separate purchase, it may take some time before it

becomes a habit. The solution may be as easy as posting a sign near the cash register to serve as a reminder.

Combine incentives. This study tested the effectiveness of an economic incentive, but combining several types of incentives may produce better results. For example, along with the price signal one could pursue social marketing techniques such as community-wide campaigns and themed events.

Mug discount program. For those who do not wish to separate the price of the cup from the coffee, it is recommended that their establishment offers mug discount program. The study implies that the Tower Café employees were not bothered by filling mugs instead of disposable cups, and that saving money for bringing a mug improved customer satisfaction.

## **B. To Researchers and Academics**

For those wishing to do further research on this subject, there are several ways that the study could have provided more statistically significant results.

Secure Data. It is highly recommended to secure inventory data and establish a control for all data sets. Because data in this study was either missing or notably unreliable, it could not be determined definitively how strongly the results were caused by either the price change or by employee error. This is a factor that can be easily avoided in future studies.

Control Employee Error. The disruption of employee error can be lessened by either testing for its occurrence or by relying more heavily on the actual number of cups used. In the former option, one could monitor employees, manually noting how often the hot cup price was not rung up. Alternatively, one could find a more direct method to calculate how many cups were given, by manually tallying purchases or marking cups, for example.

*Study Duration.* It is recommended that the study period be extended to be able to analyze the price change's impact with greater accuracy. Conducting the study for an entire semester or year would provide a larger amount of data, and also the inventory report would be easier to compare analyze in regards to the amount and cost of cups used.

*Expand the Customer Survey.* It is recommended that a greater number of customer surveys be collected as the sixteen included in this study are not necessarily representative of all Tower customers. Also, it would have been helpful to know if customers would have liked to see the price change instituted at other cafés and dining establishments. A strong positive or negative response to this question would give great insight into its possible success for other businesses.

*Test a true Pigouvian tax.* Though it was beyond the scope of this study to calculate the environmental costs associated with the production and disposal of paper cups, it would make an interesting study to incorporate this cost into the price of the hot beverage, imposing a true Pigouvian tax.

*Statistical tests.* It was not realized until late in the study that a specific statistical test could be employed to prove if the purchasing results from the Tower were statistically significant. If it is available, it is recommended that daily data be collected to calculate a comparison of means to strengthen the results.

*Value qualitative data.* A high emphasis should be put on employee interviews, as the staff has direct interaction with customers' behavior change and attitudes, as well as knows firsthand the effect on business operations. In this study, where quantitative data were lacking, the employees' insight helped negate or support alternative explanations.

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## Appendices

- I. Community-Based Social Marketing (CBSM), an Alternative Approach to Demand Management
- II. Cup Lifecycle Environmental Impacts
- III. Pricing Model
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## **Appendix I. Community-Based Social Marketing (CBSM), an Alternative Approach to Demand Management**

Community-based social marketing is another strategy for achieving consumer behavior modification. Developed by Doug McKenzie-Mohr and William Smith (2000), CBSM was developed to foster sustainable behavior by adding a holistic approach to tools developed from social science research. CBSM places an emphasis on direct contact and behavioral change at the community level while taking into account the social, economic, political, and moral factors that affect how people behave.

While CBSM has proved itself effective, it may not always be the best choice for achieving behavior change. In a study conducted at Tufts University, Marcell, Agyeman, & Rappaport (2004) found that, while it was well-received, using CBSM to encourage students to reduce their energy use was expensive, limiting, and time-consuming – the eight-week study cost over \$1,000 (not including labor), targeted less than thirty students, and did not achieve a significant change in electricity costs (Marcell, Agyeman, & Rappaport, 2004). These are the reasons why it is preferred to use an economic incentive over CBSM to limit disposable cup consumption.

## Appendix II. Cup Lifecycle Environmental Impacts

The Starbucks Coffee Company collaborated with the Alliance for Environmental Innovation to perform a life cycle analysis for the cup and sleeve that they currently offer. They traced the energy and resources consumed as well as the pollution emitted through each stage of the product’s life cycle, with the cup’s final destination being either a landfill or an incinerator:

	<u>Stage</u>	<u>Description</u>
1	<b>Tree Harvest/Transport</b>	felling and transporting trees to the mill
2	<b>Virgin Manufacturing Energy</b>	preparing the pulp for paper
3	<b>Municipal Solid Waste Collection</b>	local trash collection
4a	<b>Collection Vehicle and Landfill Equipment</b>	transporting to and containing waste in landfills
4b	<b>Waste-to-Energy Combustion Process</b>	burning waste in an incinerator
	<b>Avoided Utility Energy Releases</b>	energy regenerated by burning waste
	<b>Ash Landfill Disposal</b>	transporting ash from incinerators
4c*	<b>Litter</b>	improperly disposed of in public areas

\*Added by the author; not included in the original study.  
 Stages 1-4b were based on the data on p. 25-26 in Alliance for Environmental Innovation (2000)

There are several factors that the study does not take into consideration::

- **chemical output from production** in their measurement of solid waste. According to Tammemagi (1999) the production of paper emits a high amount and variety of inorganic compounds and water effluents.
- **negative impacts of landfill use**, ranging from the leaching of chemicals into aquifers and waterways to the release of methane, a potent greenhouse gas, to harboring disease, to the large area of secluded land required (Tammemagi, 1999).
- **pollution caused by transportation** of disposable products from the production plant to the distributors. The amount of pollution is compounded by the great amount of transportation needed to keep these highly consumed products on the shelves.
- **the effects of littering**. The cup does not always make it to a landfill or incinerator. In the table, step 4c was added to account for when the cup ends up as litter in public places such as water systems or roadsides. This has an impact on aesthetics as well as local governments. See section I(D) for more detail.

## Appendix III. Pricing Model

<b>PRICING MODEL: ONE CUP PRICE (IN US DOLLARS)</b>			
	<b>12 oz.</b>	<b>16 oz.</b>	<b>20 oz.</b>
<b>Pre-Study Hot Beverage (HB) Price</b>	1.54	1.74	2.04
<b>Cost of Cup</b>	0.15	0.17	0.20
<b>Pre-Study HB Price minus 17¢ cup*</b>	<b>1.39</b>	<b>1.57</b>	<b>1.84</b>
<b>Restructured HB Price*</b>	<b>1.39</b>	<b>1.57</b>	<b>1.84</b>
<b>Price of Cup</b>	0.17	0.17	0.17
<b>Price of HB for Mug-Bringer*</b>	<b>1.39</b>	<b>1.57</b>	<b>1.84</b>
<b>Price of HB Buying a Cup</b>	1.56	1.74	2.01
<b>Tower Profit Per Mug Brought</b>	0	0	0
<b>Tower Profit Per Cup Bought</b>	-0.02	0	0.03

*\*These prices are equivalent.*

## Appendix IV. Proposal to the Tower Café

27 December 2007

Dear Patricia Klos,

Hi! My name is Laur Fisher and I am a senior at Tufts University. I would love to involve the Tisch Library Tower Café in my Senior Honors Thesis to help prove that environmentally sustainable practices can be economically beneficial.

Over my last four years at Tufts, I have been studying how sustainability can be pursued in a variety of sectors – in national and local government, businesses, individual households – and have pursued a self-designed Plan of Study major that I have entitled “Engaging Sustainability as an Innovative Process.”

I have always been a hands-on learner and, as my major suggests, am inspired by using innovative ideas to work toward sustainability. Therefore for my Senior Honors Thesis, I am requesting your support in my launching a one-month program at the Tower Café in January or February 2008 – organized and run by myself – to see how customers respond to paying for a disposable cup (including the lid and latch) as a separate price from the coffee, while encouraging regular customers to bring in reusable to-go mugs.

I am aware that the Tower Café currently has a mug discount program. I propose an alternative pricing system over offering a discount because it provides a greater potential for change. My research suggests that customers have a greater response when they see that they are paying for something that is easily avoidable rather than their perception that they missed out on saving “just a few cents.” Explicitly stating that they are paying extra for a cup challenges people to reconsider their choices and impacts how they view their own behavioral practices.

During my research, I discovered that many cafés do not realize the cost of disposable cups and lids. Dining Services has informed me that the Tower Café spends approximately \$0.14 - \$0.20 per cup, depending on the size.

In an attempt to reduce the cases used of disposable cups, I would organize a program at the Tower Café that would reduce prices by the cost of the cup (\$0.14 - \$0.20, depending on the size), but charge customers \$0.17 for a cup. (Please see attached for my reasoning behind this pricing structure.) The program would help customers make an educated choice as to whether they should bring their own mug or pay extra for the disposable to-go cup. Either way, my model ensures that Tower Café will not lose money, but instead make a small profit. The program allows for regular customers to see the cost-savings in bringing in reusable cups, while Tower Café also maintains its profit margin.

The advantages of such a program are manifold. The program will:

- Increase your inventory space
- Decrease your purchasing of cups, latches, and lids
- Decrease your waste output (in store as well as outside the Tower Café)
- Decrease the need to dedicate more land for landfill
- Increase the market for reusable to-go mugs
- Gain media attention, as I will be contacting newspapers and the local news
- Adhere to Tufts University's environmental awareness
- Reflect Tufts students' environmental values
- Support a Tufts student's Senior Honors Thesis
- Contribute to a great opportunity for economic and social change – be an exemplar of how sustainable practices can be effective and lucrative for businesses

I plan on providing informational signs and pamphlets before and during the study, describing the program and its goals. I also will contact the Daily and possibly other local media to further promote and educate others on the program. In addition, I will perform three interviews with employees during the study, as well as conduct surveys to get customer feedback.

The Tower Café is my first choice for a number of reasons. Not only does it already have a sink for customers to rinse out their mugs, but also there is a high volume of regular customers who prepare to go there. Just as students get ready by packing their books and laptops, throwing their reusable mug into their bag can become part of the routine for going to the library.

This project will serve as a pilot study for dining establishments around the world. Eventually, I hope to take the results from this program and expand its success to businesses such as Diesel Café in Davis Square and Starbucks. It is my goal to prove that with a bit of creativity and awareness of the market, environmental responsibility can be financially and socially rewarding in business.

I am aware that there are several concerns that accompany such a program, such as determining the size of customers' wide variety of reusable mugs. I have thought extensively about solutions – such as displaying example mugs and sizes – and am open to discussing such ideas with you further. I would like to stress that the program can only be successful if it meets your needs as a business, and I am looking forward to working with you to make this as easy for you and your employees as possible. Please contact me with any questions or concerns, and I look forward to working with you!

Many thanks for considering my proposal.

Sincerely,

Laur Fisher  
[laur.fisher@gmail.com](mailto:laur.fisher@gmail.com)  
609-220-9426

## (Proposal, continued)

	<b>12 oz.</b>	<b>16 oz.</b>	<b>20 oz.</b>
Current Coffee Price	1.54	1.74	2.04
Cost of Cup	0.15	0.17	0.20
Current Coffee Price minus cup	1.39	1.57	1.84
Proposed Coffee Price	1.39	1.57	1.84
Proposed Price of Cup	0.17	0.17	0.17
Price of Coffee for Mug-Bringer	1.39	1.57	1.84
Price of Coffee Buying a Cup	1.56	1.74	2.01
Tower Profit Per Mug Brought	0.00	0.00	0.00
Tower Profit Per Cup Bought	-0.02	0.00	0.03
Tower Profit Per 100 Cups Bought	-2.00	0.00	3.00
<u>Scenario II: Constant Cup Price</u>			

While the first scenario (not shown here) more accurately represents the cost of the cup in the price paid by the customer, Scenario II is optimal for practical reasons. This structure keeps the price of the cup to seventeen cents regardless of size to make the transition easier for customers and employees. Though buying a small cup will result in a negative profit of \$0.02, this is off-set by the gain in profits of \$0.03 for each large cup bought.

I would like to note that it was expressed to me that it was important that the prices between on-campus dining establishments were equivalent to reduce competition. Keeping this in mind, I am not suggesting a cup tax, which would make coffee + cup prices more expensive at Tower than the Campus Center nearby.

## Appendix V. Marketing: Informational Sheets

(front)

### the tower café's 17-cent cup.

you may have noticed that the hot drink prices at the tower café have changed.  
the prices are lower by 17¢, but now we charge you that amount for a disposable cup.

think about it: usually when you buy coffee, you're also buying a cup, lid, and holder.

but what if you don't want one?

what if you'd rather bring a mug and save your money?

now we've separated the price of the cup from the coffee, giving you the choice:

if you want a cup – **ask for it**, and you'll pay 17¢ for one.

if you bring your mug – **say so**, and you'll avoid paying for a cup.



**(If you bought a hot beverage, please fill out a survey next to the cash register!)**

*turn over for FAQs...*

(back)



### **What are you spending your money on?**

*You're paying 17¢ for a cup, a cost you could easily avoid by bringing a mug. So the next time you're preparing to go to the library, chuck a mug in your bag!*

**What kind of mug can I use?** The Tower Cafe's accepts any 12 oz (small), 16 oz (medium), and 20 oz (large) mug. Check the bottom of your mug for its size. Please refer to the display for size comparisons.

**Can I buy a reusable mug at the Tower?** Yup. We sell plastic to-go mugs for \$1.50.

**Can I bring in my own disposable cup?** No. In order to stay true to our environmental mission, we will not fill your disposable cup.

**Where does the price 17¢ come from?** That's what it costs us for each cup, lid, and holder.

**How much will I save by bringing my mug?** If you purchase one coffee a day at the Tower and bring your own mug, in a little over a week you'll have saved enough for a free cup of coffee!

**Is it true that disposable cups are better for the environment than reusable mugs?** Though it takes less energy to make one disposable paper cup than one reusable mug, the energy and pollution associated with transportation for delivery and disposal, littering, adding to landfill, and impact on wildlife makes reusable mugs better for the environment.

*Questions? Suggestions? Contact Lauren Fisher at Dining Services: [lauren.fisher@tufts.edu](mailto:lauren.fisher@tufts.edu)*

## Appendix VI. Marketing: Door Sign – Week Prior to Study



# Our hot beverage prices are changing!

Starting Monday, February 11<sup>th</sup>,  
we will be separating the price of the  
cup from the price of the drinks:

<u>Drinks</u>	<u>12 oz</u>	<u>16 oz</u>	<u>20 oz</u>
Speeder & Earl's Fair Trade Coffee	1.37	1.57	1.87
Mighty Leaf Tea	1.32	1.42	1.52
Hot Chocolate	1.33		
Hot Chai	1.33		
<u>Cup Options</u>			
Disposable cup, lid, and holder	0.17	0.17	0.17
Bring your own mug	--	no cost	--

## Appendix VII. Marketing: Door Sign – During Study



### **Our hot beverage prices have changed!**

**We have separated the price of  
the cup from the price of the drinks:**

<u>Drinks</u>	<u>12 oz</u>	<u>16 oz</u>	<u>20 oz</u>
Speeder & Earl's Fair Trade Coffee	1.37	1.57	1.87
Mighty Leaf Tea	1.32	1.42	1.52
Hot Chocolate	1.33		
Hot Chai	1.33		
<u>Cup Options</u>			
Disposable cup, lid, and holder	0.17	0.17	0.17
Bring your own mug	--	no cost	--

## Appendix VIII. Employee Training (Personal Draft)

The goal of the employee training is to let workers know of the price change at the Tower Café and of how to handle customer concerns. Points to emphasize:

- Background
  - 17¢ is the cost that the Tower Café pays per cup (including lid and latch)
  - My study externalizes that cost, giving customers the choice not to pay it
  - Therefore, all the hot drink prices have been lowered by 17¢, but now a cup costs that amount.
- Specifics/Customer Issues
  - I'm going to ask you to hand out a small survey with every hot beverage drink. I'll have a box next to the register for the surveys, as well as one near the door.
  - A display will show normal mugs and their sizes as a physical reference (similar to the one in the front of the library)
  - There will be a info card with basic questions
  - Only reusable mugs can be filled – no water bottles, personal disposable cups, etc.
- Avoid skewing data
  - I am doing this as a study for my senior honors thesis, but I would like to keep that on the down-low, as well as the fact that this will start for only five weeks. I'd rather people assume it's a permanent change. If customers ask, say the Tower Café is trying out this new price system.
  - I'm trying to avoid marketing techniques to have the most accurate data possible, so while you can tell your friends about the price change, don't mention it's a senior honors thesis or being run by a student, or push an environmental agenda.
  - If people have further questions or concerns, tell them to contact Dining Services at [lauren.fisher@tufts.edu](mailto:lauren.fisher@tufts.edu) (email on card). Similarly, if you have any questions or there are problems, contact Dave or me.

## Appendix IX. Customer Survey & Sign

Tower Café Customer Survey

*Please fill out this survey only if you just purchased a hot beverage.  
Please choose one answer for each question.*

1. How does the price of 17¢ per cup affect your purchasing decision? *I will...*
  - continue to bring my mug, as usual.
  - try to bring my mug more often.
  - likely buy a cup every time.
  - Other: \_\_\_\_\_
2. How do you feel about the hot drink prices being cheaper, but asked to pay 17¢ for a cup?
  - Happy or pleased; I like the new price change.
  - Indifferent; I don't care.
  - Angry or upset; I don't like the new price change.
  - Other: \_\_\_\_\_
3. Briefly describe why you feel as you indicated in question 2.
4. Please write any comments or suggestions you have for the Tower Café regarding the price change on the back of this survey.

*Thank you! If you have any questions,  
please contact Dining Services at [lauren.fisher@tufts.edu](mailto:lauren.fisher@tufts.edu)*

Tower Café Price Change  
Customer Survey

Help us help you!

Please fill out this short customer survey  
**only if you just purchased a hot beverage**  
at the Tower Café.



## Appendix X. Employee Interview Questions

### Week One

1. Please state if you are employee 1 or 2, as I have told you before.
2. How long have you been employed with the Tower Café?
3. Approximately how many hours a week do you work at the Tower Café?
4. What was your initial reaction to the price change, having customers pay for a coffee cup?
5. You've been working with the price change for one week, right? How is it affecting your work behind the counter?
  - a. What are the biggest changes?
6. Can you tell me of any specific experiences you have had in the last week at work that were associated with the price change? Please don't mention any names.
  - a. If positive – why do you think this occurred?
  - b. If negative – what do you think should change so that this doesn't happen again?
7. How do you feel that customers are reacting to the price change?
8. The price changes will stay in effect for at least for another four weeks. How do you feel about this?
  - a. Do you think your experience will change over these weeks? If so, how?
  - b. What will get easier? What will get harder?
9. At this point, would you as an employee at a café prefer to have the customers pay for a cup or not? Why?
10. At this point, how do you feel about the Tower Café adopting these price changes indefinitely? Would you recommend it to other cafés?
11. Is there anything else you think I forgot to ask you or that you'd like to add regarding your experience with the price change?

### Week Three

1. Please state if you are employee 1 or 2, as I have told you before.
2. Has there been any significant change in your working hours over the last two weeks? Essentially, I'd like to know if you have worked more than, less than, or the same as usual.
3. How do you currently feel about having customers pay for a cup?
  - a. If it has, how has this changed since the first week?
4. You've been working with the price change for approximately three weeks. How is it now affecting your work behind the counter?
  - a. If it has, how has this changed since the first week?
5. Can you tell me of any specific experiences you have had in the two weeks at work that were associated with the price change? Please don't mention any names.
  - a. If positive – why do you think this occurred?
  - b. If negative – what do you think should change so that this doesn't happen again?

6. How do you feel that customers are now reacting to the price change?
  - a. If it has, how has this changed since the first week?
7. The price changes will stay in effect for at least for another two weeks. How do you feel about this?
  - a. Do you think your experience will change over these weeks? If so, how?
  - b. What will get easier? What will get harder?
8. At this point, would you as an employee at a café prefer to have the customers pay for a cup or not? Why?
9. At this point, how do you feel about the Tower Café adopting these price changes indefinitely? Would you recommend it to other cafés?
10. Is there anything else you think I forgot to ask you or that you'd like to add regarding your experience with the price change?

#### **Week Five**

1. Please state if you are employee 1 or 2, as I have told you before.
2. Has there been any significant change in your working hours over the last two weeks? Essentially, I'd like to know if you have worked more than, less than, or the same as usual.
3. How do you currently feel about having customers pay for a cup?
  - a. If it has, how has this changed since the first week?
4. You've been working with the price change for approximately five weeks. How is it now affecting your work behind the counter?
5. How has your experience with the price change changed over the past five weeks?
6. Can you tell me of any specific experiences you have had in the two weeks at work that were associated with the price change? Please don't mention any names.
  - a. If positive – why do you think this occurred?
  - b. If negative – what do you think should change so that this doesn't happen again?
7. How do you feel that customers are now reacting to the price change?
  - a. If it has, how has this changed since the first week?
8. The price changes are now going out of effect/staying indefinitely. How do you feel about this?
9. At this point, would you as an employee at a café prefer to have the customers pay for a cup or not? Why?
10. At this point, would you recommend the price changes to other cafés?
11. What are your conclusions on the outcomes of this experiment? (*If needed further prompting: Is it a success, a work in progress, a failure, or something in between?*)

Is there anything else you think I forgot to ask you or that you'd like to add regarding your experience with the price change?

Additional topics of discussion:

- Cases used of the misc button
- Employees forgetting to ring up the cup

## Appendix XI. Aggregated Data: Inventory Report

		Year before study period				Study period				
		June 28, 2006 - July 31, 2007		Day Equivalent (June 27, 2007 - April 8, 2008)		Jan 31 2007 - March 27, 2007		Jan 30, 2008 - Mar 25, 2008		
		Size	Cases used	Cups	Cases used	Cups	Cases used	Cups	Cases used	Cups
Tower Café	Number Cups Used	Small (12oz)	21.5	21500	16.5	18954	5.5	5500	5	5000
		Medium (16oz)	19.5	19500	0	0	3.25	3250	4.75	4750
		Jumbo (20oz)	10.75	5375	7	4021	2.75	1375	2	1000
		<b>Total</b>		<b>46,375</b>		<b>22,975</b>		<b>10,125</b>		<b>10,750</b>
	Cost		<b>\$ per case</b>	<b>Cost</b>	<b>\$ per case</b>	<b>Cost</b>	<b>\$ per case</b>	<b>Cost</b>	<b>\$ per case</b>	<b>Cost</b>
		Small (12oz)	93.06	\$2,000.79	93.06	\$1,763.87	93.06	\$511.83	93.06	\$465.30
		Medium (16oz)	114.7	\$2,236.65	114.7	\$0.00	114.7	\$372.78	114.7	\$544.83
		Jumbo (20oz)	67.63	\$727.02	67.63	\$543.82	67.63	\$185.98	67.63	\$135.26
		<b>Total</b>		<b>\$4,964.46</b>		<b>\$2,307.69</b>		<b>\$1,070.59</b>		<b>\$1,145.39</b>

		Year before study period				Study period				
		June 28, 2006 - June 26, 2007		Day Equivalent (June 27, 2007 - April 8, 2008)		Jan 31 2007 - March 27, 2007		Jan 30, 2008 - Mar 25, 2008		
		Size	Cases used	Cups	Cases used	Cups	Cases used	Cups	Cases used	Cups
Brown & Brew	Number Cups Used	Small (12oz)	24.75	24750	14	16082	5.75	5750	4.5	4500
		Medium (16oz)	25.25	25250	0.75	862	6	6000	1.25	1250
		Jumbo (20oz)	16	8000	7.5	4308	3.75	1875	0.5	250
		<b>Total</b>		<b>58,000</b>		<b>21,252</b>		<b>13,625</b>		<b>6,000</b>
	Cost		<b>\$ per case</b>	<b>Cost</b>	<b>\$ per case</b>	<b>Cost</b>	<b>\$ per case</b>	<b>Cost</b>	<b>\$ per case</b>	<b>Cost</b>
		Small (12oz)	57.43	\$1,421.39	57.43	\$804.02	57.43	\$330.22	57.43	\$258.44
		Medium (16oz)	52.84	\$1,334.21	52.84	\$39.63	52.84	\$317.04	52.84	\$66.05
		Jumbo (20oz)	27.75	\$444.00	27.75	\$208.13	27.75	\$104.06	27.75	\$13.88
		<b>Total</b>		<b>\$3,199.60</b>		<b>\$1,051.78</b>		<b>\$751.33</b>		<b>\$338.36</b>

\*cup case prices do not include the price of lids and sleeves.

## Appendix XII. Aggregated Data: Mix Product Report

Pre-Study Period  
(Feb 19, 2007 - Mar 16, 2007)

Study Period  
(Feb 18, 2008 - Mar 14, 2008)

	<u>Item</u>	<u>Quantity</u>	<u>Item</u>	<u>Quantity</u>
<b>Tower Café</b>	Tisch travel mug	9	Tisch travel mug	21
	<b>Number discounts*</b>	<b>192</b>	<b>Hot cup</b>	<b>5873</b>
	Coffee total	3670	Coffee total	3675
	Tea total	2142	Tea total	2222
	Hot chocolate total	423	Hot chocolate total	359
	Chai total	0	Chai total	134
	<b>Total</b>	<b>6235</b>	(Hot water*)	(147)
			<b>Total</b>	<b>6309</b>
			<b>Difference</b>	<b>517</b>
	<b>Percentage mugs brought</b>	<b>3.08%</b>	<b>Percentage mugs brought</b>	<b>8.09%</b>

*\*seven discounts were given for non-hot beverage drinks and therefore were excluded from the total*

*\* not included in the total*

Pre-Study Period

Study Period

	<u>Item</u>	<u>Quantity</u>	<u>Item</u>	<u>Quantity</u>
<b>Brown &amp; Brew</b>	Tisch travel mug	(no data)	Tisch travel mug	(no data)
	<b>Number discounts</b>	<b>27</b>	<b>Number discounts</b>	<b>22</b>
	Coffee & specialty drinks	4894	Coffee & specialty drinks	4546
	Steamed milk	49	Steamed milk	21
	Tea total	1067	Tea total	906
	Hot chocolate total	433	Hot chocolate total	259
	Chai total	821	Chai total	704
	Cider	36	Cider	
	<b>Total</b>	<b>7300</b>	<b>Total</b>	<b>6436</b>
	<b>Percentage mugs brought</b>	<b>0.37%</b>	<b>Percentage mugs brought</b>	<b>0.34%</b>