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Bottled Water: Why Is It so Big? Causes for the Rapid Growth of Bottled Water Industries

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Introduction

Recently, American consumers, as well as overseas consumers, have seen the dramatic expansion of the bottled water industry (Howard, 2003). The growth and penetration of the industry has been unprecedented, and is comparable to the recent proliferation of home computers. In a mass change of habit, Americans turned from buying sodas and beers to bottled water. Since the introduction of bottled water by the major beverage companies, bottled water has become the second most purchased drink after sodas, and will soon become the most purchased (Phoods, 2001). This has caused a major shift in the beverage landscapes, and has had significant impact throughout the world. The rapidly escalating rate of bottled water purchases has caused some consequences that are not reflected in the overall image of the product. By and large, bottlers have sold their waters on the basis that they are pure, clean, filtered, or otherwise superior to other water sources (Howard, 2003). This has placed them in competition against, at least in the developed world, large publicly funded municipal systems. To overcome this competition, bottlers uniformly market their products as cleaner than the municipal supply, or offer some other advantages, like Penta brand water's USP Medicinal Grade Oxygen (label). In any case, it has become apparent to the author that this carefully cultivated campaign of fear and doubt propagated by the bottlers takes advantage of minor lapses in municipal water quality and serves only to sabotage any meaningful discussion of addressing issues related to water quality.

This paper will address each aspect of bottled water as a product – its history, its purpose, its material, its advantages, its disadvantages and its costs; correlate it with bottler's marketing activities, and tie those to sales and government regulations. These comparisons will address and progressively eliminate the different qualities of bottled water as a whole product in order to arrive at the most likely reasons for its phenomenal success.[1]

History of the bottled water industry

The earliest modern bottled water company was founded in the United States in the middle of the 19th century. In 1845, the Ricker family of Maine bottled and sold water from a so-far unidentified source. Their small operation quickly grew, capitalizing on the spring's supposed medicinal properties, eventually becoming the Poland Springs water company. (polandspringinns.com, 2006). Mirroring the Ricker success, in 1905, the Ozarka Spring Water Company was founded in Eureka Springs, Arkansas. Since then, the bottled water landscape has expanded tremendously. This expansion has come mostly recently, and it seems to the author to be the acceleration of a slowly expanding industry. Between the early part of the 20th century and its end, there was little activity in the bottled water industry. The bottling companies eventually formed their own lobbing group in 1950 in order to promote their product, and have only been recently successful.

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[1] ***A Note on Mineral Waters***

For the purpose of this paper, mineral waters have been excluded. They are a different product, and sold on a different premise, not unlike coffee and tea. Mineral waters are usually sold on the basis of its mineral content. Bottled waters, on the other hand, are sold on the premise that the water is pure and has no other content.

Mineral water does predate modern bottled water companies by a large margin – the San Pellegrino brand, the oldest, is six hundred years old. Bottled water companies are relatively recent, and have taken cues from the mineral companies. Interestingly, some bottled water companies have placing additives in their products to enhance their marketability in niche areas.

Now, there are hundreds of companies and thousands of brand names of bottled water, and worldwide consumption is in the billions of dollars. Currently, both the Ozarka and Poland Spring brands are owned by Nestlé, and are part of Nestlé's seventy-five US water brands (US Water News, 2003).

Advantages of Bottled Water Consumption

There are many possible reasons why bottled water has become such a large industry, and some of those reasons are because of its advantages in regards to ordinary tap water, according to the large number of advertisements that showcase bottled water's qualities. Two other large reasons, pursuant to the author's viewing of many of the above advertisements, are its relative convenience, and its safety and purity (Howard, 2006).

Bottled water appeals to many as being far more convenient than tap, and logically so. Bottles are available virtually everywhere now. One can purchase water bottles by the dozens at most supermarkets, and one can find individual bottles at service stations, vending machines, and even some restaurants. Restaurants are particularly happy to sell bottled water, as bottled water replaces, or at least complements, a previously free service. At delis, fast food, takeout places and similar establishments where one picks a drink out of a refrigerator, bottled water is considered the norm, and usually takes up about half the drink refrigerators. Tap water is still available through the soda fountain, but one would have to ask for a cup. Common experience tells us that this usually results, however, in a small cup, which is hardly convenient, or even portable in a stuff-in-bag sense.

Portability as another key convenience for bottled water. The physical container is plastic bottle with a screw-on lid. This configuration allows for a re-sealable container. One can grab a bottle and not worry about spilling it. This offers an edge over conventional aluminum cans, which cannot be re-closed. Because bottles are re-sealable, places that prohibit food and drink will often allow water bottles and similar containers. Such places typically include mass transit, classrooms, libraries, museums, conference centers, and other public accommodations.

Re-sealability has granted another advantageous quality to the bottles. Since it is re-sealable, it is also re-usable. When the originally bottled water runs out, the consumer can simply refill the bottle with ordinary tap water, or soda, alcohol, or whatever the consumer wants. This changes the purpose of the product, and even the industry's purpose as well. Instead of bottled water being sold as different or better water, it is sold as a container for more water. This places it in competition with more traditional sports bottles. Using the water bottle for the re-useability does compromise another of its advantages. This advantage is purity. Many consumers of bottled water typically consider it more desirable because of its purity (Howard, 2006). One way the water can be more pure than tap because bottled water is usually placed into its container almost immediately after collection. Due to the fact that the water is usually bottled at its source, it can avoid the possible contamination that could result in city treatment processes (IBWA, 2006). These processes include wastewater treatment, river and rainwater collection, contaminated plumbing, and excessive fluoridation or chlorination. Common experience tells us that damaged, broken, or rusting pipes are a health concern, and are the responsibility of the municipality. Since such entities are typically slow to respond,

tap water may become contaminated. (IBWA, 2006) Furthermore, the compromising of treatment facilities or sources to allow particulates, excessive amounts of minerals, and biological contaminates into the water stream are simply unacceptable to most folk. (EPA FAQ, 2006) These conditions are also the responsibilities of the municipality, and so mismanagement and the resulting impurities represent a critical factor in the decision to purchase bottled water. (Bykowicz, 2004)

Disadvantages of Bottled Water Consumption

There are, as with any product, disadvantages to the consumption of bottled water. The most obvious and tangible is cost. Bottled water is very expensive. Some lines go for around five dollars a gallon ($1.15/liter), nearly twice the cost of gasoline in most places. Imported water goes for much higher prices; sometimes up to seven or eight dollars a gallon. ($1.99/liter) (Figure 1) Prices, of course, vary, but usually in-house lines for grocery stores run much cheaper, sometimes less than half as much as brand name products. This is undoubtedly because many supermarkets are simply selling municipal water.

Filtered tap water is nothing new, either. Many brands, particularly the largest brands like Dasani and Aquafina are simply filtered tap water, and have been sold that way for some time now. To do this, the bottlers simply hook into the municipal water supply and sell the water. Sometimes the bottlers run it through extra filtering systems like Pepsi's HydRO-7 scheme, and sometimes not. On the bottle, the water is usually labeled as being from a "community" or "municipal" source, (Figure 1) or even simply

stating it was bottled inside a city. This means that the bottler simply attached his plant to a city's water system and started bottling the city water (Shermer, 2003).

For the consumer, purchasing bottled water from a municipal source is simply a poor economic decision. Citizens in the United States, and in much of the developed world, have access to clean water, courtesy of extensive public works programs. In the US, the water system is one of the most reliable in the world, and benefits the entire community. Potable water is in great supply, and an average American uses about 74 gallons of clean water a day. (AWWA, 2006) These systems are not free, and taxpayers pay large sums of money to maintain the water supply. A citizen who drinks bottled water pays taxes to support a water system, pay fees to take water from that utility for showering and dishwashing at the like, then pays an for-profit, independent, and probably not local, company an exorbitant amount for the same, already cleaned water. In San Marcos, Texas, an average homeowner pays roughly $30 a month for four thousand gallons of potable water. There is an additional $30 wastewater fee, bringing the total cost for a family of three to $60 a month. This works out to half a penny per person per gallon per month. That's $0.005 per gallon.[2] (Sokol, 2006) If that water was bottled municipal water – the same potable water already cleaned by the municipal, community-funded system – the cost would be roughly $16,000, compared to the $60 charge for municipal water. The bottled water cost would vary according to the bottler; the $16,000 is at $1/quart, the cheaper end of bottled water lines. This works out to a 266.67 times increase in cost per month to acquire the same water secondhand through a private bottling company. For simply drinking water, it is reasonable to assume that an average

[2] Jake Sokol, San Marcos, TX. Actual fee is $18.98 for first two thousand gallons. Actual water bill was $28. $30 wastewater fee is mandatory. From two to four thousand gallons, the price is 1.5 pennies per gallon. Calculation was $60 divided by 4000 gal, then divided by three people.

adult drinks, at most, roughly three quarters of a gallon of water per day. (Mercola, 2001) That would be twenty-two and a half gallons a month. At a penny a gallon, that's 22.5 cents. At a dollar per quart for bottled water, municipal or not, that would be $22.5/month, 100 times the cost.

What is less obvious about bottled water is the container itself. The plastic bottle is damaging to both the drinker and to the environment. There is a popular belief that the bottle will eventually degrade into the water and contaminate it. (Snopes.com) The idea goes follows that as the bottle is reused, the plastic will break down into carcinogenic materials and can harm the drinker. (Snopes.com, 2006) The plastic used in the bottle does leach out into the water, but the rate is insignificantly slow. On average, one nanogram[3] of plastic will leach into the water per liter of water per day. This rate is simply not enough to really ever cause harm. (Benfenati, 1991) The IBWA recommends that bottles be used only once, not to avoid the off-loading effect of the plastic degradation, but to avoid bacterial contamination from refilling the bottle. (Cutler, 2003)

On the whole, however, the far greater damage is dealt to the environment. This damage comes in all forms and severities and all are major factors, but not all are included in the price of the water. The factors that are not included are what economists term "externalities." (Economist.com, 2006), and are the consequences "arising from an economic activity that affect somebody other than the people engaged in the economic activity." Construction of water harvesting installations inevitably disrupts the local ecosystem and can cause significant local problems in the future. Many pumps in the US can move 500 gallons per minute or more (Howard, 2006), and run all day every day.

[3] A nanogram is equal to 1.0×10^{-9} gram. One ounce contains roughly 28.4 grams, making 1 nanogram equal to 0.0000000000352 ounce

This has brought some concern among populations local to the wells. The collected water is then purified, which is a wasteful process. It is estimated that two gallons of water are wasted for every gallon purified (Howard, 2006). Furthermore, this water, once purified, is frequently sold far away from its source, and so must be transported to the tune of 23.5 billion tons of water a year worldwide. (Baricelli, 2001) Moving this water is done entirely without pipelines, and so relies entirely on fossil fuels. The amount of fuel is extraordinary, thousands of gallons a year simply to get water to market or a bottler's plant or market. (Howard, 2006) Millions of tons of plastic bottles are produced every year, using an amazing amount of oil to do so. These bottles, made of polyethylene terephthalate (PETE or simply PET), plastic can be recycled, but it is far more frequent to find the bottles simply thrown away. Since they are disposable water containers, it is clear that consumers do not attach great importance to them, and so simply cast them off. It is estimated that 9 out of 10 bottles used worldwide are not recycled, and find their way into landfills around the world (Howard, 2006). This is a rate of 30 million bottles thrown away every day, where they will take a thousand years to biodegrade. (Howard, 2006) In a more local context, the author estimates that he finds at least four or five discarded bottles littering the areas in which he travels everyday.

The amount of plastic used every year to manufacture enough bottles for the American market is phenomenal, requiring an impressive 1.5 million barrels of oil for the US alone. That is enough oil to fuel 100,000 cars for a year (Howard, 2006).

To top all of this off, the water for which people pay dearly may not be as pure or as clean as they expect. Bottled water is regulated by the Food and Drug Administration (FDA), which has set some extremely basic minimum standards, which are noted later in

this paper. The bottlers themselves have banded together to create their own set of standards, but these are also lacking when compared to both FDA and Environmental Protection Agency (EPA) standards, also noted below.

The IBWA, Model Code and Industry Self-Regulation

As the bottled water industry grew bigger, some manufacturers pooled some of their resources in 1958 to create an industry advocacy organization – the International Bottled Water Association (IBWA). Based in Alexandria, Virginia, it is the voice of the industry for the government. Membership is not compulsory for the bottlers, but is recommended. Being the voice of the industry the IBWA is the lobbyer for negotiations with state and federal authorities..

The IBWA, to help promote their product, published an industry standards document called the IBWA Model Bottled Water Regulation. Also referred to as the Model Code, the document was first issued in 1982, and the latest revision was published in March of 2005. This document is available from the IBWA website. However, the Model Code is just that: it's simply a model. It "provides comprehensive guidance" (Model Code, 2005), but it is not required for bottlers to adhere to the Code.

The Model Code itself is divided into six rules that highlight the major parts of water quality protection. The first rule is a convenient list of definitions that define the different kinds of bottled water, including "sparkling", "approved source" and so on.

The second rule states the most basic recommendations for bottlers. Specifically, it states that the water must be from an approved source, and that it should be free from coliform bacteria. The Rule also states that the water must meet certain contaminant

guidelines outlined in the Code. Finally, the Code asks that bottlers disclose "meaningful information" (Model Code, 2005) to those who ask upon written request, and create their own water purity protection policies.

The third Rule highlights "good manufacturing practices and operational requirements." In this, the Code recommends that bottlers adhere to the 2002 bio-terrorism laws, and to create a hazard control policy. It also defines bulk water, and how it is to be transported.

The fourth rule addresses how manufacturers are supposed to protect their water sources from contamination. These protective actions are supposed to include detailed reports on the possible contaminants of the area surrounding the source, the geology of the source, and the method of how the water will be harvested. As stated in rule two, bottling plant operators are responsible for water analysis.

Rule five institutes the schedule for the product testing after it has been bottled, and whether that testing is to be done in-house or sent to a laboratory. The Code recommends that for microbiological contaminants, bottlers should be testing weekly, and for other contaminants; annually. Currently, the IBWA contracts the laboratory testing to the non-profit National Sanitation Foundation (NSF) International. NSF was founded as part of the University of Michigan, Ann Arbor, in 1944. Since then, NSF has grown to be a world leader in standards and certifications related to sanitation. It has even been designated Collaboration Center by the World Health Organization. (NSF, 2006)

One of the indicators of NSF approval is the use of the NSF logo on product packaging. So far, the author has been unable to find a single use of this logo (Figure 1).

However, one product the author found, TRINITY, displayed the Quality Assurance International (QAI) logo, which is a subsidiary of NSF. (NSF, 2006)

The final part of the Model Code essentially is the Code of Federal Regulations issued by the FDA. These sections of the code are labeled 21 and 40 CFR, sections 101.5 and 165.110 and are the specific regulations required by the Federal government.

FDA Regulations – Code of Federal Regulations (CFR)

FDA Regulations (21, 40 CFR)

The bottled water industry is required by US consumer protection law to adhere federal standards of quality. Because the federal government considers bottled water a food product for general consumption, it is regulated by the FDA. Additionally, nearly all manufactures have to abide by state regulatory agencies like the Texas Department of Health and Human Services. Unlike the Model Code issued by the IBWA, compliance with federal regulations is mandatory and universal. A non-IBWA bottler must still adhere to government law, even if the bottler does not follow the Model Code.

The FDA regulations outlined in the CFR are actually fairly weak. They do not give any significant standards to ensure quality of the water. While the code does call for tests to be done[4], it does not give timelines or penalties. It does however, list pages and pages of certified testing facilities and methods and so is a rather handy reference tool for those interested to find a local facility. (21 CFR) In all actually, the FDA only really requires that the bottlers label their bottles with the source of the water, the volume of

[4] In the case of carbonated or seltzer water, no tests are required by federal law (NRDC)

water, and the name of the manufacturer. (21 CFR 101.13) Bottlers are not required to display the otherwise ubiquitous Nutrition Facts table on their products provided that the water contains less than one gram of any nutrient. (21 CFR §101.9(j)) Nevertheless, bottlers frequently place the table on their products anyway, and it seems to the author to be a courtesy for the consumer. Should the water contain in excess of one gram of any nutrient, or advertise a health or nutritional benefit, such as "low-fat" or "fluoridated", bottlers are required to display the table (21 CFR).

On the whole, the FDA does not do much to regulate or control for the quality of bottled water. It seems as though the guidelines laid out by the IBWA were adequate for the FDA.

EPA Regulations for Municipal Water Supplies

Fortified by millions in taxpayer dollars and lengthy public health tradition, sanitation and sewage disposal in the U.S. is one of the highest quality systems in the world. (EPA, 2004) The EPA regularly conducts tests on the public water supply to control for both bacteria and synthetic compounds. (NRDC, 1999) In the case of bacteria contaminants, there are hundreds of tests done every month, and for synthetic organic compounds, there are four tests a year. The EPA also requires disinfection of the water and routine checks for certain pathogens and viruses. These frequent tests are much more stringent (Figure 2) than those advanced by the IBWA, and have been extremely successful. (NRDC, 1999) Over 90% of the nation's drinking water is completely safe (EPA FAQ, 2004), compared to the roughly 75%[5] purity rate among bottled water.

[5] This comes from the fact that about one in four "snapshot" water inspections of bottling plants conducted by the NRDC did not meet government-issued quality standards.

(NRDC, 1999) The EPA, with a budget of $7.7 billion, serves 273 million people nationwide, and maintains large archives of water data about the drinking water systems throughout the nation. The data include statistics from all 160,000 public water systems and are easily available on the EPA website. (EPA, 2004) These databases include information on standards violations at all levels of water service, as well as other demographic information. Of particular note, in 2004, the EPA reported 98 organic compound violations nationwide. These contaminants might have affected 198,000 people, had the EPA not tested for the compounds. (EPA, 2004) Out of 273 million people, that is a 7% failure rate; much more desirable than the bottled water failure rate of 25%. (NRDC, 1999)

Federal and Industry Regulation Interaction

The Model Code of the IBWA is exact in its definition of acceptable water and the standards of quality that should be maintained by the member bottlers. Following the Model Code standards and the FDA guidelines set out in 21 CFR, the IBWA standards are set to meet or exceed FDA minimum standard (Model Code, 2005) At no point do the numbers laid out by the IBWA drop below federal criteria, and there are some cases, such as naphthalene, in which the IBWA controls for an impurity that the FDA, or the EPA, does not.

There are three specific chemicals that the FDA does not account for, but both the EPA and the Model Code address them by name, most likely due to a contamination scare in the 1990s. (Bykowicz, 2004) These three are naphthalene, used in mothballs,

methyl tertiary-butyl ether (MTBE), a gasoline additive[6], and 1,1,2,2-tetrachloroethane. All three are carcinogenic, with naphthalene being the most dangerous relative to the other three. However, all three are considered to be primarily air contaminants, and are much less common in US water supplies than other contaminants like *E. coli*. (Howard, 2003) The three, being air contaminants, do not readily enter or contaminate[7] the US water supply, although it has happened. They have done so, but usually in quantities too small to cause any significant or noticeable harm. In fact, there is doubt that they are even able to cause harm if ingested. (Wikipedia, 2006) These three chemicals, with MTBE figuring the largest, have influenced the growth of bottled water. As seen later in this document, bottlers were able to use MTBE to their advantage.

From the numbers presented in the Model Code and in the federal regulations, we can see that the industry regulations are slightly more stringent in comparison to FDA regulations. On all controlled contaminants, the Model Code asks manufacturers to meet or exceed FDA standards. However, there are a number of conditions that may degrade the on-paper quality of most bottled water.

Bottlers are not required to be members of the IBWA, or to follow the Model Code. All bottles the author examined (including Dasani and Aquafina) did not state on the label whether or not the bottler is a member. This makes it impossible to tell whether or not the water inside conforms to Model Code standards. The water quality is also more likely to fall below EPA or even Model Code standards due to the long time between quality checks. IBWA bottlers are only required to check for certain contaminants only

[6] It was approved by Congress as a fuel additive due to its oxidative properties. Oxidative elements in fuel allow it to burn cleaner. (Baltimore Sun)

[7] On still water, MTBE will form a film on the top of the water, but does not mix. (Baltimore Sun)

yearly, which is absolutely inadequate to preserve the general wellbeing of the population. (NRDC, 1999) In comparison to the EPA testing regime, the IBWA schedule is not effective. The low numbers of infrequent tests allow many contaminates to get through, (NRDC, 1999) and the EPA even specifically states that bottled water "is not necessarily safer" than tap water (EPA FAQ, 2004). The EPA goes on to say that bottled water is "valuable" in emergency situations or for people with compromised immune systems. (EPA FAQ, 2004)

Marketing Activities

The last facet of bottled water that is important to its development as a large international industry is the result of the activities of the bottlers themselves. Bottlers, in business to make money, will always attempt to convince others to buy their products. To do this, bottlers will invest large amounts of capital to promote their waters. When the above information regarding bottled water quality and its advantages and disadvantages is taken into account and combined with the information below, it becomes clearer that bottled water is a viable commercial product in the developed world simply as a result of massive investment in advertising.

In 1994, PepsiCo introduced Aquafina in Wichita, Kansas. Aquafina became available nationwide in 1997. It is, as of 2003, the top-selling brand in the US. It is taken from municipal supply and filtered. PepsiCo calls this filtration system "HydRO-7."

Very soon after, Coca-Cola introduced Dasani to compete with Aquafina. Like Aquafina, Dasani is filtered tap water. The name Dasani, like Aquafina, is an engineered word,

developed in a customer survey lab. (Howard, 2006) According to Coca-Cola the word was designed to invoke purity, comfort and freshness, and the blue bottle was also designed to complement this imagery.

Coca-Cola alone spent over 17 million dollars in 2004 to promote Dasani, while Pepsi spent over 21 million dollars to promote Aquafina. All combined, bottlers and resellers spent $71.4 million in 2004, an increase of 15% from the year before (Phood, 2001)

The money spent by the bottlers in advertisement has largely been fruitful. In 2004, sales of bottled water with flavor additives increased 47% from 2003, reaching a staggering $171 million. (Phood, 2001) Propel brand water leads this category[8] with a 73% market share. (Phood, 2001) Bottlers are, of course, unceasing in their quests to find new and profitable markets. The industry recently (1999) noticed that the preferred drink among women aged 25-39 is Evian, (Maringy, 2001) a bottled water brand without additives. Bottlers have taken this into account, and have adjusted their advertising campaigns accordingly (Phood, 2001) In an effort to attract new customers; companies have also begun to look at the kids' markets. Riding along with the current wave of kid-targeted advertising, (Lapham, 2001) bottlers have begun to introduce water brands specifically for kids. Sold in around half-sized bottles (Lapham, 2001), the bottles are designed to appeal to kids.

Perhaps one of Coca-Cola's boldest marketing move to enhance their sales was a 2001 partnership with the Olive Garden. Olive Garden was dissatisfied with its "high water incidence rate" (Gallagher, 2001) in which patrons were ordering tap water over

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[8] The industry term for this category, in which drinks and pharmaceuticals intersect, is "bepherages." Propel is advertised as a nutritional supplement in certain aspects, and is thus classified as a "bepherage." The food equivalent is "phood"

other drinks. This limited revenue because Olive Garden was not selling bottled water, sodas, or alcohol. Olive Garden then turned to Coca-Cola to find a way to sell more bottled water to patrons and help them to "experience other beverage choices to improve their dining experience." (Gallagher, 2001) The campaign, called H2NO, integrated suggestive selling techniques to divert attention away from tap water, by having servers suggest other drinks. To promote the advertising campaign, H2NO used the slogan "Just Say No to H2O" and created a contest that offered several prizes and trips to restaurants that made certain sales goals. When the contest was over, and the grand prize winners back from their all-expense paid trip to Atlanta, Coca-Cola reported that the vast majority of participating restaurants had seen "reduced [rates of]… water incidence". (Gallagher, 2001)

Like any other company, bottlers take advantage of events in order to promote their products, and one of the biggest opportunities for bottlers was in 1995. In that year, many thousands of groundwater sites in the US were found contaminated by methyl tertiary-butyl ether, (MTBE) after its initial discovery in Santa Monica, California. Fortunately, the contamination, at least in California was quickly brought under control. The widespread MTBE contamination was the result of MTBE being used as an oxygenating element in gasoline, and originated with fuel station runoff. While MTBE can cause nose and throat irritation, headaches, and nausea when inhaled, the EPA has found no evidence of MTBE-related health impacts from contaminated water. When present in the water, MTBE can make the water taste bad, even at low concentration, but there have been no reported cases of waterborne MTBE illnesses. In high concentration, MTBE may, however, be carcinogenic, although sources disagree (Wikipedia.org,

InChem, NRDC). Since the contamination was found, New York and California, which accounted for a large percentage of MTBE contamination, have both banned the use of MTBE as of 2004, and Maryland is considering a similar one (Wheeler, 2006). MTBE is also one of three chemicals for which the IBWA has made specific guidelines in the Model Code. (IBWA, 2005) Following this discovery of this harmful chemical in the nation's water supply, bottled water, and other beverage sales shot up due to opportunistic advertising that emphasized the purity of bottled water. Penta brand water specifically states "MTBE Free!" on the label. (label) Consumers, fearful of MTBE, and other contamination, turned away from tap water and to other beverages in large numbers. This is readily apparent in Coca-Cola's stock price graph, where there is a spike in stock value in 1996 that is more or less sustained until 2001. (Willett, 2004; Figure 3) This decline in stock value is in line with the general recession of the economy following the dot-com bubble and the events of September 2001.

Cost-Benefit Analysis

There are some important points to consider when one makes a choice to purchase bottled water. For the developed world, these decisions are based largely on the activity in which water will be consumed (e.g., sporting activities, social gatherings), and not on the bottled water quality. In the lesser-developed world, purchasing bottled water is entirely dependent on local water quality. In a poor nation in which there is an unreliable – if any – water utility, bottled water can be a better choice.

US Domestic Market

In the United States, with its highly developed water treatment and delivery infrastructure, regular or exclusive consumption of bottled water makes very little sense at all. In similarly developed nations, like in Europe, Japan, Australia, and elsewhere, the same conclusion holds. Bottled water is simply too expensive to regularly consume, as expensive as ten to 100 times more. (Figure 1) The quality of the bottled water, as shown above, is frequently below national standards, thus making bottled water dangerous, in addition to expensive. This combination has made many decry bottled water as irresponsible, immoral, and decadent (Standage, 2005; Adams, 2005). It really is pointless to develop, deploy, and maintain complex water systems, and then ignore them completely, and instead concentrate on shipping water from remote areas in small quantities for immediate consumption. The plastic bottle, transport fuels, import and transit taxes, corporate overhead, and additional bureaucracy costs are enormous. And the US can't get enough of it.

Lesser-Developed Countries

Below the proverbial line of development that separates the more industrialized northern nations from the less developed southern nations, bottled water is far more sensible, particularly for the tourist or traveler. Being sealed, it is therefore more pure than the local water. Imported water, while significantly more expensive than local water, is the best option for sanitary drinking. The plastic bottle waste will still be present, but at least there will be a noticeable increase in public health.

Advantages v Disadvantages.

From the reasons detailed above, the bottled water industry has some serious problems to overcome if it is to become more economically and environmentally sustainable for people other than bottlers. The high externality cost to the environment for the manufacture of bottled water is just too much to pay. The United Nations (UN), the UN Food and Agriculture Organization (FAO), and the World Wildlife Foundations (WWF) all agree that bottled water is not an adequate substitute for tap water under most conditions. (WWF) On an international scale, the economic footprint of the developed world's market for bottled water is huge, with waters being imported into the US from places as far away as Fiji. (label; Figure 1) In summary, bottled water is not cost-effective for the consumer, and is too damaging to the environment to be an adequate alternative to regular tap water.

Conclusion

Assuming a person is living in the United States or other developed countries, the regular bottled water consumption is not practical. As show above, it is not safe, it is not "better" water, and it is not economically or environmentally sensible. It is a better choice to simply purchase a single bottle, and refill it repeatedly. If one were to be traveling to areas where municipal water was unavailable or unreliable, then bottled water makes slightly more sense.

The activities of the bottlers have also been unsavory. While it is true they are simply trying to make a living, they are doing so by sabotaging, to some degree, publicly financed utilities. The companies tap into a municipal water system, and begin bottling the water. This is cheaper than tapping a spring or aquifer, and is also pre-cleaned for

easy bottling. This in turn reduces quality control overhead and the number of tests done, making the water ultimately less safe after traveling through so many machines. Furthermore, the discarded bottles are amassed in landfills, where they leach out and contaminate the groundwater (Howard, 2006). Despite this, all the company needs to do next is to market the product as the cleanest, purest, and healthiest water, and watch the stock price soar. The bottled water, however, is not as clean or as reliable as tap water and is not subject to the strict EPA standards. Because bottled water squeaks under the regulation radar with its Model Code and its manufacturing guidelines, there is a certain amount of laxity in regards to quality. If consumers were more aware of this elevated danger, it is logical that the actual quality of the bottled water is not cause for the growth of the bottled water industry.

The disadvantages of bottled water are too great to ignore. Bottled water is not an adequate substitute to tap water or a viable alternative good because its simply too expensive. It is also socially absurd to indulge in bottled water; developed countries have some of the best water systems ever built. To ignore those systems, especially when a bottled water drinker already pays taxes to support that system, is folly, and is often perceived as willful wastefulness.

The environmental cost is also too high to pay. Massive mounds of bottled water are not needed or wanted in anyone's backyard, but those bottles are placed into landfills at a very quick rate. The amount of petrochemicals and fuel used in the industry is staggeringly high, especially when there are pipelines carrying municipal water already in place. If the bottled water industry continues to expand in such an environmentally unsustainable fashion, then it will eventually cause severe repercussions in the future. It

is likely that few rational people in the world would like to see the slow destruction of the world's water resources, and therefore the environmental consequences of the industry are not the reasons for its growth.

It is ironic that the water being sold in many cases is water the companies tell their customers is unsafe and impure. The company takes municipal water, claims it is different from what it really is, or fails to identify it properly, and then tells people that water that is not bottled and without the company's mark is inferior, harmful, and dangerous, when in fact, the reverse is true. This advertising practice is simple, classic fear mongering by the companies as they spread fear, uncertainty, and doubt in an attempt to drive sales and grow the perception of quality. And it's working to an extraordinary degree and is the factor responsible for the growth of the bottled water industry in the United States and abroad.

Abbreviations:

AWWA:	American Water Works Association
EPA:	Environmental Protection Agency
FAO:	Food and Agriculture Organization
FDA:	Food and Drug Administration
IBWA:	International Bottled Water Association
MSDS:	Material Safety Data Sheet
MTBE:	methyl tertiary-butyl ether
NRDC:	National Resources Defense Council
NSF:	National Sanitation Foundation [International]
PETE:	polyethylene terephthalate (*also simply PET)*
UN:	United Nations
WWF:	World Wildlife Foundation

Specific FDA Regulations:

21 CFR Section 101.13 (Labeling Requirements) & 101.9 (Nutrition)
21 CFR Section 129.80 & 110 (Manufacturing practices)
21 CFR Section 165.110 source contaminants (biological, physical, chemical, radiological)
21 USC Section 343
40 CFR Section 141.2 & 113.3
23rd Revision, US Pharmacopoeia, Appendix B

Figure 1- Water brands found by the author:

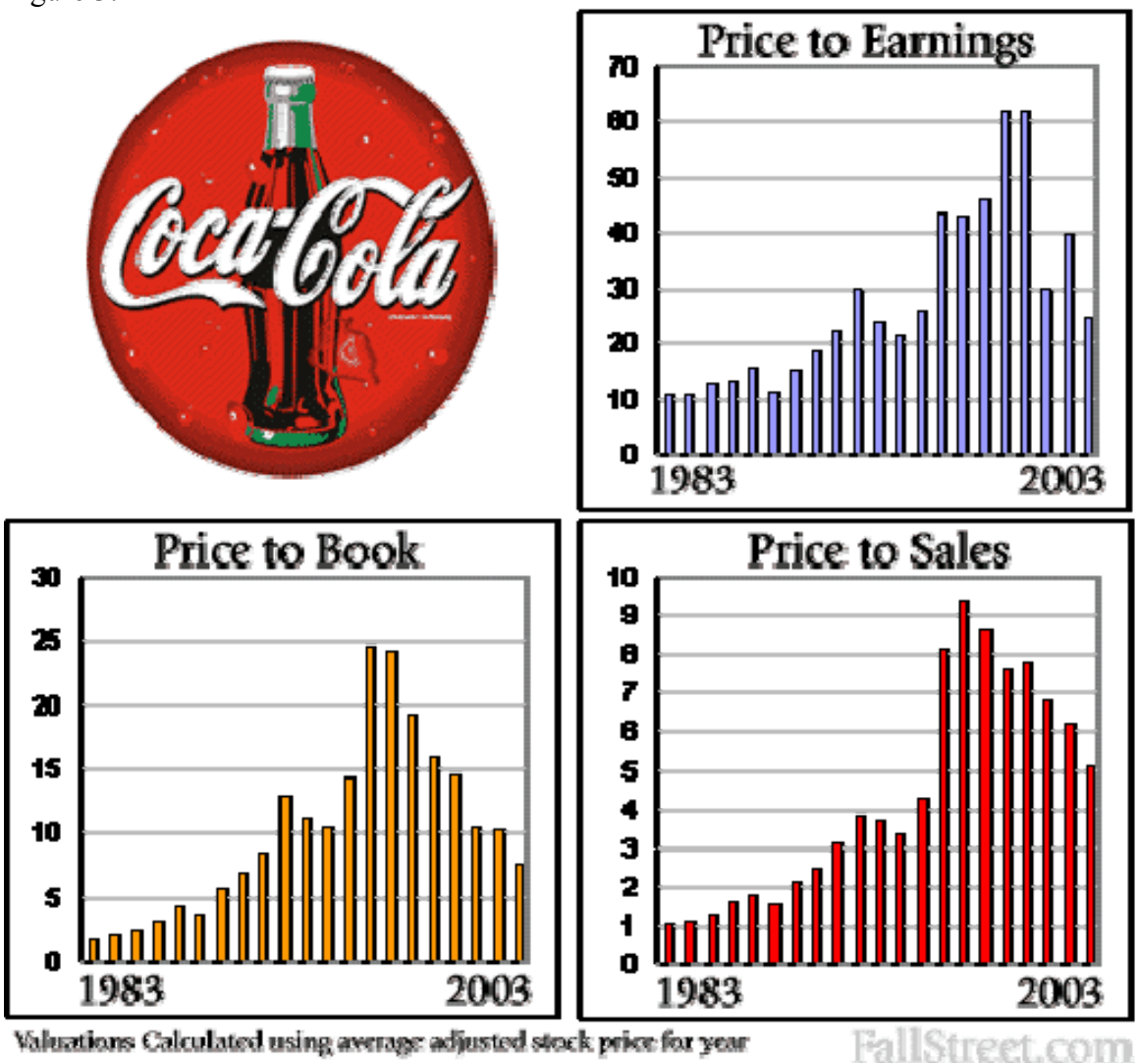
Brand	Cost	Bottler	Type	Source	Size, Oz	Servings	Cost per serving	8oz = 1 servi
TRINITY	1.99	Trinity Springs, Co.	Natural Spring	Trinity Spring, ID	33.8	4	0.4975	
Glacia	0.59	HEB	Natural Spring	Osprey TWP, ONT, CAN	33.8	4	0.1475	
SmartWater	1.19	Glacéau	Purified	Municipal	33.8	4.2	0.2833	
Volvic	2.29	Danone (Coca-Cola)	Natural Spring	Clairvic Springs, FRA	50.7	4	0.5725	
Ozarka	0.89	Nestle	Natural Spring	Piney Wood, TX	16.9	2	0.4450	
Cumberland Gap	1.09	Coca-Cola	Spring		33.8	4	0.2725	
Springtime	1.15	Southern Beverage, Inc.	Artesian	Crystalline Rock Aquifer	33.8	4	0.2875	IBWA Member
CVS Gold Emblem		Clearsource Inc.	Natural Spring	Stockbridge or Randolph Ctr, VT	16.9	2		
Dasani (mini)		Coca-Cola	Purified	Municipal	8	1		
Dasani	1.25	Coca-Cola	Purified	Municipal	20	2.5	0.5000	
Fiji	1.29	Natural Waters of Viti, Ltd.	Natural Spring	Yaqara, Vitu Levu, Fiji	33.8	4	0.3225	
Snap2O		Snapple	Purified Spring	Stockbridge or Randolph Ctr, VT	33.8	4.2		
Penta	3.21	Bio-Hydration Research Lab, inc	Purified	Municipal	33.2	4	0.8025	MTBE Free
Deer Park (mini)		Nestle	Natural Spring	Springs in PA, MD	8	1		
Evian	1.69	Danone (Coca-Cola)	Natural Spring	Cachat Springs, FRA	33.8	4	0.4225	
Vasa		CCDA Waters, LLC	Natural Spring	Big Spring, Bellefonte, PA	25	3		NSF Certified
Kim's		Kim's Convenience Stores	Natural Spring	Buck Springs, Jasper Cty, TX	16.9	2		
Essentia	1.09	Essentia Water, Inc	Purified	Municipal	20	2.5	0.4360	
Sparkletts	3.99	CCDA Waters, LLC	Purified	Municipal	405.6	48	0.0831	24 bottle package
Hill Country Fare	1.25	HEB	Natural Spring	Leoffer Spring, Jasper, TX	101.4	12	0.1042	6 bottle package
Aquafina	3.29	Pepsi-Co	Purified	Municipal	101.4	12	0.2742	6 bottle package
SmartWater	1.74	Glacéau	Purified	Municipal	50.7	8	0.2175	Vapor Distilled

Figure 2 – National Resource Defense Council Table:

Some Key Differences Between EPA Tap Water and FDA Bottled Water Rules						
Water Type	**Disinfection Required?**	**Confirmed *E. Coli* & Fecal Coliform Banned?**	**Testing Frequency for Bacteria**	**Must Filter to Remove Pathogens, or Have Strictly Protected Source?**	**Must Test for *Cryptosporidium, Giardia,* Viruses?**	**Testing Frequency for Most Synthetic Organic Chemicals**
Bottled Water	No	No	1/week	No	No	1/year
Carbonated or Seltzer Water	No	No	None	No	No	None
Big City Tap Water (using surface water)	Yes	Yes	Hundreds/ month	Yes	Yes	1/quarter (limited waivers available if clean source)
See Table 1 of NRDC's bottled water report for further comparisons and explanations.						

(NRDC, 1999)

Figure 3:



(Willett, Brady. 2004)

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