Federal Excise Taxes and the U.S. Beer Industry's Three-Tier System of Distribution:
Do beer manufacturers benefit from federal excise taxes?

by

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Spring 2006

Honors Thesis submitted in partial fulfillment of the requirements for Graduation with Distinction in Economics in Trinity College of Duke University

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Acknowledgements

I am principally grateful to my advisor Dr. Philip J. Cook[1] for his guidance, support, and time. I thank Dr. Craufurd Goodwin for helping me develop my research topic in his "Uses of Economics" course. I also thank Dr. Alison Hagy, Economics 114S and 115S professor, and Paul Dudenhefer, EcoTeach writing consultant, for their ample feedback throughout the writing of this Thesis. Finally, I thank Sunil Fadia, my father and owner of Harvard's Wine and Beverages; Tim Richards, District Sales Manager for Budweiser of Greenville; Tom Russell, former owner of Northern Virginia Beverage Company; and classmates in Economics 114S and 115S for their generous feedback and support.

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Abstract

On January 1, 1991, the federal excise tax on beer increased from $9 to $18 per barrel. Young & Bielinska-Kwapisz (2002) discovered that this $9 per barrel tax increase led to a $15-$17 per barrel increase in the end-of-sale price of beer. No study has yet explained why the beer tax increase was overshifted as it passed through the three tiers, namely manufacturers, distributors, and retailers. I hypothesize that manufacturers cooperate under focal point pricing and pass beer tax increases to distributors and retailers with a markup. Applying Taubman's (1965) model to the beer industry, I show that manufacturers could have theoretically passed the 1991 beer tax increase with a markup. In support of Taubman's (1965) model, personal interviews and e-mail exchanges with beer distributors revealed that manufacturers can pass beer tax increases with a markup to both distributors and retailers. PPI and CPI data show that manufacturers and retailers substantially marked up prices to distributors and consumers, respectively. Macrobrewer profit data establish that Anheuser-Busch and Miller's real net profits between 1990 and 1991 increased, in 1982-84 dollars, by $69 and $3 million, respectively, while Coors's real net profits decreased by $11 million due to rising costs during its expansion to national production. Since Anheuser-Busch and Miller's output did not significantly increase but their costs did increase from 1990 to 1991, macrobrewers' profits could have only increased due to rising prices. Moreover, in a leader-follower game it is expected that profits for the dominant firm, Anheuser-Busch, increase more than profits for fringe firms, Miller and Coors. I accept my hypothesis that manufacturers were responsible for overshifting, and as a whole benefited from, the 1991 beer tax increase.

Chapter 1

Introduction

"In 2002, the [beer] industry accounted for more than $64 billion in sales, employed more than 850,000 U.S. workers, and paid $8.4 billion in federal and state excise and sales taxes" (Tremblay & Tremblay, 2005, p. 10). The U.S. beer industry, as Professors Tremblay and Tremblay suggest, occupies a substantial niche in the economy with respect to sales, employment, and tax receipts for local, state, and federal governments. Partly to effectively procure tax revenues, and partly to rigidly control its distribution from distillation to final sale, its unique organization is characterized by a three-tier system of distribution where manufacturers, distributors, and retailers are mandated separate entities by law. At the federal level, the government imposes an excise tax on manufacturers' output, which is collected by the Alcohol and Tobacco Tax and Trade Bureau, a branch of the Treasury Department. Between 1951 and 2005, Congress legislated only one increase in the beer tax (Cook, 2006). Importantly, Young and Bielinska-Kwapisz (2002) discovered that end-of-sale beer prices increased more than the January 1, 1991 beer tax increase on manufacturers. The unprecedented 1991 federal excise tax increase of $9 per barrel, from $9 to $18 per barrel, led to a $15 to $17 per barrel increase in the end-of-sale price.[2] No study to date has deconstructed the passage of this beer tax increase through the three-tier system to explain why the tax was overshifted.

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[2] One American barrel contains 31 U.S. gallons, which is equivalent to 55.11 six-packs. This implies that the 1991 tax increase of $9 per barrel was an increase of 16.3 cents per six-pack. Further, the tax increase from $9 to $18 per barrel was applicable only to large brewers, or those who produced more than 2,000,000 barrels per year. Brewers who produced fewer than 2,000,000 barrels per year paid the reduced tax rate of $7 per barrel for the first 60,000 barrels. Note that while the tax on manufacturers increased by $9 per barrel, or 16.3 cents per six-pack, retail prices increased by $15-$17 per barrel, or 27.2 to 30.8 cents per six-pack.

Historically, the U.S. beer industry's market structure has always been distinctive, even before Prohibition. Before 1920, beer was manufactured by large suppliers who sold to small retailers. These small retailers had little market power and influence on the end-of-sale price. Retailers paid manufacturers near-monopolistic prices on beer because they were controlled by manufacturers who often threatened to cut off supply or provide fewer kickbacks if retailers failed to comply with marketing or sales demands (Tremblay & Tremblay, 2005). Thus, even though manufacturers did not explicitly own retailers, a so-called "tied house" relationship between manufacturers and retailers existed with manufacturers having clear influence over retailers' pricing decisions. A two-tier system of beer distribution, comprised of large manufacturers and small retailers, dominated the beer industry until 1920.

A growing temperance movement led Congress, after gaining the approval of 36 states, to ratify the 18th Amendment to the Constitution on January 16, 1919. In conjunction with Volstead Act, which was passed on October 28, 1919, Congress ushered Prohibition on January 16, 1920. Per Section 1 of the 18th Amendment, the "manufacture, sale, or transportation" of alcoholic beverages was prohibited in the United States. However, widespread negligence of Prohibition and corruption with its enforcement, notably through the emergence of bootleggers and illegal underground bars like speakeasies, soon grew. According to one estimation by Miron and Zwiebel (1991), alcohol consumption at the start of Prohibition fell to 30 percent of its pre-Prohibition level, but it increased sharply during the next several years to about 60-70 percent of its pre-Prohibition level. Congress, realizing increasing public noncompliance with Prohibition, repealed the 18th Amendment by ratifying the 21st Amendment on December 5, 1933. Although the 21st Amendment gives

states a central role in regulating the beer industry, this role is constrained by the Federal Alcohol Administration Act of 1935, which prohibits "tied house" arrangements within the industry. In effect, Prohibition shepherded a new regulatory scheme for alcohol distribution.

Drastic changes transpired after thirteen years of Prohibition that impact the beer industry to this day. Today, a three-tier system of beer distribution exists in all states, separating manufacturers and retailers with the incorporation of a "middle man," the distributor. State three-tier laws, under the umbrella of the Federal Alcohol Administration Act of 1935, prohibit complete vertical integration and mandate that manufacturers sell beer to distributors. Since each state can regulate the three-tier system independently, manufacturers own their distributors in some states; however, beer must still pass through distributors before reaching retailers. Distributors sell beer to retailers, and many distributors have local monopolies in the form of exclusive geographic territories. Retailers, in turn, can only sell beer to consumers. Some microbrewers, or small, local brewers serving specific regions with specialty dark lagers, bypass the three-tier system by selling their beer directly to brew pubs; however, they comprise a small portion of the industry and produce a differentiated product that competes separately from popular beers made by mass producing brewers, or macrobrewers.

With respect to the three-tier system, several economists explored taxation's effectiveness, in the Pigouvian sense, in curbing the negative externalities of beer consumption such as drunk driving fatalities and risky sexual behavior (Coate & Grossman, 1988; Cook, 2006; Cook & Tauchen, 1982; Grossman, Sindelar, Mullahy, & Anderson, 1993; Kenkel, 1996; Pogue & Sgontz, 1989; Saffer & Chaloupka, 1994; Saffer & Grossman, 1987). However, only one study to date has explored the relationship between beer taxes and retail

prices. Young and Bielinska-Kwapisz (2002) significantly discovered that as a result of the single largest post-Prohibition increase in the federal beer tax, the retail price of beer increased more than the excise tax increase on manufacturers. Yet Young and Bielinska-Kwapisz (2002) do not explain the mechanism behind their finding.

It is worthwhile, then, to consider the mechanism by which the federal excise tax is passed through the three-tier system of beer distribution. In the three-tier system, distributors in almost all cases, with the exception of some microbrewers who can sell beer directly to small brew pubs, have the sole responsibility to purchase beer from manufacturers and the sole right to sell beer to retailers. It may seem at first glance that distributors have the most market power since they are government-mandated "middle men," some of whom have in all 50 states exclusive geographic territories to sell to retailers. However, beer manufacturers are huge. Anheuser-Busch is the largest brewer in the world and its flagship brand, Budweiser, is aptly advertised as the "King of Beers." In fact, Anheuser-Busch comprised 55 percent of U.S. beer production in 2001 (Tremblay & Tremblay, 2005). Together, the three largest producers, Anheuser-Busch, Miller, and Coors, comprised 94 percent of domestic beer production in 2001 (2005).

Considering their concentration and market power, I hypothesize that manufacturers pass beer tax increases to distributors and retailers with a markup. This paper tests this hypothesis by exploring the relationship among and between manufacturers, distributors, and retailers. Applying Taubman's (1965) model to the beer industry, I show that manufacturers could have in theory passed the 1991 tax increase with a markup. I then illustrate using interviews and e-mail exchanges with distributors that manufacturers can pass beer tax increases with a markup to both distributors and retailers. Using PPI data, I show that the

beer tax was, indeed, marked up 5.05 percent by manufacturers. Using CPI data, I reveal that beer retailers marked up their costs by 7.77 percent. I finally show that manufacturers benefited from the beer tax increase using macrobrewer profit data; the three largest manufacturers exhibited a combined real net profit increase, in 1982-84 dollars, of nearly $61 million between 1990 and 1991.

In Chapter 2, I present a review of the relevant excise tax and markup literature. I offer a theoretical framework in Chapter 3 that outlines each tier's influence on end-of-sale prices. I then describe in Chapter 4 interview, PPI, CPI, and macrobrewer profit data used in this study. In Chapter 5, I divulge findings on the 1991 beer tax increase and its passage through the three-tier system. Finally, I present conclusions and public policy implications of this study in Chapter 6.

Chapter 2

Literature Review

Several economists since the 1970s have explored beer taxes in the context of public policy questions (Coate & Grossman, 1988; Cook & Tauchen, 1982; Saffer & Chaloupka, 1994; Saffer & Grossman, 1987). Alcohol abuse imparts negative consequences on non-consumers through, for example, drunk driving fatalities and risky sexual behavior. Consequently, alcohol consumption has marginal private benefits that exceed marginal social benefits; in other words, the market creates a level of consumption that is higher than the socially optimal level, as demonstrated by Figure 2.1. Economists, to remedy this market failure, propose tax increases that reduce negative externalities of alcohol consumption by raising prices and reducing quantity demanded. Despite several studies exploring the relationship between federal beer taxes and negative externalities, only one study has explored the relationship between excise taxes and beer prices.

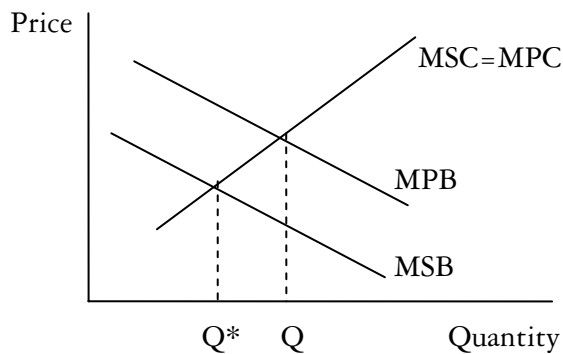**Figure 2.1: Negative Externality of Beer Consumption**. Negative externalities of beer consumption like drunk driving fatalities suggest that marginal private benefits (MPB) are greater than marginal social benefits (MSB). Assuming there are no externalities of production, or marginal social costs (MSC) equals marginal private costs (MPC), a higher quantity of beer is consumed (Q) than is socially optimal (Q*).

Specifically, Young and Bielinska-Kwapisz (2002) discovered that the end-of-sale price increase of $15-$17 per barrel from a federal excise tax increase of $9 per barrel in 1991 had no discernible time lag. The full effect of the tax was realized in retail prices within three months, or by the end of March 1991. They also found that state excise taxes comprise only 3 to 5 percent of the retail price of beer. Cook (2006) points out that state excise taxes change infrequently, for 13 states had not raised tax rates since 1975. Since state excise taxes change infrequently and comprise a small portion of the end-of-sale price of beer, federal excise taxes affect end-of-sale beer prices more strongly than state excise taxes.

Models have been proposed to explain how taxes can be overshifted. Under imperfect competition, the price of a taxed commodity can increase greater than the tax itself. Katz and Rosen (1985) and Besley (1989) researched tax passage with a markup in an oligopolistic model assuming identical firms that produce homogeneous products at a constant marginal cost. Besley (1989) found that taxes will always be overshifted if the demand curve is convex, as it is when demand elasticity is constant. Young and Bielinska-Kwapisz (2002) alternatively suggest that taxes are overshifted when the industry supply curve is downward sloping, for this implies economies of scale at the firm level. In other words, when a tax is imposed, quantity demanded falls and average total costs increase. Firms raise prices more than the tax to cover increased average total costs. Barzell (1976) proposes yet another model; he suggests producers increase "quality" when they incur per unit tax increases. For example, cigarette manufacturers increased the length of their cigarettes when they incurred a per package tax increase. They simply added more tobacco per package and charged more for that package. Since the tax was levied per cigarette pack and not on the amount of tobacco it

contained, cigarette manufacturers were able to reduce their tax incidence by increasing the "quality" of their product.

Using a model with three tiers for product distribution, Taubman (1965) showed that if an industry is characterized by a monopolistic manufacturer and perfectly competitive retailers, then prices will always rise more than the tax under markup conditions. Taubman (1965) assumed a linear demand curve for the monopolistic manufacturer, nonzero marginal costs, and non-substitutability for retailers. Relating this model to the beer industry, end-of-sale prices will, in theory, rise more than federal excise tax increases on manufacturers if (1) manufacturers can act like a monopoly, (2) manufacturers can pass beer tax increases through distributors and to retailers, (3) retailers comprise a perfectly competitive tier, and (4) retailers have no close substitutes for manufacturers' beer brands.

Despite these proposed models explaining how taxes can be overshifted, no systematic and in-depth analysis has been performed to explain Young and Bielinska-Kwapisz's (2002) finding that the federal beer tax increase in 1991 led to a much larger increase in the retail price of beer. Young and Bielinska-Kwapisz's (2002) finding suggests someone along the chain of beer distribution may be benefiting from beer tax increases by passing them with a markup. My research interest thus emerges from discerning how federal beer taxes are passed through the three-tier system and which tier benefits most from tax increases. My hypothesis is that manufacturers pass beer taxes with a markup to distributors and retailers, for they are the most concentrated tier with the "big three" macrobrewers comprising 94 percent of domestic production. As a consequence, it is likely that beer manufacturers profit from federal tax increases. Using the 1991 tax increase as a case study, I test this hypothesis.

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Chapter 3

Theoretical Framework

As the federal government imposes an excise tax on the ethanol content of beer, beer manufacturers are faced with a choice: they can either bear the burden of the tax or, if they are capable of doing so, pass it to distributors. For manufacturers to be capable of passing a tax with markup to distributors, distributors must be price-takers relative to manufacturers. According to Machlup (1937), if an industry has monopolistic producers, assuming the industry faces a downward-sloping demand curve, market prices will be higher than the tax because producers can raise prices above marginal cost without losing all customers. If, instead, firms' demand curves are flat and perfectly elastic, then firms lose all customers when they raise prices. Market power, or the ability of a firm or industry to influence the end-of-sale price, therefore increases with decreasing competition and increasing monopolistic character. Since Tremblay and Tremblay (2005) determined beer demand is downward sloping, if a tier has significant market power arising from concentration and monopolistic character, then that tier is capable of passing taxes with a markup to subsequent tiers.

Yet concentration and monopolistic character do not necessarily impart market power. An oligopolistic market can be contestable if there are no barriers to entry, for the threat of new entrants limits incumbent firms from charging prices above competitive levels. More important to market power, then, is the ability of firms to engage in unilateral anti-competitive behavior. Barriers to entry such as licensing requirements, large output capacity to achieve economies of scale, and high sunk costs promote market power and enhance the ability of firms to influence market prices.

Specifically, Taubman (1965) defines a tiered industry where taxes imposed on manufacturers result in overshifted retail prices. He assumes taxes are levied on a monopolistic manufacturer in an industry with perfectly competitive retailers who cannot substitute for the manufacturer's products. Taubman (1965) shows that retail prices, when certain assumptions are fulfilled, increase more than taxes because manufacturers mark up taxes. He assumes a linear, downward-sloping demand curve and non-zero marginal costs for the monopolistic manufacturer. Tremblay and Tremblay (2005) determine that beer follows the law of inverse demand, so a linear, downward-sloping demand curve can be safely assumed for manufacturers. Since licensing requirements exist for manufacturers, manufacturers are not perfectly competitive; thus, manufacturers face non-zero marginal costs. For the beer industry, as long as subsequent tiers accept marked up taxes and the aforementioned assumptions are satisfied, tax increases will be, in theory, overshifted by manufacturers.

Taubman (1965) assumes in his model a monopolistic manufacturer. As will be shown in Section 3.1, manufacturers are collectively an oligopoly. They must therefore collude and act as a monopoly during tax increases in order for Taubman's model to hold. Game theory, and in particular an iterated prisoner's dilemma game, provides a model for cooperation. Manufacturers have an incentive to cooperate in a repeated game because collusion can, in the long run, result in shared monopolistic profits among players. Yet a classic iterated game fails to account for Young and Bielinska-Kwapisz's (2002) finding that prices increase substantially around tax increases.

Tax increases likely serve as a signal for manufacturers to collectively pass taxes with a large markup. A focal point is a solution that players reach in the absence of communication

when presented with a choice that seems special to them. Consider a prisoner's dilemma game with two players who cannot communicate and must choose one of four blue square pieces. If both players choose the same square piece, then they receive a rewarding, monopolistic outcome. Now consider a period when a single piece on both players' boards turns red. Knowing that if they both choose the same piece they will benefit from a monopolistic payout, and knowing that they will play the same game in many future periods, Schelling (1959) postulates that both players would choose the red square. In the context of the beer industry, this special "red square" signal was the 1991 beer tax increase. Using the tax increase as a focal point signal, manufacturers likely colluded in the absence of explicit communication to pass taxes with a markup.

In summary, for Taubman's (1965) model to apply to the beer industry, the following assumptions need to be fulfilled: (1) manufacturers are capable of acting as a monopoly, (2) manufacturers can pass taxes with a markup through distributors and to retailers, (3) retailers comprise a perfectly competitive tier, and (4) retailers do not have substitutes for manufacturers' beers. If it applies to the beer industry, Taubman's (1965) model shows that manufacturers were theoretically responsible for overshifting the 1991 beer tax increase. I now turn to an overview of each tier to demonstrate that Taubman's assumptions are applicable to the beer industry.

3.1 Manufacturers: An Oligopolistic "War of Attrition" Game

"Anheuser-Busch and Miller spill more beer than the specialty brewers produce" (Tremblay & Tremblay, 2005, p. 13). Tremblay and Tremblay (2005) claim beer manufacturers are probably the best understood players in the industry because they are highly concentrated. In fact, there were only 24 traditional lager brewers in the U.S. in 2001

compared to 421 in 1947. Driving this concentration was technological improvement in beer

production, which increased the minimum efficient scale (MES) of production for brewers to

remain in business in the long run.[3] The Tremblays estimate that the MES rose from 100,000

barrels of beer in 1950 to 18 million barrels in 2000. Due to technological improvement and

a dramatic increase in the MES, three types of brewers exist today: macrobrewers,

microbrewers, and international brewers.

Macrobrewers

Only three brewers carried the macrobrewer title in 2002 with a combined U.S.

production share of 93.45 percent: Anheuser-Busch with 55.10 percent, Miller with 21.47

percent, and Coors with 12.28 percent. Although Pabst comprised 4.60 percent of domestic

production in 2002, it was not considered a true brewer because it transferred production to

Miller on a contract basis in 1991 (Tremblay & Tremblay, 2005). Scherer and Ross (1990)

and Shepherd (1997) claim that if an industry has a four-firm concentration ratio (CR_4)

exceeding 40 percent, then the industry is an oligopoly. Per this distinction, then,

manufacturers have been an oligopolistic tier since 1968, for today the three biggest mass-

producers of popular beer comprise nearly 94 percent of U.S. beer production.

Two reasons are proposed by Tremblay and Tremblay (2005) to account for this

extreme macrobrewer concentration. First, macrobrewers are able to meet the 18 million

barrels MES requirement while smaller competitors cannot produce nearly as much beer. As a

consequence, the industry has seen an exodus of smaller national beer manufacturers. Second,

macrobrewers can afford the high investment costs required to advertise and capture

competitors' market share. Although the overall demand for beer is unaffected by advertising,

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[3] The MES is the output a firm produces in the long-run where internal economies of scale are fully exploited. In
other words, it is the quantity that minimizes long-run average total costs, otherwise known as the output of
long-run productive efficiency.

individual manufacturer demands are strongly affected by advertising (2005). If one manufacturer increases advertising, it will capture a greater market share from its competitors; thus, the overall demand for beer remains unchanged as consumers simply switch consumption from one brand to another, more highly advertised brand. Sutton (1991) argues that advertising raises investment costs, which deters entrants and makes it less profitable for smaller national manufacturers to remain in the market. Concentration of macrobrewers can therefore be attributed to the large MES requirement spurred by technological innovation and high investment costs borne by advertising expenditures.

Microbrewers

In contrast to the large, nationally producing brewers like Anheuser-Busch, Miller, and Coors, microbrewers are small manufacturers who generally brew darker craft-style beers and ales catering to local tastes. These manufacturers do not have capital resources to produce enough beer and achieve the MES requirement for national production. As a consequence, microbrewers comprise approximately 6 percent of U.S. beer production and survive by seeking out and serving niche markets (McAfee, 2002).

Despite contributing a small share to U.S. beer production, over 1,000 specialty microbrewers are active today. Cook (2006) suggests many microbrewers are active today because federal excise taxes are more favorable for small brewers. Beginning in 1977, federal excise taxes have been lower for brewers who produce fewer than 2,000,000 barrels per year. The 1991 beer tax increase did not fully apply to microbrewers because their tax incidence remained at $7 per barrel for the first 60,000 barrels.

International Brewers

As the largest importer of beer compared to any other country, imported beer comprises a substantial portion of the total amount of beer consumed in the U.S., or 10.6 percent ("Craft beer and imports", 2003). Yet, imported beer remains distinct from its mass-produced domestic counterpart. Importers face high shipping costs and sell, in general, darker beer with higher alcohol content than the lighter, more popular domestic brands (Tremblay & Tremblay, 2005). Therefore, imported beer is an imperfect substitute for domestic beer because its price is substantially higher and its characteristics, both physical and aesthetic, are different. In 2001, imported beer averaged $23.94 per case while domestic premium averaged $15.62 and domestic super-premium averaged $17.62 ("Beer industry update: A review of recent developments", 2002).

Manufacturers: Overall Impression

"We don't want to start a bloodbath, but whatever the competition wants to do, we'll do" ("Busch fights to have it all", 1990). Macrobrewers are the most important component of manufacturers. They are highly concentrated because they fulfill the MES requirement and can bear investment costs associated with advertising. Furthermore, international brewers do not influence end-of-sale prices as much as domestic brewers because 89.4 percent of beer consumed is domestic. International brewers largely influence super-premium beer prices that compete separately from macrobrewers' popular beers (Tremblay & Tremblay, 2005). Due to commanding 94 percent of domestic production, macrobrewers are certainly the dominant players in the manufacturer tier.

Macrobrewers are capable of acting as a monopoly through collusion. Evidence of collusion comes from historical observation of the "war of attrition" game played between

Anheuser-Busch, the dominant manufacturer, and its rivals. This scenario is a classic leader-follower game with a trigger strategy that punishes rivals who do not cooperate. Each firm sets price equal to monopoly price (p_m) in period t if rivals pursue the same strategy in period t-1. Otherwise, each firm pursues the competitive, non-cooperative strategy. The trigger strategy is effective if punishment for non-cooperative behavior makes the present value of future profits greater for cooperative than non-cooperative behavior. In 1953, Anheuser-Busch raised the price of Budweiser after incurring increased costs from a union wage agreement. Several Midwest rivals, namely Griesedieck Western, Griesedieck Brothers, and Falstaff, kept their prices at the same level. Between January and June of 1954, Anheuser-Busch retaliated by making the price differential between Budweiser and its rivals' brands zero; Anheuser-Busch's market share increased from 12.5 to 39.3 percent in St. Louis. The next time Anheuser-Busch increased prices on Budweiser in February 1955, its Midwest rivals increased their prices in perfect accordance with the "war of attrition" game where Anheuser-Busch was the price-setting leader (Tremblay & Tremblay, 2005).

3.2 Distributors: A Likely Tight-Knit Relationship with Manufacturers

"Coors insisted that its wholesalers [distributors] not cut prices, so as to protect its image" ("While the big brewers quaff, the little ones thirst", 1972). In almost all states, leading manufacturers hold contracts with distributors. As contracts are meted out to distributors at manufacturers' discretion, it is likely that contracts give manufacturers oversight for the prices their distributors charge retailers. In states where contracting is prohibited, manufacturers can still wield influence over the prices their distributors charge retailers by offering kickbacks and other incentives for cooperation. Anheuser-Busch, for example, implements a program that provides financial incentives to distributors who only

carry its products ("Anheuser soft-pedals '100% share of mind'", 1996). Thus, a close-knit relationship likely exists between manufacturers and their distributors.

Anheuser-Busch, Miller, and Coors hold, in some states, contracts that specify exclusive geographic territories in which their distributors can sell beer to retailers. According to Sass & Saurman (1993), 24 states require brewers to have one distributor market their beer within an exclusive geographic territory. Moreover, only three states prohibit exclusive territories (Wine & Spirits Wholesalers of America, 2002). Distributors are constrained from charging a monopoly price because other distributors sell competing brands to the same retailer. In spite of competition, manufacturers and distributors might be able to charge retailers significantly higher prices during tax increases. Manufacturers can use tax increases as a focal point signal to collude and charge distributors a marked up tax. If manufacturers influence the prices their distributors charge retailers, then manufacturers can also raise the prices their distributors charge retailers. Consequently, manufacturers can directly pass taxes with a markup to retailers.

3.3 Retailers: A Monopolistically Competitive Sector

As the least concentrated and most competitive tier, retailers also have the least market power to influence end-of-sale prices. However, retailers are not perfectly competitive because there are clear barriers to entry. Retailers must fulfill licensing requirements in every state. The retailer tier, then, is characterized by monopolistic competition where retailers can generate supernormal profits by marking up costs to the demand curve. This markup above average cost is illustrated in Figure 3.1 as the difference between P* and P'.
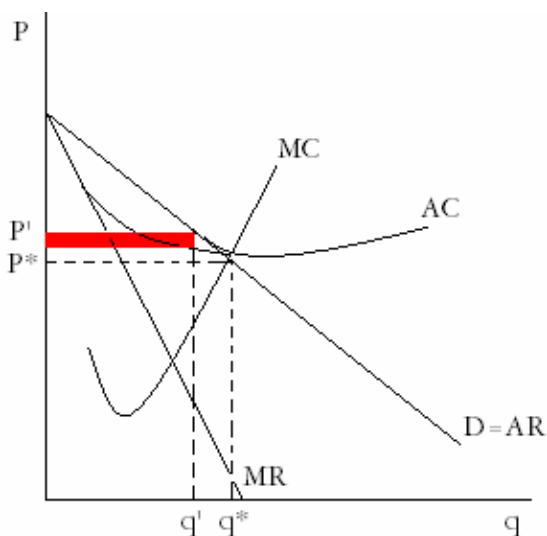
Figure 3.1: Structure of a Monopolistically Competitive Firm. The demand curve (D) coincides with the average revenue curve (AR). Also, the marginal revenue curve (MR) is like the monopoly marginal revenue curve, which is twice the slope of the demand curve. The average cost curve (AC) intersects the marginal cost curve (MC) at its minimum. Notice that the monopolistically competitive firm charges a higher price (P'>P*) and produces a smaller quantity (q'<q*) than a perfectly competitive firm. Supernormal profits are shaded.

General beer demand is price inelastic.[4] One estimate indicates that the price elasticity of demand for beer is -0.3 (Leung & Phelps, 1993). Thus, a one percent increase in the price of beer reduces quantity demanded by only 0.3 percent. Several studies suggest that wine, spirits, and soft drinks are imperfect substitutes for beer (Gallet & List, 1998; Hogarty & Elzinga, 1972; Lee & Tremblay, 1992; Nelson, 1999, 2003; Ornstein & Hanssens, 1985; Tegene, 1990). Since the general demand for beer is inelastic, it would seem plausible that retailers are able to sell beer at a substantial markup. However, since there are many retailers, they are much more competitive than manufacturers and distributors. Retailers are unlikely to increase the end-of-sale price by substantially marking up their costs, which include the beer tax, to consumers.

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[4] In general, the demand for a specific brand like Budweiser is always more elastic than industry demand because there is greater substitutability for particular brands. Consumers can more easily find substitutes for beer brands than substitutes for beer itself. Therefore, consumers are more price sensitive (firm demand is relatively elastic) for specific brands than beer in general (industry demand is relatively inelastic).

3.4 Summary of Beer Industry Organization

From 1950 to 2002, Anheuser-Busch's concentration increased from 5.83 to 55.10 percent (Tremblay & Tremblay, 2005). If in 1954 Anheuser-Busch was able to play the industry leader in a "war of attrition" game, it can surely assert greater influence today with an almost tenfold increase in market concentration. Moreover, Taubman's (1965) model applies to the beer industry because the "war of attrition game" provides evidence that (1) manufacturers are capable of collusion. If manufacturers' contracts with their distributors give them control over the prices distributors charge retailers, then (2) manufacturers can pass taxes with markup through distributors and directly to retailers. Since there are so many competing retailers, the retailer tier can be considered monopolistically competitive, (3) which is the real-world market structure closest to perfect competition. Finally, (4) retailers cannot find close substitutes for macrobrewers' beers because they must purchase beer brands from distributors who have, in all but three states, exclusive geographic territories. Since retailers in most circumstances have no choice but to purchase beer brands from one distributor, if the tax is passed with a markup to retailers, then retailers have no choice but to accept the increase and pass it to consumers. Thus, for Taubman's (1965) model to apply to the beer industry, which establishes that manufacturers *in theory* overshifted the 1991 beer tax increase, it must be demonstrated that manufacturers are able to pass taxes with a markup through distributors and to retailers.

Chapter 4

Data and Methodology

If all criteria are fulfilled, Taubman's (1965) model shows that manufacturers *in theory* were responsible for passing the 1991 beer tax with a markup. Since the only unfulfilled criterion is that manufacturers can pass taxes with a markup through distributors and to retailers, it must be shown that manufacturers can bypass distributors by directly influencing the prices their distributors charge retailers. Qualitative data, namely personal interviews and e-mail exchanges with beer distributors, were collected to discern the exact nature of the relationship between manufacturers and distributors. This data will show if manufacturers can pass taxes with a markup through distributors and to retailers.

To provide evidence for Taubman's (1965) model and show that manufacturers were *actually* responsible for and benefited from overshifting the 1991 beer tax increase, the following must be established: (1) manufacturers passed the beer tax increase with a markup to distributors and (2) manufacturers' profits increased from 1990 to 1991. Producer price index (PPI) and consumer price index (CPI) data were collected to determine by how much prices were amplified between tiers. Finally, profit data for the three largest manufacturers, specifically Anheuser-Busch, Miller, and Coors, were obtained from Professor Carol Tremblay of Oregon State University to determine if manufacturers benefited from the tax increase.

4.1 Manufacturers and Distributors: Who's in Control?

From December 2005 to February 2006, personal interviews and e-mail exchanges were conducted with Budweiser of Greenville, Piedmont Beverage, Greenco Beverage, and a former Virginian distributorship owner. Budweiser of Greenville distributes Anheuser-Busch

products in several counties in South Carolina. Piedmont and Greenco Beverage distribute Miller and Coors products, respectively, in several South Carolina counties, including Greenville. Tom Russell, former owner of Northern Virginia Beverage Company, distributed a variety of domestic and imported beer brands. Personal interviews and e-mail exchanges with four distributors provided information concerning pricing decisions made between the three largest breweries and their distributors.

Interviews with Budweiser of Greenville and e-mail exchanges with Piedmont and Greenco Beverage were conducted because they represent distributors of the three largest macrobrewers. Since Anheuser-Busch, Miller, and Coors command 94 percent of U.S. beer production, understanding their relationship with their distributors provides valuable information concerning the manufacturer tier's overall ability to pass taxes with a markup through distributors and to retailers. Budweiser of Greenville, Piedmont, and Greenco Beverage were chosen for their convenience because they know Sunil Fadia[5] well and are in close proximity to my home in Greenville, South Carolina. Since I have no personal relationship with him, Mr. Russell of Northern Virginia Beverage Company was asked similar questions that Budweiser of Greenville, Piedmont, and Greenco Beverage were asked. Importantly, Mr. Russell's responses supported information gleaned from interviews and e-mail exchanges with Budweiser of Greenville, Piedmont, and Greenco Beverage. Since his company distributed beer from various large and small breweries for over forty years, Mr. Russell's understanding of the relationship between various breweries and distributors is extensive.

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[5] Sunil Fadia is my father and a beer retailer in South Carolina.

Limitations of data acquired through interviews and e-mails include interviewees not providing truthful responses. All interviewees were distributors, so their responses to questions regarding their relationship with manufacturers were likely biased toward presenting distributors more favorably than manufacturers. However, considering the fact that Mr. Russell sold his distributorship and is no longer a beer distributor, his responses were probably more objective. Since Mr. Russell's responses supported those from Budweiser of Greenville, Piedmont, and Greenco Beverage, it is likely that data gathered from current distributors were factual and honest.

4.2 PPI and CPI: Finding the Markup

Young and Bielinska-Kwapisz (2002) found that the 1991 beer tax increase's effect on prices was fully realized within three months of its implementation. Since it was enacted on January 1, 1991, the tax increase's effect on end-of-sale prices would have been actualized by the end of March 1991. More generally, the difference between 1990 and 1991 price indices fully reflects price responses to the tax increase. The change in *beer* price indices relative to change in *overall* price indices indicates where in the three-tier system overshifting occurred, for in the absence of overshifting it would be expected that both beer and overall price indices change by the same amount.

Yearly PPI data for malt beverages were available from the Bureau of Labor Statistics (BLS) from 1947 to 2005 ("Producer price index data", 2005). Since malt PPI measures average change over time of prices *distributors* pay domestic *producers*, percent changes in malt PPI reflect the change in prices that manufacturers charge distributors. In addition, PPI data for the same time period were collected for all commodities ("Producer price index data", 2005). Since the PPI calculation for "all commodities" includes all variables in the PPI

calculation for "malt beverages," it would be expected that, in the absence of overshifting by manufacturers, both calculations would move together. Stated otherwise, the percentage change from 1990 to 1991 of PPI for "malt beverages" should, if there is no manufacturer overshifting, be the same as the percentage change from 1990 to 1991 of PPI for "all commodities." Equation 4.1 details values that indicate the absence or presence of a manufacturer tax markup on distributors.

$$\frac{PPI_{1991}^{malt} - PPI_{1990}^{malt}}{PPI_{1990}^{malt}} - \frac{PPI_{1991}^{all} - PPI_{1990}^{all}}{PPI_{1990}^{all}}$$

$$= \begin{cases} < 0 & \text{if taxes partially passed by manufacturers to distributors} \\ 0 & \text{if taxes passed passed in full and no more by manufacturers to distributors} \\ > 0 & \text{if taxes passed in full with a markup by manufacturers to distributors} \end{cases} \quad (4.1)$$

Importantly, Figure 4.1 shows that PPI for malt beverages and all commodities move, generally speaking, relative to one another. This suggests that the prices manufacturers charge change in response to normal conditions that affect all commodities alike. In times of recession, for example, it would be expected that prices manufacturers charge would change according to how other producer prices in the economy change. Subtracting the change in PPI for all commodities from the change in PPI for malt beverages, as in Equation 4.1, controls for normal business cycle fluctuations. Therefore, any deviation in the change in malt PPI relative to the change in overall PPI is due to overshifting by manufacturers. In short, if the difference in Equation 4.1 is greater than zero, then the tax was overshifted to distributors by manufacturers.

For a similar analysis of the price spread between retailers and consumers, CPI data for "beer, ale, and other malt beverages at home" were collected for all years available, from 1953 to 2005 ("Consumer price index data", 2005). The "at home" specification includes
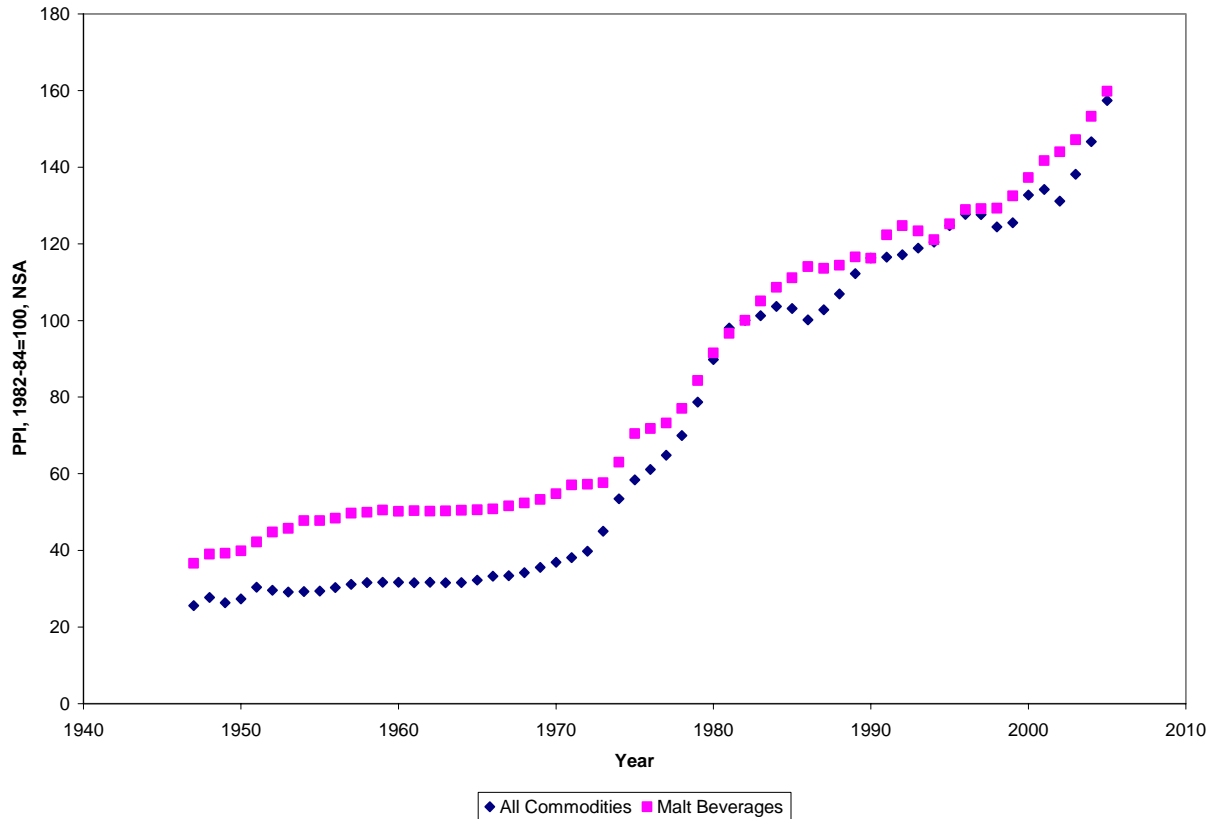
Figure 4.1: **PPI vs. Year for Malt Beverages and All Commodities**. Both measures of PPI are not seasonally adjusted, so business cycle fluctuations are contained in the data. According to the National Bureau of Economic Research (NBER), a recession[6] during the time of the beer tax increase ran from July 1990 to March 1991 (Research, 2006).

only prices for beer, ale, and malt beverages consumed off-premise, or beer that is not

consumed at bars or restaurants. Since no CPI data were available for total beer consumption,

the "at home" specification is the closest proxy available for prices paid by consumers and

charged by retailers.[7] CPI data for the same time period for "all items" were collected

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[6] I use the definition of recession as a decline in real gross national product (GNP) for at least two consecutive quarters.
[7] Approximately one-third of beer is consumed on-premise, so the "at home" indicator captures 66 percent of all beer consumed (Young & Bielinska-Kwapisz, 2002). Although the "at home" indicator for prices consumers pay retailers is far from perfect, it is the best available.

("Consumer price index data", 2005). Both calculations of CPI were for average city prices paid by consumers to retailers.

Since the CPI calculation for "all items" contains the same variables in the CPI calculation for "beer, ale, and other malt beverages at home," comparing the two values as a difference should indicate whether retailers were responsible for overshifting their costs, which includes the portion of the tax that is passed to them by manufacturers and distributors. Just like Equation 4.1, Equation 4.2 specifies the values for which retailer costs are either partially passed, passed in full, or passed with a markup to consumers.

$$\frac{CPI_{1991}^{beer} - CPI_{1990}^{beer}}{CPI_{1990}^{beer}} - \frac{CPI_{1991}^{all} - CPI_{1990}^{all}}{CPI_{1990}^{all}}$$
$$= \begin{cases} < 0 & \text{if costs partially passed by retailers to consumers} \\ 0 & \text{if costs passed in full and no more by retailers to consumers} \\ > 0 & \text{if costs passed in full with markup by retailers to consumers} \end{cases} \quad (4.2)$$

The magnitude of the difference will reveal the percentage markup, if any, of retailer costs to consumers.

As is evident by CPI data in Figure 4.2, both valuations, like PPI data, tend to move together. This shows that prices retailers charge consumers change according to how prices for all other basket goods in the economy change. Subtracting the change in CPI for "all items" from the change in CPI for "beer, ale, and other malt beverages at home" controls for normal business cycle fluctuations. The effects of the economic recession between 1990 and 1991 would therefore affect both terms in Equation 4.2 equally. Importantly, if retailers overshifted their costs to consumers, the difference indicated by Equation 4.2 would be greater than zero.

Nevertheless, Equations 4.1 and 4.2 are not perfect indicators of overshifting.
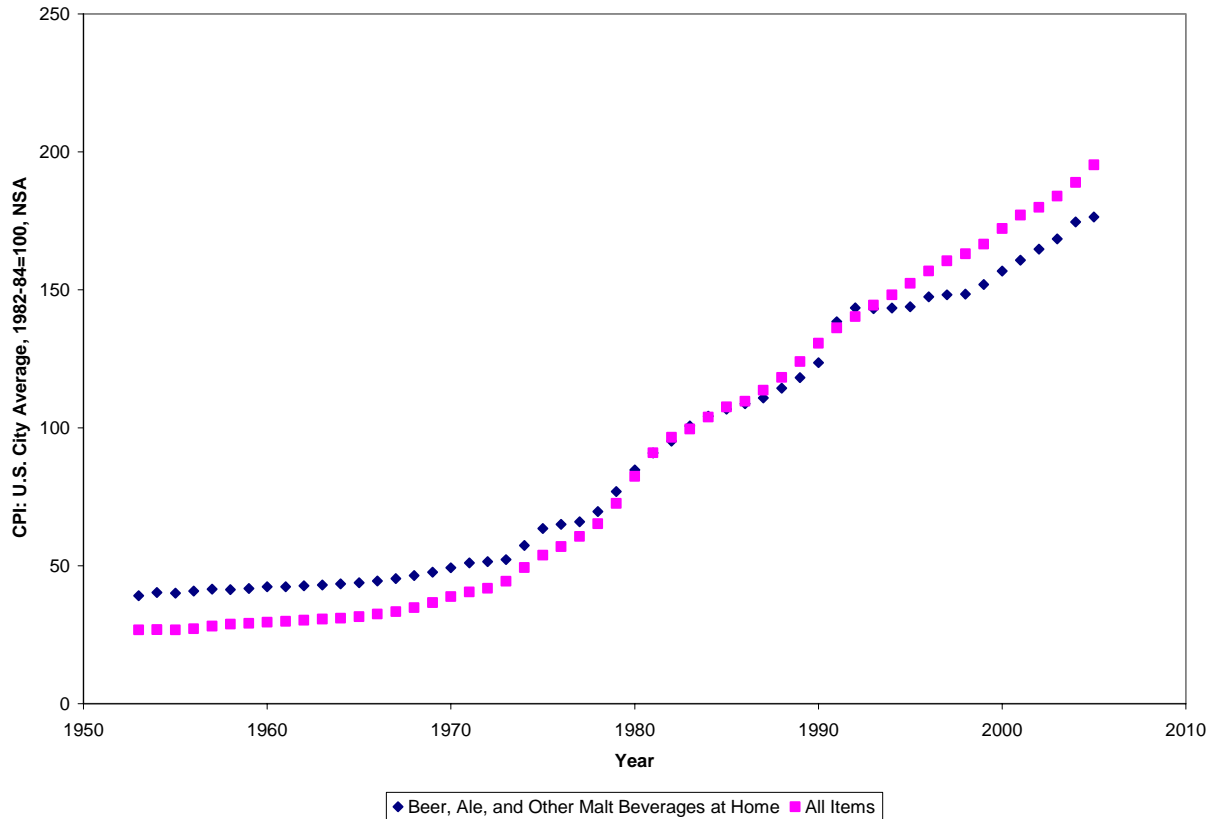
Figure 4.2: CPI vs. Year for Beer, Ale and Other Malt Beverages at Home and All Items. Both measures of CPI are not seasonally adjusted, so the effects of business cycle fluctuations are contained within the data. Recall that a recession ran from July 1990 to March 1991 according to the NBER.

Subtracting changes in the overall price index from changes in the beer price index incorporates variables that affect overall price indices but not beer price indices. For example, the producer price of cars is unlikely to affect the producer price of beer, but that price is incorporated in overall PPI and is not reflected in beer PPI. Thus, Equations 4.1 and 4.2 introduce some confounding variables like the percentage change in car producer prices. If changes in beer and overall price indices are observed between 1990 and 1991, it cannot be assumed that such changes are due to the beer tax increase alone. However, PPI and CPI are the best available public data that can indicate overshifting on distributors and consumers,

respectively. Since beer and overall price indices in Figures 4.1 and 4.2 generally move together though time, it appears there are no significant factors that affect beer price indices differently from overall price indices. It can be safely assumed, then, that any significant change in the difference value from 1990 to 1991 is due to the beer tax increase.

4.3 Macrobrewers' Profits: Did They Benefit?

Firm-level data were downloaded for the U.S. brewing industry. They were obtained from Professor Carol Tremblay, co-author of *The U.S. Brewing Industry: Data and Economic Analysis*. Since Professor Carol Tremblay, in conjunction with Professor Victor Tremblay, published one of the most comprehensive studies on the U.S. beer industry in 2005, the data are not only current, but they are expansive. Importantly, they give insight into how manufacturers responded to the 1991 beer tax increase.

The data include nominal net profits in thousands of dollars, which the Tremblays compiled from various issues of *Beer Industry Update: A Review of Recent Developments* and company financial reports. Included in the data are net profits for the top three macrobrewers, namely Anheuser-Busch, Miller, and Coors, spanning from 1950 to 2003.[8] To convert nominal values to real terms, nominal net profits were divided by CPI for all items. Real net profits are reported in 1982-84 dollars since CPI values for 1982-84 are equal to one.

Figures 4.3-4.5 reveal real net profit data for Anheuser-Busch, Miller, and Coors. As is evident, Anheuser-Busch and Miller's real net profits increased from 1990 to 1991, but Coors's real net profits decreased. Figure 4.6 combines real profit data for all three macrobrewers. Even though there are some years for which no profit data are available for individual macrobrewers, all three macrobrewers' profit data are available for the two years of

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[8] In 1990 and 1991, Anheuser-Busch, Miller, and Coors were ranked first, second, and third by production, respectively. Today, they remain the largest macrobrewers by production (Tremblay & Tremblay, 2005).
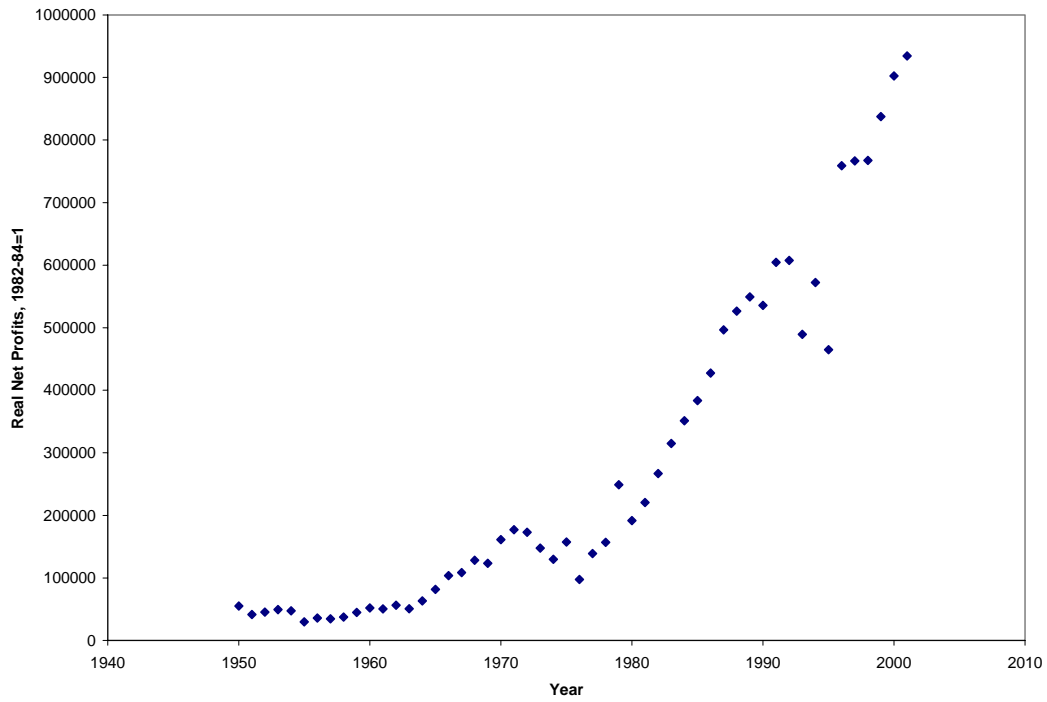
Figure 4.3: **Anheuser-Busch's Real Net Profits vs. Time**. Yearly real net profit data span from 1950 to 2001 with no missing values.
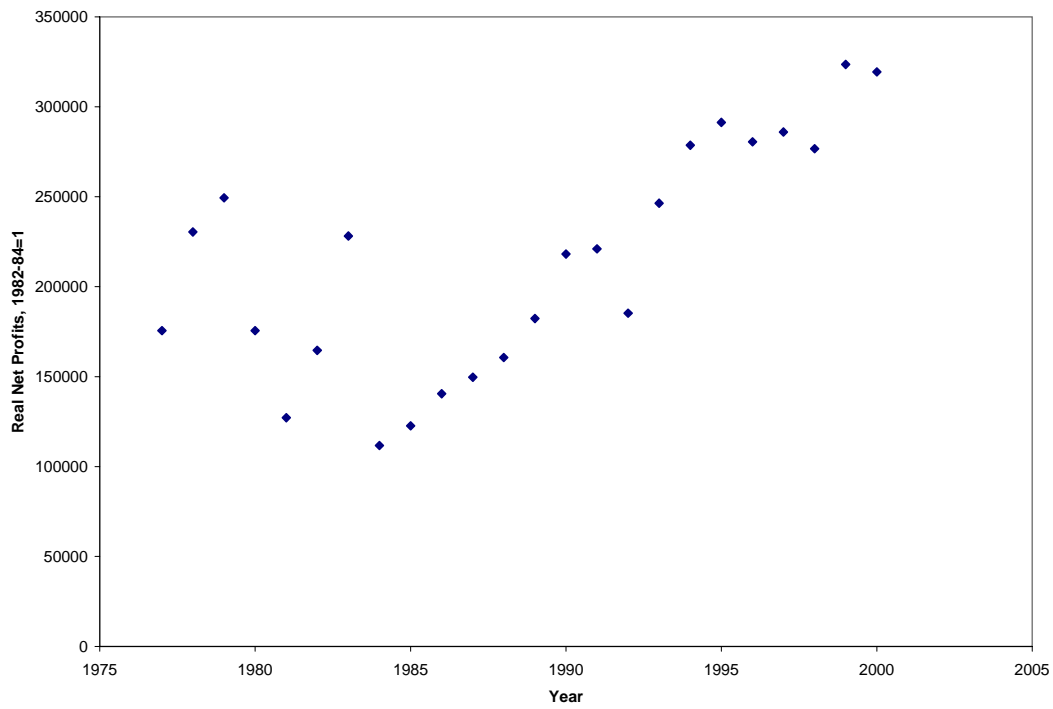

Figure 4.4: **Miller's Real Net Profits vs. Time**. Yearly real net profit data span from 1977 to 2000 with no missing values.
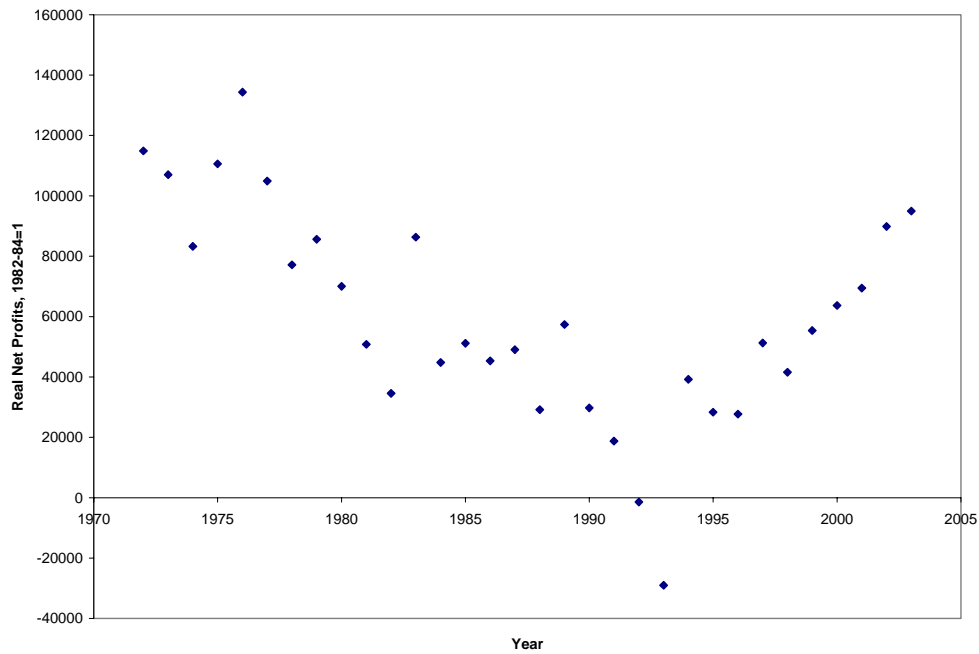
Figure 4.5: Coors's Real Net Profits vs. Time. Yearly real net profit data span from 1972 to 2003 with no missing values.
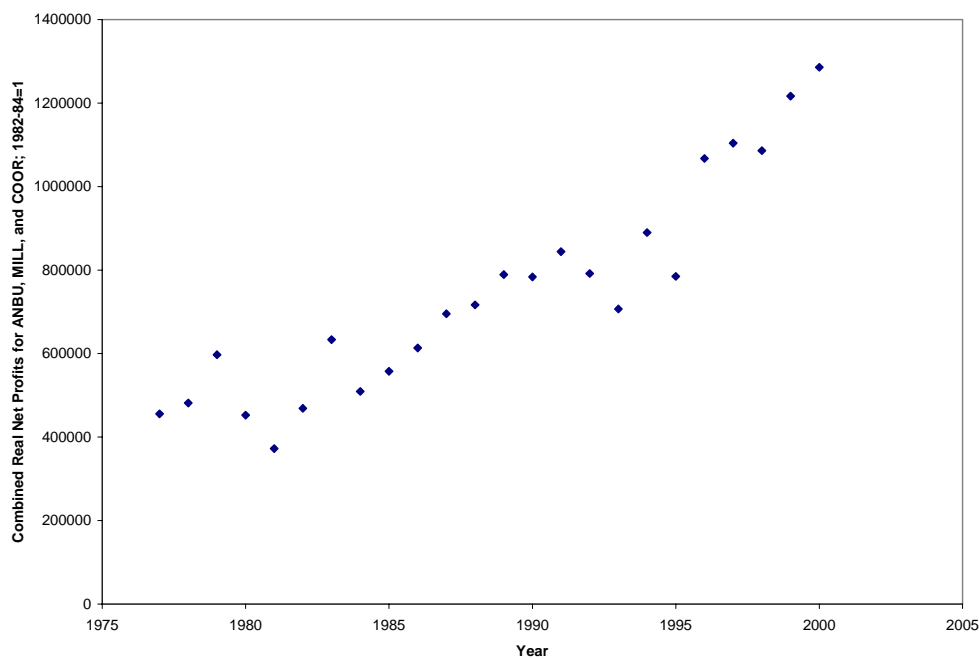

Figure 4.6: Combined Real Net Profits for Anheuser-Busch, Miller, and Coors vs. Time. Yearly real net profit data span from 1977 to 2000. Since individual macrobrewer profit data have missing values for various years between 1950 and 2003, data before 1977 and after 2000 are excluded. Between 1977 and 2000, profit data are available for all three macrobrewers.

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interest, 1990 and 1991. As observed in Figure 4.6, combined real net profits for the "big three" increased from 1990 to 1991.

Nonetheless, firm profit data do not itemize costs and revenues. It is not necessarily true that differences in 1990 and 1991 real net profits are attributed to the beer tax increase alone. Even after profit data are controlled for inflation by conversion to real values, other confounding variables may affect macrobrewers' real net profits. For example, if Anheuser-Busch found a way to cut costs in 1991, then its real net profits would increase as a result of better cost-saving technology. I assume that any cost-saving technology or productivity changes are reflected equally in all three macrobrewers' profit data. Thus, if macrobrewers' real net profits increased while their output did not change and their costs increased[9] between 1990 and 1991, then profit data support, but do not definitively prove, my hypothesis that manufacturers benefited from the tax increase. If manufacturers did pass the beer tax with a markup, then the magnitude of real net profit increase between 1990 and 1991 is indicative of which manufacturer benefited the most. Recall that Anheuser-Busch was the clear industry leader in 1991 and the price-leader in the 1950s "war of attrition" game when it had a fraction of its 1991 market power.[10] By leading a markup of the beer tax, it is likely that Anheuser-Busch's profits increased the most.[11]

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[9] Profits equal total revenues less total costs, or $\prod = P \times Q - TC(Q)$. If output does not change and costs increase, the only way that profits can increase is by price increases. Increasing profits would provide further evidence, in addition to PPI data, that manufacturers overshifted and benefited from the 1991 beer tax increase.

[10] Anheuser-Busch produced twice as much beer as its nearest competitor, Miller, in 1990 and 1991 (Tremblay & Tremblay, 2005).

[11] This paper assumes a focal point solution to the prisoner's dilemma game; the 1991 beer tax increase served as a signal for the "big three" manufacturers to collectively raise prices and pass the beer tax with a markup in the absence of communication. A leader-follower game can fall under this focal point pricing model, for Anheuser-Busch can act on the signal, the beer tax increase, before Miller and Coors follow suit.

Chapter 5

Findings

Manufacturers need to pass taxes with a markup through distributors and to retailers. Once this criterion is fulfilled using interview and e-mail data in Section 5.1, the beer industry fits Taubman's (1965) model, which shows in theory that manufacturers are responsible for overshifting tax increases by passing them with a markup. In Section 5.2, data support the hypothesis that manufacturers were responsible for overshifting the 1991 beer tax increase since PPI and CPI changes between 1990 and 1991 show evidence of a manufacturer markup. Moreover, macrobrewer profit data in Section 5.3 show that manufacturers' benefited from the beer tax increase because their profits increased between 1990 and 1991.

5.1 Manufacturers and Distributors: Who's in Control?

From the interview with Budweiser of Greenville, it was learned that Anheuser-Busch has equity agreements with its distributors that stipulate many aspects of how the distributor conducts business. Budweiser of Greenville's equity agreement even specifies how the distributor must paint its trucks. When permitted by the Alcoholic Beverage Control (ABC) Board, Anheuser-Busch decides in which exclusive geographic territories its distributors will operate. Distributors' upper-level personnel must also gain the brewery's approval before they are hired. In some states, Anheuser-Busch directly owns its distributors. Anheuser-Busch also assigns its distributors favorable status levels depending on how many Anheuser-Busch products its distributors sell. If an Anheuser-Busch distributor sells more Anheuser-Busch products, it receives a higher rating and more kickbacks from the brewery. It is thus evident

that even though Anheuser-Busch distributors are independent by law, they are in reality very closely tied to the brewery.

More importantly, the interview provided information concerning Anheuser-Busch and its distributors' pricing decisions. Although distributors have some autonomy to set the prices they charges retailers, Anheuser-Busch suggests and approves its distributors' prices. As a follow-up to the interview, Budweiser of Greenville was asked by e-mail, "Does AB in St. Louis approve AB distributors' prices? Or does the distributor independently decide what prices to charge its retailers?" Tim Richards, District Sales Manager for Budweiser of Greenville, responded, "It's a team effort, generally a 50% split, unless there's some important competitive situation to address."

E-mail exchanges with Piedmont Beverage, a Miller distributor, and Greenco Beverage, a Coors distributor revealed similar practices. Equity agreements between Miller and Coors and their distributors do not appear as strict as those between Anheuser-Busch and its distributors. For example, both Piedmont and Greenco Beverage distribute many non-Miller and non-Coors products, respectively.[12] In a separate e-mail exchange, Tom Russell, a former Virginian distributor, confirmed that Miller and Coors influence the prices their distributors charge retailers, but not to the extent of Anheuser-Busch.

E-mail exchanges with Tom Russell, former owner of Northern Virginia Beverage Company, provided a more general account of the contractual relationship between manufacturers and distributors. Mr. Russell responded in an e-mail to the following question: "Did you sell beer brands from multiple manufacturers?" He wrote that he distributed "multiple brands from multiple suppliers both domestic and imported." Mr. Russell also

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[12] Piedmont Beverage sells not only Miller, but also Abita and several other imported brands. Greenco Beverage sells Coors, Rolling Rock, Corona, Beck's, Labatt, and Molson brands.

responded to the question, "Is there a contract between the manufacturer and distributor?" He replied, "All of the big breweries demand contracts with distributors." This response confirms what was gleaned from Budweiser of Greenville, Piedmont, and Greenco Beverage interviews and e-mail exchanges, for Anheuser-Busch, Miller, and Coors demand contracts with their distributors. Mr. Russell also confirmed that Anheuser-Busch distributorship executives need approval from the brewery: "AB has gone to only allowing close personal friends of the Busch family, family members, and only AB loyalists to purchase AB distributors in recent years."

Since Mr. Russell distributed beer products from both large and small breweries,[13] he was also able to provide a more general account of the pricing relationship between manufacturers and distributors. When asked, "Did you usually have autonomy with respect to the prices you charged your retailers, or did you often have to gain the approval of the big breweries (if you did sell their beer)?", Mr. Russell responded, "The larger suppliers would strongly influence our pricing decisions and in some cases pretty much demand we work on their pricing structure. With the medium to smaller suppliers we would base our pricing as we saw fit based upon business and market conditions." It is clear, then, that macrobrewers strongly influence the pricing decisions their distributors make. Significantly, they can fully pass taxes with a markup through their distributors and to retailers. Anheuser-Busch, for example, approves the prices its distributors charge retailers. Therefore, Anheuser-Busch can simply pass taxes with a markup directly to retailers by invoking its contractual pricing privileges.

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[13] Mr. Russell's top five suppliers, in descending order, were Heineken USA (Heineken, Amstel, Murphy's), Coors (Coors, Coors Light, Killians, Blue Moon, Keystone), Boston Beer (Sam Adams line), Miller (Fosters, Pilsner Urquell, Peroni), and InBev (Beck's, Tecate, XX, Carta Blanca, Bohemia, Leffe-Belgium).

5.2 PPI and CPI: Finding the Markup

A more general form of Equation 4.1 is given by Equation 5.1.

$$y = \frac{PPI_x^{malt} - PPI_{x-1}^{malt}}{PPI_{x-1}^{malt}} - \frac{PPI_x^{all} - PPI_{x-1}^{all}}{PPI_{x-1}^{all}} \tag{5.1}$$

In the equation, the difference between percent change in malt PPI and percent change in overall PPI is computed as y. Moreover, y is a function of yearly percent changes that are computed by calculating the difference between PPI in year x and PPI in year x-1, and then dividing the difference by PPI in year x-1. Notice that Equation 4.1 is a special case of Equation 5.1 when $x=1991$.

Plotting Equation 5.1 gives Figure 5.1, which confirms that, in general, the prices manufacturers charge distributors move in tandem with overall PPI. The average value of y is -0.67 percent with a standard deviation of 3.60 percent, which supports the assumption that there are no significant factors that affect beer price indices differently from overall price indices. As is evident from the figure, the difference between malt PPI and overall PPI exhibits a positive value in 1991, with a 5.05 percent markup of the producer price for malt beverages over the producer price for all commodities. Since the 1991 ratio is 1.59 standard deviations above the average value of y, manufacturers overshifted the 1991 tax increase to distributors considerably above expectations.

Similar to Equation 5.1, a more general form of Equation 4.2 is represented by Equation 5.2.

$$y = \frac{CPI_x^{beer} - CPI_{x-1}^{beer}}{CPI_{x-1}^{beer}} - \frac{CPI_x^{all} - CPI_{x-1}^{all}}{CPI_{x-1}^{all}} \tag{5.2}$$
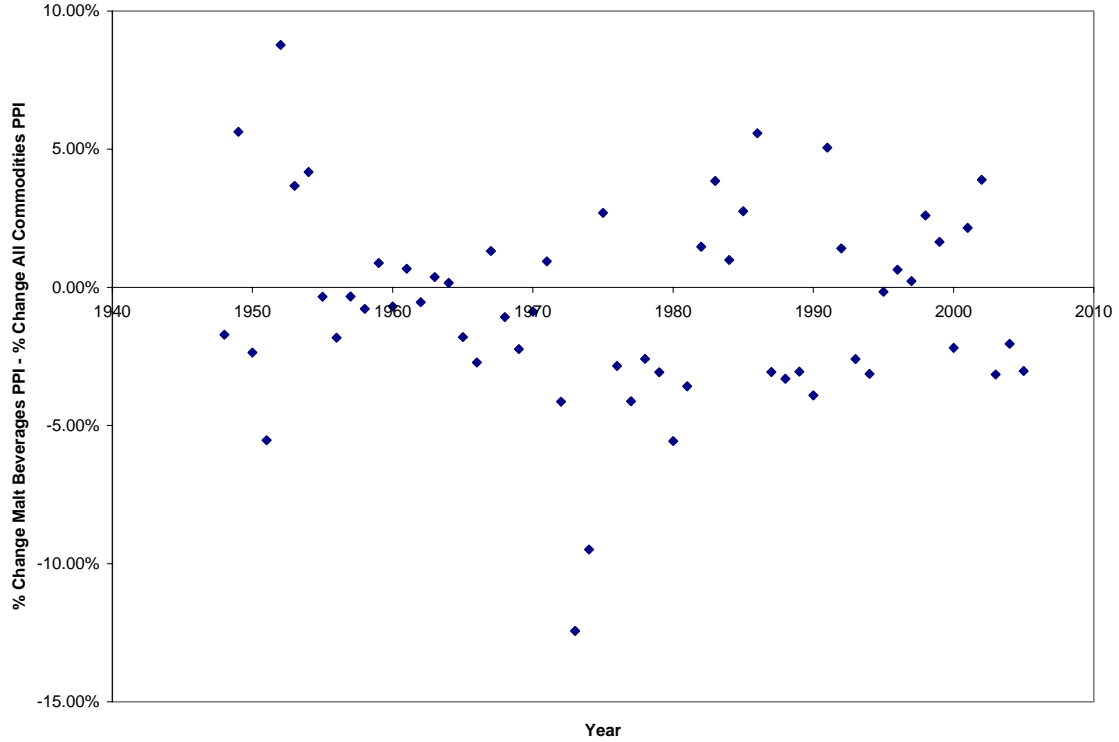
Figure 5.1: Difference Between Percent Change Malt PPI and Percent Change Overall PPI. The mean value is -0.67 percent with a standard deviation of 3.60 percent. When $x=1991$, the producer price for malt beverages rose 5.05 percent more than the producer price for all commodities.

The difference between percent change in beer CPI at home and percent change in overall CPI is denoted by y. Percent changes are computed as the difference between CPI values in years x and x-1 divided by the CPI value in year x-1. Equation 4.2 is simply a special case of Equation 5.2 when $x=1991$.

Equation 5.2 is plotted in Figure 5.2. The average value of y is -0.93 percent with a standard deviation of 1.99 percent. Therefore, prices that retailers charge consumers move, on average, very closely to prices of all goods in the economy, validating the assumption that no factors significantly affect beer CPI differently from overall CPI. The difference between beer and overall CPI jumps in 1991 to 7.77 percent, which is 4.38 standard deviations above the
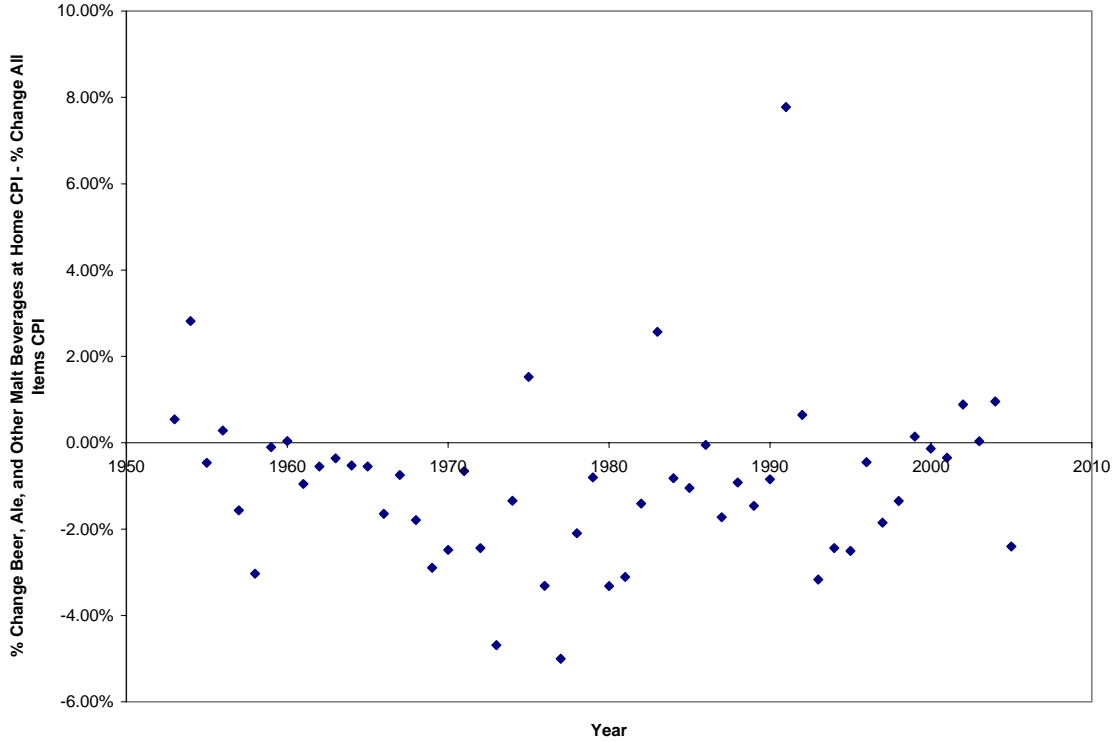
Figure 5.2: Difference Between Percent Change Beer CPI and Percent Change Overall CPI. The mean value is -0.93 percent with a standard deviation of 1.99 percent. When $x=1991$, $y=7.77$ percent, which is 4.38 standard deviations greater than the mean. Therefore, retailer costs were highly marked up to consumers.

mean. Retailers surprisingly marked up their costs substantially to consumers. This retailer markup on consumers was 2.72 percent greater than the manufacturer markup on distributors.

On November 1, 1951, the federal excise tax on beer was increased from $8 to $9 per barrel. Since the full effect of tax increases is realized quickly, PPI data between 1951 and 1952 fully reflect manufacturers' price response to the tax increase. Figure 5.1 shows that manufacturers marked up prices by 8.77 percent when $x=1952$. This year with the largest markup in the data provides further evidence of focal point pricing as manufacturers

significantly marked up prices during a tax increase. Since beer CPI data are not available for $x=1952$, it is not known how retailers responded to the 1951 beer tax increase.

In both Figures 5.1 and 5.2, prices are highly overshifted to distributors and retailers when $x=1954$. It is not clear why beer PPI and CPI values increased much more than overall PPI and CPI values from 1953 to 1954. Most likely, prices were marked up to distributors and consumers because Anheuser-Busch raised prices in 1953 after incurring increased costs from a union wage agreement. Recall that Anheuser-Busch's rivals did not follow suit, so Anheuser-Busch retaliated between January and June of 1954 by making the price differential between Budweiser and its rivals' brands zero. When Anheuser-Busch raised prices again in February 1955, its Midwest rivals followed suit, providing evidence of a leader-follower "war of attrition" game. The fact that prices were highly marked up to distributors and consumers *during* Anheuser-Busch's price hikes is even more evidence that macrobrewers, under Anheuser-Busch's leadership, overshifted the 1991 beer tax increase by passing it with a markup.

Since manufacturers marked up the tax increase to distributors by 5.05 percent while retailers marked up their costs to consumers by 7.77 percent, it seems as though retailers were more responsible for marking up prices than manufacturers. However, "at home" beer CPI data might not accurately reflect overall beer retail prices because they include only off-premise beer sales and exclude beer sold in places like restaurants and bars. Assuming "at home" beer CPI data accurately reflect overall beer prices, this bold move by retailers to overshift prices did not last long. From 1991 to 1992, manufacturer markup dropped to 1.41 percent while retailer markup fell dramatically to 0.64 percent. From 1992 to 1993, manufacturer markup dropped to -2.59 percent while retailer markup fell even more to -3.17

percent. Therefore, retailers were unable to sustain highly marked up prices while manufacturers retained a fairly large markup of 1.41 percent one year after the tax increase.

Moreover, PPI and CPI data do not detail the role of distributors in overshifting the 1991 beer tax increase. Since interviews with distributors, described in Section 5.1, showed that the biggest manufacturers, namely Anheuser-Busch, Miller, and Coors, strongly influence the prices their distributors charge retailers, it is highly likely that manufacturers, and not retailers, were more responsible for overshifting the 1991 tax increase. In other words, PPI data underestimate the overall manufacturer markup because they omit manufacturer influence on the markup distributors charge retailers. Ultimately, it cannot be proven with available data that manufacturers were most responsible for passing taxes with a markup because no data for distributor prices are available. Instead, PPI data indicate manufacturer influence on prices distributor are charged and CPI data indicate retailer influence on prices consumers are charged. PPI and CPI data, coupled with qualitative data from interviews, therefore support but do not prove my hypothesis that manufacturers were most responsible for overshifting the 1991 beer tax increase.

5.3 Macrobrewers' Profits: Did They Benefit?

As expected, Anheuser-Busch's real net profits increased substantially from 1990 to 1991, by $69 million in 1982-84 dollars. This corresponds to a net profit increase of 12.8 percent. Figure 5.3 shows that the average yearly percent change in real net profits is 7.53 percent with a standard deviation of 19.7 percent. The 12.8 percent increase in real net profits from 1990 to 1991 is only 0.27 standard deviations over the mean, so it is not an unusual increase. In fact, Anheuser-Busch's greatest increase in real net profits was $294 million in 1982-84 dollars, or 63 percent, between 1995 and 1996. Although the profit
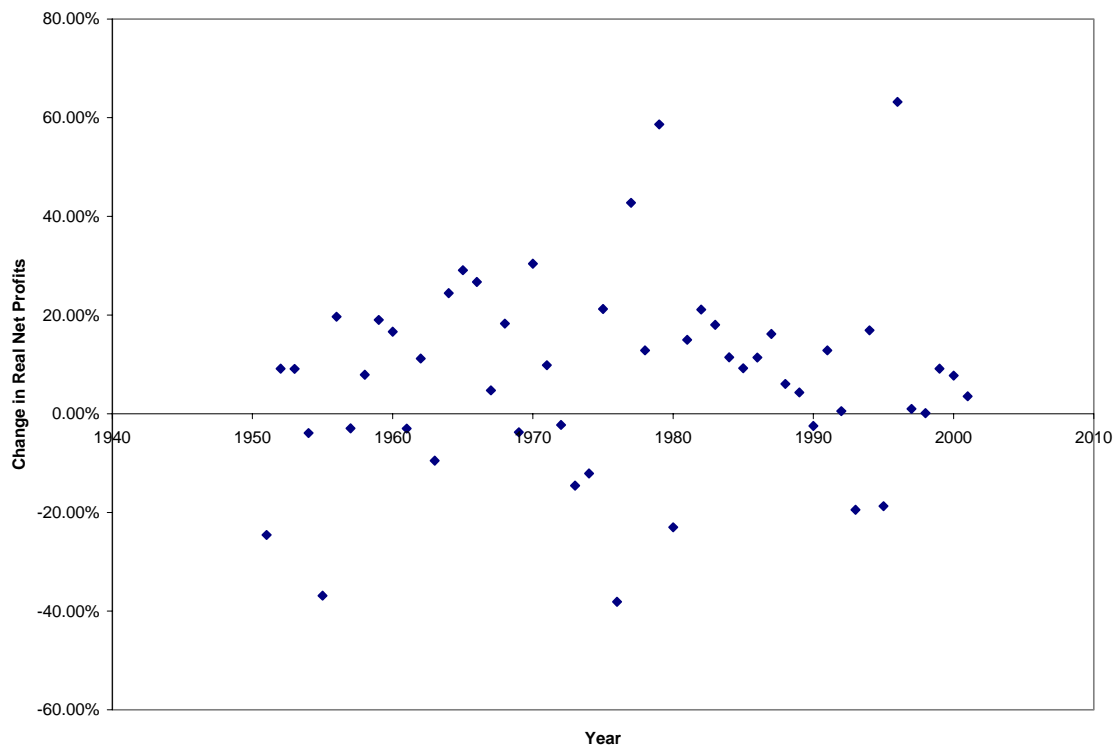
Figure 5.3: Percent Changes in Anheuser-Busch's Real Net Profits vs. Time. The average yearly change is 7.53 percent with a standard deviation of 19.7 percent. The 1990 to 1991 increase in real net profits of 12.8 percent is not substantially large as the data are noisy. This 12.8 percent increase corresponds to, in 1982-84 dollars, a $69 million increase in real net profits.

increase from 1990 to 1991 was not substantial, the fact that real net profits increased is

important.

Similarly, the number two brewer's real net profits increased from 1990 to 1991.

Miller's real net profits increased by approximately $3 million in 1982-84 dollars, which

corresponds to a 1.32 percent increase. As Figure 5.4 makes obvious, this increase is well

within one standard deviation, or 25.1 percent, of average yearly change in real net profits, or

5.12 percent. Like Anheuser-Busch, it is not important that the percentage increase is within

one standard deviation of the mean; rather, the fact that Miller's real net profits increased

after manufacturers faced a 100 percent increase in the federal excise tax is important.
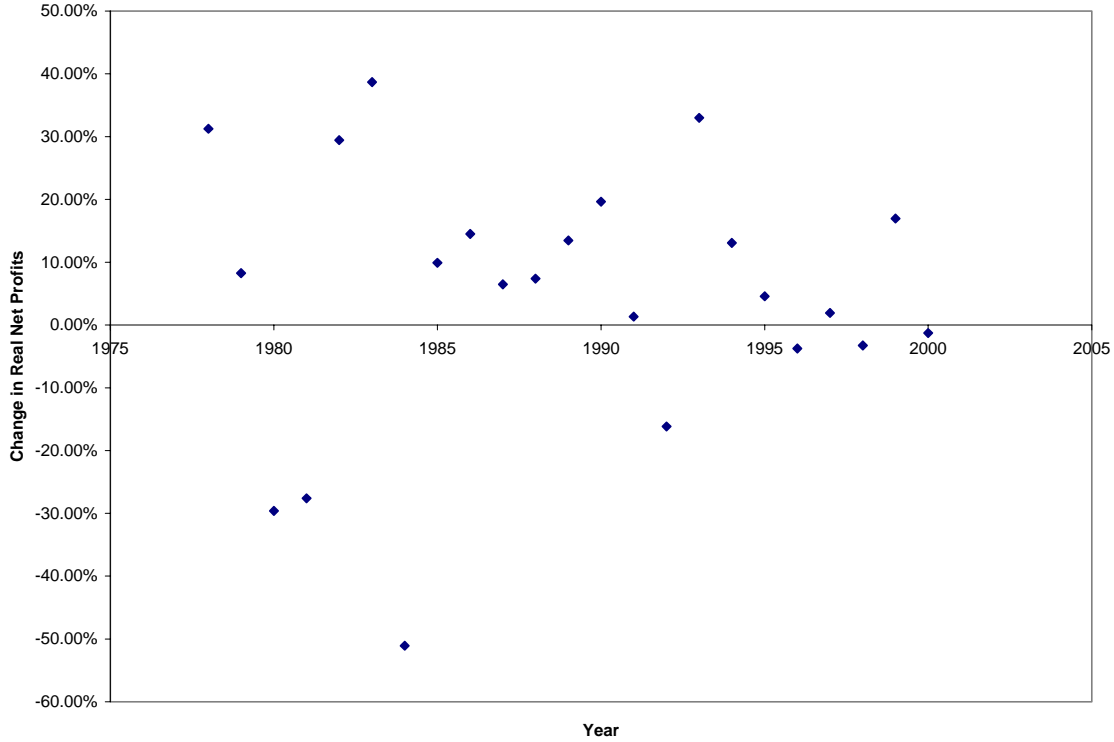
Figure 5.4: Percent Changes in Miller's Real Net Profits vs. Time. The average yearly change is 5.12 percent with a standard deviation of 25.1 percent. The 1990 to 1991 increase in real net profits of 1.32 percent is not significantly large because the data are noisy. This corresponds to, in 1982-84 dollars, a $3 million increase in real net profits.

Unlike Anheuser-Busch and Miller, Coors's real net profits fell from 1990 to 1991 by

$11 million in 1982-84 dollars, or from $30 million to $19 million. As is apparent in Figure

5.5, this corresponds to a 37.1 percent fall in real net profits, which is well within one

standard deviation, 355 percent, of the average yearly change in real net profits, -54.4

percent. Even after correcting percentage change values[14] and omitting extreme values for

x=1993 and 1994, the fall in real net profits from 1990 to 1991 is not unique from historical

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[14] In Figure 5.5, the percent change from 1992 to 1993 is +1900 percent; however, real net profits were negative for 1992 and 1993, so a fall in negative profits from 1992 to 1993 resulted in a positive percent change. Similarly, an increase in real net profits from a negative value in 1992 to a positive value in 1993 resulted in a negative percent change for x=1993. Correcting these two percent changes gives an average yearly change in real net profits of -54.4 percent with a standard deviation of 355 percent.
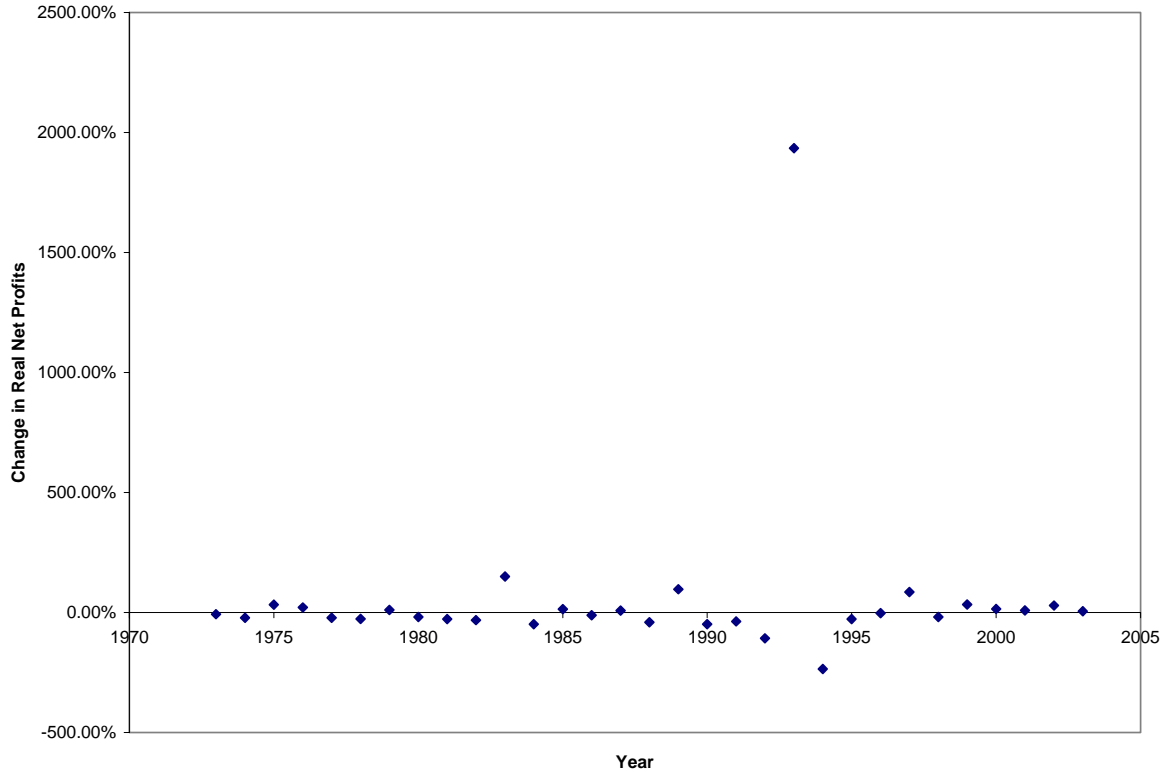
Figure 5.5: Percent Changes in Coors's Real Net Profits vs. Time. Notice that two values are erroneously calculated by the percentage change formula. The average yearly change for $x=1993$ should be -1935 percent, and the change for $x=1994$ should be 235 percent. After correcting these formula errors, the average yearly percent change is -54.4 percent with a standard deviation of 355 percent. Even after removing extreme observations for $x=1993$ and 1994, the 37.1 percent fall in real net profits is well within one standard deviation of mean.

profit changes.

As indicated by the large standard deviations relative to the means, yearly percent change data in Figures 5.3 through 5.5 are noisy. Profits are evidently influenced by various factors, even after they are converted to real values to control for inflation and business cycle fluctuations. However, Anheuser-Busch and Miller did not increase their profits by selling substantially more beer or cutting costs in 1991. From 1990 to 1991, Anheuser-Busch's output actually decreased by 224,000 barrels to about 86 million barrels, and Miller's

production increased by 56,000 barrels to slightly over 43.4 million barrels (Tremblay &

Tremblay, 2005). Additionally, Anheuser-Busch and Miller's capital stock and assets did not

change substantially from 1990 to 1991 (2005). Since manufacturers faced a double tax

incidence from 1990 to 1991, their total costs increased. Between 1990 and 1991, even

industry advertising expenditures, in 1982-84 dollars, increased by $46 million (Weinberg,

2005). As such, profits could have only substantially increased by raising prices.[15] Coors's real

net profits likely declined from 1990 to 1991 because it was expanding production capacity

to become a national producer in the early 1990s. The decline in profits is therefore a cost

phenomenon associated with moving from regional production in the American west to

national production. In fact, Coors's production increased by 224,000 barrels from 1990 to

1991 despite an $11 million decline in net profits (2005). This trend in smaller benefits for

smaller firms is expected in a leader-follower game. The dominant firm's, or Anheuser-

Busch's, profits increased more than the fringe firms', or Miller and Coors's, profits.

Combined real net profits for the top three macrobrewers are plotted in Figure 5.6.

The 7.73 percent increase in real net profits from 1990 to 1991 is well within one standard

deviation, 16.5 percent, of the mean, 5.87 percent. As a whole, the three macrobrewers'

profits increased, in 1982-84 dollars, from $783 million to $844 million. Considering that

Anheuser-Busch and Miller's real net profits, in 1982-84 dollars, increased by $69 million

and $3 million, respectively, when the federal excise taxes on manufacturers was doubled,

macrobrewer profit data support the conclusion in Section 5.2 that manufacturers overshifted

and collectively benefited from the 1991 tax increase by passing it with a markup.

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[15] Profits equal total revenue less total costs, or $\prod = P \times Q - TC(Q)$. Since costs increased due to higher taxes and advertising expenditures, and since output did not change substantially, profits could have only increased if prices increased substantially.
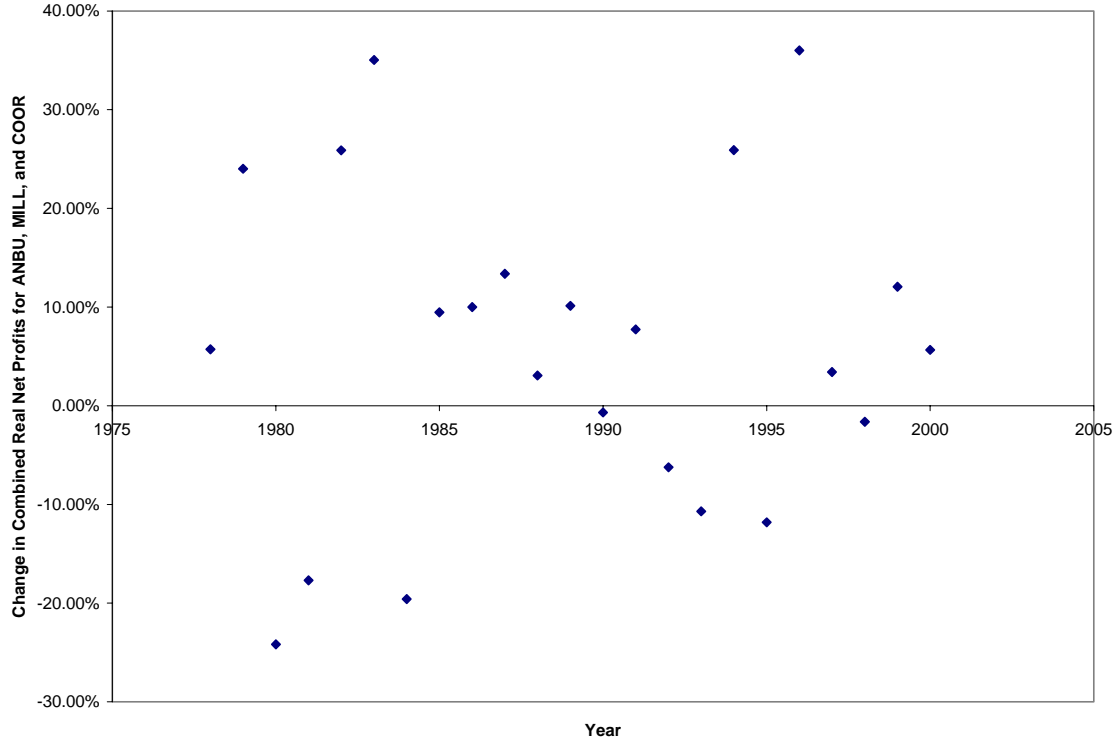
Figure 5.6: Percent Changes in Combined Real Net Profits for Anheuser-Busch, Miller, and Coors vs. Time. Yearly real net profit data for the "big three" span from 1977 to 2000. Since individual macrobrewer profit data have missing values for various years between 1950 and 2003, data before 1977 and after 2000 are excluded. Between 1977 and 2000, profit data are available for all three macrobrewers. The average yearly percent change is 5.87 percent with a standard deviation of 16.5 percent. The 7.73 percent increase in real net profits from 1990 to 1991 is only 0.11 standard deviations greater than mean.

Chapter 6

Conclusion

Young & Bielinska-Kawpisz's (2002) finding that the federal excise tax increase in 1991 was overshifted can be attributed to manufacturers passing the tax with a markup. Applying Taubman's (1965) model to the beer industry, it was found that manufacturers *in theory* were responsible for passing the tax with a markup. *In actuality*, interview and e-mail exchanges with Budweiser of Greenville, Greenco, Piedmont Beverage, and Mr. Russell confirmed that macrobrewers, namely Anheuser-Busch, Miller, and Coors, strongly influence the prices their distributors charge retailers. As a consequence, manufacturers can pass a marked up tax directly to retailers. Evidence for a significant markup to distributors between 1990 and 1991 was observed using PPI data. CPI data showed evidence of retailers passing increased costs to consumers between 1990 and 1991, and this markup by retailers was surprisingly greater than the markup by manufacturers. Unlike manufacturers, retailers were unable to maintain a high markup the following year. Finally, macrobrewer profit data indicated that Anheuser-Busch and Miller's real net profits between 1990 and 1991 increased, in 1982-84 dollars, by $69 million and $3 million, respectively. Although Coors's profits declined by $11 million because it was heavily investing to expand to national production, the trend in higher profits for bigger macrobrewers supports the cooperative outcome in a leader-follower game where the dominant firm, Anheuser-Busch, receives a higher payoff than fringe firms, Miller and Coors.

Is it necessarily bad that manufacturers were responsible for and benefited from overshifting the beer tax? It depends. On the one hand, consumers may find it undesirable

that they pay higher beer prices. Yet, from the perspective of society as a whole, it is entirely desirable that beer tax increases are overshifted. As mentioned in Chapter 2, much of the beer excise tax literature is devoted to reducing negative externalities of consumption. Overshifted taxes imply higher prices, which in the case of the downward-sloping demand curve translates to reduced beer consumption. Cook clearly states that "alcohol taxation and other measures that increase the price of ethanol are effective in promoting health and safety" (Cook, 2006, p. 226). Moreover, Cook writes that "Higher prices are conducive to lower rates of underage drinking, traffic fatality, violent crime, and sexually transmitted disease" (p. 226).

Concrete examples better illustrate the benefits of overshifted taxes. According to Cook, Ostermann & Sloan (2005), a 10 cents per ounce of ethanol increase in alcohol excise tax would reduce, in the short-term, all-cause and all-age mortality rates by 3.4 ± 2.0 percent. Although this estimate is based on increasing the excise tax on beer, liquor, and wine, a rise in the federal *beer* tax alone by 10 cents per ounce of ethanol would likely achieve a significant reduction in mortality rates because much of the ethanol consumed is in the form of beer. In fact, over 50 percent of ethanol consumed is beer (Cook, 2006). Since a study by Miller & Blincoe (1994) found that the total external costs per ounce of ethanol consumed is 63 cents, and since the current beer tax rate is 10 cents per ounce of ethanol, it follows that a 53 cents per ounce of ethanol tax increase is warranted. In other words, the negative externalities of beer consumption would be internalized if a $98 per barrel tax increase is imposed on manufacturers, which would raise end-of-sale prices by $174 per barrel.[16]

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[16] According to Kerr & Greenfield (2003), the ethanol content per barrel of beer was 4.66 percent in 2000, or 185 ounces of ethanol per barrel. A tax increase of 53 cents per ounce of ethanol implies a $98 per barrel tax increase. Assuming that the beer tax increase is amplified 1.77 times[16] like it was in 1991, this tax increase would result in a $174 per barrel increase in end-of-sale prices, or a $3.16 increase per six-pack.

Although a $98 per barrel tax increase may seem harsh, one must remember that the federal excise tax on beer is imposed on manufacturers' output and not on their sales. Accordingly, inflation erodes manufacturers' tax incidence over time. Even after the 100 percent beer tax increase from $9 to $18 per barrel in 1991, the *real* federal excise tax on beer in 1955 was 3.6 times higher than the *real* federal excise tax in 2005 (Cook, 2006). Counter to the advice of economists concerned with public policy, every year Congress and state legislatures let the real federal excise tax rate decline. As Cook (2006) points out, Congress has not allowed the tobacco excise tax to fall and has actually raised it several times in recent years. In spite of growing evidence that alcohol excise taxes, like cigarette excise taxes, promote the public health, it seems perplexing that Congress has not increased them more.

In the end, I found that manufacturers overshifted the 1991 federal excise tax increase because (1) they are capable of passing taxes through distributors and to retailers, (2) PPI and CPI data showed evidence of a substantial markup to distributors and an initially larger markup to consumers, and (3) Anheuser-Busch and Miller's real net profits increased despite manufacturers facing a double tax incidence. I assumed that manufacturers passed marked up taxes through distributors and to retailers by controlling the prices their distributors charged retailers. However, no evidence showing distributors' role in marking up prices was available. Future researchers can therefore index distributor prices and confirm that distributors did mark up prices. If distributors marked up their prices, then PPI data underestimate manufacturer markup because they exclude manufacturers' influence on prices their distributors charge retailers. In conclusion, Young & Bielinska's (2002) finding that beer prices increased more than the 1991 tax increase can be explained by manufacturers marking up and benefiting from federal beer tax increases.

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