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POSSIBLE COLLUSION IN THE SUGAR PROCESSING INDUSTRY

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Abstract

It would be hard to imagine life without that sweet powdery white stuff, sugar that is. Sugar is an ubiquitous product. There is sugar in so many of the products we consume on the daily. Cereal, protein bars, ketchup, and even spaghetti sauce list sugar as one of its ingredients. This thesis paper serves as an analysis of potential price fixing within the sugar processing industry, with an emphasis of analyzing and contrasting the Midwest sugar beet refining market and Northeast sugarcane refining market. This thesis takes a more focused look into the acquisition and purchasing of refined sugar and how additional costs associated with transportation affect the ability to do the former. My aim by the end of this paper is to draw a clear picture of this market and the external forces that influence its pricing.

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Introduction

Sugar is everywhere. If one was to completely eliminate sugar from one's diet, one would definitely have to make a conscious decision to do so. The natural question becomes: what is sugar? Sugar occurs naturally in many vegetables and fruits. Sugarcane and sugar beets have the greatest quantities of said naturally occurring sugar, thus making it the most efficient choice for sugar extraction (What is Sugar?, 2023). Sugar's chemical structure is simple, one molecule of glucose bound with one molecule of fructose. These chemicals combine to form a carbohydrate (What is Sugar?, 2023). However, this relatively simple chemical has created a 12.6-billion-dollar revenue in 2022, through the sugar processing industry (Irigoyen, 2022). The industry's structure is as follows: sugarcane and sugar beets are grown then harvested, these raw products are then refined into processed sugar, an example would be the white granulated sugar one puts in one's coffee, this refined sugar is then distributed to retailers and wholesalers as well as distributors who then resell this refined sugar to other customers (U.S. v. United States Sugar Cooperation, et al, 2021). While the structure of the sugar processing industry is by no means convoluted, there are substantial nuances that competitively separate firms; it is through these nuances and innovations that firms can become major players and drive changes within the industry. The following section will explore the sugar processing market as a whole, utilizing Porter's Five Forces to draw an overview for potential deficiencies that could lead to collusive activities.

Porter's Five Forces

Sugarcane is grown in tropical climates within the US, as seen in states such as, Florida, Louisiana, and Texas (U.S. v. United States Sugar Cooperation, et al, 2021). Sugar beets are grown in far more temperate climates, as seen in eleven states as follows: California, Colorado,

Idaho, Michigan, Minnesota, Nebraska, North Dakota, Oregon, Washington, and Wyoming (U.S. v. United States Sugar Cooperation, et al, 2021). The process of refining raw sugar beets and raw sugarcane into refined sugar are different. The former has a simpler process, "sugar beets are processed in a single facility where they are converted into refined sugar directly with no milling process required" (U.S. v. United States Sugar Cooperation, et al, 2021). Whereas there is an added step in the process of refining raw sugar cane, "sugarcane is converted to "raw" sugar at sugar mills, and then the raw sugar is processed into refined sugar at refineries" (U.S. v. United States Sugar Cooperation, et al, 2021). While this distinction may appear negligible, it holds a key difference between respective processing industries. The absence of the necessity of a milling process in the sugar beet processing industry grants sugar beet processors the ability to vertically integrate with more ease, when compared to sugar cane processors. The substantial cost of purchasing and operating sugar mills is entirely avoided, naturally allowing the possibility of more sugar beet refiners to vertically integrate, which in turn lowers the cost for consumers. It will be important to note and to hold this distinction in mind, especially when analyzing the bargaining power of suppliers in Porter's Five Forces.

Porter's Five Forces gives a general overview and snapshot of the industry at large. It sets the stage, and it will give the necessary information to address potential industry faltering that could lead to collusive activities.

1. Competition within the Industry- This force examines the number of competitors within an industry. Naturally, a greater number of competitors results in lesser individual company power, which results in lower prices for consumers (Scott, 2003). Fewer competitors result in a higher bargaining power of these firms and thus higher prices for consumers (Scott, 2003). The USDA sets quantity allotments each fiscal year that dictate

state cane sugar quantities, sugar beet processor allocations, and sugarcane processor allocations (Commodity Credit Corporation, 2022). The allocations apply to all domestic sugar beet sugar and sugar cane sugar that is for human consumption (Commodity Credit Corporation, 2022). The allocations for the major players in the sugar beet processing industry are as follows (all values are measured in short tons):

Table 1 (Commodity Credit Corporation, 2022)

Firms	FY 2023 Allocation
American Crystal Sugar Co	2,128,113
Amalgamated Sugar Co	1,238,877
So. Minn Beet Sugar Co-op	780,958
Michigan Sugar Co	597,577
Western Sugar Co	590,415
Total Beet Sugar	5,786,237

The allocations for the major players in the sugarcane processing industry are as follows, once again all values are measured in short tons:

Table 2 (Commodity Credit Corporation, 2022)

Firms	FY 2023 Allocation
Florida Crystals	1,075,489
U.S. Sugar Crop	1,066,770
Total Cane Sugar	4,860,013

It is important to note that U.S. Sugar Crop and American Crystal Sugar Company are members of the same corporation, United Sugars Corporation (Our members, 2019). This illustrates United Sugars Corporation has a strong foothold in both respective processing industries. While the USDA does set a price floor for the prices of refined sugar, it can not and does not dictate the prices that firms set to retailers (U.S. v. United States Sugar Cooperation, et al, 2021). There is a low number of firms that have a high market concentration, especially in the sugarcane processing industry. This means that these firms lead pricing in their respective markets, which undoubtedly leads to higher prices for consumers when compared to markets with many different serious competitors.

2. Entry Costs and Barriers to Entry- An industry with low costs and few barriers to entry weakens the foothold and position of existing companies within that industry (Scott, 2003). While this outcome will yield lower prices for the consumer, it is ultimately a double-edged sword. The absence of barriers to entry will lead to a significant decrease of investment within that industry. From a firm's perspective, it is not worthwhile to dedicate time and resources into an arena where one can be easily dislodged from a leading and established position. Google and Facebook are not spending precious resources on developing a neighborhood's best lemonade stand, as Jane from down the street could easily overtake them as the neighborhood's sales leader. However, industries with high entry costs and substantial barriers to entry are by no means ideal. These industries are often susceptible to becoming monopolies and oligopolies, where prices are non-competitive and greatly hurt consumers (Scott, 2003). The sugar processing industry follows more closely with the latter than the former. Sunk costs, costs that cannot be recovered, are high and daunting to potential new entrants (Irigoyen, 2022). The costs

associated with starting sugar processing business are two-fold: expensive specialized machinery must be purchased and trained and specialized employees must be hired, and if said employees are not available, resources and time will be spent in training them (Irigoyen, 2022). The necessary machinery to run a sugar processing firm poses a significant sunk cost. (Mini Beet Sugar Manufacturing Plant Sugarcane Plant, 2017). This figure does not include the costs associated with running said machinery. It is also important to note that the sugar processing industry requires raw factor inputs. Processor contracts with sugar beet and sugarcane farms also pose a potential entry barrier (Irigoyen, 2022). This potential issue is only exacerbated by the fact that many of the major players within this industry are vertically integrated, meaning that they process the sugar beets and sugar cane that their farms grow (Irigoyen, 2022). The benefits in cost reduction achieved through vertical integration will be discussed in following sections. Lastly, the major players in the sugar processing industry have established loyalties with customers (Irigoyen, 2022). Largescale food and beverage producers rely on consistent and efficient shipments of refined sugar and the major players within this market can fulfill those necessities (Irigoyen, 2022). These established loyalties and contracts could pose a significant barrier to new firms attempting to emerge in this market.

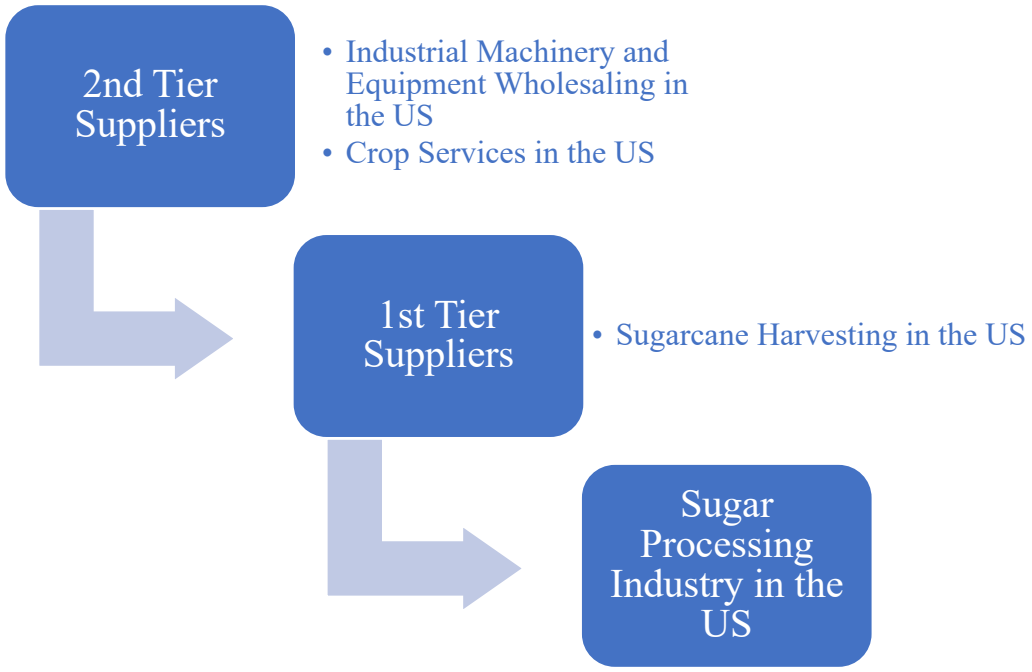

Figure 1 (Irigoyen, 2022)

3. Bargaining Power of Suppliers – Input costs affect retail prices. An increase in input costs will more than likely be passed on to consumers. The number of suppliers, the uniqueness of the product they are supplying, and the costs associated with switching suppliers are all factors that can lead to an increase or decrease in input costs (Scott, 2003). As seen in Figure 1, there are 1st tier and 2nd tier suppliers. The 1st suppliers would be sugarcane and sugar beet harvesting. In 2017, the number of farms growing sugar cane and sugar beets was 4,123 farms with an increase in the average area harvested per farm, illustrating more efficient harvesting and growing techniques (Abadam, 2021). If a sugar processing firm is not vertically integrated, meaning that they do not grow their own sugarcane and sugar beets, the large number of farms is a big positive. This creates a uniformity in these input prices, since if farm's A prices were higher than farm's B a sugar processor would simply purchase their sugarcane and sugar beets from farm B. To put it simply, sugarcane and sugar beets are not unique products. There is no difference in

sugarcane from Texas or Florida; this same principal is applied to sugar beets as well. The figures below show Producer Price Index (PPI) data from the BLS for raw sugarcane and sugar beets. In both graphs, there is a spike in price starting in the year 2010. This is due to a spike in world sugar prices, where it drove U.S. sugar prices to 30 year highs (Roney, 2013). However, these prices fell nearly 50% due to an oversupply of these raw products (Roney, 2013). Demonstrating how a surplus of these factor inputs leads to lower input costs.

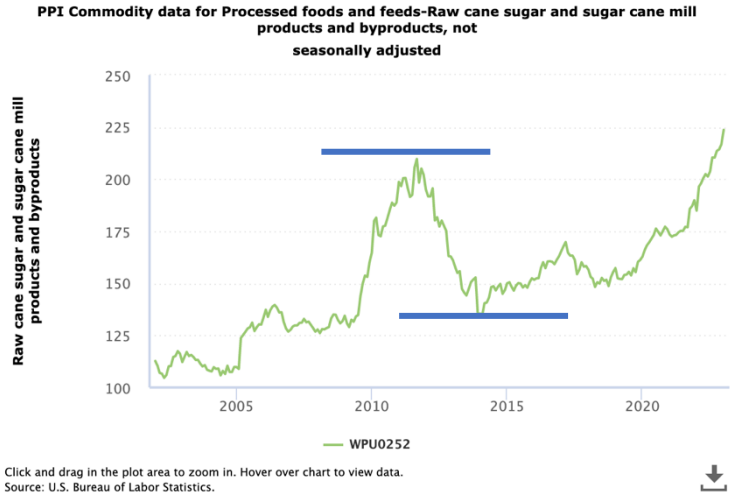

Figure 2 (BLS data viewer, 2023)

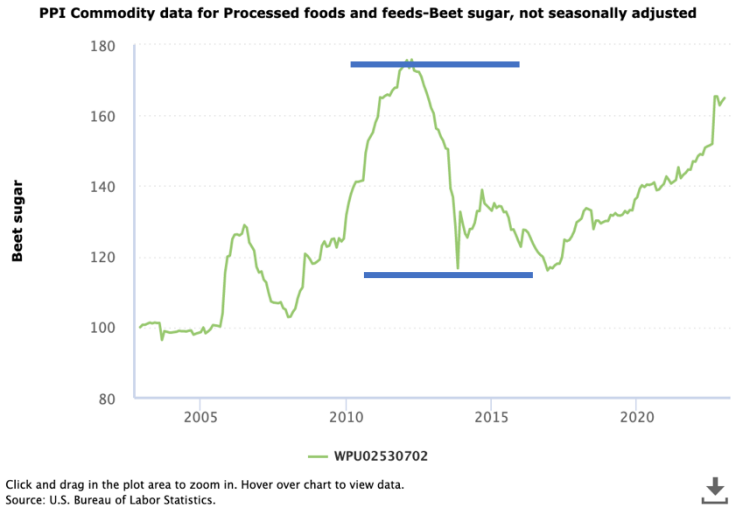

Figure 3 (BLS data viewer, 2023)

The slight discrepancy in price between sugarcane and sugar beets is largely due to greater number of sugar beet farms relative to sugarcane farms in the US. The 2nd tier supplier to the sugar processing industry, the industrial machinery and equipment industry does not yield the same input price flexibility that is afforded by sugarcane and sugar beet harvesting. As mentioned in the previous section these input prices are significant and could be daunting to potential new entrants. Sugar processing firms have substantial bargaining power with sugarcane and sugar beet farms; however, they have significantly less bargaining power with the machinery suppliers.

4. Bargaining Power of Buyers- This force utilizes the same concepts as the previous force, the bargaining power of suppliers. The main buyers of processed sugar are bakery and cereal producers, wholesale sugar sales, and retail sugar sales (Irigoyen, 2022). The processed sugar market is regional. Transportation of both processed sugarcane and processed sugar beets is costly. Customers in an article from the Department of Justice, United Sugar, one of the major players in both sugarcane and sugar beet processing, estimated that "shipping refined sugar an additional 500 miles by truck would increase the price of delivered sugar by over 10 percent. Making the same shipment entirely via rail, which is often impossible, would increase the price of delivered sugar by more than five percent" (U.S. v. United States Sugar Cooperation, et al, 2021). As a result of these transportation costs many wholesale and retail customers are bound to their regional markets for their processed sugar needs. Even though processed sugar is fungible, the cost of transportation acts a barrier in substituting processed sugar from one firm to another. The DOJ states (U.S. v. United States Sugar Cooperation, et al, 2021):

The distance between a sugar producer and the customer is a significant determining factor in the price a customer pays for refined sugar. Transportation costs make up a significant percentage of the delivered cost of refined sugar. Shorter shipping distances also reduce the likelihood of shipping delays, which can be very costly for customers that depend on a reliable supply of ingredients to run their facilities. Longer shipping distances also increase the likelihood of damage to the refined sugar. For these reasons, customers often buy refined sugar from producers in close proximity.

Buyers lose a significant amount of bargaining power due to these transportation restrictions. In reality, buyers are bound to the pricing discretion of nearby sugar processing firms: "Most sugar processors/refiners offer their sugar for sale in a number of different geographical areas and often quote a different base price for each area. The boundaries of these areas are also subject to change in response to competitive market conditions." (Polopolus & Alvarez, 1990, pg. 89) Base prices for markets with few sugar processors are higher than markets with several sugar processors, because of the high cost of transportation. Sugar is also an especially vital ingredient for bakery and cereal producers, thus also reducing the bargaining power of buyers. In summary, the bargaining power of buyers in this industry is low.

5. Prescence of Substitute Products- Substitute goods that can perform the same function as the product being analyzed by Porter's Five Forces pose a threat (Scott, 2003). If the product's price increases, consumers can simply switch to the substitute good (Scott, 2003). Industries in which there is no immediate nor comparable substitute good have a much greater ability to increase their profit margin. The greatest threat to the vitality of

the sugar processing industry, and the sugar industry as a whole, are the increasing health-conscious trends sweeping the nation. Especially after the COVID-19 Pandemic, where individuals who were diabetic and obese were at a higher risk of death; the move to a more health-conscious nation is noticeable. Sugar and sweetener consumption is expected to fall at an annual rate of 0.6% (Irigoyen, 2022). Many of the industry's major players have responded to these trends by looking for calorie-free sweetener alternatives (Irigoyen, 2022). In fact, Imperial Sugar, a subsidiary of the Louis-Dreyfus company has entered a joint venture that aims to develop such a sweetener from the well-known stevia plant (Irigoyen, 2022). However, stevia is immensely sweeter than sugar. Like many products, some consumers prefer the taste of stevia while others find it repulsive (Daniels, 2012). The average joes of America may substitute sugar for stevia on their future supermarket runs, yet it is unlikely that stevia will be able to replace the use of sugar in bakery products. The amount of stevia needed to achieve the same sweetness level as sugar is substantially smaller (Daniels, 2012). This difference should not be overlooked as it changes the weight and size of the bakery product, and another ingredient will need to be introduced to offset this difference (Daniels, 2012). There is no immediate substitute for sugar in the present day, but it will be noteworthy and interesting to see how the alternative sweetener market develops. In order to overtake sugar as the primary sweetener, alternative sweeteners will need to solve the weight and size issue that occurs when they are used in bakery products.

Analysis of Porter's Five Forces

While Porter's Five Forces give a detailed and insightful categorization of the product industry market, it is important to take a step back to assess the facts of the industry and to analyze its deficiencies. Firms that successfully collude and price fix are specifically looking for industries with high entry costs, significant barriers to entry, low bargaining power of consumers, and a low threat of substitute products. The sugar processing industry hits all of these benchmarks. However, it is the regionality of specific processed sugar markets that makes this industry particularly susceptible to price fixing. How will consumers enjoy competitive pricing when there are only a select few sugar processing firms that service their area? The answer: it is highly unlikely that they will. Thus, the focus of this paper will be contrasting two processed sugar markets: the Midwest sugar market, who acquires their processed sugar from sugar beets, and the Northeast sugar market, who acquire their processed sugar from sugarcane.

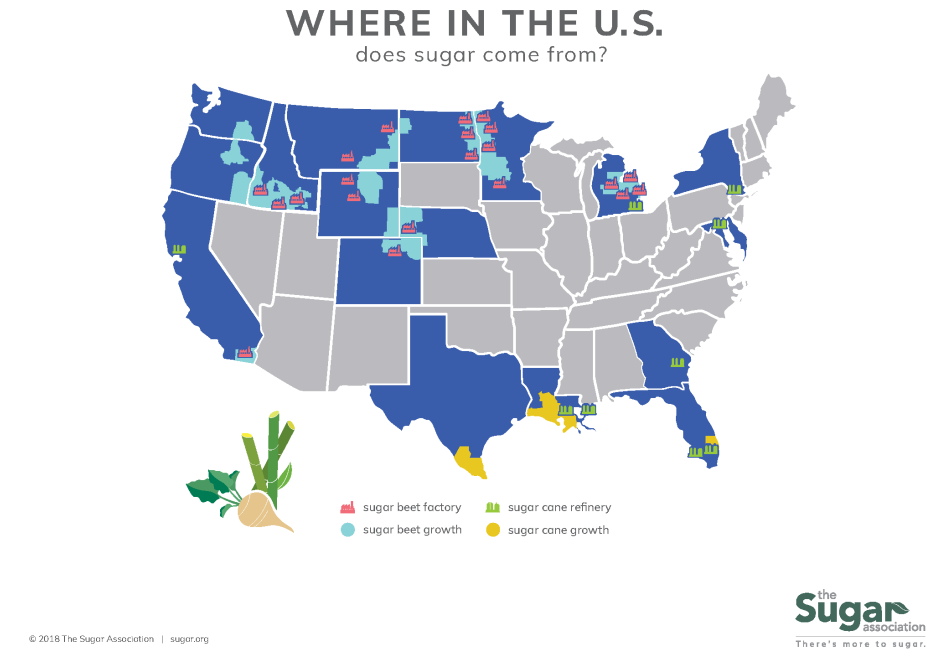

Figure 4 (Sugar resources for health professionals, 2023)

In Figure 4, it is quite noticeable the vast difference of the number of sugar beet factories in the Midwest compared to the few sugarcane refineries in the Northeast. This was one of my main motivations in selecting these two markets to compare and analyze. Potential collusive and price fixing activities perpetrated by sugar processing firms would only be successful in a market-by-market basis. Due to the geographic location of sugar beet factories and sugarcane refineries, it would likely be difficult to achieve a nationwide uniform price fixing scheme. Given that the discussion on Porter's Five Forces, from the previous section, encompasses both sugar beet processing and sugarcane processing industries, it would be insightful to investigate whether the small number of sugarcane refineries, represented by the Northeast processed sugar market, has a differing influence, in terms of regional price fixing, when compared to the far greater number of sugar beet factories, represented by the Midwest processed sugar market.

History of Collusion within Sugar Processing Industry

As with many fields, it is important to look to the past for answers pertaining to the future. In many industries there is a history of repeated collusion. By price fixing, firms make significant profits. These profits overpower and are greater than fines associated with collusive activities. From a pure cost and benefit analysis, firms that can collude will reap the profits attained from collusive activities, pay fines associated with these activities, and then attempt to repeat this process in following years. While there have not been any convicted cases of collusion in sugar processing in the US, there have been convicted cases in the European Union specifically pertaining to white granulated sugar processed from sugarcane or sugar beets (*Commission Decision,* 1999). One of the companies included in this decision is Tayte & Lyle PLC; this company forms part of American Sugar Refining. American Sugar Refining has a significant operating base in the US; they operate in partnership with Florida Crystals, one of the

major players mentioned earlier, as well as the well-known Domino Sugar company. One of the most illuminating portions of this European Union committee decision is the underscored importance of geographic markets. The committee decision states "The fact that in some respects different conditions prevail in Northern Ireland (27) does not hinder the application of these findings on the market in Great Britain. In the market in Great Britain, the sugar price is somewhat higher than the current price in markets of neighboring Member States. This is due to the costs incurred in transporting sugar across the English Channel" (*Commission Decision,* 1999). The findings of the European Union concur with those of the DOJ, processed sugar prices are regional by nature. The costs associated with transportation as well as the general difficulty of the operation leaves consumer stuck with prices that are purely bound by what region they reside in.

In the United States, there have been no convictions of collusion. However, in 1974, there was a complaint filed by the DOJ citing possible restraint of trade and horizontal price fixing. The complaint was titled, "United States v. Great Western Sugar Company; Holly Sugar Corporation; California and Hawaiian Sugar Company; American Crystal Sugar Company, Amalgamated Sugar Company; and National Sugarbeet Growers Federation. This case is specific to processed sugar from sugar beets, and as one may tell there are repeated names from the discussion of major players: American Crystal Sugar Company and Amalgamated Sugar Company. While the complaint is brief in nature, it alleges that these firms colluded with one another to restrict trade to certain regions (*U.S. V. Great Western Sugar Company, et al,* 2018). Through this alleged attempt to collude, firms are clearly looking to isolate customers, whether that be through restriction of trade or the natural elevated costs that are associated with shipping.

Companies and firms are purely established to reap financial successes. As previously mentioned, firms who successfully collude stand to make a net positive in monetary gains. The European Union's committee decision on Tate & Lyle, a firm that forms part of the American firm American Sugar Refining, demonstrates that collusion in the sugar processing industry is possible. The fact that there has not been a convicted cases of collusion within the sugar processing industry in the US does not mean collusive activities are not being perpetrated. Complaints have been filed, as shown above, that include major players that are being covered in this paper. Coincidentally, the two firms mentioned in each respective report, American Sugar Refining and American Crystal Sugar Company, who is owned by United Sugars, are rivals within the industry.

Characterization of Buyers and Procurement

The characterization of buyers is important information to understand to comprehend the nature of an industry. Processed sugar is primarily sold to retailers and industrial food producers, those who make bakery and cereal products as well as confectionary goods (U.S. v. United States Sugar Cooperation, et al, 2021). Sugar processors are typically contracted on a year-long supply contract. Where customers decide where the processed sugar should be delivered to, as many of these producers have many plants, the desired volume of processed sugar, and whether said sugar should be delivered in bulk, bag, or liquid form (U.S. v. United States Sugar Cooperation, et al, 2021). There are customers who prefer cane sugar to beet sugar and as a result will pay a premium for cane sugar (U.S. v. United States Sugar Cooperation, et al, 2021). Often times, large consumers will set up supply contracts with multiple sugar processors; this is done to ensure there is no disruption in the sugar supply chain (U.S. v. United States Sugar Cooperation, et al, 2021). Unfortunately, in areas where there is a sole sugar processor this safety netting can not be

achieved. In addition, large customers can leverage the price down of the processed sugar, by obtaining contracts from multiple processors (U.S. v. United States Sugar Cooperation, et al, 2021). Similarly, there is little to no leverage in areas in which there is only a sole processor; the inability to drive input costs down will result in a loss in profits; however, this surcharge is likely passed onto final consumers.

When processors are not directly selling to large retailers and consumers, they are often selling their sugar to distributors. Distributors allow sugar processing firm's products to reach a wider base of consumers (U.S. v. United States Sugar Cooperation, et al, 2021). Distributors also serve to fill in the gaps left by the sugar supply chain and often service smaller customers who do not require truckloads of processed sugar (U.S. v. United States Sugar Cooperation, et al, 2021). They also purchase imported processed sugar and resell it themselves, since firms do not often want to deal with the logistical issues of purchasing imported processed sugar themselves (U.S. v. United States Sugar Cooperation, et al, 2021). To put it simply distributors are resellers; they operate in the downstream. While their services are advantageous to fill in the gaps of the supply chain, distributors do not have the willingness nor capacity nor ability to service the majority of our country's processed sugar needs. They are merely a small piece in the puzzle, and they do not have the infrastructure to service a General Mills for instance, and thus they have to no ability to largely influence the processed sugar market.

Simply put, sugar is a regional product. In fact, many firms and entities within the sugar processing industry recognize this statement as a fact (U.S. v. United States Sugar Cooperation, et al, 2021). Firms discuss strategies on a regional basis (U.S. v. United States Sugar Cooperation, et al, 2021). There is no uniform strategy that can be applied to the of the United States. For example, in a meeting conducted by the CEO of the United Executive Committee,

which includes the CEO of United Sugar, they discussed a “Southeast Strategy”, where a discourse was had on their competitiveness within the states of Alabama, Florida, Georgia, North Carolina, South Carolina, and Tennessee (U.S. v. United States Sugar Cooperation, et al, 2021).

In addition, the committee presented the following PowerPoint which depicts the US sectioned off in their respective regional markets.

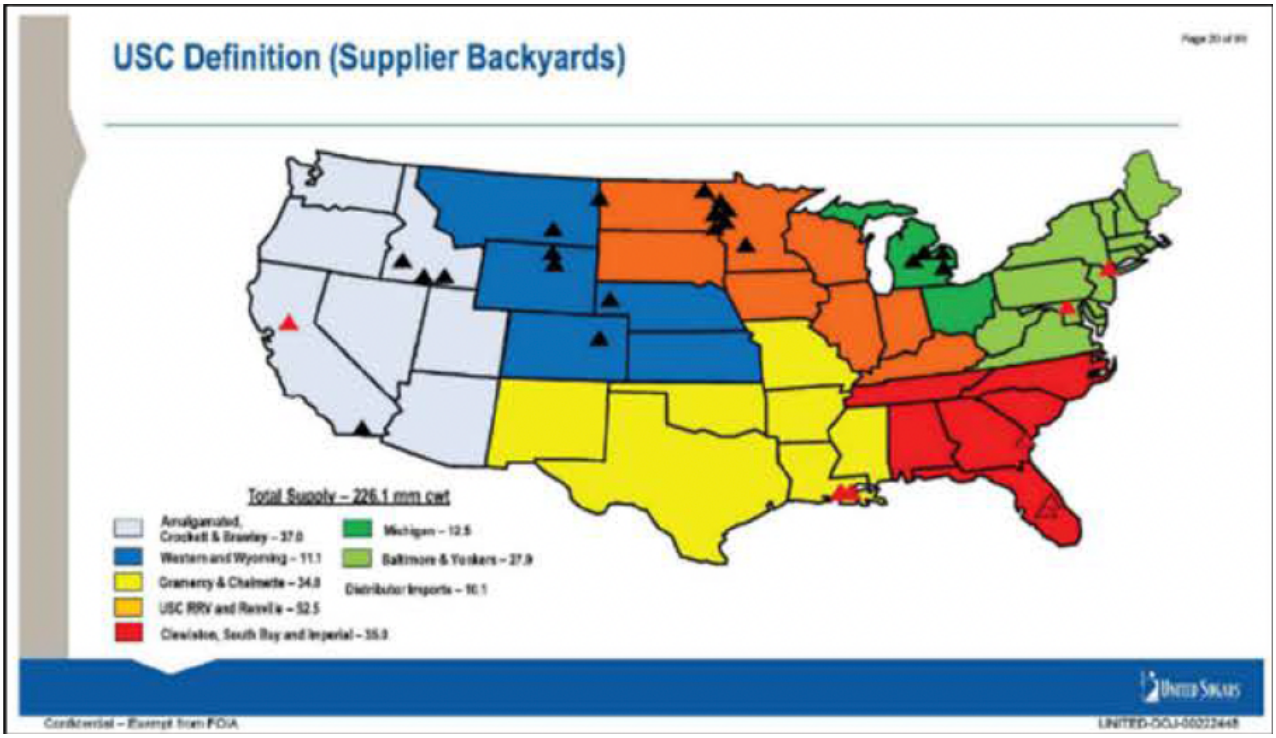

Figure 5 (U.S. v. United States Sugar Cooperation, et al, 2021).

It is evident that firms understand the regional nature of the sugar processing industry. Firms devise strategies based on their regional competitiveness. This is largely due to the fact that customers are paying a delivered price. This delivered price includes the cost of refined sugar product itself, but more importantly it includes freight costs (U.S. v. United States Sugar Cooperation, et al, 2021). Bakery and cereal producers, for instance, can not go and directly pickup their sugar from refineries (U.S. v. United States Sugar Cooperation, et al, 2021). Thus, proximity to customers, in regards to distance between customer and refineries, greatly influences the delivered price and thus the overall competitiveness of the sugar processing firm.

For example, Louisiana Sugar Refining, a sugar processing firm located in Gramercy, LA would not be able to be competitive in the Northeast market. As they would be competing with American Sugar Refining who has sugar processing plants in both New York and Maryland. The delivered price for LSR would be significantly larger than that of ASR solely due to freight costs. This point is best illustrated through the lens of United Sugar's Director of Strategic Accounts. When submitting a bid to supply Danone, an international yogurt company, with a plant in Jacksonville, Florida, he stated that United "had a significant freight disadvantage over one competitor in Savannah, Georgia" (U.S. v. United States Sugar Cooperation, et al, 2021). This disadvantage only due to the fact that the competitor was closer in proximity to the Danone plant than United.

Firms also engage in selection of customers by these same principals. There is a tangible and notable opportunity cost associated with fulfilling customer orders. As described by National Sugar Marketing's CEO,

> "Another key component is the [customer's] ability to turn our railcars, and the amount of time a railcar is away from our facility. Just simple math, if my railcar leaves Renville, Minnesota, and it takes 40 days to come back, versus my ability to ship a customer and I get it back in 20, I can turn it twice to the same railcar that would be for one railcar going 40days. That's a major decision point for us when we are looking at freight" (U.S. v. United States Sugar Cooperation, et al, 2021).

Even if theoretically a firm was contracted by a customer outside of their regional market there is this tangible opportunity cost associated with servicing that demand. The shipping resources dedicated to that order would be far better used servicing a firm's regional clients. They would be able to service more clients and more efficient rate resulting in higher profits. As a result of

this, firms strategize in which regions they would be competitive, which is ultimately determined by freight costs. NSM's CEO states, "most part, freight rates are, linear. Further mile-more miles you go, the more cost there is, whether it be truck or rail." (U.S. v. United States Sugar Cooperation, et al, 2021). A firm's competitiveness is determined by proximity. Freight costs simply can not be avoided; each additional mile travelled to potentially fulfill an order lessens a sugar processing firm's competitiveness. This sentiment is echoed by Michigan Sugar's, one of the four dominant firms in the sugar beet processing industry, Vice President of Sales and Marketing. He states that Michigan Sugar is a "regional sugar supplier . . . because "[i]t's a limitation on freight transportation costs to get to our customers" and thus "the farther we get away, the more freight cost that we are encountering" which "has an effect on our competitiveness overall" (U.S. v. United States Sugar Cooperation, et al, 2021). This demonstrates the extent of an obstacle freight costs present.

In a similar fashion, customers select which sugar processing firm to employ by these regional distinctions. General Mills, one of the nation's largest ready-to-eat cereal producers, recognize that a sugar processing firms' "geographic proximity" to General Mill locations has a significant effect on a processors' competitiveness (U.S. v. United States Sugar Cooperation, et al, 2021). Naturally, the closer a sugar processing firm is to their respective customer the more competitively priced their product will be. Proximity, as described by General Mills, allows "the supplier to remain competitive in a given area" (U.S. v. United States Sugar Cooperation, et al, 2021). This sentiment is echoed by the CEO of Piedmont Candy, who stated, "[i]n order for [sugar suppliers] to be competitively priced and be able to service us, it would be obvious the closer they are to our facility the better it would be from a freight perspective" (U.S. v. United States Sugar Cooperation, et al, 2021). The narrative is all the same: the closer a sugar processer

is to the customer the more competitively priced their products will be. Regional proximity serves as a physical and monetary cut off point. Even if sugar processors successfully won a bid outside their regional market, fulfilling said order does present logistical issues. Farther shipping distances does affect a sugar processor's ability to provide a reliable service (U.S. v. United States Sugar Cooperation, et al, 2021). Shipping processed sugar by railcar is not simple. Shipping sugar long distances not only increases the risks of damaging the product but transit times by railcar are regarded to be unreliable. A spokesperson for CSC sugar stated, "railroads are not reliable when it comes to just in time deliveries (U.S. v. United States Sugar Cooperation, et al, 2021). Given the homogenous nature of processed sugar, a processing firm's ability to be reliable in fulfilling customer's need within stringent time constraints is ultimately a necessity. Geographical proximity is a natural barrier to fulfill said contracts. It is largely accepted within the industry that processed sugar is a regional product and has regional markets. Thus, consumers in areas with few sugar processors are particularly susceptible to monopolist or oligopolist pricing and a significant decrease in consumer surplus.

Concentration of Sugar Processors in the Northeast

The previous section established how consumers purchase their sugar, as well as showing that sugar itself is a regional product, where the main determinant in a sugar processing firm's competitiveness to a consumer are low delivered prices and overall general efficiency with fulfilling orders. However, both of these qualifications for contracting a sugar processing firm rely on geographical proximity. For instance, if Firm A is 100 miles away from a General Mills factory and Firm B is 250 miles away from the same General Mills Factory, Firm A would have the competitive advantage as their delivered cost would be lower simply because their freight

costs are lower. They would also be more likely to fulfill orders in a more efficient manner. It is well known that competition is good for consumers, as it drives prices down and leads to innovation. However, an important distinction must be made: the delivered price a sugar processing firm offers to a consumer is dependent on the geographic proximity of its competitors. If there are ten sugar processing firms within a 100-mile radius of a cereal producer, the mere fact that there are ten viable prospective contracts brings prices down. However, if there is only one sugar processing firm in a 200 miles radius, for instance, obviously the contract will be awarded to that firm. Yet, that firm has no need to price their sugar competitively. They are essentially made monopolists by the regionality of the sugar processing market. Consumers in the Northeast of the US are in this unique position. There are only two sugar processing refineries (one located in Baltimore, MD and the other in Yonkers, NY), both processing sugar cane. The only other viable competition was the sugar processing facility in the southeast of Michigan, but this refinery was closed in the first quarter of 2020 (*Michigan farm news*, 2019). Both remaining refineries are owned by Domino Sugar, who's parent company is American Sugar Refining. Given the regional aspect of the market, ASR has full control over the Northeast region. The acquisition of Domino by ASR is fairly recent. ASR bought Domino and its respective refineries from Tate & Lyle North American Sugars Inc. in 2001 (*American Sugar Refining to acquire Tate & Lyle's European sugar operations,* 2010). It is also important to note that Tate & Lyle have engaged in collusive activities in Great Britain. From an antitrust perspective this merger is incredibly concerning. A merger of any two or more firms is essentially collusion that is allowed by the government, and it is no surprise that processed sugar prices in the Northeast are the highest in the nation, more on this subject is explored in the Narrow Analysis section of the paper. The Department of Justice has allowed ASR to essentially

become a monopoly of processed sugar in the Northeast due to the regional nature of the processed sugar market. ASR has substantially invested in the Baltimore refinery by means of a project completed last April. $27 million dollars in investment were used to add four 161-foot silos each respectively holding 3.5 million pounds of sugar (Oxenden, 2022). Ultimately the expansion quadruples the amount of processed sugar the refinery can hold (Oxenden, 2022). The plant manager stating the expansions will allow the refinery "to supply sugar more reliably. We'll be much more nimble, flexible and better serve our customers" (Oxenden, 2022). It is evident that ASR understands and comprehends their unique position. An expansion to better serve this regional market is incredibly logical. Their position as a monopolist within this market will yield incredibly lucrative profits. This expansion will serve to cement their market power and successfully fulfill all orders serviced through them.

Fundamentals of the U.S Sugar Program

Another important aspect of the U.S sugar processing industry are the government regulations and specifications that surround it. The U.S Sugar Program has been employed since the 2014 farm bill (McMinimy, 2016). The program has four clear and distinctive roles that are as follows: price support loans that serve the function of a price guarantee, marketing allotments that quantifies how much each processor can sell, import quotas that control the amount of sugar that comes in the country, and lastly, a sugar to ethanol backup that is only implemented when market allotments and quotas can not prevent a sugar surplus (McMinimy, 2016).

The first three components of the U.S Sugar Program have real and tangible ramifications. Sugar processors, not sugarcane farmers of sugar beet farms, have the ability to take out a non-recourse loan; the payment structure is best represented by the following figure and applies to both sugar cane and sugar beet processors (McMinimy, 2016).

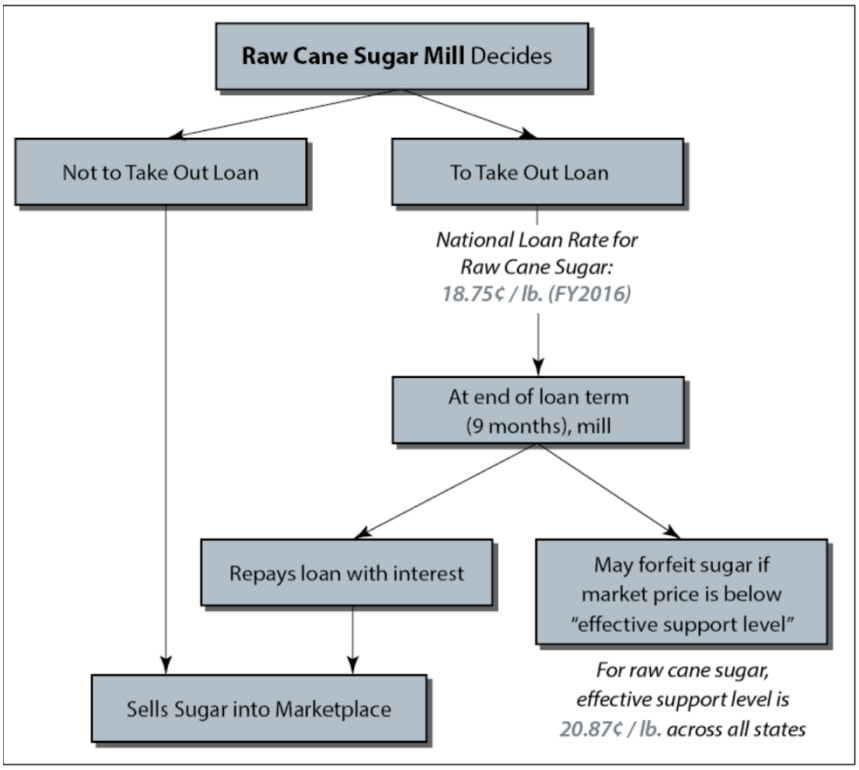

Figure 6 (McMinimy, 2016)

As seen in the figure processors have the ability to forfeit processed sugar if the market price for sugar is too low. This maintains the price of sugar and essentially acts as a price floor. There has been significant controversy regarding these loans, as consumers, especially those that use processed sugar as an input, complain of the high cost of domestic processed sugar compared to the low cost of the same processed sugar in the rest of the world (McMinimy, 2016). These consumers have cited having to move factories out of the country in order to combat these input costs (McMinimy, 2016). However, from a sugar processing firm's standpoint a price floor is certainly a positive. The US government sets annual limits and creates market allotments limiting how much sugar individual processors can sell (McMinimy, 2016). It also sets out a mandate stating that at least 85% of human consumed sugar is afforded through these market allotments (McMinimy, 2016). If for instance, these allotments fall short off the need for processed sugar the "shortfall" is corrected by allowing more imports (McMinimy, 2016). One may begin to question as to why don't consumers import processed sugar from overseas, especially when

world sugar prices are substantially lower. This would especially pertain to consumers in the northeast where there is virtually no competition to keep prices low. The simple answer is tariff rate quotas. The previously mentioned farm bill gives power to the USDA to oversee the importation of sugar, which is often imported via raw sugarcane (McMinimy, 2016). The USDA is mandated to maintain the market value of sugar so that it does not fall below " the effective support level" (McMinimy, 2016). The World Trade Organization (WTO) obligates the US to at least allow 1.256 million metric tons of sugar to enter the market from a designated 40 countries (McMinimy, 2016). The US also have various trade agreements like DR-CAFTA, NAFTA, and the TPP that also comes along with its respective import quota arrangements (McMinimy, 2016). However, if a consumer wants to import sugar in excess of the allotted quotas, they are able to but a higher duty (McMinimy, 2016).

The Sugar Program does pose a barrier of entry to new entrants. In the words of the USDA, "The program sets out allocation conditions for new entrants and for the effect of the sale of factories between processors," and these allotments are determined by "on the States' and processors' production histories" (Abadam, 2021b). One would naturally conclude that new entrants would find it difficult to prove their production capacity, especially since there is not an endless supply of raw sugarcane or raw sugar beets. Simply put, there may not be a big of enough piece of the processing sugar pie to even begin business. There is little to no possibility of new entrants emerging due to these marketing allotments. This is a natural limitation on the number of sugar processing firms, which undoubtedly leads to higher domestic prices. In addition, the marketing allotments that limit how much a sugar processor can sell does lead to the possibility of collusive activity. The USDA states, "If a cane processor cannot market its allocation, it is reassigned to the other processors within the same State, taking into account their

ability to make up the deficit and also the interests of producers served by the processors. If the deficit cannot be eliminated by this step, the remainder is allocated to the other cane-producing States, and then to the processors in those States" (Abadam, 2021b). Firms could potentially collude to purposely not meet said quotas. Restricting output has been shown to increase firm's individual profits as seen in the graph below (Pettinger, 2020).

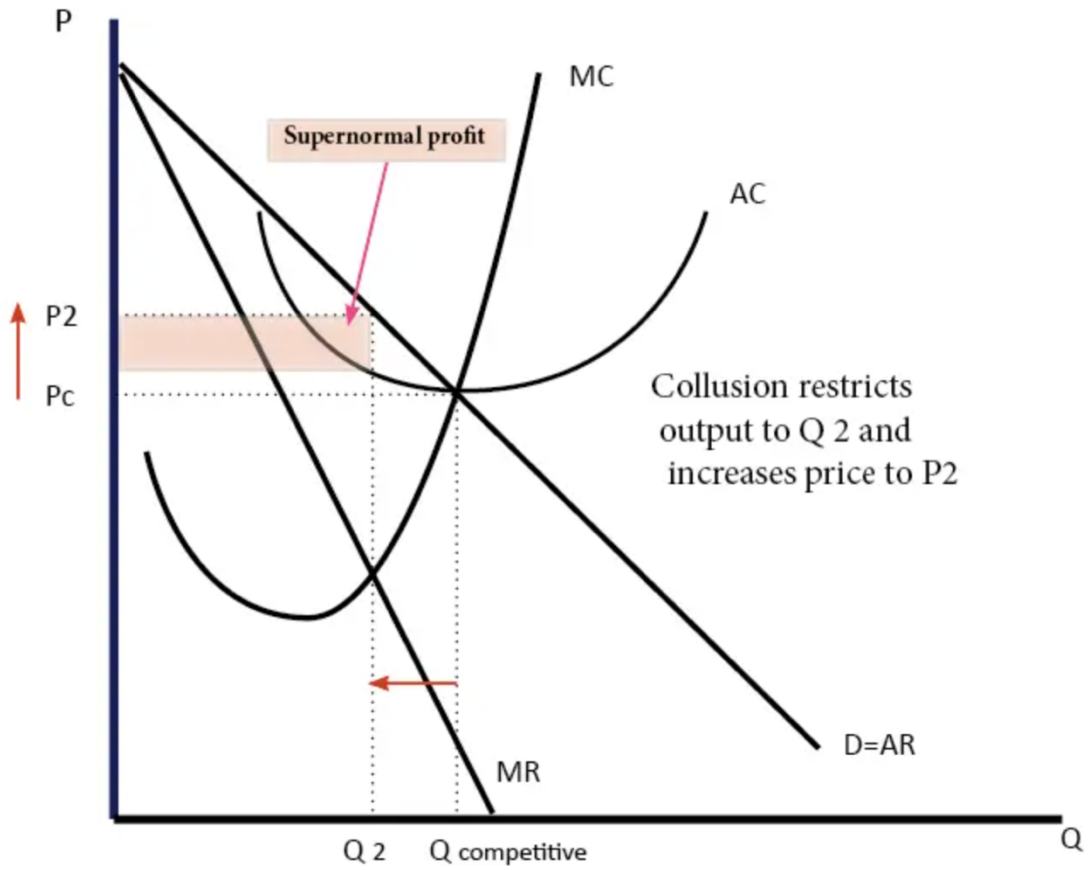

Figure 7 (Pettinger, 2020)

In summary, the US Sugar Program has glaring loopholes that can be exploited by sugar processing firms to artificially inflate prices through collusive activities. The program itself limits the amount of competition between sugar processing firms, as new entrants see the program as a significant barrier to entry. Consumers are ultimately hurt by this program, and these deficiencies need to be addressed.

Narrow Analysis

For the narrow analysis portion of this paper, I decided to conduct a difference in difference analysis. Difference in difference analyses are often used in Economic papers. This particular analysis is well suited for inquires of collusion, especially when internal and company sensitive information cannot be obtained, especially in my case as an undergraduate student.

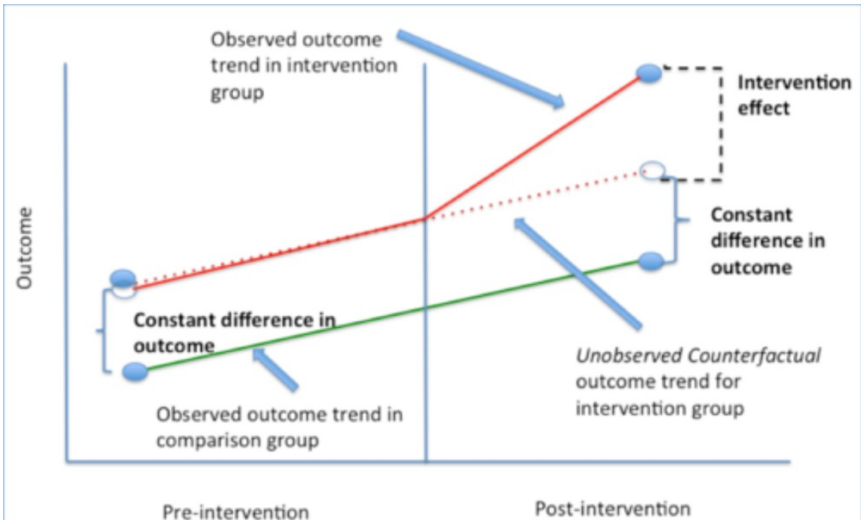

Figure 8 (Current Students n.d.)

The premise of said analysis is relatively simple in nature yet it yields illustrative and enlightening findings. There are two groups depicted in Figure 6: the control group (green) and the treatment group (red). There is an initial observed difference between the groups; however, it is important to note that the seemingly parallel lines are led astray post intervention, as represented by the vertical line in the figure. A final difference is observed following a period of one's choosing. The intervention has had some effect upon the path of the treated group, yet the difference in difference analysis allows one to determine whether said difference is caused by the intervention and whether this difference is statistically

significant. It is assumed that if there was no intervention present the two lines would continue in a parallel fashion. One then runs a regression using these observed differences using the following equation. $Y= \beta0 + \beta1*[Time] + \beta2*[Intervention] + \beta3*[Time*Intervention]$ (Current Students n.d.). The coefficients are as followed in a respective order: baseline average, time trend in the control group, difference between the two groups pre-intervention, and difference in changes over time (Current Students n.d.). One then uses the data from the regression to see whether the treatment had a statistically significant effect. However, there are some important assumptions that must be held in order to use such a method of analysis; it also important to hold these assumptions to justify one's findings.:

1. The control group is not influenced by the treatment (Marshall, 2022).
2. The quality or nature of the commodity being sold for both groups does not change after the treatment (Marshall, 2022).
3. There are no technological innovations that create differential impacts on productivity post treatment then pretreatment for both the control and treated groups (Marshall, 2022).
4. The DID should not waver or change to a significant degree for differing control groups. If this is the case then the control group chosen is not truly a control group (Marshall, 2022).
5. Shocks to the market must equally impact both the control and treatment group. If not, this must be accounted for in the DID regression (Marshall, 2022).
6. The prices used in the data observed must accurately measure transaction prices (Marshall, 2022).
7. Control and Treatment groups should have parallel trends prior to treatment (Current Students n.d.).

With these assumptions in mind, I then decided to use flour as my control group and suspected price fixing as my treatment. Flour is similar to sugar in that it is a refined product. The dataset that I chose for bakery flour is the average price coming out of Minneapolis as it was closest to the northeast market that I was analyzing. Bakery flour was a suitable control group as it similar to sugar in terms of use. One must keep in mind that the primary customers of the sugar processing industry are bakery and confectionary product producers. Flour is similarly an input good that is used to make a variety of different products. There is little to no history of collusion within the flour industry which is a necessity in order to use such a product as a control. In a similar fashion, I used the bakery flour prices out of Chicago for the difference in difference analysis of the Midwest sugar beet processing industry. Assumptions 2,3, and 5 above have relatively little or nothing to do with my difference in difference analysis. The treatment for both groups does not affect the nature, nor the quality of product sold. Similarly, there are no technological advancements post treatment, as the treatment itself is just price fixing. Most importantly assumption 7 is held for my analysis. The control and treatment groups do follow parallel trends prior to treatment as will be seen in the following graphs.

Given the low concentration of sugar processors in the Northeast when compared to the relatively abundant concentration of sugar processors in the Midwest, one would expect processed sugar prices to be higher in the Northeast. As previously mentioned, this is due to the phenomena of the next closest competitor. The higher concentration of processors within the Midwest forces these firms to quote competitive delivered prices, as consumers have more of a choice in selecting the best contract for their respective needs. The selection process ultimately boils down to the minimization of freight costs and the physical proximity of a consumer's factory to the sugar processing firm. Naturally, the two sugar processors in Northeast, three prior to the closing of AmCane's processing facility in 2020, can price their product monopolistically. Theoretically, consumers could potentially import sugar from overseas; however, only a limited quantity can enter the US at a low duty (Abadam, 2021b). These factors all culminate into one simple outcome: higher processed sugar prices in the Northeast than in the Midwest, as reflected in Figure 10.

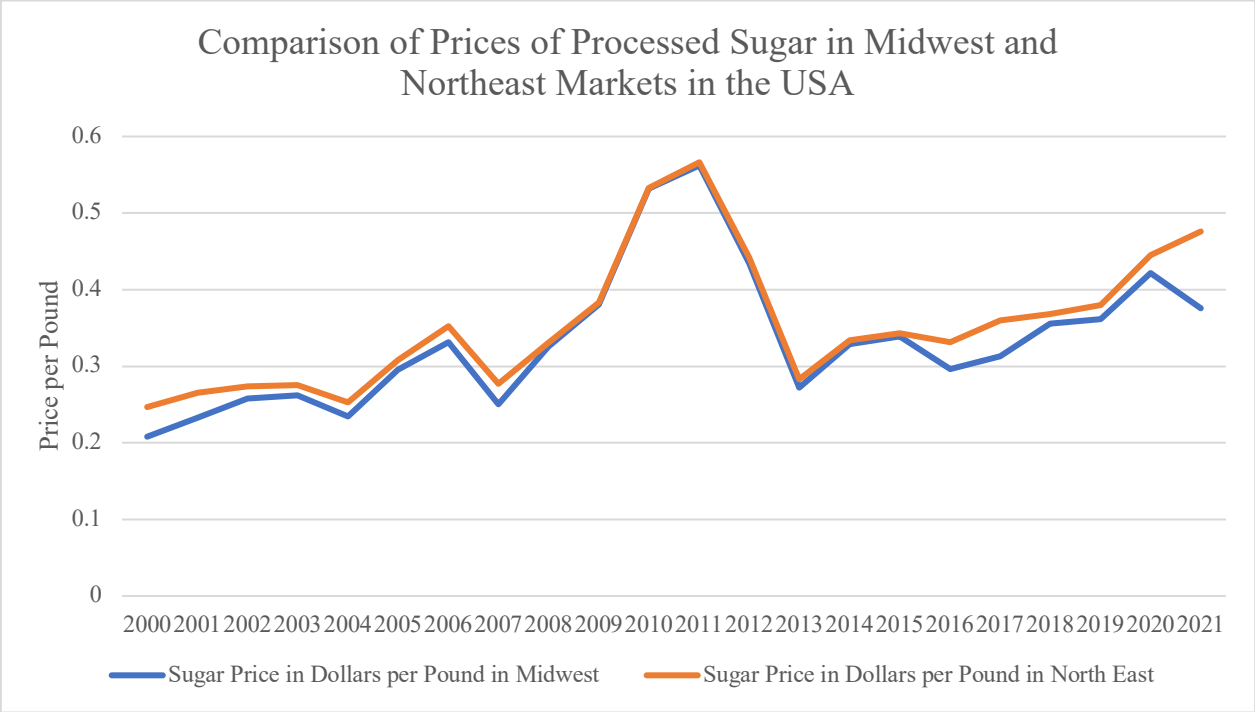

Figure 9 (Abadam, 2023)

Using data from the USDA, I plotted the price of processed sugar compared to the price of bakery flour in the Midwest of the US. The vertical axis measures the price per pound where 1 equals $1 per pound. It becomes clear to see that sugar does not have a valuable price per pound, once again adding to the assertion that delivered price is heavily influenced by freight costs. It has been established that the processing quantity allotments given by the USDA are a barrier to entry; however, they also serve as an incentive for processing firms to collude. Tacit or explicit price fixing, presents firms the opportunity to maximize their respective profit given their pre-determined market share. Firms can also engage in swaps, where one sugar processor can deliver on the account of another sugar processor (*Sugar Glossary*, 2023). Swaps could potentially allow colluding firms to service extensive geographic areas, expanding the pre-established regional markets.

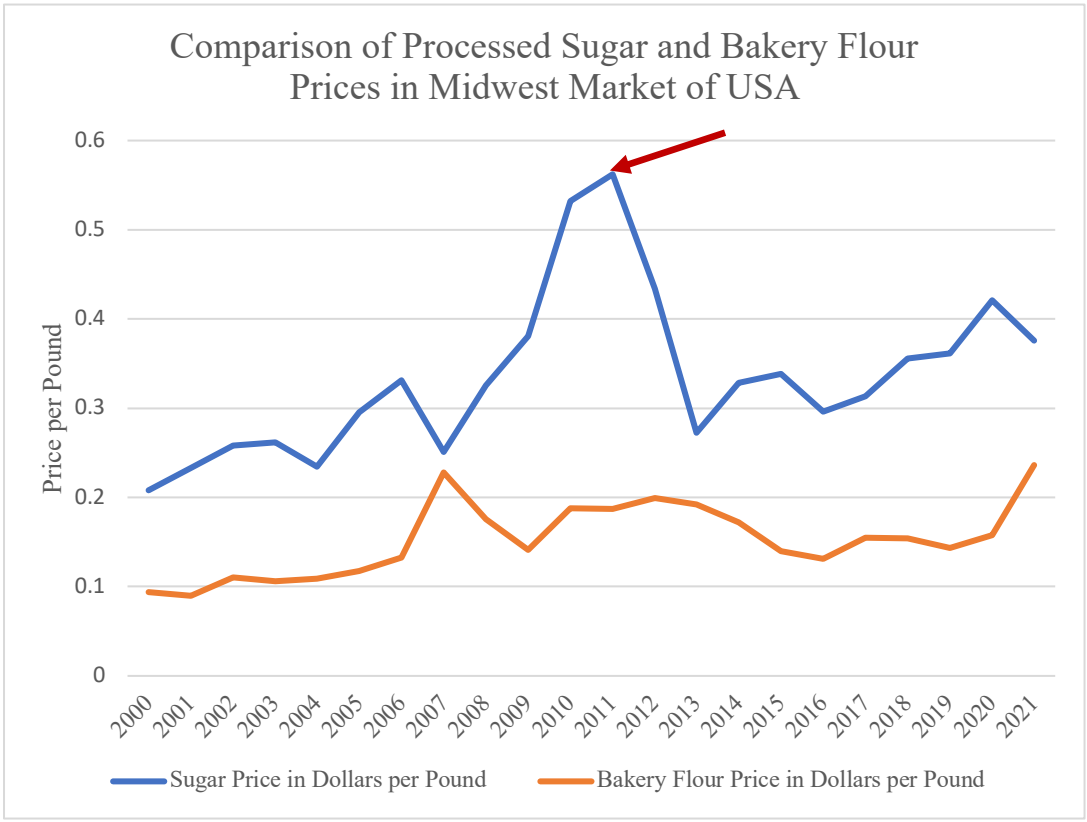

Figure 10 (Abadam, 2023)

When looking at Figure 11 above the most noticeable aspect is undoubtedly the spike in sugar prices in 2010, as indicated by the red arrow. As previously discussed, this spike was largely due to the spike in world sugar prices in 2010; however, the quick over supply of processed sugar caused a rapid almost instantaneous decline in sugar prices. For my difference in difference test, I predicted that collusive activities commenced in 2013. As firms would have even more willingness to return to those 2010 profits. The USDA also wary of the rapid price decline, and its individual mandate to maintain a price floor for the price of processed sugar, doubled down on its stance to impose tariff rate quotas and marketing allotments for US sugar processing firms (Dohlman, 2010). In reality, these events created a perfect storm for a rise in potential cartel activities. As a result of this, I ran the following regression in Stata: $Sugar\ Price = \beta\theta + \beta 1\ Flour + \beta 2\ Time + \beta 3\ Treated + \beta 4\ DiD + \beta 5\ Drought + \beta 6\ Recession.$ The variable DiD is the interaction between the Time and Treated variables, whereas Time is whether it was a collusive period and Treated is whether firms were engaging in collusion. The latter two variables I used, Drought and Recession, were both included into the regression as they both have a respective effect on the price of processed sugar, and I wanted to see if the increase in price noted after 2013 was due to these factors. The regression brought the following results, as seen in the table below.

```
regress Sugar Flour Time Treated DiD Drought Recession
```

Source	SS	df	MS	Number of obs	=	37
				F(6, 30)	=	4.24
Model	.105816592	6	.017636099	Prob > F	=	0.0033
Residual	.12476688	30	.004158896	R-squared	=	0.4589
				Adj R-squared	=	0.3507
Total	.230583472	36	.006405096	Root MSE	=	.06449

Sugar	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
Flour	1.16037	.317556	3.65	0.001	.5118343	1.808906
Time	-.0139014	.0697921	-0.20	0.843	-.1564359	.1286331
Treated	-.0747695	.0702894	-1.06	0.296	-.2183195	.0687805
DiD	.0848979	.0973385	0.87	0.390	-.1138938	.2836895
Drought	-.0343626	.0221522	-1.55	0.131	-.0796034	.0108782
Recession	.0045821	.0301607	0.15	0.880	-.0570144	.0661785
_cons	.1661781	.0390026	4.26	0.000	.0865241	.2458321

Table 3

The most illuminating figures from this table are the coefficients on the Flour and DiD variables and their respective p- score. Flour had a positive coefficient meaning that the price of flour has a positive effect on the price of sugar. This result is not surprising as these good are complements to one another, and the parallelism in pricing trends that both goods follow is seen in Figure 11. The DiD variable also had a positive coefficient; however, it was not statistically significant. The R-squared value was .4589 in this regression. In future studies this value can be elevated by analyzing production quantities and the affect that has on price.

In a similar fashion, I wanted to analyze whether there were collusive activities in the Northeast market prior to the closing of Michigan's sugarcane refining facility. Using the same logic as the previous regression, the period of interest would however be from 2013-2020. As one may notice in the graph below, there is stark increase in price following the closure of that Michigan refinery, as indicated by the red arrow in Figure 12. Most interestingly, during the post

2020 period, sugar prices in the Midwest declined, while those in the Northeast increased. Once again, reaffirming the stringent geographical markets in the sugar processing industry, but also showing how proximity of one's competitor helps keep processed sugar prices down. This is because the remaining two refineries that service the Northeast, were both owned and operated by Domino Sugar. Due to the regionality of the sugar processing industry, Domino sugar was able to price their sugar at monopolist levels.

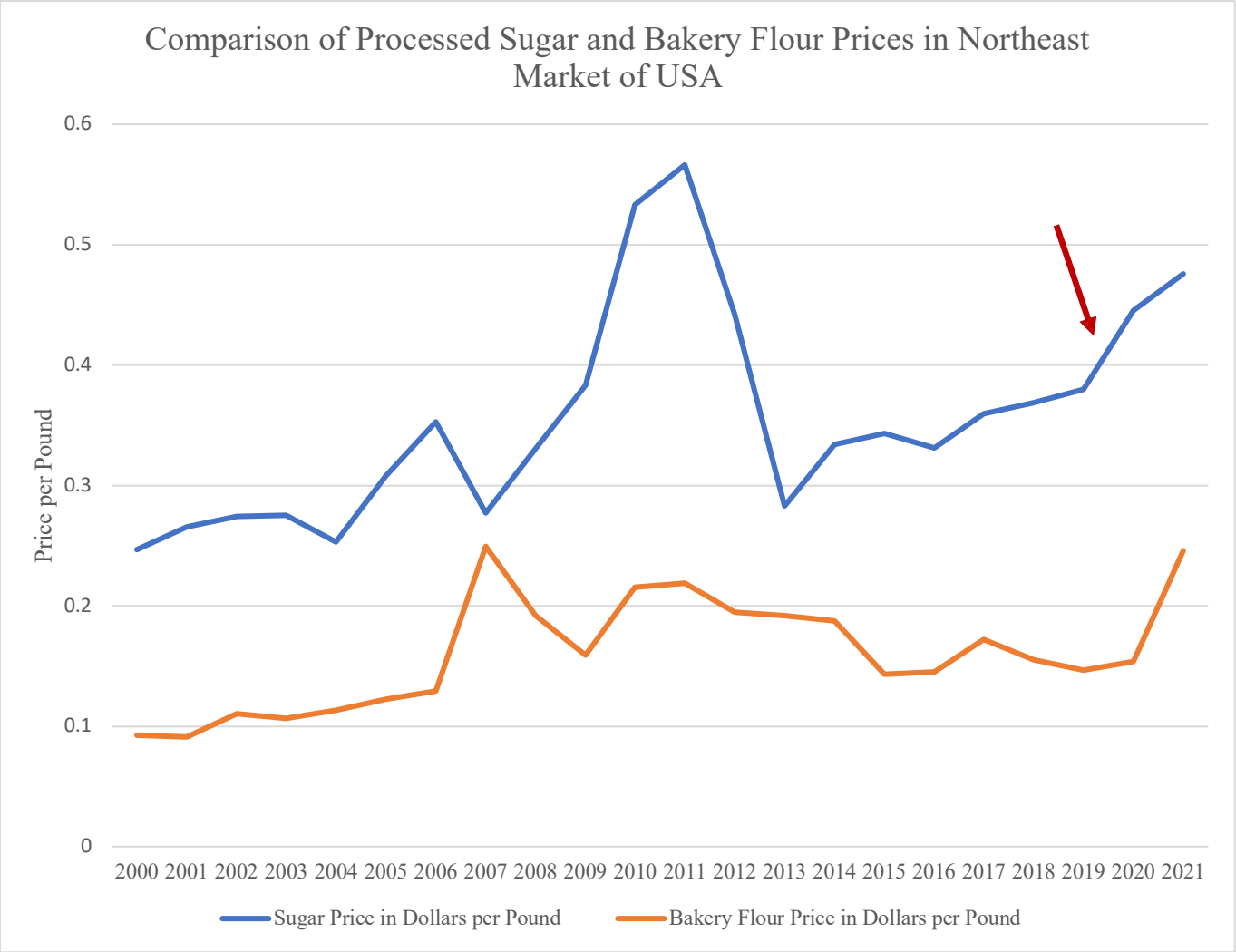

Figure 11 (Abadam, 2023)

Using the same regression formula as before, with the only exception being analyzing droughts that affected sugarcane growth rather than sugar beet growth, the following results were rendered:

```
regress Sugar Flour Time Treated DiD Drought Recession
```

Source	SS	df	MS	Number of obs	=	22
				F(6, 15)	=	4.98
Model	.11082732	6	.01847122	Prob > F	=	0.0054
Residual	.055623389	15	.003708226	R-squared	=	0.6658
				Adj R-squared	=	0.5322
Total	.166450709	21	.007926224	Root MSE	=	.0609

Sugar	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
Flour	1.185844	.3007723	3.94	0.001	.5447633	1.826925
Time	-.1439778	.0655879	-2.20	0.044	-.2837751	-.0041804
Treated	.1020933	.0659317	1.55	0.142	-.0384369	.2426234
DiD	.0562055	.0861281	0.65	0.524	-.1273721	.2397832
Drought	-.0770035	.0303895	-2.53	0.023	-.1417771	-.0122298
Recession	-.0162053	.034155	-0.47	0.642	-.0890049	.0565943
_cons	.1993681	.0506035	3.94	0.001	.0915092	.3072269

Table 4

Similar to the results from the previous regression the only statistically significant coefficient is that of the price of Flour. Naturally, when the price of bakery flour increases the price of processed sugar increases. From a bakery product producer's outlook these products are complements. The DiD coefficient though positive is once again statistically insignificant. However, the R-square value of .6658 is a more comprehensive figure within this regression.

Conclusion

While the findings of the narrow analysis did not provide any statistically significant evidence of price fixing, it would be incredibly unwise to make the conclusion that there is no

cartel activity within the sugar processing industry. An analysis that includes data on swap agreements and production quantities could potentially illuminate how these firms are colluding. Unfortunately, this sort of data is not available to public. However, one thing should be clear: the sugar processing industry is ripe for collusion. The regional markets, the stringent USDA allocations, and the USDA imposed tariff rate quotas make collusion an incredibly enticing prospect for processing firms. The industry itself seems to be closed for entry due to the USDA's production quantity restrictions. As seen in British markets, collusion within the sugar processing industry is possible and it is certainly profitable. It would also be worthwhile to continue investigating sugar price increases in the Northeast market. The closure of the refinery in Michigan was fairly recent, and ASR has significantly invested in the two Domino refineries in the region since its closure. It is clear that ASR has complete control within that specific region and consumers will only continue to hurt from their monopolist pricing.

In conclusion, the DOJ must keep a wary eye on the sugar processing industry. With the limited resources of an undergraduate student, I was unable to access some data that I would suspect add to my belief in collusive activities within this industry. A government investigation would uncover any and all evidence of explicit or tacit collusion, output restriction, and price fixing.

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NICOLAS PASTOR

EDUCATION

The Pennsylvania State University — **University Park, PA**
Schreyer Honors College — *Paterno Fellows Program*

College of the Liberal Arts — *May 2023*
Bachelor of Science, Economics — *Dean's List*
Bachelor of Arts, English

PROFESSIONAL EXPERIENCE

Henson Pachuta and Kammerman PLLC — **Fairfax, VA**
Legal Assistant — *May 2022 - Aug 2022*

- Assisted paralegals and attorneys to complete I-589 forms (asylum applications) and I-765 forms (work permit applications)
- Prepared 10+ supplemental filings using country conditions research and accompanied attorneys to file documents in Immigration Court
- Translated and communicated court proceedings to Spanish speaking clients
- Shadowed attorneys in Fairfax County Traffic, SIJ Court, and Immigration Court
- Completed official translations of foreign documents between English and Spanish
- Compiled and highlighted documents regarding human rights violations and other pertinent information in a company accessible database with the intention of aiding potential asylum seekers with respective filings

Penn State Lion Line — **University Park, PA**
Alumni Outreach — *Jan 2023 – Present*

- Conduct phone calls to solicit monetary donations for Penn State University from alumni across the nation for all 20 Penn State campuses and Penn State scholarship funds
- Demonstrate impeccable customer service with engaging conversations encouraging, even distant alumni, to participate in donations and financial support
- Utilize updated Lion Line call databases and university information sheets to help advise prospective donors
- Ensure donors are directed and connected to the correct platforms for individualized donations

Pass Academy — **McLean, VA**
Program Director and Coach — *Jun 2020 – Aug 2021*

- Developed an advanced tennis coaching program with an emphasis on technique and skills for young players while adhering to all health guidelines
- Coordinated meetings with management to ensure programs were running efficiently and safely
- Designed individualized program lessons unique to students particular athletic needs
- Led upper-level tennis teams in top tier competitive matches

CAMPUS INVOLVEMENT

Zeta - Historian (Executive Board Member) and Initiated Member since Fall 2020
University Park, PA
Chi Phi Fraternity – Alpha Delta Chapter — *Nov 2020 – Sep 2021*

- Served on the 2020-2021 chapter executive board overseeing 90+ fraternity members
- Worked alongside the national chapter to successfully teach and implement brotherhood rituals
- Maintained house records and activities in an organized way to keep, collect, and preserve chapter history
- Coordinated chapter meetings with all members on a weekly basis and sent out chapter agendas
- Informed members of upcoming charity, academic, social, THON, and brotherhood events

Penn State Club Tennis **University Park, PA**
Senior Member of the Traveling Tennis Team *Sep 2019 – Present*

- Represented Penn State while travelling with the team to compete in high-level competitive tennis matches
- Expanded tennis knowledge through working with team members and coaching staff
- Assisted coaching staff with lesson development plans that target technical skills and abilities
- Exemplified good sportsmanship and led various team building activities

SKILLS

- **Penn State Schreyer Honors College – Paterno Fellows Student** *(rigorous academic requirements)*
- **Hard Skills**: Fluent Spanish, Proficient French, Microsoft Office (Word, Excel, PowerPoint, Outlook, Yammer, Notes), Tableau, Clio, Econometrics, Labor Economics, Proficient in Python, Google+
- **Soft Skills**: Leadership, Adaptability, Articulate, Problem-Solving, Collaboration, Ambition, Communication