

The State and Industrial Agriculture: An examination of political dynamics emerging from the
Bayer-Monsanto acquisition

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The State and Movements of Enclosure in Industrial Agriculture: An examination of political dynamics emerging from the Bayer-Monsanto Acquisition

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ABSTRACT (Academic)

This thesis uses the recent Bayer-Monsanto acquisition in order to examine historical and contemporary power dynamics found throughout industrial agriculture. With the theoretical aid of Karl Polanyi and Michel Foucault, I examine how the Bayer-Monsanto acquisition is a viable site in order to reflect the interconnectedness of political and economic forces that organize societies and markets across the globe. I briefly introduce the merger-turned-acquisition between these two former 'Big 6' firms that dominated international agricultural input markets. Questions are asked such as how has the history of agriculture led to its current organization, how have these particular firms garnered such market power, and what power structures or historical economic incentives have contributed to the acquisition's manifestation? In order to address these questions I engage in an economic-historical analysis of industrial agriculture, particularly focusing on the role of the U.S. state in drafting agrarian legislation, spreading knowledge regarding production processes, and promoting particular food products to be patented, grown, and consumed across the world. Through an examination of the acquisition itself, potential economic, environmental, and political implications are presented to analyze whether historically visible strategies have appeared to evolve to become invisible overtime. Although the result of this acquisition does involve few firms governing almost entire markets, I contend that there is more at stake than simply few firms monopolizing agriculture. The Bayer-Monsanto acquisition has economic, environmental, and political implications on a host of actors, and it forces us to question the legitimacy of democratic governmental institutions across the world and where power is situated within them.

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ABSTRACT (General Audience)

Mergers and acquisitions are by no means an emerging trend throughout agricultural markets; however, Bayer's \$66 billion acquisition of Monsanto is a recent development that has garnered attention from politicians, farmers, environmentalists, and public consumers alike. In this thesis I examine how the Bayer-Monsanto acquisition is a viable site in order to show how political and market logics are constantly entangled with one another. I first briefly introduce the merger-turned-acquisition between these two former 'Big 6' firms that dominated international agricultural input markets. I then ask how has the history of agriculture led to its current organization, how have these particular firms garnered such market power, and what power structures or historical economic incentives have contributed to the acquisition's manifestation? After contextualizing the acquisition within a history of legislating land policy, spreading knowledge regarding production processes, and promoting the consumption of particular food products across the world, I present various economic, environmental, and political implications of the acquisition. Although the result of this acquisition does involve few firms with centralized market share, I contend that there is more at stake than simply monopolistic practices. An analysis of the Bayer-Monsanto acquisition reflects why we should question the quality and legitimacy of political institutions across the world, and ask where power lies within them.

Preliminary thoughts: What food do I eat, where does it come from, and why do I eat it?

As my graduate studies began at Virginia Tech, for no particular reason, I became interested in food security. My school was consistently ranked for having some of the best collegiate food in the nation. I ate this food every day, yet I never questioned where it came from, how it got to Blacksburg, or even what constitutes as “quality food”. As I read, I found that sustainability of production methods to feed the world could be a serious future concern, given exponential worldwide population growth. There needs to be enough livestock to feed 10 billion people in the coming decades, enough grain to feed that livestock (80% of all agricultural land actually feeds animals – not us), and enough water to grow that grain. Additionally, I read about the associated detrimental environmental impacts. The beef industry is a leading contributor to deforestation and waste from livestock pollutes the air we breathe, water we drink, and soil we grow our food. However, at least we do not have to literally live in our own waste, as I read many of our livestock do. As my interest in food production, distribution, and consumption began to rise, a major current event began to unfold in big-agriculture: The Bayer-Monsanto merger.

Just as my interests were peaking in food security, Bayer and Monsanto, two of the largest six agriculture corporations, were conjoining forces to further consolidate markets. These companies individually produced and distributed genetically modified seeds and the inputs used to most effectively grow them. These seeds are the initial energy source for the majority of food sold across the world. This research topic was further fascinating due to its immediate relevance. In the middle of my research, the ‘merger’ of these two companies unexpectedly turned into an ‘acquisition’. At first this switch may seem negligible, yet why would Bayer want to rid of the

Monsanto name? If these are two leaders conjoining knowledge, resources, and intellectual property in the name to solve universal starvation once and for all, why not do so together?

My suspicions were raised, and such a simple adjustment from ‘merger’ to ‘acquisition’ forced me to more closely examine why Bayer would want to drop the Monsanto name, how markets have allowed for this acquisition to occur in the first place, and what other actors (besides firms) played a fundamental role in the formation and maintenance of these markets.

Throughout this research I was forced to reevaluate my personal ethics several times; however, learning about industrial agriculture did not persuade me to become vegetarian, convert to veganism, or boycott genetically modified products, and I do not wish this thesis to do the same for any reader. Instead, I would rather it makes one think more critically about things that people interact with day-in and day-out. I acknowledge the redundancy of this statement, but I eat food every day. If something is so heavily involved with my daily life, should I not be more knowledgeable about it? This research allowed me to learn how food markets function and where the majority of my food actually comes from, but it also allowed me to examine who has stakes in the organization of these markets and who benefits the most from the meals I consume on a daily basis. Political and economic power should be examined, challenged, and contested in all facets of societal life— even through the meals we regularly consume, day by day.

Henry Kissinger once said, “Control oil and you control nations; control food and you control the people”. With this quote in mind, I want to ask: Does the food we eat, and lack of knowledge surrounding it, in any way reflect how we are governed? If the answer is yes, the next question to ask is *why* and *benefits who*? I hope this is where you find my project valuable.

-Robert (CJ) Myers

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Chapter 1- Introduction: An industry consolidated and the acquisition of an agro-chemical giant

Recent Developments of the Bayer-Monsanto Acquisition

In June of 2018 two of the largest international agrochemical corporations integrated into one, a corporate deal worth 66 billion dollars. Bayer's acquisition of Monsanto could impact the health of millions (if not billions) of consumers worldwide, with Bayer collecting most revenues through its pharmaceutical group and Monsanto deriving most of its revenues from products relating to agro-biotechnology ("Key Figures, 2018). As of 2015 both companies were a part of the "The Big 6" leading firms in the world's agricultural sector. These included Monsanto, Syngenta, Bayer, DuPont, Dow, and BASF, all recording a respective sixteen, fourteen, twelve, eleven, and seven billion dollars of revenues in 2015 (Macdonald et al, 2018). In recent years, analysts of the agricultural industry have called attention to mass consolidation (Macdonald et al, 2018); however, Bayer and Monsanto are simply the most recent examples of a long history of agricultural vertical integration. Among the six firms mentioned above, five of them announced their intentions of merging in 2015, which effectively consolidated "The Big 6" into "The Big 4". ChemChina acquired Syngenta in February of 2016 (\$43 B), Dow and Dupont merged successfully on August 31, 2017 (\$130 B), and a pending Bayer-Monsanto acquisition appeared imminent to be finalized by late May of 2018 (\$66 B) through the European Union (EU) and the Department of Justice (DOJ) (King, 2017). Perhaps the most interesting of these integrations involves the German pharmaceutical company Bayer and the U.S.-based agrochemical firm Monsanto.

In Monsanto's fiscal year-end 2017 annual report (Form 10-K) to the United States Securities and Exchange Commission (SEC), the company stated that it entered an official agreement and plan of merger on September 14, 2016 (Monsanto Company Form 10-K, 2017). Initially shareholders were unsettled. However, a statement was made by a Bayer spokesperson in regards to "a productive meeting about the future of agriculture and its need for innovation" with U.S. president-elect Donald Trump in January 2017 (Burger and Weiss, 2017). The value of Monsanto stock rebounded, considering the fruition of the acquisition would be vital to the regulatory approval of Trump's prospective nominees to head antitrust enforcement agencies such as the Department of Justice and Federal Trade Commission. The first regulatory clearance was approved by the Committee on Foreign Investment in the United States (CFIUS) in November 2017. After eight months of open investigation and billions of euros in assets sold, the European Commission approved of the acquisition on behalf of the European Union on March 21, 2018 ("European Commission", 2018). On May 29th, 2018, the U.S. Department of Justice conditionally approved the merger with a tentative \$9 billion divestment to BASF ("Justice Department", 2018). China, Brazil, and India are other countries that also confirmed of the acquisition through regulatory processes. In a final 8-K submission form to the SEC, Monsanto reported its completed plan of merger on June 7, 2018. (Monsanto Company Form 8-K, 2018). Later that month Monsanto submitted a voluntary certificate and notice of termination of registration, officially revoking its securities.

With an expressed goal of combining pest control and seed businesses, a plethora of products are also associated with these firms including chemical pesticides, biological products, seed treatments, genetically modified seed traits, and Bayer's massive line of pharmaceutical and consumer health products ("Bayer's Products", 2018). Each of these companies has an

interesting history in the development of both the agricultural and pharmaceutical industries, which intertwines several actors ranging from farmers, federal agencies, government officials, and most notably the public consumer.

Brief Corporate Histories of Bayer and Monsanto

Bayer is a multinational pharmaceutical and life sciences firm, headquartered in Leverkusen, Germany, with an extensive history that began with its foundation in 1863 (“A Journey”, 2018). Bayer was one of the largest surviving German chemical companies emerging from World War Two, originally a cartel known as IG Farben (“IG Farben”, 2017). Products that were first developed in the late 19th century by Bayer included pharmaceuticals, dyes, acetates, synthetic rubbers, plastics, fibers, and insecticides before it joined the German chemical conglomerate (“IG Farben”, 2017). IG Farben, the ‘IG’ standing for *Interessengemeinschaft* (community of interests), grew out of a merger between BASF, Bayer, Hoechst, and AFGA in 1925 (“IG Farben”, 2017). Spearheaded by Bayer’s general director Carl Duisberg, Germany completely consolidated its chemical industry. In relation to the rise of the Nazi party in Germany, there is much debate surrounding whether large corporations were cooperative or rendered complicit (Hayes, 2007). Peter Hayes’ dissertation argues that IG Farben attempted numerous times to influence state policy within various military, racial, social welfare, and economic realms but ultimately failed (Hayes, 2007). Regardless of the political disagreements between the state and the company, the regime still provided opportunities for the cartel to flourish. Hayes states, “Nazi economic policy rested on the recognition that so long as a state displays its determination but permits businessmen to make money, they will let themselves be manipulated as to how” (Hayes, 2001, pg. 379).

IG Farben profited from arming and supplying the Nazi regime, received monopolistic protection by consistently obtaining enormous government contracts, and opened a manufacturing plant for synthetic oil and rubber in Auschwitz. The most notorious product produced by the company during the war was Zyklon B gas, which was instrumental in the subsequent mass genocide. Exploitation of slave labor and live medical experiments were both motives to prosecute 23 corporate leaders during the sixth of the twelve infamous Nuremberg trials. Succumbing to Allied authority in 1945, its industries were dismantled in order to “render the impossibility of future threat”. In 1952 (in the development of the Cold War), Western powers agreed with West Germany to divide IG Farben into three units: Hoechst, BASF, and Bayer (Hayes, 2001).

Today Bayer’s specific medicinal products include several widely used antibiotics and birth control pills, but most notably, the pain reliever Aspirin. Other recognizable grocery store and pharmacy goods that can familiarize Bayer are Alka-Seltzer, Flintstones children vitamins, and One-a-Day adult vitamins. Bayer’s other business segments include crop science, consumer health, and animal health (“Names, Facts, and Figures”, 2019). Crop science will now expand with Monsanto, particularly with its production and research of fungicides, herbicides, and insecticides. More recently Bayer has acquired a number of companies since 1994, with such notable brands including Claritin, Coppertone, and Dr. Scholl’s. But its largest corporate action is its recently approved acquisition of Monsanto in June of 2018, which was originally publicized as a merger, making it the world leader in genetically modified crops and pesticides (“Bayer and Monsanto”, 2016). Through the acquisition, the Monsanto name will be omitted from all products and service lines, which is speculated to be a strategic move to distance the

new behemoth of a company away from negative publicity surrounding Monsanto (Brodwin, 2018).

Monsanto is an American agrochemical and agro-biotechnology company formerly headquartered in Missouri and founded in 1901. Originally the founder, John Queeny, sought to bring the artificial sweetener saccharin to the U.S. that at the time was only produced in Germany. By 1905 the company's products expanded to include saccharin, vanillin, and caffeine, and with the emerging presence of the Coca-Cola Company – their largest customer – sales began to reach in the millions of dollars by 1915 (“Monsanto Company”, 2019). Monsanto expanded rapidly during World War I under the protection of high U.S. tariffs and eventually became a key producer of styrene, a component of synthetic rubber. The production of styrene was vital for the U.S. war effort in WWII, mirroring a role that was similar to their German counterpart Bayer as a member of the chemical cartel IG Faber that was instrumental in supplying Nazi Germany. Post-WWII Monsanto focused on the production of various chemicals and insecticides, including DDT to prevent malaria-transmitting mosquitos and distribution of the weaponized chemical Agent Orange for U.S. war operations in Vietnam (“Monsanto Company”, 2019). Monsanto's most notable product became Roundup, a widely used weed killer, which was developed in the 1970's. The development of this herbicide preceded the corporation's pivot to focus on agri-biotechnology, beginning with Monsanto scientists being among the first to genetically modify a plant cell in 1983 (“Monsanto Company”, 2019).

In the later part of the 20th century, Monsanto invested heavily in researching genetically engineered seeds that thrive along-side the use of complementary herbicides, pesticides, and insecticides (“Monsanto Company”, 2019). Monsanto was originally a chemical giant; however, its focus pivoted to biotechnology and production of genetically modified crops in the late

1980's. By 2005 Monsanto became the largest seed company in the world through numerous acquisitions, most notably those of Dekalb, Cargill, and Seminis Inc., all within ten years ("Justice Department Secures", 2018). It was one of the original firms to begin patenting genetically modified seeds, while strategically recovering the majority of research expenses back through these industry patents. As of 2015, Monsanto controlled 26% of the world's seed market, the largest of any other firm in agriculture (Macdonald, 2018).

The EU and DOJ approved of the Bayer buyout in the event of it selling significant portions of its prior agricultural businesses involving seed and herbicide production. Monsanto has been infamous for utilizing judicial practices, whether it is the role of the plaintiff or defendant, in patent enforcement as well as consumer health and environmental trepidations. Monsanto also aggressively lobbies the U.S. government, with expenses ranging between four and eight million dollars from the years 2008 to 2016 ("Lobbying Spending", 2018). Political contributions are also made during election cycles to persuade state officials in policy matters related to trade, environmental, and patent law and regulations. Through its political action committee for the 2016 election cycle, \$339,500 were contributed to the Republican Party and \$97,500 to the Democratic Party ("Monsanto Co. Contributions", 2018). In 2012, California proposed the mandate of Proposition 37 which would have banned any genetically modified products to be labeled as 'natural'. It was rejected, and Monsanto spent \$8.1 million to oppose its passage and was the leading donor in company of other big food firms such as PepsiCo Inc., Kraft Foods, Coca-Cola North America, and Bayer Cropscience. Employees also often move from the private to public space (and sometimes even returning back), becoming employees to several agencies such as the FDA and EPA, reaffirming its strong political foothold in Washington.

Although there are several examples employees contributing to ‘revolving door practices,’ a prominent name that roused voices in Washington was Michael Taylor. Taylor was appointed as Senior Advisor to the FDA Commissioner by the Obama administration in 2009 after serving as the Vice President of Monsanto for the previous decade (Nestle, 2013). Linda Fisher left the EPA to become vice president of Monsanto from 1995 to 2000, to then return to the EPA as a deputy administrator. Monsanto’s board of directors also included former employees of the United States Trade Representative. Supreme Court justice Clarence Thomas even wrote a crucial Supreme Court opinion on genetically modified patent rights that was formerly an attorney for Monsanto’s corporate law department. U.S. foreign diplomats have even been involved with Monsanto, such as instances involving Craig Stapleton that “The Guardian” reported, “asked Washington to penalize the EU and particularly countries which did not support the use of GM crops” (Vidal, 2011, paragraph 2). Several WikiLeaks documents of diplomatic cables suggest that, in relation to biotechnology and international trade laws, the push for genetically modified crops has been a strategic governmental imperative (Vidal, 2011).

Significance of the Bayer Takeover of Monsanto

The integration of an *agricultural* and a *pharmaceutical* corporation is one dimension of this “merger” that makes the strategic implications of this acquisition so fascinating, with both industries having significant power on the public health of populations across the world. Bayer and Monsanto officials have both publicly stated that the driving force behind the corporate move is to invest in and create innovation. Monsanto’s chief technology officer, Robb Fraley, stated, “By the time 2050 rolls around, the world will have 10 billion people, and the demand for food will double. The whole point here seems to be that the business combination between Monsanto and Bayer will allow the companies to invest in and create more innovation, and it's

going to take a great amount of innovation in order to double the world's food supply” (Brodwin, 2018). Although investing in innovation to feed a growing world is an exciting (maybe even capable of being framed as ‘selfless’) motive, contextualizing the acquisition within the greater history of the agricultural industry, as well as its current state, may elucidate alternative – and not so apparent – strategic implications between Bayer and Monsanto.

In order to examine the implications of this merger we should contextualize this particular site of study Bayer and Monsanto can be understood as two actors within a much larger, complex structure. Relevant actors must be established such as federal arbitrators of the acquisition, farmers that play a role in the seed and food markets, and consumers that ultimately demand the final products sold at the end of a long-supply chain, keeping in mind that all of these roles overlap and have effects on the general public. Key questions to consider entail what are the roles of these actors in the development and subsequent economic, environmental, and political implications of this acquisition? Are there consequent negative repercussions felt by (or forced onto?) a particular subset of these actors? All of these players, whether economically or politically motivated, work within a larger agricultural or pharmaceutical-industrial complex, so what power structures or historical economic incentives have contributed to the acquisition’s manifestation? Aside from the various regulations that control the production and distribution of products sold by these firms, the acquisition had to be approved by domestic and international trade organizations such as the U.S. Department of Justice (DOJ) and the European Union (EU). The health and agribusiness industries are also two of the most lobbied sectors in the U.S., spending totals of over eight and four billion dollars respectively over the past decade (“Lobbying Spending Database”, 2018). These political dynamics involved with the acquisition will be explored in this thesis in greater depth, ultimately to aid in uncovering what agents and

market forces have allowed such a merger to happen, and to speculate an extrapolation of more severe, complex theoretical implications onto the populations. Before exploring effects on the public health can be discussed, several questions must be asked in order to facilitate exploration of the firms themselves and their role within a macroeconomic-historical analysis of industrial agriculture.

Several other questions arise in the wake of this corporate acquisition: What is the role of the agricultural firm in the industry's long history of consolidation, and how has this role developed throughout industrialized states? The media has often coined this acquisition as part of a recent trend in consolidation, yet a brief historical analysis reflects how consolidation of agricultural markets has been observed since the beginnings of industrialized economies. Political intervention in agricultural economic structures also makes the development of the acquisition an interesting case to study, along with the implications that are associated with the acquisition relative to those who are governed by those political actors. This particular exploration is vital in uncovering the strategic, maybe even hidden, intentions of varying actors involved in the acquisition. These goals, whether political or economic, may be prioritized at the cost of others, or the very objectives themselves may be to control, manipulate, and optimize others. Further questions include whether vertical integration is simply observed and accepted through economic rationality, and if so, what political dynamics in the American and European economies have allowed it to occur on such a massive scale in the first place? Stakes are evident in the very size of power structures have allowed this acquisition to happen, and what political tools have been used for its establishment, such as policy that incentivizes agricultural overproduction, anti-trust legislation that deems the acquisition fair and competitive, and regulation (or even lack thereof) that controls the two industries and their sectors. Are there

visible political-economic strategies that utilize these tools, and what actors and market agents are these strategies ultimately likely to benefit?

Given this site of exploration, what is the best analytical framework within which to examine these questions? To begin with, a historical analysis of the agricultural industry could be deemed useful in order to situate the contemporary role of Bayer and Monsanto in the context of a rich history in agricultural and pharmaceutical consolidation. This will reveal relevant actors, incentivizing structures, and institutions that have contributed to the development the industries, while focusing on crucial points and events in the evolution of their contemporary setting. The specific pattern that will be analyzed is the intensity of state involvement in the progression of industrial production processes in an industry that is quite involved in the management and maintenance of populations, which will be interwoven into a broader structural macroeconomic level of analysis. One of the purposes of this thesis will be to examine if Western states have always had an integral role in the development of agricultural markets and firms, through processes of intervening political and economic incentivizing structures since the dawn of the industrialized era. Understanding how the roles of the agricultural firm and the state have changed over time throughout the United States and other European industrial economies can contribute to our understanding of where power and politics lie within these complex agricultural-pharmaceutical systems, and whether it renders producers and consumers within the sector vulnerable to interventions that aim to meticulously organize and incentivize the production and distribution of food and medicine across its public populations.

Given the context of this relationship between the state, agricultural markets, and their potential effects on populations, an application of Michel Foucault's biopolitics may be relevant. Emerging from 1970s College de France lectures, biopolitics is an analytical approach to

examine various dimensions of government, political economy, and to account for the ensuing effects of micro-level forms of power on populations that produce normalizing contexts and political subjects (Foucault, 2008). Power is concerned for the actual biological processes of life, with this power characterized as positive, focused on the administration, optimization, and multiplication of bodies, and succumbed populations to precise controls and regulations. If population is the object of modern forms of government, what could be a more viable intervention onto populations other than the political economy of food? Since various political institutions have a direct role in approving the Bayer-Monsanto acquisition, are there not viable avenues to control how much food is produced, the quality it is produced, how it is distributed, what populations are targeted for its consumption?

Diagnosing these complex power structures will further aid in explaining whether vertical integration has continued to be prevalent, even to the extent that few companies control entire economic sectors while simultaneously intervene into others. Monopoly power in itself exerts economic pressures onto its consumer. However, my concern is that the potential dangers associated with the Bayer-Monsanto acquisition extend well beyond the area of economic and market consolidation.

The biological, health-related implications that are associated with these two firms, represents intense centralization of production processes that could result in a lucrative system of pharmaceutical products being utilized to treat disease associated with the very food the *same firm* has circulated into markets. If these stakes do not appear significant enough, there are possibly even greater political implications associated with the intense centralization of agricultural and pharmaceutical production networks such that few entities have the ability to incite, reinforce, control, monitor, optimize, and organize forces surrounding food production

and consumption in markets across the world. When market rationalities intervene into all domains of society, dangerous implications regarding environmental degradation and social dislocation may be associated with organizing land and labor under strictly economic logics, opposed to considering the quality of life of populations administered within these logics.

Once the Bayer-Monsanto acquisition has been situated historically, what is politically at stake can be explored for both the agricultural and pharmaceutical industries. This thesis will inquire whether markets simply appear consumer driven, whether the state has (and may) along had an integral role in these markets, and most importantly whether this role has altered from a considerably visible authority into a centerless, placeless power that drives economic demand. Ultimately, who is the public consumer governed by and why? Although the state is a primary actor directly involved with the agricultural industry, the industrial-agricultural-pharmaceutical structure is a complex cluster of interconnected apparatuses, with strategies of governance emerging through these modern apparatuses. The Bayer-Monsanto acquisition will thus be used as a site to explore what I will argue are the genealogical formation of the multitudinous institutions, procedures, analyses, and strategies that allow exercises of power in this particular complex assemblage of industrial production processes. Populations may be targeted and vulnerable to intervention that is legitimated by constructed bodies of knowledge that define security; furthermore, these governing mechanisms have the ability to move away from the state, disguising itself through the market with a motive to optimize life processes. History may reflect how the state once had an intimate, highly visible role in organizing agricultural markets; however, markets have evolved in a way to make this role less visible, but in no way less effective in practice.

What is at Stake?

This thesis analyzes the economic-historical-market formation of industrial agriculture in order to better understand what agents, market mechanisms, and external incentive structures have allowed the fruition of the Bayer-Monsanto acquisition. Similar to analytical techniques deployed by the Austro-Hungarian economic historian Karl Polanyi in *The Great Transformation* (1944), this analysis investigates the complex, historical and contemporary, interplay of markets, society, and politics that have contributed to the development of the Bayer-Monsanto acquisition. Rather than simply looking at this event from a perspective grounded in economic theory, I will study the relationship between markets, politics, and social history in correlation with that of the industrial-agricultural-pharmaceutical complex. What power dynamics have shaped the macroeconomic structures of this particular market that has essentially combined agriculture with pharmaceuticals? What agents hold power, albeit economic or political, and how is this power checked, balanced, or maintained?

Polanyi argues that the 20th century nation-state and market economy should be seen as a single conceptual structure known as “Market Society” (Polanyi, 2001). The following chapter will discuss the history of agricultural industrialization and the interplay between the state and industrial agricultural markets. Given that there is a significant amount of state involvement with that of market policy, it may be viable to view this merger as a perpetuation of dangers discussed in Polanyi’s hypothesis that laissez-faire markets were conceptual constructions used to transform our notion of economic rationality. Laissez-faire dynamics appear to be at work here with large firms consolidating power in large market forces, but the political power that these firms had is now consolidated as well. Monopolistic prices will impact farmers and consumers, but additionally concentrated political power has the potential to shape policies that benefit corporations at the expense of those who grow their product and ultimately consume it.

Polanyi becomes even more relevant with the incorporation of his provisional hypothesis relative to ‘fictitious commodities’, which is the artificial commodification of land and labor. He argues that markets, before the emergence of market societies, were not an ordering principle for the distribution of land and labor, but rather they were embedded in social relationships (Polanyi, 2001). Nature came from God and had somewhat of a sacred dimension, previously untouched by Man. For example in the context of 18th century English Enclosure movements, the general public was suspicious of the regulation, manipulation, or intervention of nature as morally indecent and exploitative in order to cater to the goals of those that hold political power. Given the Bayer-Monsanto acquisition, particularly the incorporation of agriculture and big pharma, his notion that commodifying land and labor is a, “means to subordinate the substance of society itself to the laws of the market”(Polanyi, 2001, pg. 75) becomes alarming if we consider certain knowledges as privileged, nature as a limitless resources, and human beings merely fungible laborers. These companies publicize this merger as a journey to innovate the future of food production, but potentially what cost will this have on the environmental quality and the public health of populations around the world?

Although Polanyi’s most widely known works were published in the mid-20th century, his conceptualizations regarding markets and social life still parallel contemporary concerns regarding neoliberalism. He argued that an unchecked market, one that is educated and understood as ‘natural’ — left to function on its own — can lead to the destruction of individuals and the planet by treating them as simple market mechanisms without any consideration of their social lives (Polanyi, 2001). Broadly in alignment with Wendy Brown’s more contemporary concerns with neoliberalism as a mechanism for financializing all domains of social and political life, Polanyi believed that land and labor should have been prevented from being absorbed into

the jurisdiction of the market. Brown additionally contests that within a neoliberal market ideology, several of the fundamental liberal democratic properties are imperiled, rendered negligible within a laissez-faire market ideology (Brown, 2015). Completely open markets can result in few safeguards to protect public health of populations as well as the environment they reside in (Polanyi, 2001). Therefore, delving into the history of industrial agriculture can aid in understanding what power structures have supported and preserved a market that has allowed for a massive acquisition as that of Bayer and Monsanto, an acquisition that can impact the lives (human or nonhuman) of millions. In order for markets to become rational across society, they must be supported by a state institutions. They must be legislated; therefore, several agents must be outlined in order to truly source where power lies in the industrial-agricultural-pharmaceutical complex and who it is intended to benefit.

This thesis is a social scientific inquiry that explores the various contexts relative to economic incentives and political dynamics that have shaped contemporary industrial agriculture that have ultimately fostered the acquisition of Monsanto by Bayer. In order to contextualize the Bayer-Monsanto acquisition within the economic-social history of agriculture, as well as examine its contemporary economic, environmental, and political implications, my methodology will comprise somewhat of a literature review from a plethora of sources. Past and current political thinkers and food experts will be analyzed; agrarian land policy, federal court decisions, regulatory body antitrust reviews, and international trade agreements will be investigated; and opinions of the acquisitions' proponents and opponents will be taken into consideration to generate a holistic look at the relationship between states and agricultural markets, how they have fostered the emergence of the Bayer-Monsanto acquisition, and what economic, environmental, and political effects will be seen and felt by a variety of actors managed in this

industrial-agricultural-pharmaceutical complex. I do not wish to be condemning or judgmental throughout my research. However, there may be long-term, potentially hidden, and meticulously calculated political risks relative to how the Bayer-Monsanto acquisition came to be — risks that public consumers, private industry analysts, government officials, and academics should all be mindful of.

The proposed research question is as follows:

Does the Bayer-Monsanto acquisition represent something new politically relative to the state's involvement in the agricultural and pharmaceutical sectors, and what agents, market mechanisms, and incentive structures have established the economic and political climate of these two sectors?

The immediate outcomes of this acquisition will be analyzed, such as how this consolidation affects farmers and consumers alike; however, so will the historical development of political and economic structural elements that have contributed to its genealogical evolution. To help facilitate this analysis, the main questions I wish to raise include: How can the role of agricultural firms be situated in context of the state throughout history? What is the role of these firms play in contemporary politics, and how has the progression of this political-economic role, particularly through state intervention, created new power structures that remain unexamined, even unacknowledged? Through what interventions can power be maintained, and (most importantly), how might they become visible? Polanyi is again relevant with his conception of an 'embeddedness' of political and economic logics, as Fred Block notes, "the human economy was always embedded in society" (Polanyi, 2001, pg. xxiii). Through this embeddedness, logics of society and politics were actually subordinated to that of the market. Has this concept of embeddedness evolved further into the 21st century, and is the Bayer-Monsanto acquisition a site

of study that can be used to ‘dissemble’ these logics and uncover where political and economic power truly lies?

The remainder of this thesis will be presented through three substantive chapters. The next chapter, *An Economic-Historical Analysis of Industrial Agriculture*, is vital in order to take a critical look at the presented industries and uncover what structures and agents have molded it into its contemporary framework. This will allow the contextualization of important actors related to the specific site of study, and expose various patterns relative to federal policy, technological developments, and organizing market mechanisms that may elucidate how power has been organized throughout history between markets as well as the state. The third chapter, *The Integration of Bayer and Monsanto: Economic, Environmental, and Political Implications*, will be an analysis on the particular site of study. As the most vital chapter, various political-economic implications associated with the acquisition will be investigated in order to comment on emerging forms of political power. The concluding chapter, *The Bayer-Monsanto Acquisition: A Continuation of Corporate Political Order*, will elaborate what is at stake for the industrial agricultural and pharmaceutical industries in regards to how the acquisition can represent emerging political dynamics embedded into agribusiness and big pharma. It will link the initial presentation of the merger, the historical analysis of the sectors as a whole, and the integration of the firms themselves in order to speculate the future of the industries and their potential effects on world populations.

Chapter 2- An Economic-Historical Analysis of Industrial Agriculture

The Historical Context of Industrial Agriculture: Why situate the Bayer-Monsanto acquisition?

The Bayer-Monsanto acquisition presents an important current development in the industrial political economy that should be situated within the agricultural history of the United States and Europe. Before delving into an analysis of the acquisition itself, a broader economic-historical analysis of the agriculture sector as a whole will be useful to contextualize the predominant agricultural players and more particularly the integration of Bayer and Monsanto. By focusing on crucial points in the evolution of the industry, such as implementation of state policy, incentivizing strategies for farmers and firms, industrial production processes, and the emergence of genetic engineering and patent law, I will explore in this chapter whether the state has long had an integral role in the optimization of agricultural market activity. An acquisition this large has appears to have been completed within a laissez-faire context. But has ‘natural’ competition actually been structured by the state through policy and legislation to formulate a sector that has allowed Bayer, a leading pharmaceutical firm, to acquire the world’s leader in agricultural inputs? Uncovering shifting roles of the firm and the state has changed over time can contribute to an understanding of where power lies within these two systems, what political or economic institutions reinforce these power dynamics, and how it renders the sector’s producers and consumers vulnerable to governmental intervention and potentially corporate exploitation. This analysis will further aid in explaining how vertical integration has continued to be prevalent in an industry to the extent that a few companies control almost an entire economic sector that

feeds the world, while simultaneously intervening into other sectors. In this case, the relevant sectors are the agricultural, chemical, biotechnological, and pharmaceutical industries.

With the theoretical aid of economic historian Karl Polanyi, and in conjunction with various other experts in agricultural economics and food security, I will frame the history of agricultural industrialization as a story of an industry that has, in an important sense, been incorporated by the state. The story here coincides with Polanyi's argument of embeddedness, an argument that critiques the traditional understanding that markets operate most efficiently on their own devices, outside of government influence or intervention (Polanyi, 2001). Polanyi argued that the economy should not be understood as a wholly autonomous system, but rather should be seen as embedded within political, religious, and social relations in any society. Interactions between state and market actors are intrinsically linked, then, regardless of whether they are in conflict or whether they complement with one another. Furthermore, Polanyi rejects the idea that public and private spheres of activity can be neatly distinguished from one another (Polanyi, 2001). The history of events that I frame describe how industrial agricultural markets could never (and most likely will never) be completely understood for what they are when separated analytically from the context of other political, societal, institutional structures, and forces.

Classical economists of the early nineteenth century supported the ideology that self-regulated markets could incite economic logics that led to the subordination of a whole host of domains of society. Yet, Polanyi argues that this subordination is unachievable. When market restraints associated with pure commodity goods are applied to human laborers and natural resources, the results can be catastrophic to the general health of society and the environment (Polanyi, 2001). Polanyi says how completely unregulated, self-sufficient markets as “an

institution could not exist at any length of time without annihilating the human and natural substance of society” (Polanyi, 2001, pg.1). English thinkers responded to disruptions caused by the industrial revolution in the early nineteenth century by promoting the organization of society as an adjunct to markets, but the attempted disembedding of economy was claimed to be that of a utopian vision: a state crafted “double movement” that emerged in order to combat the consequences of growing, completely self-sufficient markets (Polanyi, 2001, pg.79). In reality, states and markets have always operated in cooperation with one another, with the border between private and public functions often blurred. The history of industrial agriculture will be used as a site of study to situate how knowledge associated with markets, politics, and society often interpenetrates many of these domains. By tracing how food production has been shaped by federal agrarian policy, technological developments, and international trade and intellectual property laws, I will argue that the historical interrelation of politics, economics, and society is quite suggestively conveyed from the original English enclosure movements up until the acquisition of Monsanto by Bayer.

The history I present corresponds with this “double movement” as it was discussed by Polanyi in *The Great Transformation* (2001), with state mechanisms promoting firms to have limited autonomy through the regulation of market activity (Polanyi, 2001, pg.79). It appears that a laissez-faire mentality has been consistent in the expansion and growth of agricultural markets throughout their industrial history; however, the strategies taken in order to regulate, control, and administer this expansion have altered over time. Fundamental neoliberal market rationalities such as the dismantling of trade and capital flow barriers have been observed throughout agriculture, but this is contributed to an active, managerial role of the state, rather than a reduction of governmental interference. Throughout the existence of agricultural markets, one

thing is fairly certain: although markets are often perceived as free from government interference, the state has steadily fulfilled a key role in their formation, management, and future development.

In relation to the Bayer-Monsanto acquisition, what counter measures have been taken by regulatory agents in order to ensure the embeddedness of economic logic with that of politics and society? Polanyi claims that markets can be embedded in different ways depending on any particular historical moment (Polanyi, 2001). For agricultural history, processes of enclosure have been rather constant, and quite prevalent tactics used to ensure that political rationality remains embedded with that of the market. How these processes of enclosure have altered overtime are vital to understand and can be indicative of how the embeddedness of agricultural economics and firms with that of politics and the state has developed as well. In some cases, tactics taken by the state may appear to be ‘disembedding’ the market from political institutions, whereas the relationship is actually only further extended and the tactics refined (Foucault, 1990). Policies of enclosure that were once crafted and administered by the state alone have evolved to the point where corporations can now deploy them on their own. These processes become apparent through the tracing of political, economic, technological, and legal developments that have interdependently formed throughout the history of industrial agriculture.

Once the site of the Bayer-Monsanto merger is presented within the context of a history that has seen movements of enclosure, the implications of “what is at stake” can be explored for the agricultural, biotechnological, and pharmaceutical industries. What appears to be critical for these industries is how the role of the state has altered from a considerably visible authority into a centerless, placeless power that influences economic demand. Polanyi discusses in his book *The Great Transformation* (2001) how markets appear to be dictated by prices and the demand

of consumers, but the state always has an integral role in the restriction and optimization of economic expansion in order to limit the spread and influence of these markets in society (Polanyi, 2001). In the rest of this chapter I will examine what strategies the state has taken throughout the history of Europe and the United States in order to monitor, manipulate, and limit agricultural markets, and speculate how much *restricting* (by using Polanyi's language) the state is currently employing.

The Original Enclosure Movement: Initial state involvement with agriculture in Europe

An initial focal point in the developments of agricultural markets was the first agricultural revolution of Great Britain, and specifically the Enclosure Acts that passed between 1750 and 1860, acts that sparked prevalent socio-economic change in rural England (Collins, 1967). Kins Collins analyzes a Marxian perspective that claims the previous Late Middle Ages feudal ownership structure of England was replaced by that of the capitalist ownership structure and larger tenant farms, with governmental acts that legally enclosed land which was once open to the peasantry (Collins, 1967). Marx defined the agricultural revolution as part of the separation between laborers from the land they once owned and tools they used to produce their goods, which was then theorized as a precondition to the catalyst of industrial capitalism (Marx, 1981). During this industrial revolution, masses of the landless poor migrated to urban areas. But under what circumstances did this migration occur? Was the movement of these populations voluntary due to a larger labor market demand in cities, or did parliamentary enclosure of land motivate and force this mass migration, driving peasants off the property that was previously theirs? This is something of the beginning, the first major instance of state intervention into agriculture, which resulted in mass social dislocation. Land that once sustained generations of rural laborers was now privatized and consolidated into the hands of a few owners. Farmers with

the best economic and political connections were able to afford and maintain the newly amalgamated spaces, driving the unfortunate remaining families to find new homes (Collins, 1967). This was one of the first legal means of redistributing land at the cost of those who previously survived off of it, to ultimately systematically disadvantage the peasantry. This “separation process” stripped laborers from their means of production with operations of larger tenant farms. The resultant migration into cities depressed wages, which ultimately benefitted the wealthy entrepreneur with cheap labor to sell (Marx, 1981).

State policy is what ultimately drove the majority of the rural class into the urbanized cities, with others choosing to emigrate to the Americas. Armies of wage laborers flooded urban sprawls that drove wages down near the level of poverty (Collins, 1967). Massive social dislocation was characterized as a consequence of free-market capitalism, with capitalistic logic used as a façade to mask governmentally funded and institutionalized policy that resulted in social atrocities such as dangerous industrial working conditions and poverty wage levels. Marx characterized this period as a crucial transition period from feudal to capitalistic systems because it created the accumulation of labor necessary in order to induce industrialized markets (Marx, 1981). Peasants were removed from the land and systematically forced to work as laborers within a strategic hierarchy. Laborers were displaced and land was consolidated, yet the very families exiled were the ones that drove the demand for the products their banishers would produce (Collins, 1967). The beginning of consolidation in agriculture were was to optimize output for those already in power, at the expense of those who were the most economically and socially disadvantaged.

The Enclosure Acts of rural England throughout the 18th and 19th centuries will be used as a starting point for the remainder of this chapter in my exploration of enclosure logics that

engulf industrial agriculture. What is crucial to my overall analysis is to ask if these practices have evolved into modern processes of manipulative economic tactics justified through legal acts of coercive political strategies throughout the history of industrial agriculture? Based in logics of productivity, large landowners in England that dominated the political landscape of the time had the authority to issue petitions to parliament to redistribute land in systematic estates of enclosure (McElroy, 2012). If this discussion is returned to the context of Polanyi, society was explicitly intertwined with economic rationalities of the market. Social dislocation of populations was justified by increased yields and outputs.

As England was enclosing land, a newly founded United States of America was expanding by the creation of a standardized system to title and sell underdeveloped western territories. This may appear to be a strategy that increased the amount of available land and property (in other words 'open' land as opposed to 'enclosing' it), but specific populations were rendered to dislocation in the original implementations of U.S. agricultural policy, just as they were in 18th and 19th century England.

The Original Establishment of United States Agricultural Policy

Land policy in the United States began with The Land Ordinance Act of 1785 which facilitated westward expansion after the revolutionary war (Gates, 1976). This was the foundation of federal agrarian legislation until the passing of the Homestead Act in 1862. Any land west of the Appalachian Mountains owned by individual states or Native Americans had to be ceded to Congress, which was then bundled into six-mile-squared townships (Indiana Historical Bureau, 2019). Entire or fractional townships were to be sold to the public, but few citizens had the capital to purchase the overpriced, government-sold land. The cost of land was

decreased with the help of James Monroe in the passage of the Land Act of 1820, which resulted in the expansion of 3.5 million acres of settled farmland (Preston, 2016).

With final westward expansion beginning in the mid nineteenth century, and the passing of much federal legislation, the ideology of Manifest Destiny led the American public to believe that God encouraged the expansion the United States' dominion, democracy, and capitalism across the entire North American continent (Anaya, 2016). C. Ford Runge presents a brief intellectual history of agricultural economics, and discusses how since the 1860's, structural, legal, economic, political, and legislative forces have constructed institutional adaptations for larger markets and productive technologies (Runge, 2006). Signed by President Lincoln, the Homestead Act provided 160 acres of public land to settlers in exchange for a diminutive fee and continued homestead residence for five years. Eighty million acres of land were distributed in response to the Homestead Act between 1862 and 1900, often at the cost of Native American populations (Stephenson, 1967). Although minimal funds were offered to some Native Americans, sales of the land were involuntary. Even though tribal sovereignty was judicially established in 1832 by *Worcester v. Georgia*, the "undisputed possessors of land" were constantly disregarded because economic logics of agricultural profits eclipsed any social or ethical concerns regarding the dislocation of Native American populations (Tucker et al, 2011). In the name of growing cotton, natives were forced into federally designated "Indian territories". Often known as the trail of tears, this is another instance of where implementation of state policy disrupted entire societies in order to facilitate economic growth. This agrarian expansion developed along with the second industrial revolution, with a transition from independent manufacturing to large systems and organized formations of production (Chang, 2009). These industrialized forms of production led to new agricultural technological developments, the

passing of federal policy to promote research and development of the agricultural industry, and the distribution and application of this agricultural economy knowledge across the United States.

Along with the Homestead Act, the United States passed the Morrill Act of 1862 that established the land-grant college as a research institution to legitimate agro-economics as an academic field and endorse competent techniques of production and distribution (“Land Grant”, 2019). In order for states to pursue agricultural and mechanical arts, states were distributed 30,000 acres of federal land for each Congressional delegate (“Land Grant”, 2019). President Lincoln also created the Federal Department of Agriculture, which later became the U.S. Department of Agriculture (USDA) that then created the disciplinary foundations of scientific management in agricultural production and legitimated its application across the country (Runge, 2006). The Hatch Act of 1887 established USDA sponsored Agricultural Experiment Stations to work alongside land-grant state colleges, and information was more easily disseminated by federally sponsored colleges through extensive education outreach with the passing of the Smith-Lever Act in 1914 (Runge, 2006). The United States government from the mid to late 19th century systematically began to build the institutional foundations for the dissemination of knowledge regarding agriculture in order to invest in production processes around which domestic farmers would be pressured to organize. At least for now, this would apply only *domestic* farmers.

This time period had several key developments regarding industrial production process and the interconnectivity between agriculture, statistical sciences, and federal legislation. Considering the amount of effort political agents put into legislating agrarian policy throughout the United States, Polanyi’s theory of embeddedness appears even more relevant with agricultural markets becoming shaped by actions of the state. Although state-sponsored sciences

invested to spread research and development across the nation, the initial stages of agricultural consolidation, characterized by new quasi-industrial farming techniques, experienced complications throughout a changing and expanding America in the 1870's. Although original patterns of industrial agriculture consolidation were not effective in the U.S., it maintained space for the governmental institutions to persistently dictate the organization and future direction of markets.

Troubled Beginnings of U.S. Industrial Agricultural

Bonanza farms became a common practice during the late nineteenth century in the Mid-Western American frontier, and were some of the original examples of industrial consolidation in the United States agriculture. As discussed by Harold Briggs and Hiram Drache, large open areas of land were owned by companies and organized like factories, juxtaposed to the common practice of individual, family-owned farms (Briggs and Drache, 1965). These were professionally managed organizations that were claimed to be more efficient in production and distribution, but the efficacy of these industrialized production networks only occurred in seasons with reliable weather conditions. Although more crops were able to be grown for a lesser marginal cost (due to cheap migrant labor) and a greater profit, times of drought made it difficult for these large scale organizations to adapt (Briggs and Drache, 1965). Expensive technology and a vast number of laborers were difficult to fund when crops could not grow, so the individual family-owned farm prevailed by adapting to historically observed boom-bust cycles. Bonanza farms were a crucial step in the attempt to turn completely industrial due to the fact that companies began to organize large allotments of land as opposed to individual family farms, but climate factors prevented its influence to keep hold.

These initial examples of U.S. consolidation in industrial agriculture, yet again, were contributed by the crucial role of the state and federal policy. The federal government allotted millions of acres of land to railroad companies to expand West, with 10 million acres alone in North Dakota in 1871 (Lee, 2008). Since production processes were consolidated in fewer, larger farms, agricultural markets became dependent on other sectors for distribution, especially railroads. A consolidated farm was also a vulnerable one, reliant on state sponsored railroad companies to distribute product as well as transport labor. These transportation networks propelled a Westward expansion of America, but the second industrial revolution would drive the majority of citizens to urban areas. Food and agriculture began to escape the general public's eye, which gradually led to an increasingly distanced gap in knowledge between the consumers of food and the farmers that produced it. Bonanza farms also created some of the first environmental concerns to arise from agricultural consolidation, with overproduction completely exhausting once arable land (Lee, 2008). Federal allotment of land for railroad networks continued to induce agricultural consolidation in rural areas outside of industrializing urban sprawls, but eventually these initial efforts to consolidate industrial agriculture failed by the beginning of the 20th century due to unpredictable environmental conditions and unsustainable farming practices.

Even though the initial trend in agricultural consolidation was slowed by external factors, productivity and output still increased for the average farmer from the 1870's onward (Lee, 2008). The expansion of railroads and improvement in farming technology, such as steam and horse powered machinery, were key developments in the progression of industrial agriculture, while also contributing to the dispersion of rural and urbanized areas. In fact, productivity began to increase to the point that classical economic laws of supply and demand often conflicted with

farming practices (Pollan, 2006). With substantially increased productivity and rising supplies, came prices that were substantially driven down given demand remains constant. Suppressed prices made it extremely difficult for farmers to make a sustainable living during this time, especially when extraneous fees were charged by railroad companies to bring their crops to urbanized markets and banks issued loans with exploitive interests rates. Even with farm improved technology, increasing production and efficiency, the populist movement of a politically oriented coalition of agrarian reformers in the Mid-West and South advocated a wide range of economic and political legislation to combat interests of the elite banking and transportation sectors (“Populist Movement”, 2019). Populist movements arose to become one of the original political counter movements in order to politically check corporate influence of creditors, railroads, and industrialist, but ensued to be politically ineffective on the national scale. The rest of this chapter will present instances of the United States government prioritizing the technological development, at the expense of its farmers, what would become a consistent trend throughout the history of industrial agriculture.

Although environmental uncertainty, monopolistic railroad companies, and elite bankers with exploitative interest harmed the agriculture industry throughout the turn of the 20th century, WWI pulled the United States’ farming sector out of its economic trough by almost single-handedly feeding the Allied war effort (Pollan, 2006). The government implemented price support systems onto crops, and even became the market’s largest buyer. Artificial pricing instituted by the government masked overproduction which created pricing effects contributing to the Great Depression. With an abundance of supply post-WWI and a tariff war that essentially closed the entire Western European market, crop prices plummeted (Kosmerick, 2017). Federal responses to the Great Depression guided agriculture until the 1970’s, with markets continually

being effected by a complex interrelation of both international and domestic political engagements of the state. Thus in the early stages of industrialization, agricultural markets were vulnerable to a host of external forces that necessitated the guidance of political institutions outside of any laissez-faire market system, and ultimately reflected the embeddedness of private and public spheres.

The New Deal: Emergence of federal price controls in the United States

The years of the Great Depression constituted the next era that had profound impact on federal agrarian policy in the United States, due to crop overproduction resulting from WWI continuing into the 1920's. Depression-era policy gave farmers a safety net to grow as many crops as possible. In efforts to combat plummeting prices during the Depression, Franklin Delano Roosevelt signed the New Deal that included the Agricultural Adjustment Act (AAA) in 1933 (Bowers, 1985). The residual effects of the AAA to control crop prices still impact the sector today; however, the exact price control methods have evolved overtime. Originally, production was regulated by actually restricting crops from entering the market in an attempt to maintain a reasonable price level (Runge, 2006). Supply was artificially reduced and loans were given to farmers who preserved this shortage, resulting in farmers encouraged to simply not use all of their land (Pollan, 2006). In order to hit the target price for commodities, the government issued loans to farmers and used excess crops as collateral until the price was once again balanced. When corn prices recovered, the supply would be sold to pay back the loan; however, the Supreme Court eventually declared that the federal government could not interfere since agricultural policy was a state issue (Bowers, 1985).

In 1936 the AAA was deemed unconstitutional by *United States v. Butler*, and it was replaced by the Soil Conservation and Domestic Allotment Act (Runge, 2006). Limiting supply

was now considered a federal issue and legitimized in order to prevent erosion and conserve soil (Bowers, 1985), although the indirect driver of passing this legislation was still to undercut crop surpluses of agricultural markets. This particular federal policy passed relatively easily after the infamous Dust Bowl of 1930, using environmental concerns to justify prior economic controls that were deemed unconstitutional. Although this event is sometimes referred to as a natural disaster caused by an unconventional combination of droughts and high winds, some scholars characterize it as one of the country's worst man-made disasters due to careless farming practices (McLeman, 2014; Woolner, 2010). Political institutions began to get creative when drafting agrarian policy, and governmental tactics were overlooked by the public. For example, price controls were legitimated with a goal to improve ecological conditions of farmland in response to natural disasters, rather than to effectively regulate agricultural markets.

The post-WWII period would be the next major shift for agriculture through the development of technology that proved to address problems that once plagued failed Bonanza Farms. Energy obtained from fossil fuels could now be used to grow crops. The state had a crucial role (yet again) in this process by distributing artificial agricultural inputs across the United States in order to dump post-war chemical surpluses.

Post-WWII Era in the United States: Industrialized agriculture thrives

With the original intention of being used for explosives, the U.S. government had a large surplus of ammonium nitrate after WWII (Pollan, 2006). In 1947, during fruition of chemical fertilizers, this surplus was spread on farmlands across the country (Pollan, 2006). With new fertilizers and gasoline or electric powered machinery, productivity and crop yields were at their historical peak. Yet again, the state played a role in organizing the inputs of these markets by utilizing leftover resources of war. Technology improved efficiency, but the main component in

the escalation of crop yields was the use of synthetic nitrogen fertilizers that allowed crops to grow year after year, regardless of climate conditions (Pollan, 2006). Droughts and boom-bust cycles no longer determined the success of larger scale farms. Imperfect weather conditions once interfered with Bonanza Farms' capability to efficiently grow crops, but now synthetic and artificial inputs allowed for production year round. This was the first step that led to industrialized farming practices to be the most reliable, efficient, and productive agricultural techniques deployed across the United States.

Given that federally funded agricultural economic research was no longer limited by earlier environmental constraints, production on a mass scale became mainstream. Logic of industry (growing as large as possible through the use of industrial inputs) trumped logic of biology (using energy from sun), with this relationship being eerily similar to Polanyi's observation of economic knowledge effectively interweaving the knowledge of other domains of society (Polanyi, 2001). Policy making ensued that adapted to these new logics, regulating production in order to balance demand for two decades into the later 20th century (Pollan, 2006). Food surpluses and loans to farmers continued to grow in order to combat depressed price levels, and other programs were created, such as Food for Peace (1966), that exported crops abroad or the food stamp program (1964) that redistributed surpluses to the poor in order to control aggregate supply ("Short History of SNAP", 2018). Although production had already exponentially increased, the 1970's brought about the next major policy shift that encouraged more production. In fact production was encouraged, as much as physically and spatially possible, regardless of the stagnant demand that characterized the agricultural sector. Producing a surplus was incentivized at all costs, even if it had been proven to be historically disadvantageous to markets.

“Get Big or Get Out”: The federal advent of ‘agribusinessmen’ in the United States

Earl Butz was the United States’ Secretary of Agriculture from 1971 to 1976 and completely reconstructed New Deal agricultural policy through the Agriculture and Consumer Protection Act of 1973, otherwise known as the 1973 Farm Bill (Pollan, 2006; Bowers, 1985). American food prices soared after to the Soviet Union purchased 25% of wheat off the U.S. market, and Richard Nixon’s response was to declare a ‘war on hunger’ and sign the 1973 Farm Bill into effect (Maclean, 2015). Rather than loans, subsidies became direct payments that were proportionally determined by yield counts. Crops were previously encouraged to be held back from the market, but now they were encouraged to be overproduced. Messages were espoused to farmers such as “adapt or die,” and reference from using the term ‘farmers’ was even shifted to ‘agribusinessmen’ (Pollan, 2006). Messages such as “Get big or get out” and fill “fencerow to fencerow” shifted the economic climate of the sector to promote large consolidated farms rather than small to mid-sized family owned land plots (Pollan, 2006, pg. 52). Once again, agricultural knowledge was manipulated by politicians and the state to manage markets regardless of almost any social or environmental repercussions.

Capital-intensive operations became the norm throughout the second half of the twentieth century, with the diversity of crops dwindling to just corn and soybean in its commodity form (Maclean, 2015). Prices were reduced as intended, but an entirely new market imbalance was created in industrialized agriculture that had long-lasting externalities on the public health and the environment.

Throughout the short history of United States agriculture, federal agrarian policy has always impacted the general welfare of particular American populations. 18th and 19th century policy displaced entire rural and native regions and destabilized prices that hindered small,

independent farmers to thrive in largely unregulated economic market. Policy throughout the 20th century promoting the maximization of outputs can be linked to cheap calories flooding food markets, what is perhaps a prime instigator of health crises that has contributed to some of the leading causes of death in the United States (Pollan, 2006). New capital-intensive federal policies were coupled with technologies that contributed to what is now widely referred to the third agricultural or ‘green’ revolution. Policy that was originally instituted in the United States began to be applied to agricultural markets across the developing world, significantly reshaping international industrial agricultural production processes. Although there may appear to be an altruistic intention in increasing agricultural yields to feed growing populations, revisiting the emergence of the Green Revolution reveals political stakes that countries like the United States and Great Britain have in burgeoning agricultural markets across the globe.

The Green Revolution: Industrial agriculture spreads to the developing world

The Green Revolution in agricultural is characterized by a worldwide increase in production due to technological developments from the late 1960’s onward, including the use of high yielding varieties of seeds in association with chemical fertilizers and agro-chemicals such as herbicides, pesticides, insecticides (Hazell, 2009). The use of seeds, fertilizers, and chemicals became an agricultural package of goods that completely replaced former farming techniques and technologies — resulting in an international maximization of yields the industry had yet to witness (Hazell, 2009). An American scientist, Norman Borlaug, won a Nobel Prize for the development of high yield seed varieties, which led to the creation of the International Maize and Wheat Improvement Center in Mexico. With a Spanish abbreviation of CIMMYT, agricultural research was funded by the Ford and Rockefeller foundations in order to feed rapidly growing populations, but mainly the effect was to stabilize areas of geopolitical struggle to impede the

spread communism (Perkins, 1990). Several governments from around the world, including the United States and Germany, were also key contributors to fund research and development of crop improvement and selective breeding, juxtaposed to a context of socialist and communist movements in Eastern Europe and China that resulted in state-controlled agricultural collectivization (Perkins, 1990).

Supporters of the research behind the Green Revolution argue that several developing nations would not be able to feed their rising populations without high yield varieties, but opponents claim the new technologies were environmentally damaging, unsustainable, and socially inequitable (Perkins, 1990). Some of these complaints include a loss of genetic diversity, exhaustion of fertilizers and petrochemicals, soil salinization from irrigation, dangerous pest outbreaks, and the displacement of marginal farmers (Davies, 2003). The idea of the independent farmer became more difficult to grasp, considering that farming practices were becoming intrinsically based on science along with the systematic production and distribution of new technologies.

The Green Revolution, once again, signifies the interwoven role of government and agricultural development. Funded international programs to increase productivity were influenced by political and military concerns to impede the spread of communism, linking overpopulation and hunger with ideological concerns (Chang, 2009). Land reform pressures were applied by the United States in countries such as Japan, Korea, and Taiwan to combat these (real or imagined) ideological threats (Chang, 2009). Industrialized economies such as the United States spread knowledge production about agriculture to the developing world by supplying inputs and sharing industrial farming techniques to states such as India, Mexico, and Chile, while also allowing room for biotechnological and chemical companies to permeate the realm of agro-

economy (Chang, 2009). Federally funded agrarian sciences now empirically legitimated the complementary use of selected breeds of seeds and chemical fertilizers. Studies of food insecurity also emerged from this era, with the coining of “The World Food Problem” by the Rockefeller Foundation to develop agricultural technologies- the same rhetoric used by Bayer in justifying their acquisition of Monsanto (“The World Food Problem”, 1951).

The international modernization and industrialization of agriculture through the Green Revolution was tied to international geopolitical concerns as well. State rhetoric constructed existential threats to security, so in order to feed growing populations and impede ideological threats to capitalism, new agrarian technologies and farming methods were spread across the world.

Through agricultural research conducted to contest discourses surrounding international food security, several developments of biotechnology emerged. As the next major phase of industrial agriculture was coined ‘Gene Revolution,’ these two revolutionary eras of agriculture allowed for chemical and biotechnology companies such as Bayer and Monsanto to enter and all but completely alter agricultural markets. Food insecurity was an international issue that research and development emerging from the gene revolution sought to resolve (Maxham, 2015), to which firms such as Monsanto assumed their role through developing techniques on the genetic modification of seeds. However, a critical look at these technological developments also poses important questions regarding agricultural markets. What is actually being made secure for whom?; how are economic and environmental externalities taken into consideration when attempting to solve the ‘world food crisis’ through genetic modification?; and what political and economic actors ultimately benefit from the technological and legal developments that emerged from this ‘Gene Revolution’?

The Gene Revolution: Modern movements of enclosure?

With the purpose of improving public health, food production, and agricultural techniques, the Gene Revolution sprouted from the Green Revolution in the 1990's with a unique effort focused on increasing the use of genetic modification in biotechnology. This era, towards the end of the twentieth century, marked the mass production of genetically modified organisms (GMO's) through transgenics, which is altering the very genetic makeup of crops (Varshney, 2010). The genetic structuring of seeds are modified in order to improve plant growth and be complementary with particular herbicides and pesticides, or even prevent the use of them altogether. For example, as Amanda Maxham discusses relative to the beginnings of genetic modification, the first major breakthrough in genetically modified plants was presented in a 1987 article that discussed a bioengineered tobacco plant (Maxham, 2015). This particular crop was vulnerable to burrowing hornworms, so genes were inserted into the plant from a bacteria named *Bacillus thuringiensis (Bt)* that produces a toxin that is deadly to the pests (Maxham, 2015). Now, instead of spraying pesticides, the toxin producing gene allowed the plant to protect itself from the otherwise harmful hornworms. *Bt*-toxin producing genes were used in genetic seed modification for decades, with the majority modified even further for all of Monsanto's genetically engineered varieties of maize ("EFSA Opinion on MON863 Hybrids", 2005). Advocates of the GMO movement link the scientific developments with economic growth and an improvement of worldwide food security, although opponents have been critical of GMO's due to potential unknown environmental and public health concerns (Fakurda-Parr, 2007; Maxham, 2015).

Although artificial selection had been in the breeding of plants and animals for thousands of years, transgenics (altering the genes directly to produce GMO's) has been in development

only since the 1970's (Maxham, 2015). Other than being a more efficient artificial selection technique, transgenics allows for the combination of genes from completely different species. As new breed varieties were created to grow stronger, higher yield (densely grown) seeds, Congress passed the Plant Variety Protection Act of 1970 (Goeringer, 2013). This extended intellectual property rights to sexually propagating varieties of plant seed, which represented an extension of the 1930 Plant Patents Act that only protected asexually reproduced plants (Maxham, 2015). Several of the original pioneers in plant breeding allowed for their modified seeds to be publicly traded without patent protection in order to make a lasting environmental impact across the world. However, research that was once influenced by altruistic motivations to improve societies across the world eventually succumbed to economic logics of the market through the implementation of intellectual property rights. From 1970 onward, breeders or corporations could then own exclusive production rights to genetically modified seed varieties in the United States for up to twenty years (Maxham, 2015). Federal agricultural policy was once focused on the organization, maintenance, and distribution of land, but contemporary times reflect that federal policy promotes the intervention and reconstruction of the very biological makeup of living organisms, allowing firms to own varied traits of seeds to be sold onto markets. When intellectual property laws and the genetic modification of nature are contextualized alongside the concept of embeddedness, it appears relevant to revisit the dangers Polanyi associates with market ideology and the commodification of land.

Allowing corporations to secure property rights over genetically modified seeds has led to the emergence of new market strategies for selling and distributing products domestically and across the globe. Intellectual property rights have given corporations a new medium to capture rents from farmers and take exploitative measures to allow access to privately researched

varieties of seed breeds. However, producers in some countries may be paying for fees that are not enforced on their competitors in countries where patents have not been able to be approved as in the United States (Kneen, 1999). Farmers in the United States may have to pay fees for the licensing of the same product that farmers in Brazil or Argentina do not own. These market strategies are considered by some to disproportionately impact the developing farmer as opposed to the large scale farm, since local agriculture often depends on experimentation of cross-cutting seeds to improve regionally specific future harvests (Azadi et al, 2015). Once again, the economically disadvantaged are crippled by policy enacted by those players already holding the power.

Another development regarding seed biotechnology and property rights is genetic use restriction technology (GURT), otherwise referred to as terminator technology or suicide seeds. This is a biotech method that renders second generation of seeds infertile, therefore preventing seed piracy or imitation. It was first developed in cooperation with public and private funding, including that of the USDA (“Genetic Use Restriction Technologies”, 2003). This technology would safeguard revenue for corporations, with an effect of further widening the gap between developing and industrialized agricultural markets due to large players’ ability to annually repurchase product (Katirae, 2015). Although terminator seeds are shrouded in public debate due to potential exploitive market strategies, they have never been commercialized. This has surprisingly not yet impacted the amount of patents issued for the technology to both public institutions and private companies (Katirae, 2015; Brankov, 2016; Azadi et al, 2015).

Of these patents, the most notable is the 1995 patent filed by the USDA and Delta & Pine Land company, who was acquired by Monsanto in 2007, for “genetic switch” seed sterility (Katirae, 2015). Is it suspicious that a federal agency and private corporation would want to

own property that would never be commercialized? Are their forward-looking goals concerning the future of agricultural markets where the state would want to co-own intellectual property with a private firm? Since the technology was never commercialized, corporations such as Monsanto have implemented other strategies in order to prevent seed piracy, forcing customers to sign contracts to obtain annual product licenses (Kneen, 1999). Monsanto's former Technology Stewardship Agreement customers agree not to sell or distribute products in regions they are not registered in, to follow EPA regulations, and to be subject to any random inspection and testing of land (Katirae, 2015). Overall, the emergence of biotechnological developments regarding GMO's and intellectual property right laws has created a space for agro-chemical such as Monsanto to enter the sector of industrial agriculture, reordering how producers buy seeds and distribute their products.

One would think there would be extensive regulations regarding the genetic manipulation of seeds, especially considering that these seeds are the very foundation of so many food products sold to the public. In application there was little to no regulation, largely thanks to former vice president Dan Quayle. Referred to as the "regulation terminator" (Harbrecht, 1991), Quayle drafted policy that allowed for genetically engineered food to go to markets without safety testing by the FDA. Firms were allowed to self-police any environmental or health concerns related to genetically modified products, with FDA policy analyst stating, "It's the manufacturer's responsibility to insure that the product is safe" (Johnson, 2013). Quayle made deregulation of American business an administration priority when appointed as the director of the newly created White House Council on Competitiveness, and he gave biotechnology companies such as Monsanto exactly what they needed in order to bypass any governmental regulatory requirement when selling genetically engineered products (Ruskin, 2015).

What once took scientists decades to breed near-perfect varieties of crops, could now be engineered in a lab in a matter of months. Particular genes could be isolated and moved from one organism to another, rather than combining entire genomes. Genetically engineered varieties of corn, soybeans, cotton, canola, and beets now represent 90% of all crops planted in the United States (Maxham, 2015). It is also estimated that 70-80% of all food sold on most grocery store shelves comprises of ingredients that were grown from genetically engineered, bio-technological seeds (Maxham, 2015). The green and gene revolution both had significant impact on agriculture, but the research and development regarding genetic engineering was almost entirely carried out by privately funded agricultural research. New varieties were introduced and provided to farmers that were almost entirely dictated by firms manipulating markets, rather than a motivation to improve agricultural growth, development or sustainability (Azadi et al, 2015). Genetic modification was not only an economic driver for companies like Monsanto, but it seems to be a quest to fundamentally refine, if not perfect, the organization of life itself.

Through the creation of the World Trade Organization (WTO) in 1995 and the drafting of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), a cooperation between the United States and multinational corporations such as Bayer and Monsanto allowed for this quest to organize agricultural markets across the world. The use of genetically modified seeds was promoted by Western nations and international trade institutions, penetrating as many international markets as possible. However, few corporations owned the majority of these patents, and they were the very same corporations that helped in drafting the international trade policy (Robins, 2010). Just as land used to be enclosed through government policy, now what *was grown* from land, and ultimately how land was used, began to be enclosed through political

institutions. Were these international trade laws enacted to better feed a growing world, or were political and economic actors driven by unclear motives to cooperate with one another?

A Brief History of Agriculture: A brief history of enclosure?

In this chapter I presented important sites of political and economic power in the history of industrial agriculture. These sites include developments in federal agricultural policy, seed technologies created throughout the gene revolution, and legal patent protection laws regarding GMO seed traits, that have all organized contemporary agricultural markets in a way that allows massive firms with enough resources to research, develop, and patent various agricultural inputs.

A study performed by the USDA published in 2018 characterizes the agricultural sector as roughly three decades of consolidation (Macdonald, 2018). The industry's largest revenues come from formerly the Big 6, now Big 4, agro-chemical and biotechnology companies. This chapter has established that patterns of consolidation are not occurring merely because of a laissez-faire, free market logics, but rather are effects of various political agents and institutions that administered strategies to allow these new firms to attain this power through market consolidation and control. Without the legislation of federal policy or the policing of legal measures taken by the state, would the consolidation of agricultural, biotech, and chemical firms have been as developed as it arguably is today?

Originating from the Enclosure Acts of the 1750's in England, familiar strategies involving land distribution and appropriation within agricultural markets have been adopted by industrialized states throughout Europe and the United States. State policies have evolved to maintain market power structures still exist to this day, but they have also been transformed to fit the context of contemporary markets and governmental institutions. Ownership has continued to be centralized, but the types of resources that are manipulated have changed, transforming from

actual farmland to the varieties of seed species that are forced to be cultivated from that land. Regardless of the federal policy passed throughout the history of industrial agriculture, it appears that certain actors are often strategically benefited at an intentional cost to others.

While the industrial revolution in Europe deployed strategies of enclosure to exploit vulnerable populations, the United States implemented federal policies from the late 19th century that had similar intentions in the bundling and redistribution of land. These policies evolved throughout the 20th century with the goal to mold the agricultural sector to fit the emergence of industrial capitalism and maximize economic growth. The foundations of particular economic and political tactics were settled to support similar strategies of enclosure as those observed in England. These governmental tactics today are nowhere as visible to the public. Land was taken away from populations, and now policy indirectly dictates how that land is used. Before the gene revolution, federal policy measured how much of what crop was grown by incentivizing through subsidies. The next chapter will reveal that due to the administration of intellectual property rights and bundling of market inputs, companies such as Bayer and Monsanto now dictated how land is cultivated.

Throughout the 20th century the percentage of Americans who lived on a farm fell from nearly 25% during the Great Depression to about 2% today, and only 0.1% of the United States population works full-time on a farm (Pollan, 2006). Now that fewer farmers could feed more due to industrial processes, economics has rationalized lower crop prices and the systematic removal of farmers from their land, a process which was all driven by federal policy. Not only did the size of farms grow, but the amount of labor provided to maintain farms shrank significantly. Just as enclosure acts plagued the peasantry in the eighteenth century, rural laborers have been systematically forced out of an industry that has always been dominated by

patterns of consolidation. Originally land was consolidated. With the emergence of new industrialization processes and GMO's, consolidation was enacted through the extension of intellectual property rights, giving corporations exclusive knowledge regarding the production and manipulation of even individual plants breeds. Looked in more depth next chapter, Monsanto's (now Bayer's) usage of licenses and patents in genetically engineered seeds, fertilizers, and pesticides consistently forced production inputs onto farmers across the world (Kneen, 1999). Property and patenting rights permit corporations to own genetically modified seeds as well as the complementary herbicides and pesticides that renders entire production processes driven by a single corporation. Furthermore, policies are instituted that incentivize the production of specific crop yields. In the case of the United States, this crop is overwhelmingly corn. Overproduction of corn is in part of the reason for such an inundation of cheap calories onto food markets across the United States, thereby making sugary foods so cheap. The role of the state has always penetrated agriculture, effectively regulating supply and artificially creating demand for products that feed the nation governs. The success of national economies appear to be dictated by the health of corporations, not the health of citizens.

This chapter presented a brief history of the agricultural sector in the context of the ever-lingering, intervening role of the state onto the industry, as well as reflecting how agro-chemical giants such as Monsanto and Bayer were able to infiltrate the international-industrial-agricultural market. The next chapter will focus on these companies, examining how their integration may produce economic, environmental and political effects on various agents found within industrial agriculture, and it will explore how the cooperation between Bayer-Monsanto, the United States, and international trade institutions could impact the entire world's food supply.

Chapter 3- The Integration of Bayer and Monsanto: Economic, environmental, and political implications

A closer look at Bayer and Monsanto

In the previous chapter, I presented particular historical moments throughout the development of industrial agriculture that enabled agrochemical and pharmaceutical behemoths Bayer and Monsanto to enter and dominate agricultural markets. These instances included passing of federal legislation, technological developments and the implementation of legal guidelines regarding the patenting and protection of property rights. These intellectual property rights, as concluded by William Lesser, often make vertical integration in biotechnology firms necessary and create financial resources that encourage downstream mergers and acquisitions (Lesser, 1998). I also argued how the intervention of political institutions has been a recurring feature throughout the development of modern agriculture, as contemporary agriculture has been shaped by a complex variation of both political and economic agents that influence the public welfare of millions based on market logics and corporate profitability. From just an economic perspective, one can look at the history of markets as one filled with continual patterns of consolidation (Macdonald, 2017). I propose that these patterns of consolidation throughout the history of agriculture present much more political stakes than simply economic monopolization of markets, but rather varying forms of political enclosure processes in order to foster, distribute, and suppress particular knowledge involving agriculture and food security. Even the European Commissions stated that “the merged entity would hold both the largest portfolio of pesticide products and the strongest global market positions in seeds and traits, making it the largest integrated company in the industry” (“European Commission”, 2018), so how did this

acquisition get approved when it appears to run against the most basic of E.U. (as well as U.S.) competition laws?

In this chapter, I will engage these concerns through an analysis of not simply *economic* implications of the Bayer-Monsanto acquisition, but *political* and *environmental* implications as well. By utilizing various antitrust reviews, public comments sent to the Department of Justice (DOJ) from farm coalitions, and academic studies that forecast the economic future of agricultural market structures, a traditional economic analysis of the repercussions of this acquisition will be presented. In the context of Polanyi's conception of embeddedness, I will also highlight how political and environmental logics have been subordinated throughout the regulatory process of approving this merger-turned-acquisition. Once the economic, political, and environmental implications of the acquisition have all been presented, the embeddedness of knowledge regarding land, food, and nature itself will be apparent, along with its potentially catastrophic effects onto society.

The Driving Force of the Merger (According to Bayer)

One of the original press releases from Bayer in September of 2016 highlighted how farmers were the main concern of both them and Monsanto, specifically stating that they “Realize a shared vision of integrated agricultural offerings, delivering enhanced solutions for growers and creates a leading innovation engine for the next generation of farming” (“Bayer and Monsanto”, 2016). The company will propose a broad set of solutions to this next agricultural generation, including enhanced solutions in seeds and traits, digital agriculture, and crop protection. If this is actually the case, why not start evaluating this acquisition based on the opinion of those that it is intended to benefit the most? Do farmers support Bayer and Monsanto? As discussed in the very chapter, “The Big 6” agricultural firms have essentially been

consolidated into “The Big 4” when ChemChina acquired Syngenta in February of 2016 and Dow and Dupont merged successfully on August 31, 2017 (creating a company called Corteva) before Bayer and Monsanto were even approved (Macdonald, 2017). Have these patterns of consolidation benefitted farmers thus far?

The Konkurrenz Group, a legal advisory firm whose founders are former attorneys with the U.S. DOJ Antitrust Division, has written an antitrust review of the merger that includes a survey conducted by a coalition of farms and farming organizations¹ in 2018 (Stucke and Grunes, 2018). The survey is intended to represent the concerns of farmers regarding the integration Bayer and Monsanto from across the entire United States and included responses from all states other than Delaware and Rhode Island (Stucke and Grunes, 2018). Overall, 83% of respondents claimed they were very concerned with the merger and 11% answered that they were only somewhat concerned. The top three apprehensions of the merger were as follows: Bayer/Monsanto will use its influence in a current product to push sales on other future products (80% very concerned and 12% somewhat concerned), Bayer/Monsanto will control data about farm practices through the complete control of open sourced digital farming (79.5% very concerned and 12% somewhat concerned), and the merger will result in increased pressure for

¹ In order to reflect the breadth of organizations involved but to save room, here are all the contributing groups that circulated the survey: “Agricultural Justice Project, California Farmers Guild, Center for Rural Affairs, City Seed, Community Alliance with Family Farmers, Domestic Fair Trade Association, Farmworker Association of Florida, Family Farm Defenders, Farm Aid, Farm and Ranch Freedom Alliance, Farmworker Association of Florida, Florida Organic Growers, Friends of Family Farmers, Hawai’i Farmers Union United, Hawai’i Tropical Fruit Growers, Iowa Farmers Union, International Federation of Organic Agriculture Movements, Kansas Rural Center, Maine Organic Farmers and Gardeners Association, Minnesota Farmers Union, Missouri Coalition for the Environment, National Family Farm Coalition, National Farmers Union, National Latino Farmers and Ranchers Trade Association, Natural Born Tillers, New Britain ROOTS, Northeast Organic Dairy Producers Alliance, Northeast Organic Farming Association of Connecticut, Northeast Organic Farming Association of Massachusetts, Organic Farmers Association, Organic Farming Research Foundation, Organic Seed Alliance, Organic Seed Growers and Trade Association, Organization for Competitive Markets, Our Family Farms, Pesticide Action Network North America, Practical Farmers of Iowa, Ranchers-Cattlemen Action Legal Fund, United Stockgrowers of America, Rural Coalition, Rural Vermont, Sustainable Food Center, Texas Organic Farmers and Gardeners Association, The Cornucopia Institute, Vilicus Farms, and the Women Food and Agriculture Network.”

chemically dependent farming (77% very concerned and 12% somewhat concerned) (Stucke and Grunes, 2018). It appears that the majority of farmers who are supposed to be the intended beneficiaries, have valid hesitations over the future of agricultural that span across a variety of issues. The acquisition was still approved, even if the majority of beneficiaries were greatly concerned with the company monopolizing agricultural inputs, rendering farmers vulnerable to specific chemical-dependent production processes, or having personal data of their crops and land collected, stored, and sold through digital platforms. These antitrust reviews were not just compiled by consulting firms. Farming organizations across the United States also expressed trepidation by directing complaints to the DOJ themselves through formal public opinion requests (*United States of America v. Bayer AG, Monsanto Company, and BASF SE*, 2018).

The president of the National Farmers Union, Roger Johnson, stated in response to the Bayer Monsanto merger that “Corporate consolidation is squeezing family farmers from all sides, leaving them with higher input costs, less competitive markets and less innovation” (Farm and Food Watch, 2017). This letter was cosigned by, again, an overwhelming amount of farming organization from across the United States and sent to Andre Finch, the acting assistant attorney general of the U.S. DOJ Antitrust Division.² Other claims include that the cost of seeds are continually the highest input expense for farmers, mainly due to the imposition of technology fees that are forced onto them by corporations. Johnson claims that it has been, “seen time and again that consolidation and market restructuring has increased the cost of crop inputs. In a lagging

² Letter cosigned by, “California Farmers Union, Community Alliance for Global Justice, Connecticut Northeast Organic Farming Association, Dakota Rural Action, Farm and Ranch Freedom Alliance, Federation of Southern Cooperatives/Land Assistance Fund, Food & Water Watch, Food for Maine’s Future, Sustainable Iowa Land Trust, National Family Farm Coalition, National Farmers Union, National Hmong American Farmers, National Organic Coalition, National Sustainable Agriculture Coalition, National Young Farmers Coalition, New England Farmers Union, Northeast Organic Farming Association Massachusetts, Northeast Organic Farming Association of New Jersey, Northeast Organic Farming Association of New York, Northeast Organic Farming Association of Rhode Island, Northeast Organic Farming Association of Vermont, Organic Seed Alliance, Rural Advancement Foundation International–USA, Wisconsin Farmers Union”

farm economy with multi-year trends of low commodity prices, additional cost increases for crop inputs could cripple a lot of family farms in this country” (Finch, 2017). According to the actual customers of the eventual products sold by the proposed Bayer-Monsanto merger (also supposedly the chief benefactors), recent years of consolidation have not been so advantageous to independent and family-owned farms. With concerns coming from farmers themselves comprising of increased input costs, less innovation, and centralized control of digital information, it makes sense to analyze the economic indicators that may or may not support these apprehension. If further research proves these anxieties legitimate, how did the Bayer-Monsanto acquisition get approved through political regulating agents? Considering there is an abundance of pushback from those who allegedly comprise of “the driving force” behind the merger, what political and economic actors, structures, and forces have fostered this acquisition into fruition?

An Analysis of Economic Indicators: Are farmers’ concerns of consolidation legitimate according to data?

Several economic indicators can be explored in order to grasp the legitimacy of concerns expressed by farmers regarding consolidation, such as models predicting changes in agricultural input prices and measures of market concentration. A report published by the Agricultural Food and Policy Center of Texas A&M looks at the proposed mergers and acquisitions among biotechnology firms and their likely effects on seed prices (Bryant, Maisashvili, Outlaw, Richardson, 2016). By reviewing relevant literature regarding changes that have occurred relative to agricultural input markets, they apply a model of change in price markups to the corn, soybean, and cotton prices. Their models resulted in estimated aggregate price increases of corn, soybean, and cotton to be 19.2% given particular price elasticities of demand and changes in market power (Bryant et al, 2016). Other literature looks at the concentration of seed markets, such as a white paper report published by the Farmers and Families First organization, reporting

that the new conglomerate would own more than a third of the global market for corn seed, almost 70% of the global market for cotton seed, and 69% of herbicide-tolerant alfalfa, canola, corn, wheat, soybean, and cotton seeds (“A Monsanto-Bayer Merger”, 2017). By collecting changes in specific seed markets, the report applies economic formulas specially used to measure potential fluctuations of market power and concentration.

The Texas A&M report also analyzed the acquisition’s impact on market share, by calculating changes in the Herfindahl-Hirshman Index (HHI) that measures market concentration based off of explicit guidelines published by the DOJ and Federal Trade Commission (FTC). Sums of squared market share percentages are taken to calculate the HHI on a range from 0 to 10,000, with a measure of 10,000 a pure monopolistic market. The report explains that According to DOJ/FTC guidelines a market is considered “moderately concentrated” if the HHI is between 1,500 and 2,500, and “highly concentrated” if the HHI is above 2,500 (U.S. Department of Justice, 2018, paragraph 3). For an industry that is highly concentrated, any action that increases the HHI by 200 or more points is considered ‘likely to enhance market power’ (Bryant, Maisashvili, Outlaw, Richardson, 2016, section 6 paragraph 2). Data regarding corn and soybean seed industries market share estimate was taken from Begemann (2015) and cotton from the USDA AMS report (2015) by the Konkurrenz Group, and Monsanto held 35.5%, 28.0%, and 31.2% of the corn, soybean, and cotton markets respectively, with Bayer owning 38.5% of only the cotton seed market (Stucke and Grunes, 2018). They calculated that the Bayer-Monsanto and Dupont-Dow mergers would have increased the HHI by more than 300 points in all markets, well above the guidelines marker for likely enhancement of market power. In fact, the score for cotton markets would increase by 2,400, more than quadruple that of a score that is labelled as fair competition by the U.S. DOJ (Stucke and Grunes, 2018).

Mimicking the calculation method of the Texas A&M seed market study, I applied the same analysis to the Bayer-Monsanto acquisition by examining the effects on market power of aggregate global pesticides and seeds markets. Data were collected from the United States International Trade Commission (USTC), with Syngenta, Bayer, Monsanto, BASF, Dow, Dupont, and 'Other' corporations comprising of 14%, 10%, 17%, 6%, 7%, 14%, and 32% respectively of the global market share of pesticides and seeds in 2015 (DeCarlo, 2018). Given this data prior to any mergers, the HHI market share measurement of the Big 6 is 1890. This measurement would deem a moderately concentrated market by the DOJ and FTC. With Bayer's acquisition of Monsanto, this measurement increases by 340 points all the way to 2,230, almost eclipsing the 2,500 heavily concentrated measure. If the Dow Dupont merger is also taken into account, truly reflecting the Big 6 to Big 4 transition, the HHI increases to 2,426. This particular economic indicator clearly shows that there would be a substantial increase in global market power, as well as a DOJ and FTC measurement labelling it as heavily concentrated.

This consolidation of market power is not a new trend, so how have these recent patterns affected markets and farmers over the past few years? Before 1990 there were more than 600 potential firms from whom farmers purchased seeds with traits complementary to their respective climates; however, by 2009 less than 100 of these companies remain ("A Monsanto-Bayer Merger", 2017). Four companies accounted for more than 54% of all seed sales in 2009, more than doubling since their sales in 1994 at 21% (Stucke and Grunes, 2018). Corporate press releases that encourage allowing this increased concentration and collaboration of agricultural behemoths claim that farmers would benefit with: "more innovation, greater variety, more choices, lower prices, and better quality" (Stucke and Grunes, 2018), but surveys taken by farmers and other evidence prove otherwise. Data collection from the USDA has published that

overall net farm income across the United States has steadily declined since 2013, from \$123.83 billion to \$61.50 (Leonard and Yang, 2019). *The Wall Street Journal* recently published an article that reported that this reduction of earnings has forced the majority of farm households to search for second jobs in order to bring in multiple forms of income, with 82% of income expected to come from off-farm work (Bunge and Newman, 2018).

The USDA records farmers' gross income increasing since 2013; however, prices of inputs necessary to perform work are growing at a faster rate that result in decreased net income figures over the same period of time (Stucke and Grunes, 2018).³ The Konkurrenz Group found that crop seed prices from 1994-2000 more than doubled to that of the price received for agricultural commodities sold by farmers (Stucke and Grunes, 2018). Prices paid by farmers for their inputs have thus generally risen faster than the prices received for crops. According to Keith Fuglie, an Economist with the Structure, Technology, and Productivity Branch in the Resource and Rural Economics Division for the USDA, the majority of price increases in seed markets is accounted for by the increasing fees for genetic traits, a tactic heavily utilized by Monsanto. Technology fees or the cost of seed treatment account between a range of 32% to 74% of the overall prices of seed for corn, soybeans, cotton, and sugar beets in the United States and the European Union (Fuglie et al, 2012). In the 2018 survey conducted on various farm coalitions, respondents were vocal about the constraints they faced due to input prices, with 80% reporting they have been gradually paying for increased prices over the past five years, and 65% admitting that their bargaining power agricultural inputs such as chemicals and seeds has diminished (Stucke and Grunes, 2018).

³ Net farm income decreased from \$123.80B in 2013 to \$61.50 in 2016

Overall market share of the Bayer-Monsanto acquisition results in the control of more than a quarter of the global agro-chemical and seed market, reaching projected annual revenues of \$67 billion (“A Monsanto-Bayer Merger”, 2017). I employed a simple economic formula used by regulating agencies to measure market concentration. For the aggregated pesticide and seed markets, the change in HHI value is well above the indicators that reflect substantial increases in market power. Basic economic measures appear to demonstrate that farmers’ trepidations are valid, and it appears that the majority of farmers have criticized past instances of consolidation due to increased input prices. Next it is useful to ask what market tactics, specific to that of Bayer and Monsanto to increase price on agricultural inputs, are particularly worrisome concerning this merger-turned-acquisition?

How the Merger could further Increase Input Prices

The former section presents how this acquisition concentrates both the seed and agrochemical products, resulting in the integration of two massive markets. Surprisingly, the amount of market control attained by Bayer and Monsanto through this acquisition (over 25% aggregate pesticide and seed, and over 70% in some specific seed markets) has already been ruled as anti-competitive by the United States DOJ. Monsanto used to sell the traited cotton seed through a subsidiary company known as Stoneville Pedigree Seed Company, effectively allowing 96% of all cotton seed in the U.S. to have Monsanto traits (“A Monsanto-Bayer Merger”, 2017). In 2007, Monsanto proposed a merger with Delta & Pine Land Company (DPLC) that was ultimately rejected. DPLC sold over 80% of traited seeds in both the Mid-South and Southeast regions of the U.S., and if a merger with Monsanto were approved, this percentage would have increased to more than 95%. The DOJ ruled that this would have been anti-competitive and the resulting elimination of competition would have resulted in farmers

suffering from, “fewer choices of, and face higher prices for, traited cottonseed” (*United States of America v. Monsanto Company and Delta and Pine Land Company*). The DOJ required that, for fair competition, Monsanto divest the entirety of Stoneville and twenty lines of DPLC’s proprietary cotton seed (*United States of America v. Monsanto Company and Delta and Pine Land Company*, 2008). The company that Monsanto sold this seed company to was Bayer. In hindsight, the same regulatory agencies approved of a merger that was even larger than an instance it rejected ten years prior. In 2015 the top three sellers of cottonseed were respectively Monsanto, Bayer, and Stoneville; and by Bayer controlling the same cottonseed brands Monsanto was forced to divest, the resulting ownership equates to 70% of cottonseed throughout the United States succumbing to a single firm (“A Monsanto-Bayer Merger”, 2017). It is perplexing to think that an agency with the purpose of regulating mergers and acquisitions would approve a merger that renders one of its past decisions obsolete. For Bayer’s acquisition of Monsanto, the DOJ declared that \$9 billion of divestments be made to BASF, an agro-chemical competitor of Bayer (*United States v. Bayer AG, Monsanto, BASF*, 2018). However, recent collaboration between Monsanto and BASF may cause speculation as to whether this divestment would reduce or even *enhance* Bayer’s control of seed markets.

Opponents to the merger speculate that Bayer’s divestment of interests of traited seeds is “a shell game” that could result in the Bayer-Monsanto acquisition having greater control of the global agrochemical market (“A Monsanto-Bayer Merger”, 2017). In order to address potential antitrust concerns, Bayer offered to divest the majority of seed trait interests to a competitor BASF, giving that company Bayer’s Liberty herbicide and Liberty Link seed system, the primary competitor to Monsanto’s Roundup and Roundup Ready seed package (“A Monsanto-Bayer Merger”, 2017). However, since 2007, Monsanto and BASF have cooperated with joint research

and development programs across various seed breed varieties and traits. Each company can recommend developed genes or traits, but Monsanto is the only corporation permitted to commercialize any products that arise from its collaboration, bringing in 60% of any net profits opposed to BASF's 40% of any jointly-developed products ("BASF Plant Science and Monsanto expand collaboration", 2010).

This cooperative arrangement between Monsanto and BASF also had implications on cross-licensing agreements. Traits from each firm could be stacked, with some specializing to increase yields and others to allow crops to thrive in varying climates. The cross-licensing agreement would therefore substantially impact the role that Monsanto would continue to have in products that were jointly developed by the two firms. For example, the Farmers and Families First organization discusses that Monsanto and BASF both created a next generation herbicide tolerant crop system that uses the chemical dicamba. In their white paper to the DOJ Farmers and Families First states "while the herbicide formulation was proprietary to BASF, the trait for dicamba tolerance in soybean, corn, canola and cotton seeds was proprietary to Monsanto" ("A Monsanto-Bayer Merger", 2017). If Bayer is divesting assets that directly compete with Monsanto dicamba-based products, then there is a possibility that BASF will commercialize products that combine these divestments with the dicamba trait owned by Monsanto! If these traits are stacked, then Bayer's divestiture is still integrating joint research and concentrating market control of intellectual property.

Additionally, the final DOJ judgement does not even address "stacked traits". The most relevant statement to divesting intellectual property is as follows: "Because Bayer and Monsanto compete to develop new products and services for farmers, the proposed Final Judgement requires the divestiture of associated intellectual property and research capabilities, including

‘pipeline’ projects, to enable BASF to replace Bayer as a leading innovator in the relevant markets” (*United States v. Bayer AG, Monsanto, BASF*, 2018). BASF will replace the property rights of any intellectual property owned by Bayer, but Monsanto cross-licensing agreements do not appear to be altered. If BASF intends to stack traits with any of Bayer’s products, the sale would result in the two largest seed trait competitors integrating under one seed system. This would undercut the very purpose of the initial Bayer divestiture.

Other than concerns of anticompetitive market control associated with the acquisition, Monsanto also implements cross-licensing agreements that exploit farmers and competitor firms through usage restrictions. These have intentionally ensured that as many seeds as possible on the global market contain a Monsanto-owned trait. Seeds of competitors can only “stack” their traits with those that are developed by Monsanto if they have one of these agreements. Farmers must also agree to not reuse traited seed over multiple years, a practice that was once extremely common in the past. Patents and licensing of traits typically force growers to plant only for one season, and forbids them from reusing or supplying others for replanting in latter seasons.

Severe penalties are enacted onto those that stack competitor traits alongside Monsanto seeds. This way seeds must be repurchased for every growing period, and this even disables farmers to attempt to try new product of a Monsanto competitor — in a sense ‘locking-in’ farmers to their specific traits. By 2009, more than half of all seeds that contained stacked traits incorporated some sort of Monsanto intellectual property (“A Monsanto-Bayer Merger”, 2017). This percentage increases significantly when analyzing specific crops; in 2009 roughly 60% of the world’s stacked corn seeds and 100% of its stacked cotton and soybean seeds contained one or more Monsanto traits (Moss, 2011). When the DOJ ruled Monsanto’s proposed merger with Delta Pine & Land Company, it decided to permit the stacking of cottonseed with Monsanto

traits for 10 years, restricting the use of cross-licensing agreements (*United States of America v. Monsanto Company and Delta Pine Land Company*, 2008). The 10-year penalty will expire in 2018, thus leaving no anticompetitive measures to limit the cross-licensing influence of placing stacked seed traits for a merged Bayer and Monsanto. In the event of Bayer implementing these restrictions, the already high cost of market entry will substantially increase due to licensing fees (“A Monsanto-Bayer Merger”, 2017). Millions of costs have been sunk to research and development traited seeds and complementary chemical inputs, and hefty fees create significant barriers to market entry in order to have access to this licensed intellectual property (Lianos and Katalevsky, 2017).

Agricultural economists Robert Jenson and Christopher McIntosh examined justifications as to why a particular farmer that “recently used patented seed cannot immediately transition if there are seemingly better profit opportunities with the other types” (Jenson and McIntosh, 2016). If a farmer could increase profit any particular year by switching away from Monsanto trait crops, intellectual property right restrictions would require a one-year delay when transitioning away from traited to conventional crops (Stucke and Grunes, 2018). Additionally, if farmers wanted to transition to organic seeds, their cropland would need 36 months to even comply with seeds lacking patented seed traits. With such a lag in time periods, farmers are indirectly incentivized from switching away from patented seeds even if they wanted to.

Monsanto also exhibited vertical and horizontal monopoly practices by strategies of “Tying and Bundling” agricultural inputs, which can be further exacerbated through the Bayer acquisition. The survey reported relevant statistics in relation to farmers’ views on bundling practices over the last decade. Almost half of the respondents noted that seed vendors or distributors only offered seed from a single manufacturer, a quarter of farmers answered that a

discount or rebate was offered with those who also used finance services from the same seed manufacturer, and one fifth of farmers stated that they were offered lower prices on seeds if they bundled their purchase with pesticides, herbicides, or other chemicals from the same manufacturer (Stucke and Grimes, 2016). Farm coalitions that oppose these ‘tying and bundling’ strategies have expressed concern that discounts of some products are simply negated by price hikes on others (“A Monsanto-Bayer Merger”, 2017). Farmers and Families First gave an example of bundled Roundup Ready products. Roundup herbicides have a significantly higher price point than Roundup tolerant seeds, so when these products are bundled, a discount on the seed is considered negligible when bought with the expensive complementary chemical product (“A Monsanto-Bayer Merger”, 2017). Although these bundling tactics have already been put into practice, a major concern for the future of agriculture, and in particular this merger, will be the influence of bundling *digital agricultural* services with their products.

Digital agriculture consists of collecting data and information of farmland intending to provide custom-made advice for individual farmers or aggregated data for a particular region of land (Stucke and Grunes, 2018). These platforms allow farmers to access instantaneous data on soil, irrigation conditions, and climate. In 2013, Monsanto acquired a company named the Climate Corporation, the only firm that spread a network of sensors across the United States that can feed data to the Monsanto-developed platform FieldView product (“A Monsanto-Bayer Merger”, 2017). This platform is an open source network that allows any developer to create their own application, just as the app stores do for telecommunication companies. When the acquisition was announced, the chief technology corporation (Mark Young) outlined Monsanto’s four preliminary primary revenue streams; these included subscriptions through FieldView, revenue share agreements with data providers, movement into other verticals such as livestock

through licensing agreements, and selling information collected to other industries (Taylor, 2016). Different levels of subscriptions will offer varying services, so a free subscription will offer the most basic of services, whereas a mid-tier and top-tier account will have access to all Bayer-Monsanto has to offer including, in-field sensor networks, soil mapping, nutrient-detecting sensors, and other data-driven agronomic tools (Taylor, 2016). While this technology can be transformational for the aggregate agricultural industry, it can also result in these platforms maintaining power structures for agents that already hold the majority of market power. Surely the dependence of farmers on digital software platforms will be increased through the use of the development of this technology, along with already instituted seed cross-licensing agreements and chemical input bundling strategies. Farmers will have access to data regarding their farm like never before. However, they will also rely more on firms such as Bayer-Monsanto for seeds, traits of those seeds, and pesticides- products to respond to the data collected by the same firm. Apprehension is raised even further, with an uncertain future of how Bayer will proceed to distribute and sell the data of individual farmers as its digital platform grows.

By analyzing potential economic repercussions of this acquisition, it appears that the vertical integration occurring through digital farming platforms, agricultural inputs, and intellectual property ownership rights may be unprecedented. Farmers, the driving force behind the merger, may be further constrained by exploitive Bayer-Monsanto market tactics such as anticompetitive market control, cross-licensing agreements, and ‘tying and bundling’ strategies associated with the future of digital agriculture. The next major concern of farmers that is examined is the fear that innovation will be lost with less competitive pressure exerted onto a Bayer-Monsanto agricultural input monopoly.

Agricultural Research & Development: Do consolidation and innovation have an inverse relationship?

Another anxiety shared by opponents to the acquisition is a reduction in total spending of research and development (R&D) and concentration of spending on already existing technologies, resulting in an overall decrease in innovation. A study done by the International Panel of Experts on Sustainable Food Systems (iPES) analyzed how consolidation across industrial agriculture has a major impact on molding R&D for broader innovations in food systems (Mooney, 2017). Throughout the 20th century the majority of agricultural research was publically funded; however, by 2013 private research accounted for about half of total agricultural studies (Mooney, 2017). In accordance with this trend, farmers are concerned that research is focused on the development of complementing and facilitating products sold by private firms as opposed to creating revolutionary breakthroughs that could actually reshape agricultural markets. For agricultural inputs specifically, the largest eight agri-biotech firms account for 76% of all R&D spending (Mooney, 2017).

By 2013, the ‘Big Six’ firms had total values of R&D at \$6.59 billion which was six times larger than that of the USDA Agricultural Research and Information budget (Mooney, 2017). Industry leaders have often referred to the pooling and combining of these research resources as crucial to overcome the ever-growing challenges of feeding growing populations; for example Mooney discusses that in 1980, the research director of formerly the largest seed company in the world prior to Monsanto (now DowDupont) stated that research capacity in merged companies allows for, “greater and faster ‘diversity in time’: input companies would have a research pipeline providing farmers with an annual turnover of varieties in response to rapidly evolving diseases or pests, and other environmental stresses” (Mooney, 2017). But

evidence also shows the opposite of this forecast across all industries, even those unrelated to agriculture. The Federal Trade Commission (FTC) compiled evidence from a range of sectors (automobile, computer, and pharmaceutical industries) that found economies of scale fail to translate into dynamic innovation strategies, in fact resulting in the opposite effect (Mooney, 2017). Species diversity used to be anticipated by commercial breeders throughout the 1970s as agriculture continued to consolidate and implement intellectual property protections, while R&D has been constantly focused on only a few crops. For example, over 40% of private crop breeding research only focuses on corn, and the farming coalition survey conveyed that farmers expressed limited access to a diverse set of seed species (“A Monsanto-Bayer Merger”, 2017; Stucke and Grunes, 2018). As the overall percentage of private funds increase in overall research investment of agriculture, the R&D of each firm is frequently diminished. Different strategies are implemented in order to fulfill these ‘innovation gaps’ (where there owned intellectual property or research is lacking) when companies consolidate, such as buying out smaller firms, entering licensing agreements, or partnering with start-ups (Mooney, 2017). Effects on R&D efforts within the largest firms in agriculture have already been observed, with BASF preparation for the divestitures from Bayer ordered by the DOJ.

In response to expecting Bayer’s Liberty link seed trait system to be acquired due to a DOJ ruled divestiture, BASF eliminated 350 R&D jobs and its overall plant biotechnology R&D program by 50% (Matthews, 2016). Field testing sites were shut down altogether in the United States and India, with research sites in the United States, Germany, Belgium, and Brazil being reduced (Matthews, 2016). Before the acquisition even occurred research sites began to decrease, and it is forecasted that R&D competition will continue to diminish along with a concentration of joint venture research programs, just as Monsanto and BASF previously shared (“A Monsanto-

Bayer Merger”, 2017). Since the acquisition has materialized, apprehension is also raised by analysts that predict Bayer’s purchase of Monsanto could redirect resources that would otherwise contribute to developing promising pharmaceuticals (Staton, 2017). Skeptics do not think Bayer will have enough capital to sufficiently fund research in both big agriculture and big pharma, especially with competitors emerging in several areas of Bayer’s consumer health focus. The acquisition may not only incentivize R&D efforts to be concentrated to specific, already existing products in agriculture, but it could also divert funds that would otherwise improve quality of remedies for the public’s health such as anticoagulants, vision treatments, colon cancer, prostate cancer, multiple sclerosis, and pulmonary arterial hypertension (Staton, 2017).

Overall R&D budgets have been both extensively privatized as well as consolidated for the past 30 years, and Bayer’s acquisition of Monsanto is the latest event that continues this trajectory. Mooney suggests that “innovation is focused on a narrow range of crops, technologies and approaches, creating path dependencies that detract from research on traditional crop varieties or social innovation strategies” (Mooney, 2017, pg.56). Commercial returns are the primary driver for R&D research, rather than long-term, efficient, or environmentally sustainable solutions to agricultural production. Given a future that appears to lack innovation, the Bayer-Monsanto merger-turned-acquisition poses cautionary risks to both the ecological systems that its agricultural inputs are grown in and the health of the public that consumes food constituted of these inputs.

Environmental Anxieties: How does the Bayer-Monsanto acquisition impact non-human actors and public health?

As massive chemical conglomerates, both Bayer and Monsanto have had attention drawn to them for environmental damage done to people and nature alike. Even recent studies have

linked a decline in certain animal species as a result of increased Bayer-Monsanto pesticide use (Brown, 2018). In fact, studies from France have recorded the amount of birds have been decimated by a third within the past fifteen years, coincidentally corresponding with the discovery that three quarters of all flying insects have also been devastated over recent decades (Brown, 2018; Baxter, 2017). With insects being a food staple for birds and many other animal species, pesticides such as clothianidin and imidacloprid produced by Bayer or herbicides such as glyphosate in Roundup are suspected to be chief suspects in this drastic decline of wildlife (Brown, 2018). Toxic pesticides that are harmful to insects impact an important step in the complex food chain of wildlife that consume them, and they also may eliminate natural pollinators of fruits and vegetables. Even with these data conducted by European scientists linking increased pesticide, herbicide, and fungicide with drastic decline in farmland wildlife, the EU still approved the Bayer-Monsanto acquisition. As Bayer's neonicotinoid pesticides have suspected to be harmful to insects and their predators, Monsanto's glyphosate has been linked in several studies to harming humans through the air we breathe, the water we drink, and the food we consume (Brown, 2018; Swanson et al, 2014).

Over the past two decades the United States has seen a significant increase in the incidence and prevalence of chronic diseases, which scientists such as Nancy Swanson have linked to the introduction of glyphosate with herbicide-tolerant genetically modified crops. Glyphosate has been found by some studies to disrupt the endocrine system, interfere with metabolic processes in both plant and animals, damage DNA, and induce mutations that lead to cancer (Swanson, 2014). Correlation analyses were conducted between glyphosate applications in the United States with 22 diseases that resulted in highly significant Pearson coefficients

(<10⁵)⁴, and the relationship between the percentage of genetically engineered corn and soybean planted in the United States was highly significant (<10⁴) with 18 diseases (Swanson, 2014).⁵

Although these tests do not suggest causation, their strength and significance should initiate further investigation into how the relationship between GE crops, glyphosate, and public health is connected. Chronic diseases have a plurality of potential causes, but data show that there has not been a greater increase in the use of any other toxic substance or pathogen over the past two decades than glyphosate on genetically engineered crops, increasing from 1996 to 2009 by more than 200 million pounds (Swanson, 2014).

The United States Food and Drug Administration has claimed that genetic modification and the hybridization of plants (that has occurred for hundreds of years) are one in the same (“Biotechnology-Statement”, 1992). This justification has also allowed genetically modified crops to bypass any additional safety testing that naturally grown food would not have to clear, even though traits of genes are stacked and transferred across not just breeds but even, “taxonomical kingdoms in ways that do not occur by natural breeding methods” (Swanson, 2014, pg. 7). Glyphosate residues have even been found to be absorbed from genetically engineered seeds into stems and leaves; these residues have even been measured in the carcasses of livestock that feed from these crops. Moreover, the United States has one of the highest maximum allowed

⁴ Diseases related to glyphosate application included, “hypertension (R = 0.923), stroke (R = 0.925), diabetes prevalence (R = 0.971), diabetes incidence (R = 0.935), obesity (R = 0.962), lipoprotein metabolism disorder (R = 0.973), Alzheimer’s (R = 0.917), senile dementia (R = 0.994), Parkinson’s (R = 0.875), multiple sclerosis (R = 0.828), autism (R = 0.989), inflammatory bowel disease (R = 0.938), intestinal infections (R = 0.974), end stage renal disease (R = 0.975), acute kidney failure (R = 0.978), cancers of the thyroid (R = 0.988), liver (R = 0.960), bladder (R = 0.981), pancreas (R = 0.918), kidney (R = 0.973) and myeloid leukaemia (R = 0.878)”

⁵ Diseases related to GE corn and soybean included, “hypertension (R = 0.961), stroke (R = 0.983), diabetes prevalence (R = 0.983), diabetes incidence (R = 0.955), obesity (R = 0.962), lipoprotein metabolism disorder (R = 0.955), Alzheimer’s (R = 0.937), Parkinson’s (R = 0.952), multiple sclerosis (R = 0.876), hepatitis C (R = 0.946), end stage renal disease (R = 0.958), acute kidney failure (R = 0.967), cancers of the thyroid (R = 0.938), liver (R = 0.911), bladder (R = 0.945), pancreas (R = 0.841), kidney (R = 0.940) and myeloid leukaemia (R = 0.889)”

glyphosate levels in the world, with the Environmental Protection Agency (EPA) even increasing this threshold as recently as 2013 (“EPA Glyphosate; Pesticide Tolerances”, 2013). The FDA has only recently developed a specific method to test food glyphosate levels in 2016, claiming that past tests could measure the levels of multiple chemicals at once but could not read glyphosate because of its specific chemical nature (FDA, 2018).

Critics of current testing methodologies have claimed the United States’ regulatory approach to testing chemical residue is, “reactionary rather than precautionary,” insisting that a harmful side effect must be demonstrated before any preventable action is taken (Swanson, 2014, pg. 33). Without any regulatory requirement forced onto industry to ensure the safety of chemicals sprayed over crops, public and environmental health is essentially put to risk. Recent patterns of consolidation in agriculture reflect that governments and their regulatory agencies show no intention of halting the use of these toxins on seeds. “The Guardian” journalist George Monbiot has criticized international trade agreements that allow firms to manipulate government and promotes a new international structure to regulate agricultural chemical inputs stating, “The profits of these companies depend on ecocide. Do we allow them to hold the world to ransom, or do we acknowledge that the survival of the living world is more important than returns to their shareholders?” (Monbiot, 2017, paragraph 11). The abundant use of hazardous chemical reflects the immense environmental implications associated with this merger and further explicates the relevance of Polanyi’s conception of embeddedness. These concerns highlight how the larger context of environmental quality is interrelated with that of markets and governmental regulatory institutions choosing to not only ignore potential monopolistic practices, but also the very ecology of the planet

So far I have presented evidence from scientists and environmentalists concerned with the Bayer-Monsanto acquisition as potentially exacerbating public health issues associated with agro-chemical inputs. But farmers have concerns of their own regarding chemical drift, lack in seed diversity, and unregulated genetic modification.

Environmental externalities produced through the utilization of Bayer and Monsanto agricultural inputs appear to pose threats to the quality of products grown by farmers. Neighboring farms that may not utilize genetically modified seed have become susceptible to cross-pollination through chemical drift (Stucke and Grunes, 2018). Farmers that want to remain strictly natural or organic are at risk of their products cross-pollinating with genetically engineered crops as well as their crops dying altogether due to lacking a pesticide or herbicide-tolerant trait. If cross-pollination does occur through chemical drift, it would allow for Monsanto to sue the farmer for patent infringement and refrain from royalty payments because their product bred with a trait protected by intellectual property rights. Telling statistics were collected from the survey done by the Konkurrenz Group concerning agrochemical drift: 90% of organic farmers responded they were concerned of their organic certification due to drift in the future due to this merger, 21% had to sell product as non-organic, 6% claimed they could not sell their product for human consumption at all, and 4% indeed completely lost their certification (Stucke and Grunes, 2018). Some farmers are already economically constrained due to only a single company providing entire product lines from seeding to harvest, but other farmers are further constrained by environmental side effects produced through the use of Bayer-Monsanto inputs, forcing some farmers to use the same traited seed as their neighbors.

The increased use of agro-chemical products resulting from recent patterns of consolidation is a grave concern to farmers, but so is a reduction in seed choice, variety, and

species (Stucke and Grunes, 2018). According to farmers, one of the most important factors in choosing what seed to purchase involves suitability for particular geographic features and local climate. As 81% of farmers answered that regionally adapted seed varieties are critical to their operations, it appears that variety may be just as important to farmers as price (Stucke and Grunes, 2018). Bayer has promised the acquisition will lead to more choices and solutions to farmers, yet past patterns of consolidation have not reflected this, with 61% of farmers agreeing with the statement that “we have fewer seed variety options than 5 years ago” (Stucke and Grunes, 2018). The iPES reports that there are nearly 2.1 million unique varieties of natural plants that are wild-harvested for food, but commercial breeders have access to roughly 100,000 varieties protected by intellectual property patents (Mooney, 2017). It also presents data collected by the United Nations Food and Agriculture Organization (FAO) that reflects a 75% decline in genetic diversity available to the public for breeders and researchers. While farmers are apprehensive to externalities regarding agro-chemical inputs and lack of seed biodiversity, both of these concerns stem from the commodification of genetically engineered seeds, the primary source of energy to all living things, regardless any unintended ecological consequences.

The genetic modification of crops has proven to induce unprecedented agricultural growth. However, as regulations waned in order to genetically engineered seeds to flood world markets, little research was done to examine its effects on agricultural sustainability or ensuing effects on the organisms that consume them. Azadi et al published an article analyzing the effects of genetically engineered crops on agricultural growth, development, and sustainability, highlighting that, “what we eat and how our food is grown are increasingly political questions” (Azadi, 2015, pg. 204). They discuss various arguments given by critics of GE crops, including their sensitivity to mutagenicity, how they can lead to the breeding of herbicide-resistant super

weeds, how they may stimulate the evolution of deadly pathogens and viruses, their potential cause of new allergenic reactions to people and animals, and contribute to overall decline in world biodiversity of all living organisms (Azadi, 2015). Although these costs to environmental and public health may seem grave, there have been few long-term studies verifying the safety of genetically engineered crops used for either food or feed; additionally, the short term studies that have been done overlook most toxicological data to solely focus on nutritional values (Azadi, 2015). Without any legitimate examination of the long-term effects of genetic engineering, uncertainty regarding public health and unintended ecological side effects are what is most worrisome for farmers, scientists, and environmentalists alike. In 1998 Michael Pollen published “God in the Garden,” which explains how uncertainty is what unifies critics to not just genetic engineering but biotech agriculture at large: “By planting millions of acres of genetically altered plants, we have introduced something novel into the environment and the food chain, the consequences of which are not -- and at this point, cannot be -- completely understood” (Pollan, 1998). It appears that more than twenty years later, this uncertainty has still never been addressed by the United States or its regulatory agencies.

Pollan also discusses an interview he did with a current public interest attorney (then director of Center for Technology Assessment) Andrew Kimbrell, who cautions several of the potential environmental deprivations discussed throughout this section. Kimbrell states how pollution laws were too outdated for the advent of biotechnology and new agro-chemical inputs, with regulations fitting the previous agricultural era of the chemical age, and how, “Biological pollution will be the environmental nightmare of the 21st century” (Pollan, 1998, section 4 paragraph 4). Yet (another reminder), this interview was over *twenty years ago*. Studies published within the last four years share the same concerns that the health risks of biotech plants

have not been thoroughly researched, even though regulatory agencies such as the USDA, FDA, and EPA have all deemed genetically engineered products as undeniably safe. Given the entangled role of the state with the development of contemporary agriculture in the previous chapter, along with the conscious effort of economic and environmental regulatory agencies to ignore valid concerns associated with the Bayer-Monsanto acquisition, the political influence of the Bayer-Monsanto acquisition needs to be seen in a more critical light. Through what domestic or international governmental institutions have Bayer or Monsanto been able to influence? If the claimed beneficiaries to the acquisition are farmers, what tactics have been effective to the point that all of concerns, whether economic or environmental, are ignored by governmental leaders and regulators?

Bayer and Monsanto's Political Influence in the United States: How big-agriculture dictates the behavior of political officials in Washington

Although Monsanto has been scrutinized in the United States for its market practices throughout the entire 21st century, the negative attention has in no way inhibited its ability to secure a strong political foothold in American government. Monsanto's European counterpart, Bayer, has not been exposed to as much international criticism. Although, this may change given the EU's unfavorable opinion towards genetically modified crops, even though products containing genetically engineered ingredients are still sold to its citizens. Europe still imports genetically engineered products, but a two-thirds ban was passed in 2015 to prevent the actual cultivation or growing of genetically modified crops (Keating, 2016). By dropping the Monsanto name, Bayer may be able to redirect the previous negative perception of its acquisition to be more influential in the spread of genetically engineered crops throughout the EU. Bayer's new incredibly diversified product lines will additionally make it difficult for public attention to focus

on a common issue (Keating, 2015).⁶ The countries that currently grow the most genetically modified crops are Argentina, Brazil, Canada, and the United States, but this acquisition could very well increase the political influence of Bayer throughout the EU, possibly altering this list to include its member countries.

Although Bayer has a distant history of scandal (I.G. Farben, etc.), the contemporary negative perception that its acquired American counterpart shares internationally is unmatched (Keating, 2016). Several environmental and anti-GMO organizations, such as ‘Millions against Monsanto’, attempt to raise awareness relative to corruption in agricultural markets (Keating, 2016). However, these ‘millions’ have yet to find successful strategies to halt the political influence of big-agriculture onto governmental organizations across the world. Even with this negative perception, Monsanto employs various political tactics including contributing to electoral candidates, lobbying efforts, and engaging in ‘revolving door’ practices that continue to dictate the behavior of political officials in Washington, whether it be supreme court justices, directors of federal agencies, or even the president himself.

Campaign donations across various political parties in the United States have been a consistent policy-oriented strategy used by Monsanto. In its corporate political disclosure, Monsanto states that the political contributions impact important policy decisions to ensure, “we add our voice to include trade, environmental, tax and patent laws and regulations directly affecting Monsanto, as well as its employees, customers, and stakeholders” (“Political Disclosures”, 2018). Close to a million dollars (\$926,466) in total was spent by Monsanto in 2016 federal election cycles (“Monsanto Co Contributions”, 2016). Through the political action committee (PAC) called Monsanto Company Citizenship Fund, contributions totaled over

⁶ <https://www.dw.com/en/what-the-bayer-monsanto-merger-means-for-food-farmers-and-the-environment/a-19296103>

\$400,000 to more than fifty House of Representatives candidates and twenty Senate candidates. In the same year Bayer spent more than a total of \$500,000, donating \$480,000 from its Bayer Corporation PAC (“Bayer Corp Summary”, 2018). Although political campaign donations are an important facet to Monsanto and Bayer in maintaining that their political influence is kept with newly elected officials, their most effective strategies have been through lobbying and actually inserting their own employees into governmental positions. Enticing the United States’ government with promising economic forecasts and revolving company leaders into the public sphere (and bringing them back into industry) have been an extremely effective tactic in forming policy that benefits the big-agriculture and biotechnology industries.

In 2016 Monsanto (the largest contributor to lobbying in the agricultural industry) and Bayer (the eight-largest contributor in the pharmaceutical industry) spent \$2.5 million and \$3.6 million on lobbying efforts respectively; however, this is not a new trend (McQueeney, 2016). Big agriculture and biotech corporations have been influencing government officials and regulators since the mid 1980’s. In the past decade alone, Bayer and Monsanto have contributed over \$120 million to lobbying the American government (Sharav, 2016; McQueeney, 2016). In 1992, the White House Counsel of competitiveness, led by Dan Quayle, instituted regulatory relief for the penetration of biotechnology into that of agriculture. Mirroring trends of the software and pharmaceutical industries, big-agriculture lobbied that new genetically engineered crops could boost the U.S. economy through a new technology-based model along with the implementation of intellectual property rights (Sharav, 2016). Throughout his political career, Quayle has fought for the deregulation of American businesses, but his most impactful accomplishment for big-agriculture was limiting the scope of the FDA’s oversight under the US Food Additive Amendment of the Food Drug & Cosmetics Act (Woodward and Broder, 1992).

Policy for determining the safety of genetically modified food was then considered “science-based”. By allowing firms to self-police genetically modified products, opponents still criticized the policy as both framed and motivated by political and economic incentives (Sharav, 2016). This was the first instance of biotechnology firms exerting influence in Washington, allowing for the increased use of genetically modified products. Monsanto has maintained this trend throughout the company’s existence until its acquisition unto Bayer.

In the article “From Lab to Debacle,” Kurt Eichenwald notes “It was an outcome that would be repeated, again and again, through three administrations. What Monsanto wished for from Washington, Monsanto — and, by extension, the biotechnology industry — got. If the company’s strategy demanded regulations, rules favored by the industry were adopted. And when the company abruptly decided that it needed to throw off the regulations and speed its foods to market, the White House quickly ushered through an unusually generous policy of self-policing” (Eichenwald, 2001). Examples that reflect this relationship between Washington and Monsanto were observed in the Obama administration, with the passing of legislation in 2013 and 2016 nicknamed by opponents and environmentalist groups as the “Monsanto Protection Act” and the “Denying Americans the Right to Know” (DARK) Act (Redstone, 2013; Detisch, 2016). President Obama signed both of these bills officially known as the Farmers Assurance Provision and the Safe and Accurate Food Labeling Act. The first protects biotech corporations from interference of the courts when producing or selling genetically engineered seeds, and the second allows for companies to lessen the transparency of labelling genetically engineered products through the use of scanning QR codes or having to actually call the company itself to find out what ingredients are genetically modified (Redstone, 2013; Detisch, 2016). Technical comments from the FDA on the drafted bill even claimed how transparency through labelling

was not guaranteed, stating, “The definition of ‘bioengineering’ (new sec. 291) would result in a somewhat narrow scope of coverage. First, in subparagraph (A), the phrase ‘that contains genetic material’ will likely mean that many foods from GE sources will not be subject to this bill” (“FDA/HHS Technical Assistance”, 2016). If there is such backlash to the passing of bills related to food safety (a topic one would think should require great attention from government officials and representatives), how has Monsanto successfully penetrated governmental institutions in order to pass legislation that further drive profits?

Governmental institutions ranging from the Supreme Court to the White House have been linked to Monsanto officials. These links are best characterized by Monsanto officials’ “Revolving Door” relationships between private industry penetrating public governmental institutions in order to represent interests of the food industry. Marion Nestle, author of *Food Politics*, contends that revolving-door issues are best represented by the career of Michael Taylor, a former Vice President of Monsanto public policy operations. (Nestle, 2013, pg.101). Taylor began his career as staff attorney for the FDA in 1976 before moving to a private law firm that represented Monsanto from 1981 to 1991. He then returned to the FDA a Deputy Commissioner for Policy, where he had input in approving food and biotechnology policy that encourages the use of Monsanto produced growth hormones in dairy cows (Nestle, 2002, pg.101). Due to these efforts Taylor was investigated by the federal General Accounting Office, though he was absolved of any and all conflict-of-interest charges. Taylor moved back to the FDA in 1994 as the administrator of its Food Safety and Inspection Service before returning back to Monsanto as Vice President for Public Policy in 1998 (Nestle, 2013, pg.101). Throughout his career, Taylor was appointed by two presidential administrations (Bush and

Clinton) to hold key food and policy positions within the U.S. government while alternating between serving public and private interests.

In *Altered Genes and Twisted Truth*, Steven Druker who organized a lawsuit against the FDA, discusses how policy shaped by Taylor has allowed the FDA to ignore the safety testing of genetically engineered food, even though its own staff has concluded that novel genetically engineered products (that constitute more than 70% of food sold in the U.S.) is unduly hazardous to human health (Druker, 2015). This correlates with research discussed earlier by Azadi that claimed there have been little to no long-term safety studies conducted around genetically engineered food, decreasing the regulatory pressures put on these industries in order to get products onto markets as quickly as possible. Aside from Taylor, Supreme Court Justice Clarence Thomas is another prime example of former Monsanto employees infiltrating political institutions. However, Thomas reflects Monsanto's political influence in the judicial branch rather than that of the executive.

Thomas worked as a corporate lawyer for Monsanto throughout the 1970's, and was nominated by Bush for a seat on the U.S. Court of Appeals for D.C. in 1989 and the Supreme Court in 1991 ("Thomas Confirmed", 2010). Since then he has ruled in favor of Monsanto in two cases, *Bowman v. Monsanto* and *Monsanto v. Geertson*, both involving farmers infringement of Monsanto patent rights, but his most vital contribution to big-agriculture (and indirectly to Monsanto) was his decision in 2001 on *J. E. M. Ag Supply, Inc. v. Pioneer Hi-Bred International* (Boschma, 2013). Although this case did not directly involve his past employer, it decided that genetically engineered plant breeds and varieties could be protected under intellectual property rights and patentable by corporations (*J.E.M. AG supply, Inc., DBA farm advantage, Inc., et al., petitioners v. Pioneer Hi-bred International, Inc.*, 2000). Taylor's and Thomas' careers reflects

the revolving door relationship between Monsanto and the American government, with both of their roles as political agents serving the firm to maximize profits. Taylor relaxed regulatory and safety testing of genetically engineered products, and Thomas ruled the patenting and application of intellectual property rights onto these products as constitutional. Monsanto's success in big-agricultural was grown from several strategic, calculated political actions taken by former employees that infiltrated the public sphere. Taylor and Thomas are simply two individuals linked to Monsanto taken from a number of examples across various departments and agencies that acknowledges the extent to which an individual can advocate public policy for exclusively private interests, brushing economic, public health, and environmental risks aside.

Likewise, Monsanto board members, staff lawyers, and lobbyists previously held positions in the White House such as Legislative Affairs Specialist, Secretary Department of Commerce and U.S. Trade and Ambassador, and Chief of Staff (Sharav, 2016).⁷ Multiple members of congress also went on to fill Monsanto positions such as lobbyists, political strategists, and tax consultants (Sharav, 2016). One senator and seven members of the House of Representatives have previously owned stock in Monsanto while they served (Boschma, 2013).⁸ Regarding federal agencies, individuals have gone to Monsanto from the EPA Office of Pollution Prevention & Toxic Substances, the USDA Animal & Plant Health Inspection Service, the USDA Agriculture Biotech Council, the FDA food advisory committee, and the United States Trade Representative (Sharav, 2016).

Numerous examples of 'revolving-door' practices are substantial in reflecting the tight-knit relationship between Monsanto and various governmental institutions throughout the United

⁷ These were respectively David Bockorny, Mickey Kantor, and Jack Watson

⁸ According to Open Secrets these included, "Sen. Kay Hagan (D-N.C.) and Reps. Dave Camp (R-Mich.), Joe Kennedy III (D-Mass.), Alan Lowenthal (D-Calif.), Michael McCaul (R-Texas), Jim Renacci (R-Ohio), Jim Sensenbrenner (R-Wis.) and Fred Upton (R-Mich.)"

States; however, documents have been uncovered through WikiLeaks that further corroborate an agenda taken by the United States to accommodate biotech and big-agriculture corporations in order to exert their political and economic influence around the world.

The International Political Influence of Monsanto

Monsanto's 2005 pledge report entitled "Seeding Values" has an entire section dedicated to the, "Ethical Frameworks for Agricultural Biotechnology," with a revealing excerpt that goes as follows: "Through dialogue with many people, Monsanto has learned to appreciate that agricultural biotechnology raises some moral and ethical issues that go beyond science. These issues include choice, democracy, globalization, who has the technology, and who will benefit from it" ("Seeding Values", 2005, pg. 32). 'Dialogue' and 'many people' are such vague terms to employ by the firm; however, 926 leaked diplomatic cables have revealed that 'these people' that Monsanto have conversed with include top U.S. State Department officials.

In 2013, Reuters published a column by Carey Gillam that discusses how 926 diplomatic cables released by WikiLeaks read how U.S. taxpaying dollars fund lobbying efforts abroad in order to promote the distribution of Monsanto's genetically engineered crops (Gillam, 2013). Embassies in over 100 countries were in contact with State Department officials discussing how to actively stimulate the commercialization of GE seeds developed by Monsanto. Negotiations were facilitated surrounding patenting and intellectual property right issues, and public criticism by vocal opponents of Monsanto products were attempted to be quelled (Gillam, 2013). When put into the context of Monsanto being fined \$1.5 million under the Foreign Corrupt Practices Act for bribing a political Indonesian official, the United States' involvement of international Monsanto affairs becomes more perplexing ("Monsanto fined", 2005). These cables show that when Monsanto has trouble gaining traction in foreign countries, the State Department is a

reliable resource to reach out to. Wenonah Hunter, director of nonprofit consumer protection group Food & Water Watch, stated how these cables have deeper meaning than reflecting how the United States promote biotech and big-agriculture initiatives abroad stating, “It really gets down to twisting the arms of countries and working to undermine local democratic movements that may be opposed to biotech crops, and pressuring foreign governments to also reduce the oversight of biotech crops” (Gillam, 2013). The fact that farmers’ concerns regarding the Bayer-Monsanto merger were ignored by domestic regulators is no longer surprising, considering that the United States government is willing to mobilize the State Department and taxpayer dollars in order to combat public and government resistance to Monsanto’s biotech crops across the world.

If we return to the discussion of the ‘Green Revolution’ that occurred throughout the mid-20th century, the American government partnered with the Rockefeller foundation in order to improve the food security of underdeveloped countries across the world. In *The Violence of the Green Revolution: Ecological Degradation and Political Conflict in Punjab*, Vandana Shiva discusses how India adopted these industrial agricultural practices in order to feed the world. Plants were filled with fertilizers and flooded with water that degraded soil conditions (Shiva, 1989). Nutritional quality and biodiversity was disregarded in order to maximize yields, which in turn necessitated the use of pesticides and fungicides due to a host of fungi and pests being drawn to such dense croplands (Shiva, 1989). She also discusses how tens of thousands of farmers were displaced into slums and while their air, water, and soil had been polluted, all so India could adopt these industrial production methods to become the world’s second largest supplier of wheat (Shiva, 1989). The United States government and its most valuable investors publicly funded the first ‘green revolution’ to feed the world; however, the ‘gene revolution’ was

crafted by governmental institutions and Monsanto to impose laws that maximize the private profits of big-agriculture and biotech corporations.

Marie-Monique Robin, author of *The World According to Monsanto*, questions whether patents on the genetic recoding of living organisms can be equated to a new form of international “economic colonization” (Robin, 2012, pg. 311). Robin, with the help of Shiva, draws a comparison between the use of patents by European sovereigns to have exclusive rights in the conquering of foreign lands and, “the economic conquest through the appropriation of living organisms by the new sovereigns, the multinational corporations like Monsanto” (Robin, 2012, pg. 312). In the past, governments would appropriate land through enclosure acts, and now governments facilitate the conquest and appropriation of *actual living organisms* that are cultivated from that land through intellectual property rights. In both instances, the populations most affected by the exclusions were the most disadvantaged — the poor. Pollan discusses how biotechnology can be viewed as the scientific insertion of human intelligence into other living things, with seeds attaining added-value by actually inserting “us in them” (Pollan, 1998, section 2 paragraph 5). This is relevant to the work of Robin in that seeds have lesser intrinsic value without being genetically modified, just as land was considered devoid of worth before colonizers invaded its native populations (Robin, 2010). Knowledge surrounding life sciences is further enclosed as the number of biotechnological patents increase. Even though this patent-centric market strategy has proven to undermine the economic rights of the lower classes, the World Trade Organization’s (WTO) Trade (originating from the GATT) in cooperation with the United States has continually pressured Monsanto’s biotech seed patents across the globe. Enclosure of land have evolved into enclosures of knowledge.

If WikiLeaks' diplomatic cables were not enough evidence to convey the United States international political influence, then a review of the World Trade Organization's (WTO) Trade Related Aspects of Intellectual Property Rights (TRIPS) surely conveys how the United States has pressured foreign states to adopt patent laws that favor big-agriculture, biotech firms, and most importantly Bayer and Monsanto. The final round of the General Agreement on Tariffs and Trade in 1994, known as the "Uruguay Round," was a victory for big-agriculture and biotech corporations. The United States pushed for four areas to be included into the final international trade agreement that were otherwise only under domestic political jurisdiction, two of which that were substantial for Bayer-Monsanto: agriculture and intellectual property rights ("TRIPS", 1994). Robins discusses how a study conducted by the University of Quebec was used by the U.S. trade representative to justify the inclusion of these areas. The study found that \$24 billion were lost by multinational corporations due to "a weakness or absence of protection for intellectual property in some countries," with the majority of these countries being from the underdeveloped South (Robins, 2010, pg. 313). Once again, the U.S. government promoted international trade policy that favored firms including Bayer and Monsanto at the expense of those most disadvantaged.

Applying intellectual property rights to agriculture and biotechnology was further implemented in the drafting of the TRIPS agreement just before the WTO replaced the GATT in 1994. TRIPS was shaped by a coalition of firms that were referred to as the Intellectual Property Committee (IPC), and consisted of several major biotech firms (Robins, 2010). The original outlined was entitled the "Basic Framework of GATT Provisions on Intellectual Property: Statement of Views of the European, Japanese, and United States Business Communities", which formed the initial basis for TRIPS in 1988 (Robins, 2010). It claimed that the extension of the

patent system used by industrialized nations was necessary for the underdeveloped world. In fact there was a specific line that stated “This protection should apply to the processes as well as the products of biotechnology, whether they be microorganisms, parts of microorganisms, or plants” (Robins, 2010, pg. 314). The official WTO text decided that plants and animals could be excluded from patent protections; however, types of genetically modified plant varieties could not (“TRIPS”, 1994). The WTO, conveniently for Monsanto, ruled that genetically engineered seed varieties were patentable — the same products that Monsanto has founded as an agricultural and biotech empire. If a nation does not enforce property rights to which Monsanto lays claim, the company can inform the U.S. government to bring it to the WTO Dispute Settlement Body (Robin, 2010). Through the acquisition, Bayer-Monsanto, the United States, and the WTO are all so interconnected and are thus able to influence the political jurisdiction of intellectual property rights across the world.

Through international patent laws advocated by the United States, Bayer-Monsanto could very well control the world’s majority of seeds and therefore dictate the distribution of food worldwide — potentially having a role in the governance of populations worldwide. Bayer has stated that farmers are the driving force of the acquisition, to improve agricultural products and solutions, yet even with economic evidence supporting their claims of market exploitation, they were ignored. Total R&D spending has been reduced throughout patterns of agricultural consolidation, yet it is often just accepted that cooperation between corporations will spur innovation. Concerns have been raised regarding the toxic qualities of chemicals and the unknown long-term effects of genetically modified food, yet food safety and public health regulatory agencies continue to turn a blind eye. Opponents have been vehement about strict GMO labeling guidelines, yet legislation has still been endorsed across administrations that favor

the firms that profit from the products. Foreign governments and public populations around the world have opposed the spread of genetically engineered products, yet the U.S. State Department has mobilized resources and spent taxpayer dollars in order to pressure Monsanto objectives abroad. Evidence reflects that appointed regulatory officials, elected political representatives, and international bodies of trade have all participated in coercive activity that prioritizes the interests of corporations at the expense of the consumer. Polanyi's embeddedness is once again relevant. One would think issues regarding food security are determined by public interests, yet they are dictated by the private firm. Big-agriculture and biotech firms may have a role in effecting the quality and legitimacy of democratic governmental institutions across the world. Agricultural markets, in conjunction with international trade and patent law, have fostered emerging forms of colonization that appear to almost be completely hidden from the greater public. Political relationships with the United States have pressured, and will continue to pressure, the international distribution of Bayer-Monsanto products. Knowledge surrounding agricultural production methods, food safety, environmental sustainability, and public health have all been embedded, have been crafted by political officials, and have been incentivized by corporate actors. The Bayer-Monsanto acquisition further blurs the boundary between governmental institutions and the firm, and fosters penetrations of private logics into the public sphere.

Conclusion- The Bayer-Monsanto Acquisition as a Continuation of Corporate Political Order

“Control oil and you control nations; control food and you control the people”
-Henry Kissinger, 1974

I was surprised to read that Bayer and Monsanto met with President Trump in early 2017. A Bayer official stated that, “it was a productive meeting about the future of agriculture and its need for innovation”. Why would this be one of Trump’s primary objectives right after being sworn into office? Trump is a notorious businessman, but I was not aware of any direct ties involving him or members of his administration to either of these companies. As my research progressed, I learned how this meeting was not of importance to Trump as an individual, but rather to the United States as a leader in global trade. From Bayer and Monsanto’s standpoint, future regulatory agency officials appointed by the president would be vital for the merger to be approved. However, from the viewpoint of the Trump administration, this would be yet another opportunity for the U.S. to dictate the future of big-agriculture and biotech.

Initial state involvement in agriculture began with the enclosure acts of England, taking public land from the peasantry. Eventually government-sponsored educational institutions began to generate and spread knowledge surrounding efficient and highly productive agricultural techniques. Once industrial production methods proved profitable in the United States, the spread of these technologies was instigated across the developing world to feed the globe. With such intense state involvement, the firm did not play the dominant role in guiding agricultural markets. It was not until the advent of chemical inputs and genetic engineering used to modify the very biological structure of seeds did the corporation cement its market influence.

Corporations played a fundamental role, through the shaping of international trade policy and the

creation of the WTO, in order to justify the institutionalization of intellectual property rights related to genetically engineered seeds. In essence with cooperation of the United States, few firms had the ability to control of the world's agricultural inputs. Domestically, political influence has been maintained through a variety of tactics. These include political contributions made during election cycles (Bayer and Monsanto have their own PACs), revolving employees from industry to the government and back, and increased lobbying efforts that have penetrated the influence of firms such as Bayer and Monsanto into political institutions not only in the United States, but across the world. With this political leverage, corporations have the capability to direct legislation and policy across a number of institutions that contribute to determining how safety tests are regulated, how living organisms are patented, and what rules for international trade are dictated. Unfortunately, these policies often cost the most to those who actually purchase and grow the products — economically disadvantaged farmers across the world.

At the start of my research, I suspected the U.S. government had the goal of penetrating agricultural markets. I also believed this goal was driven to maximize the productivity and efficacy of food productions systems in order to more efficiently feed its citizen. However, I second-guessed these altruistic intentions behind the state's penetration of big-agriculture when I learned about the intimate role political institutions had in promoting the use of potentially toxic chemicals in tandem with patented, genetically modified seeds. Should governments provide sustenance to their citizens, or should they try to maximize profits for the corporations that feed their citizens at any public cost? Either way, the new administration of life appears to be a primary goal of the state in ways that help dictate the very health of populations through regulating (or failing to regulate) the quality of food consumed. Throughout this thesis I have presented a rather insidious presence of the state that lingers in agricultural markets, and future

research would be useful in analyzing tactics of state supervision and the study of, “*interventions and regulatory controls*” that monitor these markets (Foucault, 1990, p.139). Foucault would refer to these calculated market penetrations as, “a biopolitics of the population” (Foucault, 1990, pg.139).

The appropriation of Foucault’s theory of biopolitics becomes apparent with the deployment of state power linked to the human body (Foucault, 1990). An article from the *Journal of Agriculture and Human Values* (1999) included a quote from a 1997 interview with the former president of Monsanto, Hendricks Verfaillie, stating, “Once we add quality traits into crops, traits for producing healthier foods, the line between crops and food will be erased. Take one step beyond that and build healthenhancement compounds into crops. The line between pharma and crops and food will have been erased. That’s what we call life sciences” (Kneen, 1999, pg.163). Biotechnology is essentially designed to insert human intelligence into other organisms, and through the development of life sciences, Monsanto has inserted technologies into the majority of food we eat. Biopolitical concerns can be extended to non-human actors as well — not simply the populations that consume genetically modified Monsanto products. Monsanto has successfully lobbied for political institutions to support the permeation of its products across global agricultural markets. States and international trade institutions do not only allow their products to monopolize agricultural inputs, they have a direct role in reinforcing it. It must be asked if states, through this reinforcement to control global food networks, have “given rise to infinitesimal surveillances, permanent controls, extremely meticulous orderings of space...to an entire micro-power concerned with the body” (Foucault, 1990, pg. 145). I suspect that knowledge surrounding food security and production has been a quite direct agent used to target power through the transformation of human life, allowing the state to achieve a calculated,

disciplined social order through bottom-up methods of voluntary participation. If consumers, including myself, fail to question everyday tasks such as where the food they eat comes from, can this complacency be reflected through other political facets of life?

But other than implementing monopolistic practices and dominating the world's food supply, I am skeptical of a pharmaceutical firm merging with that of agriculture. Pollan discusses how, "four of the top 10 killers in America today are chronic diseases linked to diet: heart disease, stroke, Type 2 diabetes and cancer", and as health care expenses continue to increase, is there not a conflict of interests (Pollan, 2008, paragraph 4)? Furthermore, are there not severe implications given a corrupt regime uses the management of its populations as an objective of a government? Is there a more effective way for said state to disallow certain forms of life when the majority of all vertical and horizontal food production networks that feed its population are controlled by a single firm? In an analysis of 20th century German chemical cartel IG Farben, historian Peter Hayes states, "Nazi economic policy rested on the recognition that so long as a state displays its determination but permits businessmen to make money, they will let themselves be manipulated as to how" (Hayes, 2000, pg. 379). The leading firm of IG Farben, the very cartel that contributed to mass genocide by producing gas-chamber-used Zyklon-B toxin, was the company Bayer. The same company that acquired Monsanto, is yet another firm intrinsically tied to the poisoning of millions through inundation of hazardous chemicals on crops and fraught genetic engineering practices.

Despite either of these companies' somewhat scandal-filled histories, the dangers associated with the consolidation of agricultural are apparent with my study's examination of the commodification of nature. The application of intellectual property rights in the patenting of seeds is a completely new form of commodifying nature, indirectly embedding land with market

logics through agricultural input products sold by Bayer-Monsanto. This is where Polanyi can be brought into discussion of this project along with Foucault.

Whereas Polanyi initially theorizes the dangers associated with the entanglement of political and markets logics, Foucault takes a step further in characterizing this entanglement of knowledge between the private and public spheres as a matter of meticulous calculation. This interpenetration of knowledge viewed through Polanyi's conception of embeddedness would be deliberately measured in order to form multitudinous institutions that most efficiently govern populations. Polanyi remarked: "...land and labor are no other than the human beings themselves of which every society consists and the natural surroundings in which it exists" (Polanyi, 2001, pg. 75). Forcing land and labor to operate within mechanisms of the market subordinates the societal logics into the laws of the market. Enclosure movements originally privatized land to facilitate these market logics, but now, Man actually *produces nature* through genetic modification in a calculated manner. The life sciences appear to have found a way to truly turn what Polanyi referenced as a "fictitious commodity" into a man-made good (Polanyi, 2001, pg. 76). Artificially constructed market economics created space for the artificial construction of nature. Ecological byproducts have essentially become an accessory to the neoliberal economic system, adding an entirely new dimension to the dangers Polanyi originally suspected when land is rendered to market ideology.

Throughout the history of agriculture, I presented how forms of enclosure resulted in social dislocations. The economically disadvantaged often suffered the most from agrarian legislation and policy that ultimately set the foundation for companies such as Bayer and Monsanto to gain economic and political power; however, Polanyi discusses how throughout the social history of the nineteenth century a double movement occurred. This double movement was

characterized as, “the extension of the market organization in respect to genuine commodities was accompanied by its restriction in respect to fictitious ones” (Polanyi, 2001, pg. 79). If market mechanisms dictate the purchase and flow of nature and people, the result would be social catastrophe. Markets spread across the world, yet political institutions still checked these market actions relative to fictitious goods such as land and labor. Polanyi claims how, “society protected itself against the perils inherent in a self-regulating market system” (Polanyi, 2001, pg.80); however, is this still the case today?

The Bayer-Monsanto acquisition has been approved by political regulatory institutions across the world, and international trade institutions have promoted the spread of products regardless of potential environmental or public health related externalities. As discussed by Polanyi, this acquisition is an indicator that the embeddedness of the public and private sphere is continuing into the 21st century, coming to the point where markets of fictitious goods have been the least vulnerable to any type of checks or balances (Polanyi, 2001). Market growth has reigned supreme, but a contemporary ‘double movement’ is lacking to check the power of the consolidating agricultural market. Enclosure movements have evolved to avoid these regulations. The commodification of land often proved to be environmentally and socially detrimental. Now agrarian inputs, seeds and chemicals sold by Bayer-Monsanto are the products that political institutions have allowed gargantuan corporations to be incomplete, private control. Dangers were once easily observed by the public, but now the potentially catastrophic political, economic, social, and environmental effects are made invisible by that of the private firm with help from the state. Economic indicators such as prices have been softened by federal legislation, safety tests have been deemed unnecessary by regulatory bodies, GMO labelling has been censored, and covert diplomatic operations have attempted to spread Bayer-Monsanto products across the

globe. One would think the food that a state's population consumes should be one dictated by public engagement and democratic practices, yet the evidence presented throughout this thesis points to the contrary. Polanyi's logic of political and economic embeddedness is apparent in the agricultural markets, with firms being scrutinized to less resistance from public governmental institutions to protect the ecology and public health of societies they are meant to serve.

The Bayer-Monsanto acquisition has been utilized in this study as an analytical focal point, generating something of a theater of study to examine emerging political aspects that big-agriculture and biotech companies implement across the world. I have presented various short term externalities resulting from the governance of agricultural markets, but what long-term political implications can be extrapolated from this acquisition? There is a sense of naturalness that surrounds laissez faire market mechanisms that ultimately operate in certain calculated, predetermined ways. As if a creed, free markets are accepted as truth, yet where does this perceived freedom lie within these markets? My research has shown that in the context of this particular acquisition, both economic and natural sciences have been taken for granted, used in ways to benefit those who already hold political and economic power (and at times to great cost to others who do not). Science is not value neutral, and human intervention is continuing to expand in realms that God will not. Science is linked to society, culture, and most importantly mechanisms and institutions of power. Genetic modification, the use of toxic pesticides, and intellectual property domination relative to food grown across the world have all exhibited how defending the interests of the public consumer may be fictive. As neoliberal logics reign states that rely on the effectiveness of self-regulating markets may face grave, long-term political implications that creates space for both opportunities and dangers if the interests of the greater public are ignored. This space could even foster a new sovereignty. In light of my findings, if

society continues to be justified by market logics, even at the ignorance of societal interests, roles for alternative sovereigns could emerge — roles that corporations like Bayer and Monsanto may be able to fill.

If anything has been elucidated through this study it is that prudent future research involves determining whether governmental strategies of intervention have been forced onto populations through agricultural markets, strategies that have the ultimate goal to foster knowledge that controls and modifies the very biological processes of life and societies they constitute. This thesis has presented how the state has always had a hand in the organization of industrial agriculture and how the public is fed, but most importantly it asked what actors is it choosing to benefit and why, and at what cost to the greater public?

Throughout this research, the most vital conclusion is that the state, before any other actor in agricultural markets, has chosen to benefit corporations. The emergence of genetic engineering and intellectual property rights have allowed contemporary forms of conquest to emerge. Farmland used to grow our food is now indirectly appropriated through the use of agricultural inputs that are incentivized to be used by the state, and these inputs happen to be the explicit modification of actual living, non-human organisms. An irony is found here in that the genetic code of living, non-human organisms is transformed to ultimately calculate the governance of other living, human populations. I have presented that political power has encouraged that Bayer-Monsanto products be consumed by billions, all at grave costs to the safety of food we consume, the ecological life of the planet, and the health of the greater public.

I would like to finish my conclusion by returning to the discussion I had with myself at the beginning of my research. I asked if the food we eat, and lack of knowledge surrounding its production, in any way reflects how we are governed. If so, *why* is this and *benefits who*? In

general, I suspect few citizens are well-informed on food production or how the majority of our food is grown from genetically modified seeds sold by Bayer or Monsanto, yet eating food that originates from these seeds is something a majority of the world does multiple times on a daily basis. Although there are some valid voices of journalists and environmentalists that attempt to rouse apprehensions relative to food security, I find these voices to be too few and far between in order to combat contemporary political power dynamics embedded within agricultural markets.

What we eat is the energy that fuels us, contributing to the very biological vitality of our bodies and minds. If a society is rendered complacent to what it consumes day-in and day-out, is this indicative of how its population can be manipulated in such ways to voluntarily participate within calculated political power structures that are driven from the bottom-up? If individuals continue to accept what they eat at face-value, does this not reflect societies' fatalistic attitude toward broader political institutions? I claim that the lack of general public discussion surrounding contemporary food networks symbolizes the absence of such resistance to exploitative, democratic political institutions that are increasingly embedded in capitalist market ideology.

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