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An Institutional Perspective on Innovation System Dynamics: *The Case of Plant-Based Proteins*

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Abstract

Inefficiencies in current practices associated with meat consumption and production have prompted societies to search for more environmentally sound alternatives. Plant-based proteins have been identified as viable substitutes for meat products with substantially less to no environmental, health, and social impacts. In the United States, the market for plant-based proteins has undergone an immense transformation since its beginnings in the 1970s causing one to question the driving force behind this transition. The technological innovation systems (TIS) framework has been identified as a proclaimed framework to analyze these societal shifts to more sustainable modes of both consumption and production. Given, the deeply cultural aspects associated with food, however, this study complements the TIS with institutional theory in order to examine the institutionalization and de-institutionalize processes employed by actors in the United States plant-based protein innovation system. Theory on the structuration of socio-technical regimes is also incorporated to conceptualize the dominant American 'meat' regime. Accordingly, this research conducts a qualitative event analysis from 1978-2019. Findings indicate that plant-based protein actors mainly *create* institutions through gaining legitimacy for the plant-based protein industry. Apart from simply creating institutions, actors simultaneously fit into *existing* practices associated with meat consumption and production which has resulted in unprecedented growth of the plant-based protein industry in America.

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1. Introduction

The recent escalation of global environmental problems has prompted societies to search for more sustainable methods of production and consumption in multiple societal domains (Fuenfschilling & Truffer, 2014; Markard et al., 2012). One of the sectors with the largest environmental impacts is the food sector (Aiking, 2011; Kohler et al., 2019; Tziva et al. 2019;). Some of the most substantial impacts are its contribution to climate change, species loss, land use change, and distorting both the nitrogen and water cycle (Boer & Aiking, 2014). While the food sector is already a major contributor to environmental problems, the challenges are likely to increase. By 2050, a societal 'grand-challenge' the food sector faces is taking on the requirements of providing enough food for an increasing global population, hypothesized to reach 9 billion. Research suggests that this entails increasing food production by at least 70% (Aiking, 2011; FAO, 2009). Achieving this goal demands necessary improvements in food system efficiency, as current 'business-as-usual' methods do not nearly suffice (Aiking & Boer, 2018; Alexander et al., 2017).

One of the most promising strategies to achieve sustainable food security is transforming meat consumption and production practices in societies oriented around meat (Aiking & Boer, 2014). Both the scale and intensity of producing meat from animals results in intolerable environmental impacts. Specifically, an estimated 1kg of animal protein requires nearly 6 kg of plant-proteins to produce (Aiking & Boer, 2011). Additionally, meat production has been associated with rising CO_2 emissions and is cited as being one of the largest contributors to global climate change. Not to mention, the production of animal proteins is increasingly associated with rising biodiversity loss, depletion of global water resources, and pollution. Equally important, in recent years, meat consumption has been increasingly correlated to both public health and dietary problems, such as its link to cancer and cardiovascular disease. Finally, rising concern over factors such as animal welfare has been negatively associated with the industry (Petrovic et al., 2015; Weele et al., 2019). Consequently, holding the meat industry responsible for a disproportionate amount of human and environmental pressures (Aiking & Boer, 2011).

Research has shown that pressing sustainability challenges such as those associated with meat consumption and production are the result of deeply entrenched societal norms and practices (Kohler et al., 2019). Western nations specifically are seemingly 'locked-in' to a meat-

oriented society (Frank, 2007), as per capita meat consumption is increasing annually in places like the United States (Godfray et al., 2018). In American culture, for example, meat has been coined as a symbol of masculinity, freedom, and economic status. In addition to being positively associated with an essential part of a nutritious diet (Modlinska & Pisula, 2018; Sobal, 2005). Nonetheless, in recent years, there has been an urgent call to search for more profound alternatives (Weele et al., 2019).

Markedly, novel alternatives known as meat substitutes, defined as those innovations which have the similar appearance, taste, and texture of meat, enjoy a strong rise in popularity (Weele et al., 2019; Tziva, et al., 2019). Notably, in the United States, the rising plant-based meat alternative industry has experienced unprecedented growth since 2016, accounting for nearly $800 million in yearly sales ("Plant-Based Food Retail", 2019). Causing one to ask the question, how exactly is this occurring in one of the world's largest meat consuming countries and why *now*?

Literature on transitions has been used to unravel how exactly these radical shifts to new methods of production and consumption, or *technological transitions*, take place (Geels, 2002; Kohler et al., 2019; Markard et al., 2012). Granted that this research is focused on the diffusion of a novel technology, a proclaimed framework within transition literature is the *technological innovation systems* approach (TIS). The TIS proves useful to explain the rise of new products. Moreover, the TIS explores how a technology diffuses through an innovation system, focusing on specific activities carried out by actors (Hekkert et al., 2007; Markard et al., 2012; Suurs, 2009; Tziva et al., 2019). The TIS approach is widely acclaimed for conceptualizing how new technologies are eventually able to overthrow established 'regime' technologies, i.e. those incumbent technologies deeply rooted in society (Markard et al., 2012). Furthermore, the TIS approach exhibits both a strong technological and institutional character conveyed through function fulfillment.

Conventional TIS studies highlight the necessity of an exceptional technological component to induce diffusion of a technology throughout an innovation system. However, given that *'first generation'* meat substitutes have been featured on the U.S. market since the 1970s, this forces one to question if technology is the sole factor behind its recent and rapid diffusion (Tziva et al., 2019). In the food sector we see that consumers are not motivated entirely by technological factors, but instead other aspects such as identity, ethical, egoistic, and altruistic

motivations play a substantial role. Moreover, consumers' *perception* of food and the meanings it holds influence consumer behavior (Verain et al., 2016). Thus, convincing people to change their diet is far from simple as it requires careful consideration of both deeply personal and cultural mechanisms which impact human choice (Modlinska & Pisula, 2018). This therefore implies that while "technological fixes" are necessary, they do not simply suffice on their own. Drastic changes in cultural and normative behaviors are crucial (Bakker & Dagevos, 2012). Furthermore, given the cultural aspects surrounding meat consumption, this research focuses on the institutional build-up of a technological innovation system. It is these institutional characteristics that enable one to gain deeper insights into TIS-regime interaction.

Currently, there is a lack of understanding of how novel innovation system actors can influence these regime shifts and how exactly they unfold. There is no thorough understanding of how strategies employed by actors influence innovation system development and thus, are able to overthrow or create a dent in the current regime. Recent topics within the literature, nonetheless, have examined the 'flip-side' of transitions in which a regime may both decline or be phased out in its entirety due to increasing pressure from niche-innovations (Geels, 2002; Geels, 2012; Kohler et al., 2019). However, these breakthroughs or 'tipping-points' remain largely understudied in transition research and thus, require greater explanation in light of the harrowing global issues mentioned prior (Kohler et al., 2019).

Institutional theory, therefore, provides as a necessary complement to the TIS as it explains how actors embedded in a socio-technical system, are simultaneously enabled and constrained by their institutional environments. It delineates how actors as agents both hold influence and are influenced by their institutional structure. Institutional work, within institutional theory, unravels the strategies actors use in order to purposefully *create*, *disrupt*, and *maintain* institutions. Furthermore, it delineates how actors are able to challenge existing regimes through the deployment of institutional work strategies (Lawrence and Suddaby, 2006; Zietsma and Lawrence, 2010).

Fuenfschilling & Truffer (2014) provide a conceptual foundation for evaluating institutional structures within a socio-technical system and assessing their degrees of structuration. Moreover, the framework highlights how actors' behaviors are shaped by prevailing institutional logics (Fuenfschilling & Truffer, 2014). Institutional logics being defined as the "*deep-structural rules that coordinate and guide actor's perceptions and actions*" (Geels,

2012). As a result, this research also incorporates aspects of this framework but delves deeper focusing on smaller-scale *institutional practices*. Institutional practices are largely influenced by and built-upon prevailing institutional logics (Zietsma & Lawrence, 2010). Furthermore, given that transitions require overcoming existing largely path-dependent and historically embedded institutionalized structures, in order to fully understand technological change, it is crucial that one also understands institutional change (Fuenfschilling & Truffer, 2014). Therefore, the inclusion of both theory on the structuration of socio-technical regimes and institutional work to literature on transitions effectively allows one to analyze how actors in a developing innovation system are able to construct and continuously reinforce novel practices while de-institutionalizing those practices deeply entrenched in society.

Empirically, this research employs a qualitative single-case study of the plant-based protein transition in the United States from 1978-2019, in order to analyze the strategies by which dominant actors in the plant-based protein industry have challenged America's deeply ingrained institutions surrounding its 'meat culture'. This research aims to understand how various actor groups have challenged these *'taken-for-granted'* institutions and thus, contributed to the widespread adoption of meat substitutes throughout the United States. Given, the aforementioned necessity of an efficient method to meet rising food demands this research serves beneficial to not only wider society as a whole, but also to the nation's working to accelerate the protein transition in their countries. Moreover, if this thesis is able to provide rationale for how sustainability transitions, such as that of plant-based proteins, are able to challenge the dominant 'meat' regime in America, those working to further accelerate the transition can develop strategies which further promote the diffusion of meat alternatives. Additionally, seeing that meat consumption and production is cited as a massive source of depletion of our earth's finite resources, identifying the drivers behind this transition will direct the focus towards more sustainable methods of production and consumption. Therefore, the research question is as follows:

How are actors in the plant-based protein innovation system challenging dominant meat-based institutions in the United States?

The remainder of this thesis is structured accordingly, Section 2 will introduce and delineate the theoretical framework underpinning this analysis. Section 3 outlines the methods used to guide

this study. Section 4 presents the results derived from this analysis. Section 5 is the discussion. Section 6 provides the conclusions and directions for future research. Finally, section 7 concludes this thesis with acknowledgments.

2. Theoretical Framework

The theoretical framework is structured as follows. Firstly, the *technological innovation systems framework (TIS)* is outlined and described given that this research focuses on the plant-based protein technological innovation system in the United States. Following, the *structuration of socio-technical regimes* and specifically, *institutional practices* are discussed to provide the logic needed to properly conceptualize regime structure. Finally, *institutional theory* is delineated in order to provide the rationale for how actors maneuvering in the plant-based protein innovation system effectively contest dominant meat institutions and create those which facilitate the transition towards plant-based proteins in America.

2.1 Technological Innovation Systems

Transitions literature has been increasingly utilized to examine the complex dynamics involved in sustainability transitions, ultimately leading to systemic change (Tziva et al., 2019). It examines the complexities associated with transitions as they require the coevolution of societal norms, user practices, actors, infrastructure, markets, and institutions (Kohler et al., 2019). Furthermore, it is composed of a myriad of differing theoretical perspectives including the technological innovation systems framework (TIS), the multi-level perspective (MLP), transitions management (TM), as well as strategic niche management (SNM) (Geels, 2002; Geels and Raven, 2006; Hekkert et al., 2007; Loorbach et al., 2010).

Within this body of literature, the technological innovation systems framework has been demonstrated as a renowned framework to analyze sustainability transitions (Markard & Truffer, 2012; Markard et al., 2015). The TIS employs a systemic perspective in an attempt to properly capture the co-evolutionary nature of sustainability transitions. It explains the mechanisms supporting path-dependency, technological emergence and development, and the non-linearity of the innovation process (Hekkert et al., 2007; Kohler et al., 2019; Markard & Truffer, 2008; Tziva et al., 2019).

Analytically, the technological innovation systems framework diverges from other transitions approaches, as it examines the conditions necessary for both the successful diffusion of a specific technology and the creation of a technological field (Hekkert et al., 2007; Markard & Truffer, 2008; Tziva et al., 2019). The TIS analyzes the influence of actors, institutions, infrastructure and the interactions among them on an emerging technological field. Additionally, the framework expands its explanatory power by shedding light on the vitality of systems functions. System functions are defined as specific *processes* which influence both the functioning and diffusion of a technology throughout an innovation system (Bergek et al., 2008; Hekkert et al., 2007). Furthermore, the framework introduces seven dynamic systems functions which determine a system's overall performance or success.

Table 1 below depicts each system function and its definition.

Table 1. Systems Functions as adapted by Hekkert et al. (2007)

Systems Functions	**Definition**
1. Entrepreneurial activities	Entrepreneurs are a central component of innovation systems. They promote learning through experimentation, willingness to take risks, and their abilities to cope with uncertainties and turn them into novel business opportunities.
2. Knowledge development	This function pertains to research and development, as well as knowledge about markets, users, application of technologies, and networks.
3. Knowledge diffusion	This function, in its simplest form, can be described as the act of 'learning by interacting' and 'learning by using'.
4. Guidance of the search	Activities that affect future expectations surrounding a technology in addition to its visibility.
5. Market formation	All activities that are aimed at creating a protective niche or a temporary competitive advantage for the novel technology under analysis.
6. Mobilization of resources	Regards to all resources mobilized, whether that be human, material or financial, in an attempt to fulfill other functions.
7. Creation of legitimacy	Refers to the activities aimed at creating legitimacy for the new technology.

As mentioned, prior, for the purpose of this research the functions with an institutional nature are the focus of this research. Namely, guidance of the search [F4], market formation [F5], and creation of legitimacy [F7]. However, the remaining functions are also taken into account as these also influence the diffusion of plant-based proteins throughout the United States.

2.2 The structuration of socio-technical regimes

Given that this research is focused not only on the institutionalization of plant-based proteins but also the de-institutionalization of the dominant 'meat' regime in the US the structuration of socio-technical regimes by Fuenfschilling & Truffer (2014) proves as a necessary complement. Moreover, the framework allows for the conceptualization of the regime as it explains how institutional logics affect socio-technical systems. The scholars illuminate that socio-technical systems contain a number of materials and structures, rooted in culture, which exhibit varying degrees of institutionalization. These structures, accordingly, consist of *coexisting* logics.

The scholars conceptualize a regime as representing the most institutionalized logic of an *organizational field*. An organizational field is composed of multiple organizations that compose an agreed upon area of organizational life. The concept highlights the aggregate composition of actors whom share a common meaning system amongst them. For example, suppliers, product producers, consumers, resource producers, regulatory bodies, and other organizations which create similar products (DiMaggio & Powell, 1983; Fuenfschilling & Truffer, 2014). Organizational fields are largely heterogeneous, composed of manifold institutional elements which belong to diverse *institutional sector* logics. Scholars have identified seven principal institutional sectors that hold influence on actors in Western societies. Namely, "the family, the community, the religion, the profession, the state, the corporation, and the market" (Fuenfschilling & Truffer, 2014; Thornton and Ocasio, 2008). Each institutional sector manifests its own distinct logic. Institutional sector logics can be defined as the socially constructed rationalities which guide and govern actor's behavior in a sector. For example, institutional factors establish that firms seek profits (Fuenfschilling & Truffer, 2014; Scott, 1987). The previously mentioned ideal type logics get reorganized and reconstructed in organizational fields.

Furthermore, organizational fields represent a combination of multiple institutional sector logics which is deemed a *field logic*.

Field logics are variations of institutional sector logics and can be seen as the 'rules of the game' for that particular field. Field logics, thus, grant varying amounts of power and status to certain actors operating within an organizational field. While one logic may be the dominant logic at a certain period of time, this can also change. Furthermore, as these field logics may change over time, this simultaneously triggers a shift in actors' strategies, dominant technology, and problem focus of an organizational field (Fuenfschilling & Truffer, 2014; Thornton and Ocasio, 2008).

The strength of the regime, however, depends on the number and strength of other competing logics within the field. If a field exhibits a sole field logic that is widely accepted by actors, the regime is likely to be characterized as strong and secure. Accordingly, a regime of this type will exert significant power over regime actors and therefore, signifies change or a regime shift is highly unlikely. In line with this, if a field exhibits multiple field logics, suggesting that the regime is incoherent, this indicates areas of change within socio-technical systems. Furthermore, a weak regime suggests that multiple actors within an organizational field are competing for legitimacy and thus, weaken the structuration of the field. This serves as an indicator of a socio-technical transition as there is no longer one recognizable field logic adhered to by the majority of actors constituting an organizational field (Fuenfschilling & Truffer, 2014).

2.2.1 Institutional change from a practice perspective

Given that meat consumption and production, flexitarianism, veganism and the like are much smaller than the broader overarching field logics previously delineated, this research seeks to use Fuenfschilling & Truffer (2014) as merely an inspiration. This research, thus, uses the concept of *institutional practices* to conceptualize aspects of regime structure as theory on institutional practices recognizes that smaller-scaled practices like veganism, for example, are constructed as material enactments of larger institutional logics. Similar to field logics institutional practices are highly negotiated, ultimately resulting in shared understandings between actors. They must be widely accepted by actors and conform to specific social expectations to be deemed a *practice.* Furthermore, institutional practices are the combination of

values, culture, routines, habits and norms which provide understanding for how activities should be carried out (Zietsma & Lawrence, 2010).

To sum up, while institutional logics are broader than institutional practices, they provide the foundations from which institutional practices are born. Institutional practices, thus, are connected to these broader institutional belief systems and can stimulate structural change (Lounsbury, 2008). Therefore, combining this with the TIS is necessary as it allows one to investigate how competing practices get de-institutionalized and institutionalized by actors populating an emerging innovation system.

2.2 Institutional Theory

Given that regimes are not static, and that both transitions and technological change require efforts of a number of actors and social groups, institutional theory provides a needed complement to both approaches. It further highlights the role of actors' agency in effectively maneuvering through path-dependent systems and challenging dominant belief systems (Battilana et al., 2009; DiMaggio & Powell, 1983; Kohler et al., 2019; Meyer and Rowan, 1977). Institutional theory is a central approach in organization science expounding the relationships between organizations and the fields they operate in. Furthermore, it illuminates how seemingly 'fixed' institutions influence the decisions individuals make in their daily lives and guide their behaviors (Battilana et al., 2014; Tonoyan et al. 2010).

2.2.1 Institutional Entrepreneurship

While traditional approaches of institutional theory have focused primarily on using institutional contexts as rationale for organizational similarities, in recent years attention in the academic community has shifted to closely examining the role of actors in institutional contexts (Lawrence & Suddaby, 2006). Specifically, emphasis has been placed on the role of actors as 'embedded agents', whom are constrained yet enabled by the institutional structures in which they are embedded (Battilana et al., 2009; DiMaggio & Powell, 1983; Fuenfschilling & Truffer, 2014; Lawrence & Suddaby, 2006).

A prominent approach emerging in the literature is the theory of *institutional entrepreneurship*. Institutional entrepreneurship provides the rationale needed to understand why and how new institutions and practices both come to existence and become highly accepted

through time. It zooms in on actors' ability to influencing seemingly static or locked-in institutional arrangements through leveraging critical resources (Battilana, 2009; DiMaggio, 1988; Garud et al., 2007). It emphasizes the 'paradox of embedded agency' which highlights that structures in which actors are embedded do not merely act as constraints yet provide an environment in which actors are motivated to engage in entrepreneurial activities (Garud et al., 2007). Furthermore, it characterizes institutional entrepreneurs as individuals who not only break and disrupt existing well-established institutions but also *actively* work to institutionalize alternative practices and logics which they themselves advocate (Lawrence & Suddaby, 2006).

While institutional entrepreneurship is a dominant framework in studies of institutional theory, it primarily focuses on a main 'heroic' actor or actor group. Much of the literature on institutional entrepreneurship to date, however, fails to provide in-depth accounts of what actors actually do in order to institutionalize new practices (Lawrence & Suddaby, 2006). Therefore, seeing that this research focuses on the totality of actors' efforts aimed at furthering the plant-based protein transition in the United States, the concept of *institutional work* is also introduced.

2.2.3 Institutional Work

Institutional work broadens the institutional entrepreneurship view of a main actor and thus focuses on groups of actors' strategies aimed at institutional change. It harps on the belief that new institutions are created through efforts that go significantly beyond just that of an institutional entrepreneur. The institutional work concept furthers that of earlier work on institutional theory as it calls for the need to continuously consider and reconsider the recursive relationships between agency and institutions. It invites scholars to go beyond merely analyzing the embeddedness of actors and to further examine actors' capacity to reflect on this and thus, to undertake conscious intentionality (Lawrence & Suddaby, 2006). It takes a more *'reflexive'* approach focusing on these forms of activities aimed at purposefully affecting institutions (Lawrence & Suddaby, 2006; Zietsma & Lawrence, 2010). Furthermore, it recognizes that agency is an activity that is ongoing where individuals both reflect upon and strategically maneuver in their institutional contexts (Lawrence et al., 2011).

Lawrence and Suddaby (2006) recognize three broader categories of institutional work, namely, *creating, maintaining*, and *disrupting institutions.* Creating institutions refers to those activities aimed at the creation of new institutions. Creating institutions, therefore, relates to

regime structure as it signifies the simultaneous but gradual creation of institutions supporting new practices through the institutional work activities carried out by actors. Moreover, it suggests an eventual decrease in the coherent structuration of the regime (Lawrence and Suddaby, 2006; Zietsma & Lawrence, 2010).

Maintaining institutions refers to institutional work strategies which result in the preservation of existing institutions. Specifically, actions which reinforce dominant practices by adherence to existing rule systems and existing beliefs and norms. Finally, disrupting institutions refers to those activities which result in breaking existing institutions and thus, weaken the practice of meat consumption and production in the U.S. through meticulously dismantling the cognitive, normative, and even regulative foundations upholding them (Lawrence and Suddaby, 2006; Zietsma & Lawrence, 2010). Concluding, each category represents specific forms of work carried out by actors aimed at achieving one of the three goals.

Table 2, 3, and 4 present each category as well as the individual forms of institutional work.

Table 2. *Forms of institutional work (creating) as adapted from Lawrence & Suddaby (2006)*

Forms institutional work (Creating)	**Definition**
Advocacy	Mobilizing both political and regulatory support through deliberate efforts and tactics of social suasion.
Defining	Constructing specific rule systems that create status hierarchies, boundaries for membership or grant status identity.
Vesting	Creating rule structures which grant property rights.
Constructing identities	Defining relationships between actors and their organizational field.
Changing normative associations	Re-making and/or redefining the link between sets of practices and their cultural and moral underpinnings.
Constructing normative networks	Manipulating the relationship between accepted norms and the institutional field in which they are created.

Mimicry	Associating new sets of practices with those 'taken-for-granted' sets of practices in order to stimulate adoption and diffusion.
Theorizing	The development and classification of abstract categories in addition to the elaboration of cause and effect chains.
Educating	Educating individuals to support the new institutions created.

Table 3. Forms of institutional work (maintaining) as adapted from Lawrence & Suddaby (2006)

Forms of institutional work (Maintaining)	**Definition**
Enabling work	Creating rules that support or reinforce existing institutions, such as creating authorizing agents or redirecting resources.
Policing	Guaranteeing compliance by actors through activities such as enforcement and monitoring.
Deterring	The establishment of coercive barriers to change in institutions.
Valorizing and Demonizing	Providing the public with both positive and negative examples that conveys the normative foundation of specific institutions.
Mythologizing	Maintaining the normative underpinnings of institutions by effectively sustaining the myths of its history.
Embedding and routinizing	Actively incorporating the normative underpinnings of an institution into individual's day to day routines and activities.

Table 4. Forms of institutional work (disrupting) as adapted from Lawrence & Suddaby (2006)

Forms of institutional work (Disrupting)	**Definition**
Disconnecting sanctions	Institutional work directed at the state (i.e. government bodies) working to disconnect rewards and other government sanctions from a technology, practice or rules.
Disassociating moral foundations	Activities leading to dissociation of old norms, practices, rules, or technologies from their moral foundation within their specific cultural contexts.
Undermining assumptions and beliefs	Activities which strategically undermine core assumptions and beliefs and result in decreased perceived risks associated with innovation.

Concluding, the addition of institutional work to both the TIS and theory on regime structure allows one to pinpoint exactly which institutional work strategies result in greater function fulfilment and thus, are able to effectively challenge and over-throw existing practices surrounding the United States meat industry.

3. Methodology

This chapter presents the methodology used to conduct this research. Firstly, the research design is explained. Secondly, data collection and analysis methods are discussed. Finally, research quality is delineated.

3.1 Research Design

This research employs a descriptive qualitative event analysis by means of a single-case study of the US plant-based protein innovation system from 1978-2019.

3.1.1 Case Selection

The United States has been selected as a case for this research. Remarkably, the US serves one of the world's largest exporters of meat (FAO, 2018) and while meat consumption is already high, per capita consumption continues to rise (Kruse, 2019). Nevertheless, meat is deeply ingrained in America's socio-political context and its culture, often coined as 'America's favorite pastime' (Frank, 2007; "My Beef with Beef", 2013). In addition, recent advancements in farming technology have lowered the barriers to American meat consumption offering both lower prices and increased access to products ("My Beef with Beef", 2013).

As previously mentioned, however, the plant-based meat sector has undergone a rapid transformation. Despite decades of unignorable stagnation, in recent years, the US has become home to a more-than-remarkable plant-based protein industry, experiencing sky-rocketing sales from 2016 onwards. In 2018 alone U.S. sales of plant-based proteins grew over 10% valuing the plant-based market at 4.5 billion dollars ("Plant-based Food Market", 2019). Therefore, the US proves to be a more than suitable landscape for this study.

System boundaries are delineated to focus on the plant-based meat substitutes food processing sector in the US. This includes those product manufacturers which are non-US based but sell their products in the United States meat substitute market, as these innovations are likely to hold noticeable influence on the plant-based protein TIS.

3.1.2 Case background

In line with Tziva et al. (2019), this thesis conceptualizes the advancement of technology in the sector by distinguishing between *first-generation* and *second-generation* meat substitutes. First-generation meat substitutes, or textured vegetable protein (TVP) products, are made by low-moisture extrusion methods and characterized by their rather hard texture and chewy consistency (Lin et al., 2000). Second-generation products, however, use a high-moisture extrusion process resulting in a texture, flavor, and even an appearance which closely resembles real meat (Lin et al., 2000; Tziva et. al, 2019). While the United States has engaged in first-generation products for decades the emergence of novel second-generation products has resulted in increased adoption of meat substitutes in the country (Asgar et al., 2010). These second-generation technological developments have sparked the birth of successful international plant-based protein start-ups such as Beyond Meat and Impossible Foods. Moreover, these companies

have taken the nation by surprise, resulting in an outstanding IPO and rapidly increasing market shares for the industry as a whole (Carbajal, 2019). Strikingly, some of the world's leading incumbent meat producers, such as Tyson Foods, Perdue, Hormel, and Smithfield have also begun to support the transition to plant-based proteins, offering their own diversified lines of meat alternatives (Durbin, 2019). Thus, causing one to ask the begging question of *why* and *what* particular conditions have led them to do so.

3.2 Data collection and analysis

The first step of this research consisted of mapping the relevant actors, institutions, and networks, pertinent to the plant-based protein TIS in the US. This involved collecting secondary data from firm and industry-association websites, prominent plant-based protein news outlets, in addition to both scientific articles and research reports.

Thereafter, a qualitative event-history analysis was conducted between the years 1978-2019. Data was collected using the LexisNexis database. The LexisNexis database is a data source which includes patent data, news articles, press releases, conference call manuscripts, and the like from thousands of news sources all around the globe (Tziva et al., 2019). Moreover, the database has been utilized and tested for its accuracy in a myriad of other transitions studies (Negro et al., 2007; Negro and Hekkert, 2008; Suurs and Hekkert, 2009; Tziva et al., 2019).

In order to find data specific to the plant-based protein transition, the predefined key words *'meat substitutes', 'plant-based proteins',* and *'plant-based meats'* were utilized. The search was then filtered to the United States which resulted in approximately 3,900 articles and finally 2,076 relevant and detailed event accounts stored in the database *(full database can be shared upon request)*. 1978 was selected as a starting point given that this was the first recorded event in LexisNexis. While all articles were read thoroughly, those pertaining to plant-based dairy products were filtered out and deemed not relevant to answer the research question. Additionally, statements reporting the rise and fall of stocks were removed from the search results as they did not provide essential information.

As an intermediary step, after the data was collected, the events were classified as ideal event-types by the researcher. Beginning with the first event in the database, each event was classified until no new event types were detected in the database, thus, signifying a saturation

point was reached. This resulted in approximately 49 event types. For a full overview of each event type and its description see *Appendix 1.*

As a next step, each event was classified according to the system function it fulfills (Negro et al., 2007). The description of system functions as seen in Hekkert et al. (2007) was utilized as a heuristic tool to properly identify each event in the database. Trademark data was also included as an additional indicator for function 1 entrepreneurial activities as in the U.S. trademarks can serve as an indicator of both new entrants and products. A methodological novelty was also introduced pertaining to function 1. This function was categorized into *F1 sellers* and *F1 producers* given the nature of entrepreneurial activities in the US. Furthermore, because a multitude of American fast-food chains not only sell meat substitutes but innovate their own products to include plant-based meat, such as the "Beyond Whopper" sold at Burger King, two separate categories deemed necessary. Events related to regime actors were also labeled separately as *regime response* in order to clearly identify the counterstrategies employed by regime actors. Finally, events were then classified as positively (+) or negatively (-) contributing to the diffusion of plant-based meats. Positive events were those classified as positively affecting the plant-based protein innovation system while negative events were those hindering the development of the system.

3.3 Data quality

Validity in this research is measured through both internal and external validity. To ensure internal validity of the research triangulation was used. Specifically, data obtained was cross-referenced with additional sources (Yin, 2009). In order to assure the validity of the event types created, as well as their indication of function fulfilment, each event type was checked critically by another researcher. Any inconsistencies were then discussed until a mutual agreement was made on the most accurate classification. With regards to external reliability, or the extent to which the results can be generalized, this is rather limited seeing that the focus of this study is on a single case (Bryman, 2016). However, the theoretical construct could be tested and applied to other cases.

Reliability is maintained in this research through careful documentation of each step of the research process in addition to a similar research approach being tested in a number of other

transition studies as indicated prior (Negro et al., 2007; Negro and Hekkert, 2008; Suurs and Hekkert, 2009; Tziva et al., 2019).

4. Results

The following section presents the results of this research. Firstly, the dominant institutional practice of meat consumption and production in America between 1978-2019 is delineated. Thereafter, the results chapter has been divided into three periods, representative of three distinct periods within the US protein transition. TIS developments which do not include TIS functions with an institutional nature [F1, 2, 3, and 6] are briefly described in each period in order to properly understand technological developments, important influxes of resources, as well as knowledge diffusion efforts holding impact on the system. Additionally, a brief overview is given of any outstanding independent developments which influence the diffusion of plant-based proteins in the United States in order to understand system development in its entirety. Lastly, the main empirical description of this section is focused on institutional work strategies which comprise TIS functions with an institutional nature. Namely, those strategies which contribute to increased guidance of the search [F4], market formation [F5], and legitimacy [F7] function fulfilment, in order to adequately examine the activities actors take part in which have attributed to the diffusion of plant-based proteins throughout the US.

4.1 Structuration of the regime

4.1.2 Institutional practice of meat consumption and production

For centuries the meat sector in the United States has been characterized by a highly stable regime. Accordingly, the size of the U.S. meat industry is colossal, totaling to nearly a 100 billion-dollar business (“U.S. Meat and Poultry”, 2018). To Americans meat is considered “normal” (Bateman et al., 2019). American *‘meat-culture’* is enforced by various industry and lobby groups which uphold meats tradition as a standard part of every American’s daily routine. This includes, for example, the United States Cattlemen's Association (USCA) and the North American Meat Institute (NAMI), both composed of large incumbent meat producers which dominate the market. These producers have influential ties with government bodies such as the

United States Department of Agriculture (USDA), holding influence on their regulatory decision making, such as their dietary recommendations to the American public (Shanker, 2015).

The practice of meat consumption and the ability to eat meat has a number of associations with American culture. Firstly, meat is associated with freedom of choice and privilege (Frank, 2007; Radke, 2019). The established norms associated with meat eating is that it is widely seen as a metaphor for 'maleness' and thus, associated with stamina, endurance and vitality (Frank 2007; Sobal, 2005). Additionally, meat is linked to status. This status includes not only status of wealth and prosperity, but also status in the hierarchy of food (Aiking, 2011; Chan & Zlatevska, 2019). Meat has also been associated with being part of the 'traditional' American diet, holding a strong cultural presence as the centerpiece of the dinner table (Pearson, 2016). Concluding, the practice of meat consumption and production has a history of remaining rather sediment in the U.S., constantly held in place by the United States' reinforcement of these ideals.

4.2 Targeting 'the Vegan consumer' (1978-2008)

4.2.1 Developments

TIS developments [F1, 2, 3, and 6]

The period 1978-2008 rarely witnessed market acceleration as first-generation products were associated with moderate quality and low performance (see *Figure 1*), typically aimed at 'the vegan consumer' i.e. those individuals avoiding meat consumption due to solely ethical, environmental or religious beliefs. In 1992, some attention was shed upon the industry, as for the

first-time meat and meat substitutes were placed together in the USDA's "Food Guide Pyramid" ("The Battle of the Pyramids", 1994). This indicated to the public that plant-based proteins' nutritional value was equivalent to that of meat, however, the adverse health effects of meat consumption were not yet widely known [F4]. Following in 1998, the Food and Drug Administration (FDA) recognized soy as potentially reducing the risk of contracting heart disease, leaving the industry hopeful that a newly found motivation to capitalize on these findings would spark increasing research and development in the plant-based protein field ("FDA Proposes to Allow Health", 1998). Furthermore, the market during this time was driven slightly by ethics and the beginnings of a health focus, both with arguably little effect on the industry.

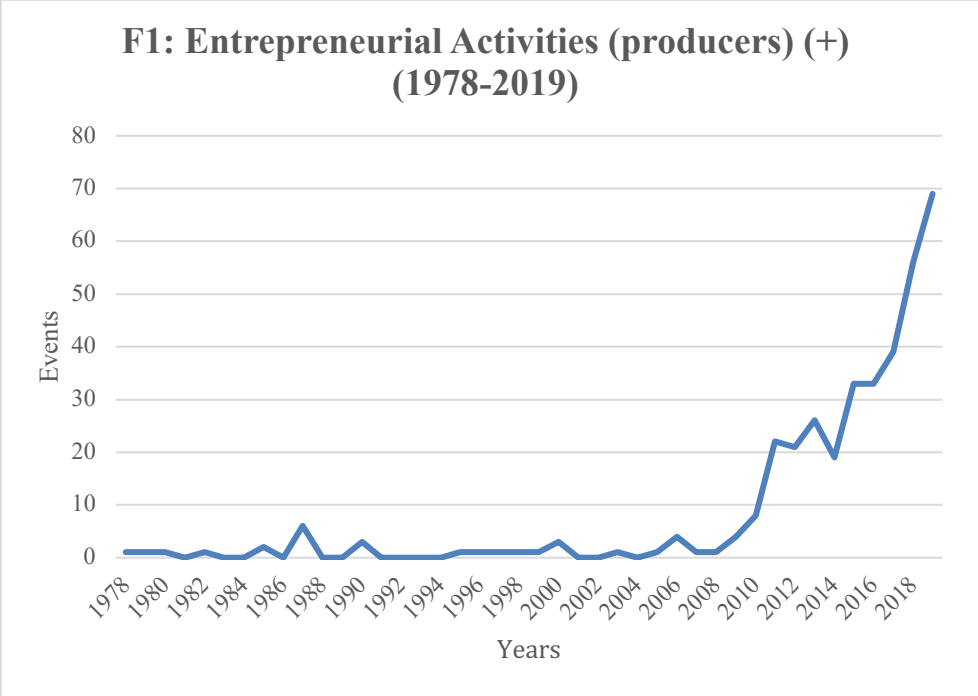

Figure 1. Graph depicting entrepreneurial activities engaged in by producers in the plant-based protein innovation system in the U.S. from 1978-2019

In 2004, the first reported technological advancements in meat extrusion technology took the media by storm. Researchers at the University of Missouri (UM) developed a groundbreaking high-moisture extrusion process which resulted in the creation of meat substitute products with the preferred fibrous structure and flesh-like texture [F2] ("Quality Control Adjusted on the Fly", 2004). Arguably, laying the technological groundwork for the second-generation plant-based protein industry. The remainder of the period witnessed expansion of R&D facilities in order to stimulate growth in the industry. In 2005, the renowned Center of Excellence in Extrusion and Polymer Rheology (CEEPR) was opened in Wyndoor, Pennsylvania with the goal to create state-

of-the-art value-added foods such as meat alternatives and texturized proteins ("Creating Novel Foods", 2005).

4.2.2 Legitimacy (+) [F7]

Legitimacy function fulfilment during this period was substantially low (see *Figure 2*). Accordingly, efforts to increase legitimacy were sparingly employed, confined to merely *advocacy* strategies from animal rights activists. During this time, product manufacturers focused mainly on first-generation product launches, largely neglecting legitimation strategies.

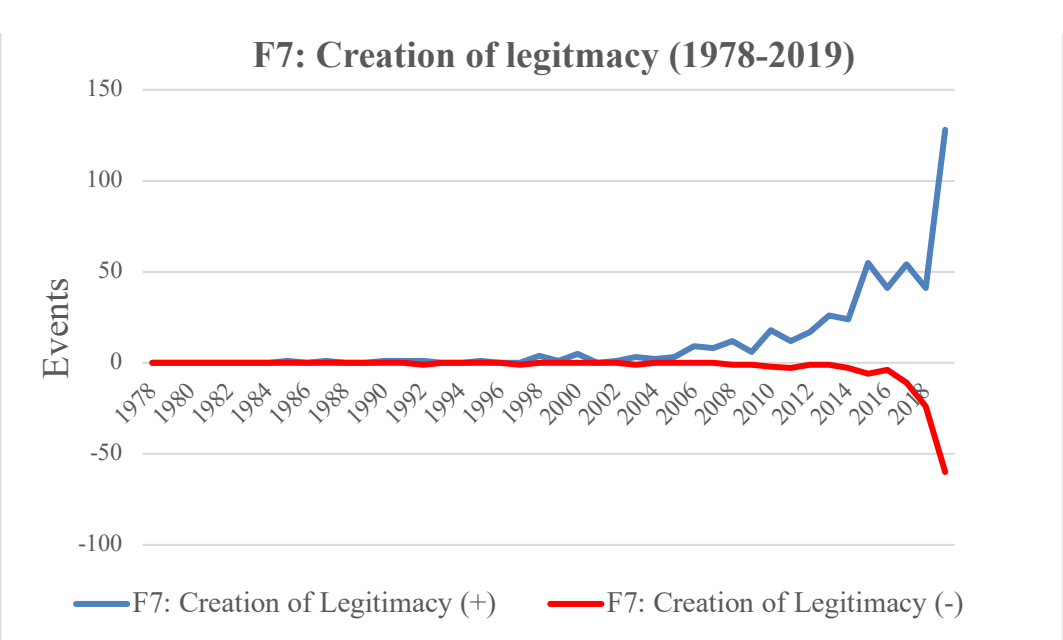

Figure 2. Graph depicting legitimacy function fulfilment by both U.S. plant-based protein innovation system actors and regime actors from 1978-2019.

Advocacy

Advocacy through animal rights activist campaigning

The first *advocacy* effort was made through a TV ad administered by animal rights group the People for the Ethical Treatment of Animals (PETA). The ad being the first of its kind, aired in numerous US cities, featuring Joaquin Phoenix, a well-known Hollywood actor, who denounced the meat industry and popular American holiday, Thanksgiving, encouraging Americans to "make this one for the birds" and avoid buying real turkeys (Watson, 1998).

4.2.3 Guidance of the search [F4]

Guidance of the search function fulfilment during this period was also low but present (see *Figure 3*). A handful of publications of studies, journals, and other forms of research began to link meat to a number of harrowing health issues such as Alzheimer's disease, a number of cancers, and high-blood pressure. In 2003, a prominent American Journal, the Journal of the American Cancer Institute, published a study portraying that red meat-eating individuals were reported having higher occurrences of breast cancer, calling for the search for a safe alternative ("Animal Free Products Attractive", 2003). A few years later, another prominent study was published by scientists at Harvard University, once again linking breast cancer to red meat consumption and suggesting consumers switch to plant-based alternatives ("Red Meat May Increase", 2006).

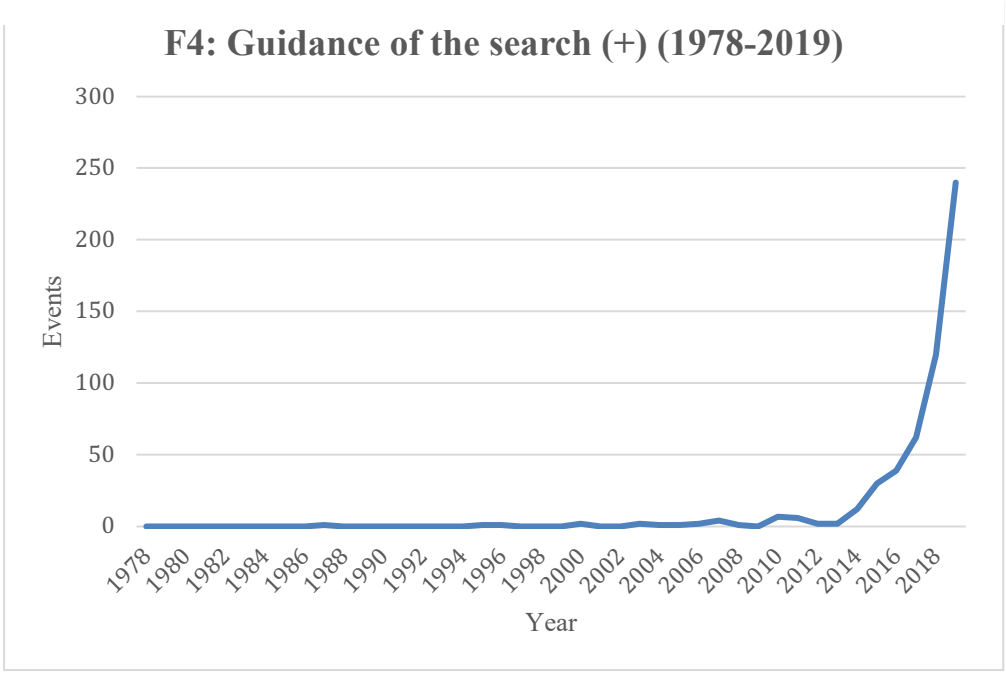

Figure 3. Graph depicting guidance of the search function fulfilment in the U.S. plant-based protein innovation system from 1978-2019.

Additionally, as previously mentioned, the search for improved texture and increasing research and development efforts in the industry also resulted in guidance of the search function fulfillment as actors worked to significantly enhance meat substitutes ("Creating Novel Foods", 2005; "Quality Control Adjusted on the Fly", 2004). Besides the search for improved quality of plant-based proteins and the publication of studies in the media, however, specific institutional strategies carried out by actors which raised expectations regarding the future of the industry were not explicitly exercised.

4.3 The emergence of the "Flexitarian" (2007-2015)

4.3.1 Developments

TIS developments [F1, 2, 3, and 6]

This period was characterized by further technological advancements, in addition to a number of research and development efforts in the industry which seemingly laid the groundwork for increased institutional work activities [F2]. Soy protein supplier Solae (later to be owned by DuPont) in partnership with Senomyx announced the development of "bitter blockers" or chemicals which were tested to neutralize the bitter soy taste of meat substitutes [F2], and thus, could potentially increase consumer acceptance [F7] (Fikes, 2008). Additionally, major US protein manufacturer, Specialty Protein Producers, received a $810,000 loan from the US Department of Agriculture to aid the company in developing a state-of-the-art protein extraction plant [F6] ("Gov. Heineman Awards", 2008). Another striking development impacting the industry occurred when USDA scientists uncovered the gene sequence of the soybean genome. Notably, this resulted in the ability to speed up the development of soybean crops leading to both high yields and greater protein content, a significant milestone for the meat alternative industry [F2] ("USDA Release: USDA Scientists", 2010).

Adding on to this, the period showed clear signs that the 'flexitarian' niche-market was growing. In 2009, the eventual grocery store sellout, start-up Beyond Meat was founded [F1] (Brissette, 2019). Developing on the 2004 high-moisture extrusion research at UM, Ethan Brown the company's founder was able to pioneer *second-generation* meat substitutes and patent the process [F1] (Guarino, 2016). Shortly thereafter, new entrants Sweet Earth Foods, No Evil Foods, and Beyond Meat's soon-to-be greatest competitor Impossible Foods entered the plant-based protein space [F1] ("Impossible Foods Poised to Disrupt", 2019; "Nestle to Buy California-Based", 2017). Notably, meat substitutes during this period were characterized by consumers as substantially improving and substantially different from their 'first-generation tofu concoction' counterparts ("Body Wise Food; Therapy", 2008). Awareness of industry potential was taking hold.

Amidst rising industry awareness, both Beyond Meat and Impossible Foods received continuous influxes of investments from high-profile individuals. For example, Beyond Meat's investors expanded to include the founders of Twitter, Evan Williams and Biz Stone, nonprofits including the Humane Society of the United States and well-known American venture-capitalist

firms such as Morgan Creek Capital [F6]. In October 2015, Impossible Foods reported an additional 108 million in funding raised, totaling almost 200 million with some of its key investors being Google Ventures, Horizon Ventures, and Bill Gates [F6] (Chiu, 2015).

During this period the health focus strengthened as a key argument for the development of meat alternatives. Additionally, an environmental argument began to develop, driven largely by novel start-ups, the scientific community, in addition to environmentally concerned millennials.

Independent Developments

Independent developments contributing to the growth of the US plant-based protein industry during this period included the 2010 United Nations Environment Program's (UNEP) International Panel of Sustainable Resource Development report which called for a necessary shift to plant-based diets, given the circumstances of food security, poverty, fuel and climate change ("Veggie Grill Earth Day", 2012). Additionally, in 2014 the United Nations held a highly publicized Climate Summit in the US which focused on promoting increased reliance on plant-based proteins as opposed to meat ("Pledge Brunch Spotlights UN", 2014).

4.3.2 Guidance of the Search [F4]

This period exhibited a slight increase in guidance of the search activities (see *Figure 1*). As previously mentioned, the period was characterized by increased health consciousness, driven by an increasing number of studies, journals, and publications exploiting the health hazards associated with meat consumption in addition to the benefits of a plant-based diet. USDA researchers, for example, continuously appeared in the media exploiting soy and other plant-based proteins' *critical* role in decreasing global food security and increasing human health ("USDA Release: USDA Scientists", 2010).

Innovative new entrants such as Beyond Meat and Impossible Foods founders voiced their future goals repeatedly in the media. The founder of Beyond Meat, Ethan Brown, for example, appeared on numerous radio news programs such as NPR Morning Edition, a well-known America news program, broadcasting his goals to revolutionize plant-based meats. Brown additionally made many appearances at conferences throughout the US conveying his logic that in as early as 50 years from now, the meat counter could no longer be seen as having a

relationship with animals (“Gates-Backed Vegan Meat”, 2013). While earlier first-generation products focused solely on attending to consumers in a ‘health-niche’, these new start-ups assured consumers that their plans were different, targeting the traditional mainstream American meat-eater and using the environmental consequences of meat production as their main argument (“Betting Better Fake Chicken Meat”, 2012). Ethan Brown was repeatedly seen stating throughout the media that goal was to be seen as a viable competitor in the multibillion-dollar American meat industry, pledging his move to “someday be like Tyson or Purdue” (Bonner, 2012). Again, in line with the previous period, these efforts further highlighted the search process for alternatives with exceptional quality and taste. Accordingly, raising expectations in the plant-based protein industry.

4.3.3 Market Formation [F5]

Market formation also grew slightly during this period attributing to aspects such as advances in food technology and growing partnerships between plant-based protein startups and grocery chains (see *Figure 4*). From 2010 to 2012 alone the market for plant-based proteins witnessed an 8 percent growth forecasted to continue to grow rapidly over the next few years. By the end of the period the market was forecasted to bring over 553 million U.S. dollars in yearly (“Author Petitions McDonalds”, 2014).

Institutional work strategies that contributed to market formation included *constructing normative networks.*

Constructing normative networks

Constructing normative networks through grocery partnerships

Innovative new entrants stimulated market formation through the construction of normative networks.

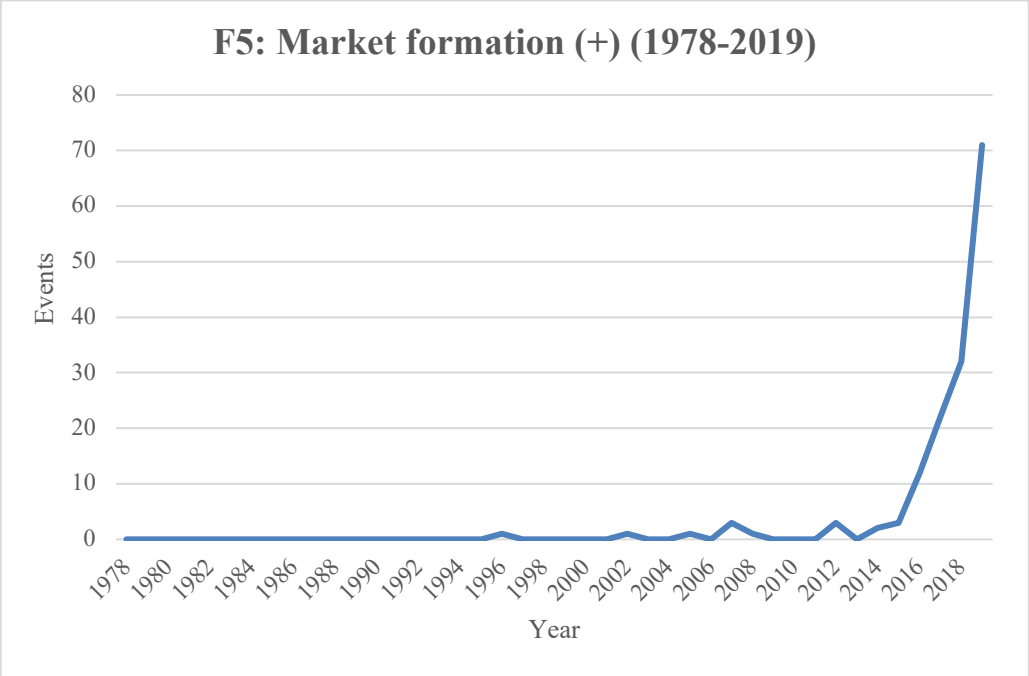

Figure 4. Graph depicting market formation function fulfilment in the U.S. plant-based protein innovation system from 1978-2019.

Moreover, this period witnessed the first of many Beyond Meat grocery chain partnerships. Markedly, after just two days on shelves, Whole Foods, an American multinational grocery chain, completely sold out of the brands products. With rising publicity, Beyond Meat quickly became available at a number of other large grocery chains, reaching 7,500 US stores by the middle of 2015. Moreover, its products were meticulously placed in the meat section next to traditional hamburgers ("Beyond Meat Plants the Future", 2015). To further nurture the company's plans for strategic growth, in September, former CEO of McDonalds, Don Thompson, as well as co-founder and CEO of Honest Tea, were invited into Beyond Meat's Board of Directors further indicating the company's plans for continued expansion ("Beyond Meat Builds Board Leadership", 2015).

4.3.4 Legitimacy (+) [F7]

Legitimacy was fulfilled most highly during this period (see *Figure 2*). As plant-based proteins gained legitimacy this contributed to further development of the US plant-based protein innovation system.

Institutional work strategies which led to increasing legitimacy included *advocacy*, *changing normative associations, theorizing,* and *mimicry* strategies.

Advocacy

Advocacy through consumer-targeted campaigns

Given rising industry awareness first-generation meat alternative producers engaged in additional advocacy efforts through consumer-targeted campaigns. For example, Tofurky, a faux-turkey producer, began a Tofurky Tuesday's campaign encouraging consumers to pledge to eat completely meat free at least once a week (Vosburgh, 2008). Similarly, Garedin, an incumbent in the plant-based protein industry, in partnership with the Pretenders, a popular American rock band launched a series of "Talk of the Town Pre-Concert Grillouts" offering free Gardein products to fans in cities across the US ("The Pretenders Summer Tour", 2009).

Advocacy through the founding of 'Meatless' Mondays

The period was additionally driven by increasing efforts to incorporate plant-forward thinking in schools as they began demanding food that was increasingly nutritious ("Alternative Meats Are Hot", 2019). With the help of environmentally conscious millennials, campaigns such as the growing Meatless Mondays' initiative was pioneered, largely driven by the 'sustainable foods movement'. These campaigns actively swept through numerous college campuses around the globe in which students pledged to sustain from eating meat on Mondays. Pioneer schools included the University of California Davis (UCD), Yale, and a number of Baltimore city schools. Some learning institutions such as the University of California Santa Cruz (UCSC) went as far to coin "Beefless Days" removing red meat completely from the menu. The University of California Los Angeles (UCLA), another plant-forward college, began the "Green Mondays" campaign similar to Meatless Mondays which once again encouraged their students to avoid eating meat on Mondays ("Where's the Beef?", 2010). By the end of 2015, hundreds of universities and colleges across the United States had adopted the Meatless Monday's campaign or campaigns of the like and began to fully welcome the soon-to-be macro-trend sweeping across America.

Advocacy through activist campaigning

During this period advocacy strategies employed by activist groups also became more aggressive targeting larger audiences and providing incentives. Campaigns, specifically, became more aggressive with the launch of the Farm Animal Rights Movement and a video called 10 Billion Lives which exploited the harsh reality of the meat industry. As prior advocacy efforts involved activities such as demonstrations and changes in menus, this campaign offered a dollar just for watching the four-minute video in order to incentivize consumers and to spread the word about removing meat from their diets ("Nothing Says Fall Like", 2013). Petitions were also part of these strategies, directed towards popular Quick Service Restaurants (QSR) such as McDonalds, calling for the corporation to incorporate meatless options into its menus ("Author Petitions McDonalds", 2014).

Changing normative associations

Changing normative associations through celebrity communicate-by-example strategies

Another popular actor strategy which led to increased industry legitimacy included a number of Beyond meat partnerships with elite athletes, including athletes from the National Basketball Association (NBA), Women's National Basketball Association (WNBA), Major League Baseball (MLB), World Surf League (WSL) and the like. The company additionally launched a global campaign, *The Future of Protein*, and for the first-time deliberately changed normative associations, by associating plant-based meats with increased performance, strength, and agility ("Beyond Meat Plants the Future ", 2015). Aspects normally linked to the practice of meat consumption [F7] (Frank 2007; Sobal, 2005).

The campaign strategically deployed a communicate-by-example strategy, debuting a series of photographs and videos of these high-profile athletes, expressing how switching to a plant-based diet has drastically impacted their athletic abilities. The campaign featured a number of consumer-targeted testimonials as well as recipes. To further enchant its viewers, the campaign included specific programs and contests to be played at the family dinner table, such as swapping a real chicken finger for a fake one ("Beyond Meat Plants the Future ", 2015).

Theorizing

Theorizing the 'flexitarian'

For the first time ever, the word 'flexitarian' was coined in the media. Specifically, plant-based protein actors theorized their target consumers through naming activities which also contributed to legitimation of the category. A 'flexitarian' was defined as an individual who was only 'part-time' vegetarian, and thus, whose goal was not to cut out meat as a whole but instead to limit meat intake (Orgel, 2006). Moreover, with a clear consumer group, meat alternatives were seen as more legitimate. Accordingly, attention of product manufacturers shifted to this newly defined group.

Mimicry

Mimicry employed by first-generation and second-generation product manufacturers

During this period novel plant-based protein manufacturers engaged in strategies of *extreme* mimicry while first-generation producers did not strive to fully imitate meat products. Gardein for example, made their products to be shaped like meat but did not work to replicate meat's exact texture and flavor. Similarly, other traditional plant-based protein producers such as Morningstar Farms made their products with the idea that mimicking meat is not exactly necessary as long as their products taste good to their customers (Chui, 2015).

Second-generation plant-based protein manufacturers such as Beyond Meat and Impossible Foods, however, specifically worked to make their products compatible with the texture and taste of meat further conveying plant-based meats as a legitimate substitute to animal beef ("Betting Better Fake Chicken", 2012). Impossible Foods sought to uncover what made 'meat-lovers' crave meat the most as over 90% of their customers identified as meat eaters (Thompson, 2017; "The Whopper Gets", 2019). Impossible's team of scientists discovered it was held in the myoglobin molecule, known as the compound heme. Heme, a compound containing iron, gives the meat it's sensory flavor. Thus, as an alternative, the company incorporates "plant-blood" into their products using leghemoglobin instead of traditional myoglobin, which provides plant-meats with their distinct red color and meaty texture ("Impossible Food's CEO Visits", 2017; Steven & Voorhes, 2015).

4.3.5 Legitimacy (-) [F7]

While strategies aimed at creating positive legitimacy began to advance during this period regime resistance also debuted (see *Figure 2*). The period witnessed regime actors engage in a number of activities aimed at countering the diffusion of plant-based proteins in the US and reinforcing institutional practices associated with meat. In the wake of Beyond Meat grocery store partnerships and Impossible Foods appearance on the menus of various luxury high-end restaurants members of the Washington Cattlemen's Association (WCA) voiced their concerns with the growing competition. Members of the association were featured on news outlets stating that these 'fake meat' entrepreneurs would face trouble with consumers, assuring the public that real meat was undoubtedly what was to remain on plates now and in the future (Banse, 2012).

Namely, regime actors utilized institutional strategies of *advocacy* and *deterrence* in efforts to delegitimize the rising meat alternative industry.

Advocacy

Regime advocacy through alternative campaigning

Despite the existing widely accepted institutions surrounding meat production and consumption in the US, meat industry trade groups participated in a myriad of alternative campaigning efforts aimed at advocating the meat industry. This included consumer targeted campaigns such as the 30-day Protein Challenge and the 'Beef. It's What's for Dinner Campaign' part of the National Cattlemen's Beef Association (NCBA) Beef Checkoff Campaign. The 'Beef. It's What's for Dinner Campaign', for example, focused primarily on making consumers feel positive about consuming meat. Moreover, the campaign highlighted how versatile beef could be when prepared and its 'exceptional' nutritional value through websites and videos ("Beef. It's What's for Dinner.", 2015). Likewise, the 30-day Protein Challenge worked to promote meat using tactics such as sending motivational emails to consumers (Radke, 2015).

Furthermore, these campaigns strategically utilized targeted marketing encouraging millennials, those highly driving the plant-based protein transition, to continue eating meat. Each campaign was created in order to reinforce the value of meat to consumers, and to offer guidance in consumers' protein choices. Additionally, these campaigns were aimed to empower and

encourage those health-minded individuals to feel confident buying meat in the meat department, again signifying threat to the meat industry was real (Dudlicek, 2015).

Deterrence

Regime deterrence through subverting government attempts to promote plant-based proteins

Another strategy the meat industry took part in was deterrence which demonstrated their long-held legitimacy in the US meat market. 2015 was met with a release of a draft Dietary Guidelines from the USDA. This time, in a 571-page report based on thousands of scientific studies, the guidelines strictly advised consumers to reduce their meat consumption. Once again, the meat industry did not stay quiet, resulting in a fierce lobby. The meat industry employed several deterrence strategies, focused on subverting the attempts of institutional actors to encourage meat alternative consumption. For example, the meat industry called on the USDA to make revisions to their final report, which would *not* suggest that consumers change their meat consumption habits. Consequently, the meat-industry experienced a dramatic win as it successfully convinced the USDA to suppress their plethora of scientific findings and remove the recommendations from the report (Silver, 2016). Furthermore, this effective deterrence work was again able to convey the legitimate authority of regime actors working to undermine and stunt the growth of the developing plant-based protein industry (Suddaby, 2006).

4.4 Plant-based meat takes over (2016 onwards)

4.4.1 Developments

TIS developments [F1, 2, 3, and 6]

During this period increased awareness of industry potential resulted in a number of new entrants joining the plant-based protein industry [F1]. Along with numerous fast-casuals opening throughout the country, plant-based butchers, the Herbivorous Butcher and Bauhaus' Atlas Meat-Free Delicatessen joined the scene (Kennedy, 2017; Tran, 2016). A handful of plant-based seafood companies were also founded, including New Wave Foods, Good Catch, Ocean Hugger Foods and Sophie’s Kitchen bringing immense variety to the market [F1] (Watson, 2018). Finally, a new group of actors, taking on the role of plant-based protein trade organizations and

signaling increasing industry organization, joined the industry [F1] (Plant Based Foods Association, 2019).

Amidst these efforts, in October 2016, the largest US incumbent meat producer Tyson Foods invested a 5% stake in Beyond Meat. Moreover, this made Tyson the first major meat producer to invest in a meat substitute company indicating the plant-based meat markets move from niche to mainstream [F6] ("13 Professional Athletes Invest", 2019; Lee, 2016; Yaffe-Bellany, 2019). In December 2017, Tyson increased its stake in Beyond Meat, participating in a 55 million funding round which allowed Beyond Meat to nearly triple production footprint [F6]. This did not last long however, in 2018 the meat producer pulled out its stake in the company in an effort to begin its own plant-based protein brand Raised & Rooted [F1] ("Nutrition Capital Network", 2017).

Following suit, a number of other Big Food incumbents also entered the market. Big Food companies comprise large traditional multinational incumbent food producers and distributors with massive market power. Beginning as competitors to the meat substitute industry, these large incumbents placed their footprint in the plant-based protein market using immediate entry strategies such as acquisitions and purchasing stakes in companies which originally set out to disrupt them [F1, 6]. In 2017 Nestle, a Swiss multinational, purchased Sweet Earth Foods, a plant-based protein manufacturer from California ("Nestle to Buy California-Based", 2017). Following suit, the same year, Canadian Maple Leaf Foods acquired Lightlife Foods another meat substitute producer and Pinnacle Foods acquired Garedin (Blumenfeld, 2017; "Nutrition Capital Network", 2017).

A common strategy for Big Food producers diversifying into plant-based proteins included not directly offering entirely plant-based products but instead beginning with blended-options, which were made of 50% meat and 50% plant-based proteins. Big Food companies such as Perdue and Hormel, each crafted their own lines of blended products featuring patties, chicken nuggets, and other meats blended with vegetables [F1] (Durbin, 2019; "Perdue Farms Launches Chicken", 2019; Yaffe-Bellany, 2019). Unlike novel startups in the industry who held sizable goals to combat the world's most challenging issues like climate change, these incumbents continued to please their meat-loving customers and thus, continued to offer new meat products. Nevertheless, they continuously referred to themselves as plant-based protein companies in the media (Hagstrom, 2019).

Another indication of industry growth during the period included Beyond Meat's opening of a 26,000 square foot R&D center in Los Angeles, California, deemed "The Manhattan Beach Project". The project was dedicated to the company's so-called ongoing initiative which involved bringing the most highly regarded scientists, food technologists, and researchers together with hopes to perfect plant-based meat. The project allowed the company to expand its R&D footprint seven-fold [F2] ("Beyond Meat Announces", 2018).

In 2018, Impossible Foods gained Food and Drug Agency (FDA) approval, which deemed its 'bleeding' product as safe to be sold and accordingly, opened the company up to a wide range of new opportunities ("White Castle Now Sells", 2018). Following, in May 2019, Beyond Meat made its Initial Public Offering (IPO) market debut making it the first purely vegan company to go public on the American stock market ("Beyond Meat Goes Public", 2019). With its shares rising nearly 175% in the initial hours of trading the company's valuation soared to over 3 billion dollars [F6] ("AgFunder Founder Rob", 2019; "Beyond Meat Shares Bolt", 2019). Shortly after, Impossible Foods managed to raise another 300 million in funding this time from high-profile celebrities like Jay Z, Jaden Smith, Katy Perry, and a handful of others [F6] (Wiener-Bronner, 2019). Accordingly, both FDA approval and the increase in resources allowed the both companies to continue to focus on growth (Hershman, 2019).

Finally, the period witnessed novel new entrants launch a myriad of improved products (see *Figure 1*) [F1]. This included, for example, the Impossible 2.0 and the latest version of the infamous Beyond Burger. Furthermore, these new editions provided consumers with products of exceptional quality and furthered the development of the industry (Garcia, 2019; Wiener-Bronner, 2019).

Independent developments

In 2016 a global phenomenon and independent development holding major impact on the development of plant-based proteins in the US was the Food and Agriculture Organization of the United Nations declaring 2016 as the International Year of Pulses (IYP). The organization set the ambitious goal of both feeding and saving the planet encouraging the consumption and production of plant-based proteins such as beans, peas, and other pulse superfoods (Krummert, 2015). In order to encourage consumers to take charge the organization began the Pulse Pledge initiative which challenged consumers to eat pulses at least once a week for ten weeks total

(Rutberg, 2016). During this period the environmental arguments consisted of concerns regarding the state of the earth's food, land, and water resources in addition to climate change, which furthered the development of the industry. Specifically, the rapidly increasing demand for plant-based proteins was fueled by the simultaneous increase of activism and climate change awareness ("Everything but The Cluck", 2019).

4.4.2 Guidance of the search [F4]

Guidance of the search activities during this period witnessed a sizable increase mostly driven by increasing journals, publications, and studies raising future expectations about industry development (see *Figure 3)*. For example, the period saw the launch of an extensive policy report produced by the International Food Policy Research Institute (IFPR) addressing the critical state of the world's food and water resources. Moreover, the report, which was referenced in several media outlets, highlighted American's overconsumption habits, bringing light to the fact that Americans consume ⅔ more protein than they actually need. Furthermore, the report highlighted the crucial need to move consumer preferences to plant-based proteins, citing factors such as access to food, rising undernourishment, and climate change as reasons for the necessary switch ("Food Security: Climate Change", 2016). Simultaneously, both the United Nations declaration and the IFPR's report signaled the increasing public awareness of the state of the planet's resources and necessitated greater calls to action.

Adding on to this, plant-based proteins were increasingly mentioned as a rapidly growing trend in various media outlets. Packaged Facts, a prominent market research publisher, identified plant-based proteins as a thriving market in which interest from consumers was "booming". Additionally, the period saw plant-based meat being notably listed as the most important technological trend by Alphabet, the parent company of Google ("I Have My Beef", 2016). Popular magazines and news outlets also increasingly reported plant-based proteins as 'culinary trends to watch out for' (Wootton, 2017).

Notably, innovative start-ups latched on to consumer needs of 'clean food', 'trust', and alternatives, providing consumers with information about each step of the plant-based meat production process as well as the ingredients used to make their mock meat magic (Fitzpatrick, 2016). These companies also appeared throughout the media, once again raising expectations,

stating their goals to "completely replace animals as a food technology by 2035" (Jean François, 2019).

Dissociating moral foundations

Dissociating moral foundations associated with the U.S. billion-dollar meat industry

A clear institutional strategy employed by novel start-up's CEOs and other board members included a drastic increase in bold media statements regarding the future of the plant-based protein industry and industry potential. Specifically, through these statements' actors worked to undermine meat consumption by not bashing meat directly but through dissociating moral foundations of meat production and consumption. This was done by making statements in the media which were subtly aimed at disconnecting meat production and consumption from being seen as moral and 'normal' in the context of the US meat industry. As actors in the prior period still somewhat deemed America's obsession with meat as accustomed and embedded in its 'culture', this period was driven by actors beginning to increasingly question the moral acceptability of the practice of meat consumption and production and thus, guiding the search for more sufficient alternatives ("Could Fake Meat Burgers", 2019).

Plant-based protein actors appeared in the news, conferences, and at presentations across the country using 'future'-oriented discourse and aptly developed arguments to promote the idea that Americans are not *fixed* to the idea that meat needs to come from animals but that they are wedded to meat ("Could Fake Meat Burgers", 2019). In other words, that meat can indeed come from plants. Furthermore, by showing through their products that meat can be made from plants, and in a sustainable manner, actors de-institutionalized the idea that meat must be made through killing livestock and that this method is moral.

Undermining assumptions and beliefs

Undermining assumptions and beliefs regarding the costs of switching to plant-based meat substitutes

To further bolster their claims, new plant-based protein actors engaged in acts which reduced the perceived risks associated with transitioning from meat products to plant-based proteins. Firstly, companies like Beyond Meat published and voiced their products' protein content, showing the American consumer that meatless patties can still offer a nutritious amount

of protein and in some cases, offer even more protein than the real meat products they aim to imitate (“Just in Time”, 2018). Novel new actors also debunked myths associated with the production of meat alternatives by conveying that fake ‘meat’ does in fact require less resources than traditional methods. In 2019, Impossible Foods, for example, published its first sustainability report. The report introduced the company's strict environmental mission, products, and its growing network. Furthermore, it highlighted that the Impossible Burger, its main product, uses nearly 80% less water, releases approximately 90% less greenhouse gas emissions, and requires over 90% less land than traditional animal beef (“Impossible Foods Launches Sustainability”, 2017). While not directly targeting the meat industry, this conveyed to Americans that consumers can indeed enjoy ‘meat’ without drastically straining the earth’s finite resources. Finally, these new actors appeared in the media pledging that within the next decade plant-based meats would be equivalent to the price of animal meats, once again, lessening the perceived risks that production and consumption of plant-based proteins would be much costlier (Taylor, 2019). Thus, all points considered, further raising expectations regarding the future of the plant-based proteins industry.

4.4.3 Market Formation [F5]

Market formation strategies also flourished during this period (see *Figure 4*). As the previous period was characterized by the beginning of partnerships between innovative new entrants, grocery chains, and some high-end restaurants, this period saw new plant-based protein products continuously added to the menus at Quick Service Restaurants (QSRs), fast-casual restaurants, food distributor and meal kit companies throughout the country. From 2015 to 2016 specifically, products introduced and marketed as ‘plant-based proteins’ was cited as having a 98% increase (Tolchard, 2017). Following suit, in 2017, the US plant-based protein market valued at 4.9 billion (Menayang, 2017). Since April 2017 total sales of plant-based proteins increased a total of 31% (“Plant Based Protein Market”, 2018). Thereafter, in 2018 the market grew a sizable 10% and was estimated to grow even more significantly in 2019 (Frech, 2019).

Furthermore, the market during this period was fueled specifically by increased strategies of *constructing normative networks.*

Constructing normative networks

Quick-service restaurant (QSR) partnerships

A key market growth strategy included further construction of normative networks. As the previous period began with grocery chain partnerships, after outstanding sales and success both Beyond Meat and Impossible Foods switched their strategies towards Quick Service Restaurants. With products becoming more and more like traditional meat products QSRs were quick to adopt these plant-based meats into their menu. This signified a change in the industry, as previously QSRs were known almost solely for selling fast-food meat products with little nutritional value. The first QSR partnership was made between White Castle and Impossible Foods, making Impossible Foods the first plant-based meat burger to launch in a fast-food restaurant on a massive scale ("White Castle Now Sells", 2018). This partnership attracted significant publicity and made way for a handful of other QSRs partnerships (Radke, 2019). By 2019 some of the most-well known QSRs, Burger King, Carl's Jr., Subway, Dunkin' Donuts, Little Caesars, and Tim Hortons had partnered with either Beyond Meat or Impossible Foods (Kelso, 2019). In late 2019, a new sort of partnership between Beyond Meat and Kentucky Fried Chicken (KFC) made KFC the first QSR to enter into the plant-based chicken space (Luna, 2019).

Notably, these QSRs did not immediately roll-out either company's products at all locations. Instead numerous product tests were employed in order to ensure consumer acceptance was present. Moreover, product tests were launched in specific locations for a limited time only and then it was decided whether or not to fully incorporate these products into the menu [F1] ("Great Taste Plant-Based", 2019; "Hardee's to Begin Testing", 2019; Luna, 2019; Taylor, 2019; Thorn, 2019). Throughout the United States, QSRs engaging in these tests reportedly sold out of these products almost immediately, even being hampered by product shortages during 2017, 2018 and 2019 (Fantozzi, 2019; Stanley, 2019). Nevertheless, every QSR which performed a product test followed by offering the company's products on their menus. These products, notably, were exceptionally novel as these QSRs developed their own specially crafted versions of their infamous menu items incorporating Beyond Meat or Impossible Food's products. Thus, this growing market resulted in an increase in entrepreneurial activities being carried out by QSR sellers (see *Figure 5*) [F1].

Interestingly, once confirmed as a partner of Beyond Meat, it's QSRs were provided with their own development lab inside Beyond Meat's production facilities in addition to a replica kitchen space (Taylor, 2019).

Not all QSR restaurants immediately followed suit, however, as some remained true to beef and beef only. Arbys, an Ohio-based QSR known for its premium angus beef sandwiches, countered other QSR's entering the plant-based protein space through a campaign promoting making plants out of meat. Moreover, the campaign seemingly mocked industry attempts and created 'Megetables'. Arby's CEO was featured on various media platforms claiming that meat-based plants was what people *really* want. Furthermore, the company created the first Marrot, or carrot made from turkey breast ("Arby Boasts the Merits", 2019).

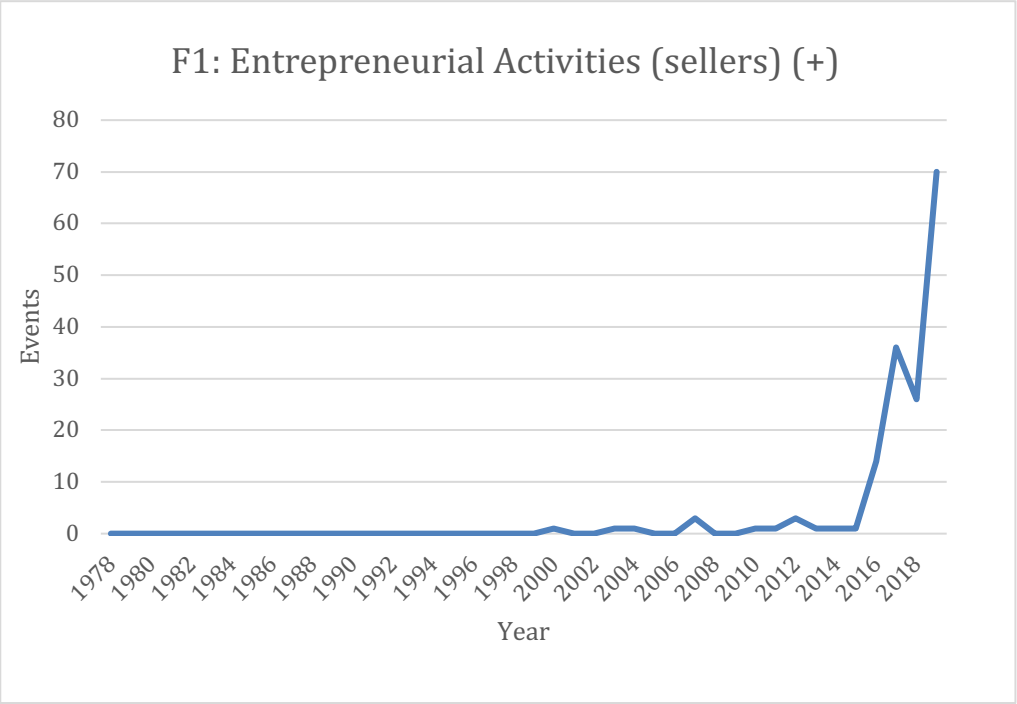

Figure 5. Graph depicting entrepreneurial activities carried out specifically by sellers in the U.S. plant-based protein innovation system from 1978-2019.

Fast-casual partnerships

The period was also characterized by increasing actors' strategies focused on partnering with fast-casual restaurants. The end of 2016 sparked the beginning of Beyond Meat fast-casual partnerships with Veggie Grill being coined the first fast-casual restaurant to offer the Beyond Burger at approximately 28 of its locations throughout the US ("Veggie Grill Introduces", 2016). Other fast-casual partnerships included, for example, Curry Up Now, a plant-based Indian

restaurant, PizzaRev, a pizza fast-casual incorporating Beyond Meat, and a handful of others ("PizzaRev REVolutionizes Menu", 2019; Thorn, 2018).

Food distributor and meal kit company partnerships

The Beyond Burger, specifically, was chosen to become a part of Sysco's, an incumbent American multinational and the largest global food distributor, Cutting Edge Solution Platform. The platform featured the latest on-trend innovative food products resulting in the Beyond Burger added to over 2,000 new menus at food service outlets such as college campuses, hotels, restaurants, in addition to places such as professional sports team training camps throughout the nation. By the end of 2017, some of the additional college campuses that offered Beyond Meat's products included Duke, Yale, Columbia, Stanford, and Notre Dame. Additionally, Beyond Meat witnessed a major win being offered in the meat case in the two largest grocery chains in the US, Albertsons and Krogers ("The Beyond Burger Joins", 2017).

Beyond Meat also partnered with a number of ingredient and recipe meat kit services such as Blue Apron and HelloFresh. Partnerships of this nature allowed customers to order a box of a variety of meals which incorporated Beyond products in them ("Blue Apron Introduces", 2019; "HelloFresh Adds Beyond", 2019).

4.4.4 Legitimacy (+) [F7]

In addition to a sharp increase in guidance of the search activities the period witnessed exceptional growth in legitimacy function fulfillment as novel new entrants such as Beyond Meat and Impossible Foods were accompanied by a handful of new allies supporting their cause (see *Figure 2)*. In 2018 TIMES magazine, one of the most prominent American news outlets recognized Beyond Sausage as the best invention of the year ("Demand for Beyond Sausage", 2019). Following suit, the same year, both Impossible Foods and Beyond Meat were awarded the highest environmental honor by the United Nations, the Champions of the Earth Award ("Plant-Based Meat Revolutionaries", 2018).

This period, accordingly, was characterized by both an increase in the intensity and type of actors' institutional work activities aimed at increasing the category's legitimacy. Namely, *advocacy, mimicry, constructing identities, defining, theorizing* and *combined strategies* were employed.

Advocacy

Increased recognition and an additional influx of investments led industry actors to employ larger advocacy strategies.

Delegitimizing the meat industry

Nonprofit organizations, for example, focused primarily on lobbying and targeted campaigns which were aimed towards delegitimizing the meat industry and US governmental organizations.

The Physicians Committee for Responsible Medicine (PCR), a nonprofit health organization consisting of approximately 12,000 US doctors employed a number of advocacy efforts throughout the period. In 2016, for example, the group protested in front of the White House calling on Americans to break their meat-eating habit. Moreover, the rally was videoed and streamed online reaching over four million people. The PCR also held a Physicians Committee International Conference on Nutrition in Medicine in which they educated their patients and other concerned Americans on the dangers of eating meat and the numerous benefits associated with plant-based alternatives ("Doctors Rally at Whitehouse", 2016).

Even more popular, included the release of an emotional TV advertisement called "Window" aired specifically on two well-known channels, Fox News and MSNBC reaching millions of viewers spread throughout nearly 20 US states. These states were reported to have the highest number of deaths from colon cancer. The ad, which was only 30 seconds, highlighted the link between increased risk for colorectal cancer and meat consumption. It featured the text "Bacon is a Killer" comanding its millions of viewers to stop eating meat ("Hard-Hitting TV Ad", 2019).

Additionally, the Center for Food Safety (CFS), another non-profit advocacy organization, published a groundbreaking report and launched a website calling attention to the environmental, health, social, and even economic consequences associated with the meat industry. The website, endindustrialmeat.org encouraged consumers to pledge eliminating 50% of the meat they currently eat from their diets and to replace it with plant-based proteins ("Center for Food Safety", 2018).

Promoting plant-based meats

Diverging from the tactics employed by nonprofits, new entrants Beyond Meat and Impossible Foods dedicated their advocacy efforts to promoting plant-based meats. Moreover, they engaged in heightened communication-by-example efforts utilizing their increasing resources and influx of investments to fuel their campaigns. Advocacy strategies employed by these start-ups were driven by 'product ambassadors' i.e. high-profile athletes in the US. Beyond Meat, for example, received additional investments from all-star athlete investors including Shaquille O'Neal, Kyrie Irving, Shaun White, and many more who became coined as brand ambassadors [F6]. The company thus, was able to launch their biggest campaign to date, the *Go Beyond Campaign.* Similar to the Future of Protein Campaign, the campaign featured a series of videos starring these athletes discussing their experience with the brand. The campaign further changed normative associations through featuring these athletes discussing their athletic journeys, which greatly prospered and allowed them to 'go beyond' their prior abilities. Furthermore, it featured the athletes on their 'journey to greatness', once again associating plant-based proteins with increased physical performance due to a change in eating patterns ("Putting Their Money Where", 2019).

Mimicry

Mimicry through more advanced products and variation

The period also witnessed more advanced product launches in addition to increasing product variety with products mimicking nearly all sorts of meat products. Beginning with traditional products such as meatless meat patties, soon mimicry products included meatless bacon, beef, and sausage even going as far to create the Impossible Kabob, a plant-based protein kabob made by Impossible Foods ("SAJJ Mediterranean Adds Plant-Based", 2018).

Additionally, the launch of the Impossible 2.0 enabled the advanced patty to be grilled, braised, saturated, or stewed just like traditional meat products. The period also witnessed the launch of the latest Beyond Burger which was specially made to melt and tenderize just like ground beef. The burger featured a blend of ingredients which resulted in both a meatier texture and a beefy taste which even included a specialized bright red "now even meatier" tag on its packaging in order to attract consumers (Garcia, 2019).

Finally, a number of faux seafood companies also contributed to industry growth focusing on products such as faux sushi and tuna made from tomatoes instead of fish ("Idaho: Will Environmentalists Fall", 2015).

Mimicry through business types

Business types employed by startups also mocked businesses previously exclusive to only the meat industry. As the US is known for its wide variety of Butcher shops spanning from coast to coast, a new start-up, the Herbivorous Butcher meticulously flipped what it means to be a traditional butcher, being the first meat-free meat butcher shop in the US. Moreover, the Herbivorous Butcher produces and sells over 40 vegan meats such as vegan barbeque ribs, Italian sausage, and other items one would normally expect to see at a Butcher shop. In order to convey the reality associated with Butcher shops serving animals, the founders planned to include colorful deli displays, deli cases showcasing the meat, as well as meat slicers (Fleming, 2014).

Defining

Defining through the creation of category standards

A distinct form of institutional work which debuted during this period was defining. Actors in the industry participated in numerous defining activities which defined boundaries of membership in the plant-based protein category and thus further increased the category's legitimacy. For example, the Plant Based Foods Association (PBFA), a prominent industry non-profit, drafted its own voluntary labeling standards for plant-based food producers. Furthermore, the PBFA made adherence to these labeling standards a specific requirement for its plant-based stamp, a certification only available to products that were solely made of plant-based products ("Plant-Based Foods Association Comments", 2019).

Defining through adhering to existing standards

In addition to defining what it means to be a part of the plant-based category, actors also made sure that their products adhered to previously defined certification schemes by acquiring FDA approval, Non-GMO and GRAS status. FDA approval, specifically, signals to the consumer that a product is safe for consumption and is able to be sold on the market. As

previously mentioned, acquiring FDA approval resulted in a massive market opportunity for Impossible Foods as it confirmed its 'bleeding' ingredient could indeed be sold in restaurants and grocery stores. Additionally, plant-based companies such as Beyond Meat, Lightlife Foods and Sweet Earth Foods for example, obtained Non-GMO approval ("Beyond Meat Opens Doors", 2018; Crawford, 2017; "Sweet Earth Natural Foods", 2015). Non-GMO products require a strenuous 1-year approval processes involving a comprehensive review of the company, its products, supply chain, and manufacturing facilities to assure full transparency from end-to-end. Thus, again increasing product's legitimacy in its field ("Beyond Meat Announces Non-GMO", 2018).

Furthermore, by not only defining boundaries of membership in the plant-based protein category but also through meticulously adhering to existing highly legitimized standards of food safety in the U.S. actors were able to establish themselves as legitimate actors in the plant-based protein industry.

Theorizing

Theorizing plant-based 'meat'

The period saw increased *theorizing*, this time further elaborating upon what it meant to be plant-based meat as earlier first-generation products were not linked to this specific term. While the scientific community and regulatory agencies referred to these products as plant-based proteins, meat substitutes, and meat alternatives, actors using plant-based meat were those creating meat substitute products which were both superior in taste and quality to earlier products and who's goal was to perfect mock meat's 'meaty texture'. Further portraying that unlike earlier products, second-generation meat substitutes were made for the flexitarian 'meat-eater' (Tyko, 2019).

Following suit, Beyond Meat, for example, avoided placing the word "vegan" on its product packaging in efforts to further establish its position as plant-based meat and to avoid losing potential customers. Actors logic behind this strategy was that vegan served as a loaded word reminding consumers of lower-quality meat substitutes and more drastic ideologies associated with the practice of veganism. Plant-based meats, however, was seen as significantly more approachable ("Beyond Meat is Shaking", 2017). In like manner, Sweet Earth Foods, for example, explicitly promoted their brand as a plant-based brand and not a meat alternative brand,

with their rationale being that the term meat alternatives is associated with not being progressive and too 'niche' (Watson, 2017).

Combined strategies

This period was also characterized by combined institutional work strategies in which actors did not focus solely on one type of strategy but employed multiple at once, often strengthening their efforts and contributing to increasing industry legitimacy.

Constructing normative networks, advocacy, and educating

A widely known ongoing initiative, the Menus of Change Initiative, for example, leverages constructing normative networks, advocacy, and educating strategies to further institutionalize plant-based proteins in the US. The Menus of Change Initiative was created by Harvard University scientists in partnership with the Culinary Institute of America (CIA). It challenges restaurants across the nation to rethink their menus promoting sustainable and healthy diets (Wilborn, 2016). Dubbed "the Protein Flip", the initiative offers two white papers which explain the environmental impacts of livestock production and educates chefs and commercial restaurants on how to reinvent their menus focusing on plant-based alternatives. Moreover, the Protein Flip encourages restaurants to make considerable cuts in the amounts of red meat they offer to their customers, and to recreate their dishes in a 'plant-forward' manner. While Harvard university is in charge of educating on sustainability aspects of the meat industry the CIA focuses on making these innovative dishes attractive (Krummert, 2016).

Constructing identities, advocacy, and educating

The construction of identities debuted as an additional form of institutional work carried out by plant-based protein actors in combination with both advocacy and educating strategies.

The appearance of a number of new organizations acquiring the role of plant-based protein industry advocates and plant-based protein trade organizations ultimately led to increasing category legitimacy. The Good Food institute, for example, mobilizes government research funding in addition to investing in and providing strategic support to companies producing and selling meat substitutes. In addition, the non-profit advocates for and educates organizations on plant-based proteins (The Good Food Institute, 2017; Khazan, 2016). In 2018,

the GFI launched a 3-million-dollar research grant program made available to all universities. The grant was created to stimulate research and development in the plant-based protein field [F6]. To stimulate competition the GFI recognized 24 global universities as having the relevant technical knowledge and expertise to become leaders in the industry ("The Good Food Institute Offers", 2018).

One of its educating strategies included its partnership with the University of California Berkeley, offering a course to university students on how to prepare and develop plant-based proteins. The course, launched in UC Berkeley's Sutardja Center for Entrepreneurship & Technology, features the Good Food Institute's senior scientist and other visiting experts who discuss the future of the meat substitutes industry and provides students with the necessary tools and skills needed to develop increasingly competitive alternative meat products (Tolchard, 2017). Additional educational activities carried out by the organization include organizing events for plant-based protein entrepreneurs such as pitches in which learning new entrepreneurs can practice pitching their innovative ideas (The Good Food Institute, 2017).

Another prominent organization taking on this new identity and serving as a further indication that the industry was getting increasingly organized was the Plant Based Foods Association (PBFA). The PBFA was established as an organization working to represent the interests of plant-based protein producers in the US. The PBFA, thus, is deemed to be the most important plant-based food trade organization serving as a prominent voice for the industry. Accordingly, the association has been recognized as winning the 2018 Nutrition Business Journal (NBJ) Efforts on Behalf of the Industry Award (Lelchuk, 2018). The PBFA specializes in activities such as lobbying, industry, sales and consumer insights, composed of over 300 member companies, investors, and affiliates which include meat industry incumbents such as Tyson Foods in addition to a myriad of plant-based start-ups (Plant Based Foods Association, 2019).

4.4.5 Legitimacy (-) [F7]

As the plant-based protein industry gained increasing legitimacy this resulted in an increase in fierce lobby activities employed by incumbent meat producers and US cattle ranchers. The meat industry employed institutional work strategies focused on policing, and increased advocacy in order to counter progress in the meat alternative industry.

Apart from institutional work strategies, regime actors also made efforts to attack the science, publicly denouncing scientific claims made by experts regarding the hazards associated with meat.

Policing

Policing through labeling laws

Regime actors employed policing institutional work strategies resulting in numerous labeling laws passed in nearly 20 US states, including Montana, South Dakota, Mississippi, Arizona, Arkansas, and Missouri (Dominique, 2019; "Judge Declines to Block", 2019; Malone, 2019). The rationale of regime actors was that if consumers see a label such as 'plant-based meat' this could be deceiving and dissuade them from purchasing traditional meat products. The lobby efforts were a result of the plant-based protein industry's unprecedented growth allowing it to effectively challenge the American meat industry (Dominique, 2019). The first state to pass the strict 'truth-in-labeling' law charged plant-based companies 1,000 per violation of these terms as well as the possibility of one-year jail time ("Missouri Meat Law Increases", 2018). However, the meat industry was divided. As incumbents normally maintain institutions lobbying for the status quo, in the US this was not the case. Attempts by industry groups like the USCA were condemned by NAMI another prominent voice for the meat industry. NAMI members made up of meat producers Tyson, Cargill, and other powerful regime incumbents deemed calls to ban the use of the term meat on plant-based products as 'ill-considered', going against their former meat allies. Additionally, NAMI members made several statements in the media calling attention to the obvious changes occurring in the industry and further hinting at the fact that today's methods of production and consumption will not be the same tomorrow (Watson, 2018).

Despite the new policy taken into effect, the plant-based meat industry did not stand down yet proceeded to employ various institutional work strategies in favor of their products. Again, this led to the construction of normative networks between parties not previously seen to work together. For example, in Missouri, the Animal Legal Defense Fund, Tofurky, the American Civil Liberties Union of Missouri and the Good Food Institute came together to sue the state of Missouri for the law (Watson, 2018). Other states saw similar efforts and lawsuits filed on the basis of the First Amendment and free speech. The meat industry was again taken by surprise, as these actors were able to utilize their resources, knowledge of law, and legitimacy to

fight for the plant-based industry. In November 2019, the plant-based protein industry scored its first win in the state of Mississippi resulting in its labeling ban being lifted. In like manner, soon after, the Arkansas state legislature temporarily blocked its ban ("Judge Blocks Law", 2019; Sibilla, 2019).

Advocacy

Advocacy through beef-promotion campaigning

Amidst labeling wars, regime actors also participated in a number of other institutional work activities aimed at further advocating the US meat industry. For example, meat industry actors created a website FactsAboutBeef.com in which they published science-based facts which compared the nutrition content of meat alternatives to meat. Additionally, the website highlighted the seemingly 'negative' aspects associated with plant-based protein consumption such as its high caloric density. Posts similar to these were not only shared on the website but also on various social media channels such as the @BeefFacts Twitter page ("Shutting the Gate", 2017). Additionally, the meat industry launched the National Beef Ambassador Program in which a selected group of collegiate beef advocates toured throughout the country promoting beef (Radke, 2019).

Attacking the science

Meat industry's attack on science

An additional strategy commonly employed by meat industry actors included attacking the science. Regime actors continuously worked to debunk scientific claims which exposed the harrowing effects of meat production and consumption. For example, in 2015, regime outrage was sparked by a study conducted by the World Health Organization (WHO) in which the agency deemed consuming meat as "possibly carcinogenic to humans" placing meats such as sausage in 'risk 1-category' indicating the highest possible risk of cancer (Khazan, 2015). The National Cattlemen's Association chose to respond publicly, harping on the uncertainty associated with the science linking meat to cancer. The association's researchers appeared in the media stating that contrary to popular belief, "the science is far from settled" and "no single food has ever been proven to cause or cure cancer" meticulously undermining the WHO's findings (Silver, 2016).

5. Discussion

This chapter provides a critical reflection on both the theoretical framework and the empirical results provided in the previous chapter. Firstly, the research limitations and alternative explanations for the results are discussed. Secondly, reflections and contributions made to theory are delineated. Lastly, future research directions are presented.

5.1 Limitations and alternative explanations

With regards to this research, given the extent of this database consisting of over 2,000 events, consistency in categorization could be seen as a limitation. However, this possibility was minimized through careful establishment of event categories and descriptions (see *Appendix A*) in order to serve as a guide for the researcher when performing each iteration of the categorization process. An additional limitation regards the pre-defined search terms utilized in this research. Given time constraints, three search terms were used which the researcher deemed suitable in order to carry out a thorough study. Inclusion of either more search terms, or broader search terms could thus, lead to an increase in data and hold some influence on results. However, the terms chosen were based on preliminary background information regarding the most commonly used terms for meat alternatives in the United States (e.g. 'plant-based meats') in order to ensure that the most relevant data was found. Another point which could increase the validity of this research regards the novelty of the theoretical construct used. Seeing that this is the first time TIS functions have been linked to institutional work strategies future studies which further solidify these couplings could prove insightful. A final limitation includes the generalizability of the results. Given that a single case study was preformed, external validity could be hampered and thus, as mentioned prior, additional case studies could offer additional insights.

An alternative explanation for the results presented in the previous chapter is market-push and market-pull factors. Arguably, one could see the plant-based protein industry in the US as a significant market opportunity and thus, argue investor-pull is the underlying factor driving the industry. Therefore, taking a more economic perspective could provide additional insights. However, as stated and conveyed continuously throughout this research, while investment does both provide the industry with a continuous influx of necessary resources and additional

legitimacy, the market is continuously fueled by consumers. Furthermore, as results show, without the cognitive, normative, and regulative institutional strategies employed by plant-based protein actors an investor-push would not suffice independently.

5.2 Reflections and contribution to theory

This study set out to examine the institutionalization and de-institutionalization processes employed by actors in the US plant-based protein innovation system and explores the strategies by which actors are able to challenge dominant institutions surrounding meat. Furthermore, the study reconstructs the institutional practice of meat consumption and production in America and conveys how this practice is increasingly contested by *flexitarianism* allowing the plant-based protein innovation system to flourish.

A first finding regards the nature of technological innovation system dynamics. Firstly, while institutions and institutional strategies are critical to the development of a TIS, an exceptional *product* is nonetheless key. Moreover, seeing that the plant-based protein industry has existed for more than three decades it was not until a more than satisfactory product was manufactured that the industry began to flourish. Second-generation meat substitutes stimulated widely by new entrants Beyond Meat and Impossible Foods led to outstanding market growth in the category and also stimulated increasing market formation function fulfilment [F5]. Furthermore, arguably, without this exceptional plant-based meat product the appearance of a myriad of normative networks between these new entrants and highly established QSRs, fast-casuals, renowned grocery chains and high-end restaurants would not have been established. Thus, while institutions are important, technological superiority is nonetheless also essential.

A second finding, contributing to the theoretical novelty of this research, is that TIS functions are fulfilled by institutional strategies. It is through these strategies that actors are able to drive development in an innovation system. In earlier periods actors employed minimal strategies and if strategies were employed, these pertained mostly to advocacy efforts. As the US plant-based protein industry gained increasing legitimacy, however, actors were able to employ a number of additional strategies which nevertheless resulted in even more creation of legitimacy. The actor strategies which stimulated legitimacy function fulfilment [F7] included *advocacy, changing normative associations, mimicry, defining, theorizing,* and *combined strategies.*

While actors focused on employing these strategies to effectively *create* new institutions surrounding plant-based meats they simultaneously used these strategies to adhere to already *existing* institutions tied to the practice of meat consumption and production. It can therefore be argued that the institutional practice of flexitarianism incorporates some habits associated with eating meat but also simultaneously diverges from values, norms, and other factors associated with it. For example, through mimicry tactics actors were further able to de-institutionalize meat eating but this only occurred *if* actors simultaneously fit into existing practices i.e. mimicked the exact taste and texture of meat. Furthermore, whilst plant-based protein actor values and industry norms were changing, demonstrated through strategies like constructing normative networks, in which fast-food restaurants began substituting traditional meat products with plant-based meats, their habits remained largely the same. Moreover, contrary to prior studies on institutional work and institutional practices, actors operating in a new innovation system are expected to *solely* create and disrupt institutions in order to stimulate industry development. However, we see here that these are only *conditions* to furthering technological and institutional change. Without being accompanied by strategic maintenance of some aspects associated with the practice of eating meat, change can thus, prove to be more difficult. Furthermore, earlier first-generation meat alternative producers did not engage in strategies such as mimicry and instead fully worked to establish themselves and their products with no linkages to meat. Second-generation producers, however, established their plant-based meat products with specific linkages to meat, and resultingly were able to stimulate diffusion of these novel products.

An additional theoretical contribution is addressed by this research when examining how TIS technologies are able to break out into the regime. Previous studies on transitions such as the well-known MLP approach suggest that as a niche-technology develops there comes a point in which it may be able to overthrow or combat the existing regime as a result of increasing pressure and tensions either from above at the landscape-level or from below at the niche-level (Geels, 2002). However, what prior studies do not show is what exactly occurs at this interface between a niche-technology or TIS and a regime. Moreover, this study meticulously conveys that at this interface lies a *continuous* battle amongst institutions. This further implies that in order to stimulate a regime shift, this requires constant changing of institutions. Where, if successful, competing new institutions are eventually able to beat out the old.

With regards to regime dynamics, contrary to earlier studies on institutional work, this research suggests that despite the fact that institutions surrounding the practice of meat consumption and production in the United States are deeply embedded in centuries of wider routines and norms, when these institutions are deeply threatened incumbents may no longer partake in maintaining institutional work strategies. Moreover, these strategies may no longer serve as being sufficient. In this study incumbents did not partake in strictly maintenance work but switched to clear *creating* strategies in which they had to seemingly *re-create* some institutions surrounding meat. For example, through tactics such as emphasizing its nutritional value and re-solidifying its place in American tradition. Incumbents were thus seen to employ various advocacy efforts similar to those employed by plant-based protein actors when maintaining institutions became unfeasible.

A final finding is that normally regime incumbents are expected to challenge and go against competing novel technologies. In this study, however, this is not the case. While some incumbents do aim to uphold the meat industry and its reputation as a symbol of American culture, other prominent regime actors partake in both *disrupting* meat institutions and *creating* new institutions surrounding plant-based proteins. The question that remains, however, and what can be a topic for future studies is assessing why only some incumbents move in quickly and others remain hesitant.

5.3 Directions for future research

With regards to future research, given that the plant-based protein industry is highly dynamic and that the market is still immensely growing, future studies could continue to unpack actor strategies as they unfold in order to detect if some strategies phase out over time whilst others become more dominant. Additionally, in light of the current global pandemic COVID-19, and a sizable meat shortage in the United States, future studies could explore how this has affected growth in the plant-based protein industry (Lussenhop, 2020). Another research avenue could look at both the role of politics and power in the development of the plant-based protein TIS in the US as this research hinted at the linkages between the United States meat industry and powerful government bodies. Finally, given the extreme mimicry tactics engaged in by industry players, one could examine the role of framing and thus, delve deeper into use of discourse in the plant-based protein industry.

6. Conclusion

This study investigated the plant-based protein transition in the U.S. by means of a qualitative event-analysis through the course of 1978-2019. The billion-dollar United States meat industry is responsible for an unjustifiable amount of negative environmental impacts arising from the production and consumption of meat made from animals. Specifically, the industry is responsible for various sources of environmental degradation such as its role as a major contributor to global climate change, biodiversity loss, and water over-consumption. With these rising negative impacts, in addition to a rapidly increasing global population, questions regarding the ability of the world's food systems to meet rising demands has shed light on the future of plant-based proteins. Plant-based meat substitutes, defined as those plant-based proteins which have similar texture, taste, and look as meat have been increasingly gaining traction in countries such as the United States. Moreover, in the past decade, the industry has been populated with a variety of new innovative firms and better-quality products causing one to wonder what the driving force is behind this transition.

By utilizing work on technological transitions, specifically the TIS framework, institutional theory, and the structuration of socio-technical regimes this study provided insights on the institutional work strategies carried out by innovative system actors which resulted in the recent and rapid diffusion of plant-based proteins throughout the US. Accordingly, the research question guiding this research was as follows:

How are actors in the plant-based protein innovation system challenging dominant meat-based institutions in the United States?

This research concluded that actors in the plant-based protein innovation system challenge dominant meat-based institutions embedded in the institutional practice of meat consumption and production through mainly three TIS functions: *guidance of the search, market formation,* and *creation of legitimacy*. Moreover, the institutional work strategies employed by actors during the period 1978-2019 resulted in a drastic increase in function fulfilment and thus, exceptional growth of the industry.

Actor institutional work strategies that strengthened the *guidance of the search* [F4] function included *dissociating moral foundations*, and *undermining assumptions and beliefs*. Results indicate that plant-based protein actors strategically dissociated the moral foundations on

which the meat industry was born by conveying to consumers that meat production and consumption is not moral, and that meat can be made from plants. Regarding undermining assumptions and beliefs, actors guided the search for plant-based alternatives through future-oriented discourse highlighting the previously debated nutrition content of plant-based meat alternatives in addition to future declining product costs.

Actors strategies that strengthened the *market formation* [F5] function included *constructing normative networks*. In early industry years actors seldomly engaged in normative network formation and when they did this was mainly contained to a limited amount of grocery stores. In the 2010s however, this drastically increased as novel actors began forming partnerships with major incumbent fast-food chains, fast-casual chains, high-end high-profile restaurants and large American grocery chains. Through these partnerships plant-based protein actors where able to position themselves in a once fully 'meat' oriented environment as well-known QSRs such as Burger King and Subway in addition to a plethora of others began selling these products in menu items traditionally intended for meat. Furthermore, normative networks were made which normalized these strategic partnerships. This was exemplified through a number of product shortages, sell-outs and limited-time offers as consumers continuously bought novel plant-based products. In addition, aside from restaurant, fast-casual, and QSR partnerships several grocery store chains also began selling these products. Notably, where first-generation products were largely contained to their own separate department, these new second-generation plant-based 'meats' were positioned strategically in the meat aisle amongst their meaty competitors.

Continuing, actor institutional work strategies that fueled the *creation of legitimacy* function [F7] included *advocacy, mimicry, constructing identities, defining, theorizing,* and *combined strategies*. Plant-based actors strengthened industry legitimacy through tactics of campaigning, TV advertisements, public demonstrations, in addition to a number of other initiatives. Innovative new entrants utilized celebrity power in order to make their products seem legitimate to consumers and the rest of the industry. Moreover, they employed several communicate-by-example strategies in which all-star athletes were broadcasted by new entrants in tailor-made campaigns attributing their improvements in performance, heightened agility and strength to a plant-based diet. With regards to mimicry*,* earlier products prior to the 2010s did not aim to replicate meat specifically. Products manufactured by second generation plant-based

protein producers, however, were made to mimic meat as closely as possible. Actors engaged in strategies of extreme mimicry which resulted in advanced products joining the market. Business types were also made similar to those common to the meat industry. Continuing, actors constructed new identities acquiring the role of plant-based industry advocates and trade organizations, formally identified as organizations which defend the interests of plant-based protein actors. These industry advocates were seen as valuable resources to new plant-based actors as they organized educational courses, workshops, research grants, and other services to industry actors. Finally, actors engaged in defining and theorizing strategies which specified and thus, further legitimized what it meant to both be a 'flexitarian' and 'plant-based meat'. Through theorizing actors were able to widen the previously existing consumer category at which plant-based protein products were aimed, targeting not only the vegetarian and vegan but also the 'flexitarian', a conscious but slowly diverging meat eater. Finally, actors also further defined the plant-based meat product category through creation of a new plant-based label and adherence to existing institutions such as FDA regulations.

Concluding, actors in the US plant-based protein transition challenged dominant meat-based institutions surrounding the institutional practice of meat consumption and production through simultaneously creating and disrupting institutions whilst fitting in existing practices. This was done primarily through institutional work strategies which stimulate guidance of the search [F4], market formation [F5] and creation legitimacy [F7] function fulfilment where legitimacy is indicated as the primary and arguably, most important driver of industry development.

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Appendix A

Table. 1 Event categories, description, and function allocation

Event Category	**Description**	**Function**
1. Product Launch	Article stating product or ingredient is invented, a new product is rolling out on a specific date, or a product is launched on a menu	1
2. Award Received	Articles discussing awards received by actors in the protein transition (e.g. Beyond Sausage wins TIMES Best Invention of 2018, Beyond Meat & Impossible Foods win the United Nation's highest environmental honor: *Champions of the Earth Award*)	7
3. Product Shortage	An article stating there is a shortage of a product and thus demand cannot be met properly	6(-)
4. Restaurant Expansion or Launch	When an article states a restaurant serving meat alternatives has launched or has expanded to different locations	1
5. Patent	When a patent is published	2

6. Positive Press	Positive press articles are defined as those positive articles reported by newspapers on actors active in the protein transitions	4, 7
7. Consumer Feedback	Articles relating to a personal/subjective opinion about how a product tastes, its texture, or how it smells	7
8. Campaign	When an article discusses a particular cultural, public health, or awareness initiative related to plant-based proteins (e.g. The UN's International Year of Pulses Campaign & Meatless Mondays Campaign)	7
9. QSR Partnership (Quick-Service Restaurant)	Partnership with a quick-service-restaurant (Chains such as Burger King, Del Taco, Dunkin' Donuts, Little Caesars, etc.)	1
10. Menu Extension/Partnership	When plant-based proteins are added to the menu of a restaurant	1,5
11. Funding/Investment	Articles reporting when companies receive funding or that an investment has been made	6 (financial) 6 (materialization) 6 (physical)

12. Product Testing or Product Sample	Article stating a product is either being tested prior to the decision to permanently offer it or articles discussing products being given as samples	1
13. Grocery Chain Partnership	An article stating a partnership between a grocery chain and a company that produces meat alternatives	5
14. Big Food Product Diversification	Events relating to incumbent meat producers also known as "Big Food" introducing plant-based options to their menus or an expected date of when they will be launched	1
15. Expert Opinion/Authority Opinion	Opinions voiced by experts (i.e. scientists, physicians, dietitians, scholars) or authorities (i.e. FDA member)	4, 7
16. Market/Sales Growth	An event stating particularly that there has been market or sales growth in plant-based proteins (for example, the market for plant-based proteins has grown 10% over the past year). This	5

	differs from *Trend Spotting and Market Forecasts* as it is concrete data and not expectations of how the market will grow in the coming years.	
17. Nutrition, health or sustainability claims	An article making claims about plant-based protein its relation to nutrition, health, or sustainability	7
18. Acquisition	Acquisition of a company by another company (large incumbent meat producers acquiring small alternative protein start-ups)	1, regime
19. Lobby	Articles discussing specific lobby activities carried out actors maneuvering in the protein transition or press articles stating that a particular lobby group relating to the protein transitions has been founded	7
20. Celebrity/Athlete Endorsement	Events relating to news of celebrities or professional athletes becoming backers of companies, ads featuring celebrities/athletes promoting products, as well as	7

	statements by celebrities made in the media stating they support a brands product	
21. Government Support	Articles reporting on plant-based proteins being supported by specific departments of government (e.g. June 2006 the Dietary Guidelines Advisory Committee of the U.S. submitted a report to the USDA and Health and Human services emphasizing the necessity of moving towards plant-based diets)	4, 7
26. Website Launch	When a website offering plant-based proteins is launched	1
27. Trend Spotting & Market Forecasts	Articles stating that plant-based proteins are increasingly being seen as a trend in addition to articles providing specific market forecasts based on market data from research firms	4

28. Company Claims, Goals or Expectations	When a company board member, employee, or founder speaks on behalf of the company with regards to its goals, targets, or future expectations regarding its stance in the protein transition	4
29. Survey/Study/Report Outcome	Articles that discuss or report on specific study, survey, or report outcomes relating to the protein transition. This category differs from nutrition, health, or sustainability claims when there is hard evidence available	4
30. Trademark	When a trademark relating to meat alternative products is published	1
31. Production Insights	Articles discussing specific production insights of companies such as Beyond Meat (e.g. insights into Beyond Meats development lab as well as its production processes)	7

32. Developments in Technology	Articles pertaining to specific technological developments pertinent to accelerating the protein transition	2
33. Company Discontinuation	When a company files bankruptcy or ceases to operate	1(-)
34. Production Expansion	An event stating an additional production facility has been opened	6 (materialization)
35. Summit	An article discussing a summit relating to alternative proteins	3
37. Certification	When a product/ingredient has received a certification (e.g. When a product is GRAS certified or FDA approved by the Food and Drug Administration) or when a certification is being discussed in the media	7
38. University Foodservice Expansion	When a University expands its current menu offerings to include plant-based proteins	1

39. Educational Program, talk, or workshop	When an event discusses educational programs related to meat alternatives, such as the establishment of courses at universities (e.g. UC Berkeley), webinars, and informational talks on the protein transition	3
40. Food Festival, expo, or show	When an article discusses a particular food festival, food expedition, or food show which features companies active in the protein transition as well as showcases their products	1
41. Opinion	When an article is published discussing opinions of the general public. This differs from *consumer feedback* as it does not include articles discussing consumer views on a particular product (with regards to taste or texture for example) but rather focuses on opinions about meat substitutes in general	4,7
42. Research Grant	When a research grant pertaining to the alternative proteins has been awarded	6 (financial)

43. Regulation	Article discussing specific regulation aimed at meat substitutes (ban on labeling meat alternatives using the term "meat")	7(-), regime
44. Promoting Product Awareness	When media reports on meat substitutes available on the market, or on restaurants/diners that are serving them. This category includes events relating to general awareness of specific options available and where to find them	7
45. Conferences	Articles discussing specific conferences relating to meat alternatives	3
46. Research & Development	Articles discussing actors increasing R&D as well as events pertaining to, for example, the opening of a new R&D facility and advancements in research	2
47. Product Discontinuation	When a company discontinues a product	1(-)
48. Lawsuit	When a lawsuit has been filed related to plant-based proteins	7, regime

49. Regime Response	When regime actors such as the United States Cattlemen's Association act in opposition to the development of plant-based proteins	7(-), regime