

Evaluating Beyond Meat's Success in the Consumer Market for Plant-Based Meat

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ABSTRACT: Behavioral economics theories were used to evaluate Beyond Meat's success in changing consumer tastes and preferences for plant-based protein in North America—mainly through its retail presence and partnerships with fast-food restaurants. Conclusions were drawn through the analysis of Beyond Meat's corporate decisions and various secondary sources, such as research conducted by Cattlemen's Beef Promotion and Research Board, Kansas University, and Purdue. The study revealed that biases, including status quo, distinction, familiarity, anchoring, and confirmation, are extensive in consumer perceptions of plant-based meats, often requiring immense efforts in choice architecture and nudging to create changes in pre-established habits such as meat consumption. However, by leveraging theories such as advertised responsibility, framing, nudging, herd behavior, and FOMO, Beyond Meat has significantly impacted the industry and the acceptance of plant-based meats. Biases pose problems in our day-to-day lives as change is required for improvement. Through exploring the factors in decision-making that influence human stagnance, we could alter the environment and context in which choices are presented through choice architecture, “nudging” consumers in the right direction. This can lead to low-cost and wide-scale change, such as more sustainable diets and reducing the impacts of imminent issues such as climate change.

KEYWORDS: Behavioral and Social Sciences; Other (Behavioral Economics); Nudge Theory; Choice Architecture; Plant-based Meat Market.

■ Introduction

To reduce human behavior within a set of given rules would do injustice to the complexity of our minds; equally inaccurate would be the theories based upon such assumptions. Traditionally, economists have studied an abstraction of human behavior referred to as ‘*homo economicus*’—a term first used by economist John Stuart Mill in the 19th century.¹ The model assumes that humans are purely driven by self-interest, make decisions with perfect rationality and information, and have unlimited cognitive capacity. However, observation of our world and ourselves reveals that this is not entirely the case. We engage in altruistic behavior, such as charity or making purchasing decisions based on the ethical origins of products. We have limited thinking capabilities, are often flawed by cognitive biases and heuristics, and can only make choices from the information available.² Popularized in recent decades, behavioral economics develops and evaluates policies based on a more accurate reflection of human behavior—expanding upon the traditional model of ‘*Homo economicus*’ by considering how humans respond and react to various circumstances. Given the immense influence of cognitive decision-making in markets, a review would be important for furthering the applications of these theories in present-day issues such as climate change. By leveraging the interconnection of psychology and economics, policymakers and companies can guide the general public toward more beneficial outcomes without the need for as great of a monetary incentive, which would otherwise be costly to implement.³ As a basis for this essay, I will use such behavioral economic theories to evaluate Beyond Meat's success in changing consumer tastes

and preferences for plant-based protein in North America, mainly through its retail presence and partnerships with fast-food restaurants. Our various human cognitive biases, leading to resistance to unfamiliarity, pose problems in our day-to-day lives as change is required for innovation and improvement. By exploring and recognizing the factors in decision-making that influence human stagnance, we could alter the environment and context in which choices are presented through choice architecture, “nudging” consumers to make more environmentally sustainable decisions.⁴ One area that could benefit from this is the food industry as “the global production of food is responsible for a third of all planet-heating gases emitted by human activity.”⁵ While behavioral economics has seen a strong emergence in recent years, very few resources have been allocated regarding the plant-based meat market. Although behavioral economics can be used subconsciously as marketing tactics, a more thorough acknowledgment and understanding of these theories will allow greater efficiency and effectiveness in applying these theories. Given the substantial influence of cognitive decision-making in consumer markets, a detailed review of its applications can further reveal its impact in present-day issues such as climate change and socioeconomic inequality.

To conduct a market analysis, background information was gathered through research, articles, news outlets, and readings of Beyond Meat's own statements—while being cognizant of their potential bias. These sources may refer to changes in the plant-based industry or focus on Beyond Meat's products specifically. In both cases, Beyond Meat maintains a significant

products specifically. In both cases, Beyond Meat maintains a significant market share in the industry, and changes to the entire sector will reflect their products to a certain extent. The applicable behavioral economic theories will be analyzed through research articles and publications describing the biases and their effects, such as *Nudge* by Richard Thaler or *Thinking, Fast and Slow* by Daniel Kahneman. The review will evaluate possible short-term and long-term barriers to transforming consumer habits due to bias and relevant economic factors from the currently available data.

■ Discussion

Context and Beef Market Analysis:

With technological developments and an increased population, our global meat consumption has tripled in the last 50 years.⁶ This poses issues as meat production leads to various negative externalities, defined as the cost to third parties not involved in producing and consuming goods. This occurs at the free market equilibrium price and quantity, which is where supply meets demand in a market without external interference from actors such as the government. As these negative external costs are not reflected in the market price of meat, the quantity being produced and consumed exceeds the socially optimum level, leading to market failure.

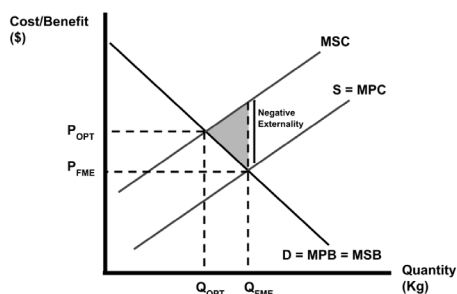


Figure 1: Negative externalities of beef production in the United States.

The negative externalities of beef production, labeled in **Figure 1**, come from sources such as the land and irrigation required for livestock feed, the release of methane from cows, pollution from machine operation, eutrophication, and fertilizer use, all contributing to increasingly prevalent environmental issues. Furthermore, modern farms are often unsanitary and overcrowded, raising ethical questions. These practices have led to various diseases, such as AIDS, SARS, Ebola, and COVID-19, with “three out of every four emerging infectious diseases in humans originating in animals,” according to PETA.⁷ The repercussions of pandemics are immense, causing supply-chain disruptions and the loss of lives, economic potential, and GDP. These consequences result in welfare loss: the total cost to society, shown in gray. This signals that beef is overproduced and overconsumed at the current free market equilibrium P_{FME} and Q_{FME} . In the interest of sustainability, it should be shifted toward the optimal equilibrium at P_{OPT} and Q_{OPT} .

However, meat production on a large scale is necessary to keep up with the population growth in the United States of 68.9% since 1970,⁸ with the average person in the country consuming 274 pounds of meat every year, a 40% increase

increase from 1961.⁹ While researchers have proven that meat consumption is not necessary to maintain a healthy diet from 1961.⁹ While researchers have proven that extensive meat consumption is not necessary to maintain a healthy diet and that protein can be obtained through other foods such as seitan, tofu, and beans, various factors such as habit, culture, taste, preference, and marketing have led to meat remaining in most US consumers' diets.

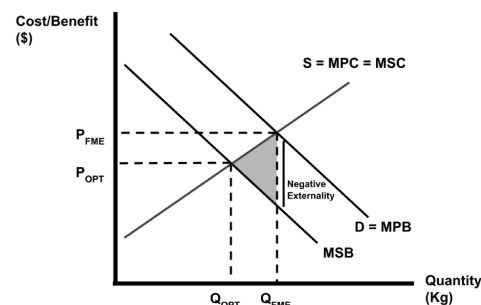


Figure 2: Negative Externalities of Beef Consumption in the United States.

According to Oxford University, consuming too much meat leads to heart disease, pneumonia, and diabetes.¹⁰ As illustrated in **Figure 2**, this further acts as a negative externality from the consumption side as the U.S. healthcare system spends an estimated USD 180-250 billion annually treating meat-consumption-related illnesses.¹¹ Funded through taxpayers, the welfare loss, shaded in gray, is equally significant.

If consuming meat poses so many issues, and there are so many alternatives, why aren't most consumers switching? Vegetarian, vegan, and keto are among various plant-based diets that have surfaced, yet, groups such as vegetarians represent only 5% of all US consumers.¹² Through a behavioral lens, this may result from status-quo bias, which is rooted in several underlying psychological factors. Examples include loss aversion, where embracing alternative options such as plant-based meats pose a greater perceived risk than the apparent benefits, or from habits, where the comfort and familiarity of the current state create a resistance to change. Consequently, those who have grown up with meat may tend to stick with it throughout their lives.

The issue of convenience also exists—you would not have trouble finding a restaurant selling meat options. However, vegetarian or vegan alternatives are a lot more scarce, with only 1471 purely vegetarian and vegan restaurants in the United States (2020) out of more than 1 million in total.¹³ This makes it difficult for consumers to switch, and thus, it is also unappealing for producers to offer such options due to the small consumer base. Suppose we are not leaving meat anytime soon: would it be possible to develop a substitute product that is almost identical in taste, texture, smell, and look, addressing the issue of human stagnancy? This introduces plant-based meat, aiming to address the aforementioned negative externalities while developing a product that consumers may find easier to switch to. Founded in 2009, Beyond Meat pioneered a new approach to the plant-based meat industry. The CEO of Beyond Meat, Ethan Brown, believes that they can change consumer tastes and preferences

through their pea-based patties. And so far, it is working, finding itself in supermarkets, media headlines, and large-name partnerships with fast-food restaurant chains such as A&W, KFC, McDonald's, and Tim Hortons. Since then, various companies such as Impossible Meats have looked to compete in the global plant-based meat industry valued at USD 8.5 billion (2021) and expected to reach USD 24.8 billion by 2030.¹⁴ However, Beyond Meats remains a significant player in the industry, holding a 22% market share as seen in Figure 3.

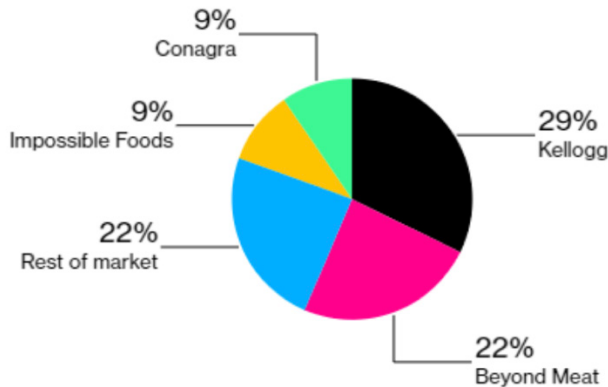


Figure 3: Market share for plant-based meats.¹⁵

Even though plant-based meat has been around since the 1970s, the primary difference between the Californian start-up and previous attempts is that pre-existing plant-based burgers had a small market of vegetarians and vegans and a poor reputation for having bad taste, with 90% of respondents claiming that beef burgers tasted better than plant-based alternatives.¹⁶ On the other hand, Beyond Meat targets meat-eaters and flexitarians: a primarily plant-based diet with the occasional incorporation of meat. This is done by trying to imitate the look and taste of actual meat, providing a healthier, more appealing, and more environmentally sustainable substitute for consumers. While a possible and commonly suggested solution to reducing meat consumption would be to increase taxation, this may pose downsides for low-income families as food, a necessity, would become less affordable. An alternative would be to offer a substitute for consumers who can afford it, decreasing the demand for meat consumption, reducing its negative externalities from Ne to Ne_1 and welfare loss from the darker to the lighter shaded region in Figure 4.

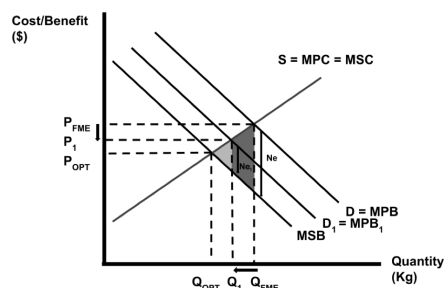


Figure 2: Negative externalities of beef consumption in the United States with the introduction of substitute goods.

However, as of 2022, rising food prices, living costs, supply-chain disruptions, and international conflicts, among various factors, have led to Beyond Meat incurring net losses of USD 100.5 million, leading to plummeting shares and doubts raised by investors. Despite the current economic environment, however, approaching the issue through the lens of behavioral economics may provide further insight into the industry's long-term prosperity.

Short-term Analysis:

Partnerships with fast-food restaurant chains, constituting USD 304.8 billion in U.S. consumer spending,¹⁷ have allowed Beyond Meat to access a more extensive consumer base. Targeting the fast-food industry may be beneficial as there is a smaller focus on meat quality compared to other preparation methods. Consumers eat for taste, enjoyment, convenience, and lower prices in the fast-food industry. The taste of the patties is often hidden behind sauces, condiments, and a subconscious taste bias from marketing strategies due to an already existing habit for producers to disguise low-quality meat. Analyzing this approach, the primary focus will be the data collected from consumer demand for Beyond Meat burgers in both fast-food restaurants and retail stores, where meat quality is less of a focus. This section draws four barriers to converting consumer choice in the short-run: anchoring, status quo, distinction, and familiarity bias.

Proposition 1: Anchoring Bias:

Anchoring bias refers to the human tendency to over-rely on initial pieces of information, the "anchor," when making decisions or estimates. This is particularly prevalent when consumers encounter unfamiliar environments and situations, seeking out reference points to make judgments. Consequently, this may lead to biased decisions as the consumer strays from rational reasoning. Within the plant-based meat market, consumers may experience anchoring bias when confronted with the choice of plant-based meat alternatives as it is considered to be relatively new. In this case, the closest anchors can be either the last vegetarian burger the consumer has tried, which is different from Beyond Meat's line of products, or the information they have received from their external sources such as advertisements or word of mouth.

The effect of this bias is noticeable in a research survey conducted by Kansas University and Purdue on consumer perceptions of meat compared to plant-based alternatives. It is important to note that it was funded by Cattlemen's Beef Promotion and Research Board, a "research program designed to increase the demand for beef,"¹⁸ signifying that the results may be skewed in preference for traditional meat.

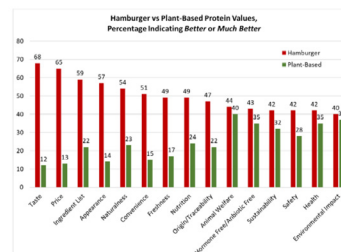


Figure 5: Hamburger vs. plant-based protein value perceptions indicating Better or Much Better.¹⁹

Figure 5 indicates the percentage of survey participants that ranked either plant-based (green) or hamburgers (red) as “Better” or “Much Better” compared to each other for specific categories, with the remaining respondents falling somewhere in between. It should be noted that while hamburgers are rated higher than plant-based burgers in every aspect, there are categories where the results are comparable. As expected, the most appealing factors of plant-based meats rely on consumer morals, with animal welfare rated at 40%, environmental impact at 37%, and sustainability at 32%. That being said, the ratings of plant-based burgers on taste, price, appearance, convenience, freshness, origin, ingredient list, naturalness, and nutrition fall significantly behind that of hamburgers. This poses a significant issue as consumers generally would place heavier emphasis on taste and price when purchasing food, as opposed to environmental impact. This may point to a setback of advertised responsibility, where consumers may only feel inclined to buy one good over another from a moral perspective if both goods are relatively similar in their primary utility, in this case, taste.

However, anchoring bias is particularly noticeable for the more objective categories, such as animal welfare or environmental impact. While taste may be subjective, it is nearly indisputable that plant-based meats—involving no animal killing in their production—should be rated higher than hamburgers for animal welfare. Yet, of the participants, 44% believed that hamburgers, relying on animal slaughter, were either “Better” or “Much Better” than plant-based alternatives for animal welfare and the environment. This points to the significance of both imperfect information and biases, going against the previously made assumption of homo-economicus, where all actors can make perfectly rational decisions. Consequently, we can observe an over-reliance on unverified information or beliefs when forming consumer perceptions. Most of the results could be attributed to anchoring bias, as seen in the following Figure 6, 65% of the survey respondents have not consumed plant-based meat within the last month.

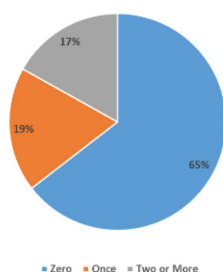


Figure 6: Consumption in the past month of plant-based burger patties or ground crumbles.

Thus, some participants would be relying on previous experiences with plant-based burgers or perceptions developed through interactions with others. Therefore, imperfect knowledge and anchoring bias toward plant-based hamburgers may play a significant role in these survey results.

Seen as the lowest consumer perception rating for traditional meat is 40% for Environmental Impact and approximately the same for similar categories; around 40% of respondents

appear to be biased in favor of traditional meat. However, bias can go both ways. A similarly objective category is price. Plant-based burgers are, on average, 70% more expensive than regular-meat hamburgers.²⁰ Factoring extreme deviations from this average, plant-based burgers would, at the very least, be expected to have a similar price to regular burgers due to their higher production costs. Either way, respondents should not perceive plant-based alternatives as “Better” or “Much Better” in terms of price compared to regular meat, leading to approximately 10-15% of consumers being irrationally biased in favor of plant-based burgers. Overall, these results point to a growing plant-based meat consumer base and the remaining work to do in converting the population to new habits against various biases.

Proposition 2: Status Quo Bias:

As explained in Kahneman’s *Anomalies*: “[...] individuals have a strong tendency to remain at the status quo, because the disadvantages of leaving it loom larger than advantages.” (197-198)²¹ In the case of regular meat consumption, there would need to be a change in dietary, cooking, and purchasing habits if consumers were to switch to plant-based meats. The effort required to change will likely dissuade most consumers from converting to a new diet, even with advertised and proven benefits. However, as seen in the first proposition, most consumers may not even have access to or accept these advantages. Consequently, anchoring bias and a lack of information may cause apparent disadvantages to seem even greater, furthering the effects of the status quo bias and the resistance to change.

A solution Beyond Meat has pursued is reducing the significance of change and normalizing eating plant-based meats, such as attempting to replicate the taste, texture, and cooking style of regular meat. However, they have also placed significant care in the choice architecture surrounding its products by “organizing the context in which people make decisions”²² to influence consumer decision-making. Choice architecture aims to design environments that help individuals make beneficial choices without restricting freedom, often employing nudges. As stated by Richard Thaler, “to count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates: Putting apples at eye level counts as a nudge.”²² In this case, Beyond Meat prides itself as the “world’s first plant-based burger sold in the meat case”²³ in North American grocery stores.



Figure 7: Beyond Meat burger patties at Canadian Loblaws in the meat freezer the author took the photo on May 8th, 2022.



Figure 8: Beyond Meat sausages at Canadian Loblaw's next to the real meat, the photo was taken on on May 8th, 2022, by the author

This is a significant step in increasing accessibility and convenience for consumers. As seen in the above Figure 7 and Figure 8, consumers can follow their purchasing habits of visiting the meat section and still encounter the option of plant-based patties. Although this has raised controversy as the product is not actually “meat,” it exposes the target audience of meat-eaters and flexitarians to this substitute good, facilitating the change by making the product align with established habits. The exposure is furthered by the company’s partnerships with fast-food restaurants such as Mcdonald’s to ensure that the alternatives are offered widely at established locations. This collaboration increases the likelihood of consumers trying the new alternatives as fast-food restaurants already have a regular consumer base. By readily offering these products at convenient locations, consumers may be more inclined to try plant-based meat instead of exerting the additional effort of going through a plant-based aisle or entering vegetarian restaurants when searching for alternatives. However, this may lead to other barriers such as distinction bias that counteract this goal.

Proposition 3: Distinction Bias:

Placing plant-based and regular burgers in the same context could lead to distinction bias, where two options are considered more different when compared side by side. This is due to individuals evaluating and making decisions based on relative differences rather than the absolute values of either choice. Where plant-based meats may have been an appealing choice on their own, the presence of traditional meat may lead to consumers becoming more aware of the differences between Beyond Meat burgers and traditional meat, driving the negative stigma around plant-based meats being unnatural and, thus, irrationally assumed to be less healthy. Plant-based patties are considered processed and are often referred to in the media as “lab-grown.” This contributes to a negative perception of plant-based meat as less natural, as indicated by a significant gap in “naturalness” perception shown in Figure 5 of 54% compared to 23%. This framing of information draws a difference between the two products and contributes to the negative stigma surrounding plant-based meat being “fake.” Consequently, this may decrease the effectiveness of the choice architecture surrounding plant-based meats next to traditional meat. As a result, consumers have become more conscious of the exact contents of plant-based alternatives. According to Market Research Firm Mintel, consumers are looking for

recognizable ingredients and packaging similar to real meat, with over 70% of consumers reading the label before buying a meat alternative they’ve never had before.²³ This plays on the familiarity bias, where consumers feel more comfortable purchasing and consuming what they know.

Proposition 4: Familiarity Bias:

Being able to recognize certain ingredients reduces the “unnaturalness” that is often associated with plant-based meats. These variables were also studied in the research survey conducted by Kansas University and Purdue,¹⁹ where respondents were presented with choices in two contexts. The first is Figure 10, with the nutrient contents of two burgers and their calorie count—the second, in Figure 11, with the ingredient list.

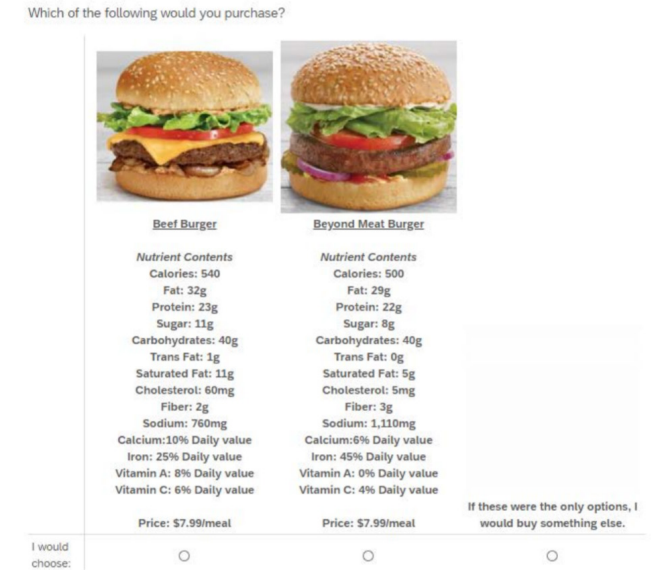


Figure 9: Choice option between beef and Beyond Beef in the presence of nutrient contents.

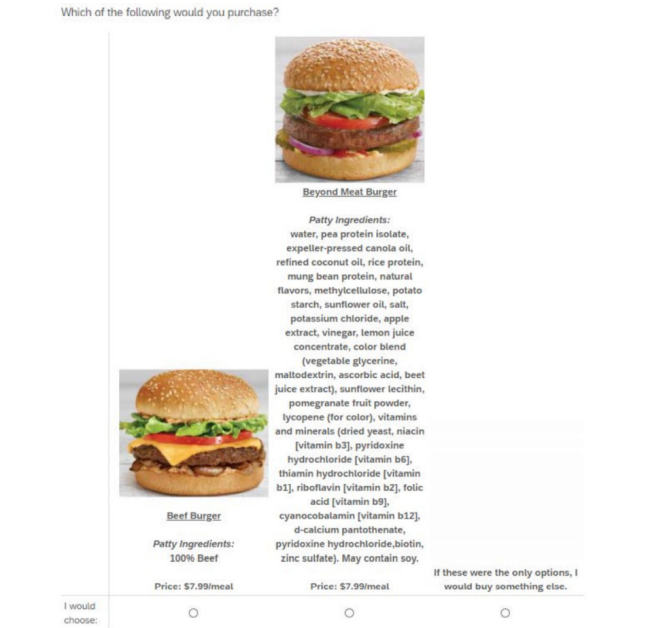


Figure 10: Choice option between beef and Beyond Beef in the presence of an ingredient list. The respondent data is recorded below in Figure 11.

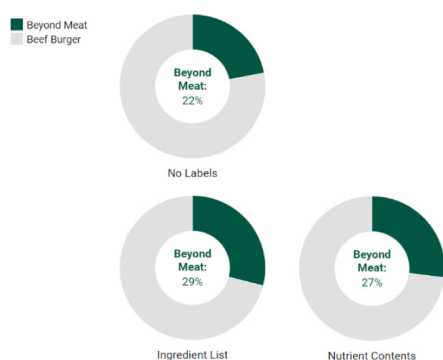


Figure 11: Respondent choice distribution in different testing conditions.

Both ingredient lists and nutrient contents yield higher choice levels from respondents than with no labels: in the presence of more information, consumers are more likely to pick the healthier alternative of Beyond Meat. According to research by The Food Information Council on U.S. households, 47.9% of consumers wanted access to more information on plant-based meat, such as the complete ingredient content, before trying them.²⁴ Despite the difference in respondent choice with more information, the nutrient contents shown in Figure 10 were somewhat misleading as regular beef can also be broken down into constituent parts, such as being 75% water, rather than exaggerating the differences between the choices.²⁵ This may further the distinction bias as many of the listed ingredients for plant-based meats such as water or sodium are also present in regular meat, which on the other hand, is listed as “100% Beef.” While certain consumers may be more attracted to familiar ingredients in the plant-based patty, others may be dissuaded by the long list of scientific jargon, causing important differences to be downplayed as it is saturated by less relevant and possibly unfamiliar information. Thus, in a market environment, packaging could highlight the health benefits of Beyond Meat more explicitly, such as the ones found at a Canadian Loblaws shown below in Figure 12 emphasizing the reduced saturated fat content (in turquoise), which could otherwise be lost in the information overload.



Figure 12: Beyond Meat burger patties at Canadian Loblaws with “New Look” packaging, the author took the photo on May 8th, 2022.

Thus, the presence of increased information can be effective in reducing consumer irrationality as it can lead to more educated and informed purchases. However, there could be further research exploring if effective packaging and presentation of information to greater change in consumer behavior.

Beyond leads the personal incentives of healthier purchasing decisions, humans are also susceptible to judgment from others, resulting in herd behavior. The heuristic describes the human tendency to act similarly to the majority or what they perceive to be the majority. This is particularly problematic in creating change from a pre-established context, such as a culture embedded in meat consumption, as most actions go against the change. However, herd behavior also leads to trends. Over the past decade, the media has given significant attention to imminent environmental issues. Thus, Beyond Meat is equally advertised as a means for consumers to save the environment through their diet. Consumers feel inclined to participate in this trend while also feeling good about themselves due to an apparent environmental benefit. However, movements, while effective in the short term, may be less effective in the long-term, which is necessary for permanent changes in consumer tastes and preferences. As seen by the recent decline of Beyond Meat, one questions whether the plant-based diet shift will last.

Long-term Analysis:

Having experienced a 46% increase in dollar sales from 2019 to 2020, the sudden flattening of growth from 2020 to 2021 may indicate a decline in the industry as seen in Figure 13.

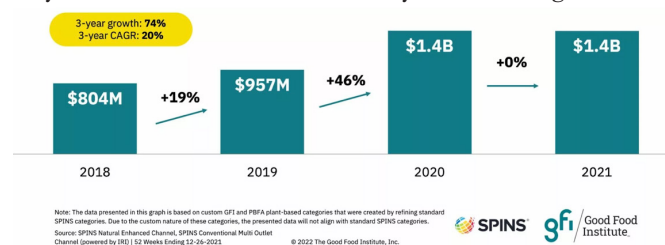


Figure 13: Plant-based meat and seafood dollar sales, U.S. retail, 2018-2021.²⁶

However, this can be attributed to various factors, such as FOMO (Fear of Missing Out) only being effective in the short-term, inflation levels, increased competition, supply-chain disruptions, and counter-advertising from the meat industry—revealing that the sale stagnancy may be short-term and not as concerning.

Proposition 1: Fear of Missing Out:

Firstly, partnerships with fast-food restaurants have been advertised as “limited time” deals, which use the FOMO and loss aversion bias by encouraging consumers to try the Beyond Meat products before they are gone. Fear of Missing Out is a psychological unease coming from the anxiety that others have rewarding experiences or opportunities that one is absent from. Whether it be due to societal influence and pressure or the fear of regret, consumers can be influenced into purchasing goods that are only available temporarily. While this technique seems to be effective in the short-run with about two-thirds of Americans having tried plant-based meats in the past year, the long-run change in consumer behavior remains for only 20% of Americans who eat it once a week.²⁴ From a sustainability standpoint, the lack of long-term commitments to the product is concerning, particularly as the trend fades from media coverage. Thus, certain approaches may need to be taken, such as re-framing the consumption of plant-based meat products as

long-term commitments or even reworks to the product itself. This is necessary for not only the plant-based meat industry but others based on environmental sustainability, as trends are insufficient to create permanent change. However, while biases may be at play, there are other significant economic factors that may be responsible for the recent slowing in growth.

Proposition 2: Competition, Inflation, and Supply-Chain Issues:

Firstly, the recent decline of 13.9% in Beyond Meat year-over-year sales²⁷ could also be associated with the increased competition that the start-up is facing. Although the plant-based industry experienced no expansion, specific competitors, such as Impossible Foods, gained USD 500 million in funding during a period of “record growth.”²⁸ As other companies battle for market share, Beyond Meat may experience decreased revenues.

Secondly, as the decline has been particularly prevalent in recent years, it could be associated with supply-chain issues and rising food prices. The high level of inflation has been steadily increasing, reaching as high as 8.5% in the United States²⁹ and 7.6% in Canada as of July 2022.³⁰ This may lead to an increase in consumer price awareness and decreased spending due to higher costs. However, inflation represents a persistent increase in the average price levels of most goods and services. Thus, it is not unique to plant-based meat sales and would require a larger context of analysis. The following data table from Good Food Institute draws a comparison between the market changes in plant-based meat to conventional meat.

Category	Dollar sales, 1-year change	Unit sales, 1-year change	Average price per unit, 1-year change
Total food	2%	-3%	+5%
Frozen & refrigerated conventional meat*	1%	-4%	+6%
Plant-based meat	0%	-3%	+3%

Figure 14: Dollar sales, unit sales, and average price per unit of plant-based meat and conventional meat 2020 to 2021.²⁶

As seen in Figure 14, while frozen and refrigerated conventional meat dollar sales increased by 1%, their unit sales decline was larger than that of plant-based meats: -4% compared to -3%. As well, the average price unit change of 6% indicates that increased prices completely drove the conventional meat's dollar sales growth. Although the plant-based meat industry had no change in dollar sales over 2020-2021, it performed better than conventional meat in consumer demand as it experienced a lower loss of unit sales. The decreased unit sales of conventional meat would also reduce negative externalities associated with meat consumption and production, possibly indicating a more sustainable trend to emerge.

Finally, inflation may result from supply chain disruptions and ingredient shortages, demonstrating that the decrease in demand for Beyond Meat products may be price-driven and unrelated to the consumer's tastes and preferences. Canada, the largest producer of yellow peas, experienced an extreme drought over the 2020-2021 summer.

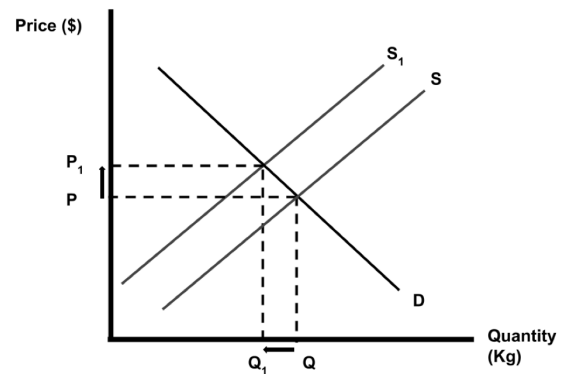


Figure 15: Effects of extreme drought in Canada on the yellow pea market.

The extreme weather conditions led to a decrease in supply (S to S_1) in Figure 15, causing a 45% decrease in yellow pea production (Q to Q_1) and an increase in pea prices by 120% (P to P_1) compared to last year.³¹ Overall, this would contribute to higher production costs for Beyond Meat as yellow peas are their primary ingredient, leading to higher prices. However, such extreme weather conditions can be considered short-term and unpredictable, indicating that the fall in Beyond Meat sales may be temporary. With climate change leading to harsher weather conditions and impacting industries trying to address the issue, the concern of environmental harm appears to be self-perpetuating and only furthers our need to take prompt action.

Proposition 3: Counter-Advertising from an Established Meat Industry:

There exist advertising campaigns from a well-established meat industry. The firms want to increase demand for traditional meat and, by doing so, may use methods to decrease the need for substitute goods. With substantial funding due to their scale, the firms can run expensive ad campaigns that criticize plant-based meat for being “unnatural.” This contributes to confirmation bias, where consumers are more likely to remember and favor information that agrees with their previous beliefs and values. If past convictions consist of negative perceptions of plant-based meats, as some may result from previous vegetarian burgers, then consumers may become more hesitant towards change. As explored throughout the analysis, many of the barriers to transforming consumer habits are due to biases involving ideologies and the lack of factually correct information. Consequently, in a free market, traditional meat firms that have the necessary resources and economies of scale to maintain control over the industry may continue to do so by playing on psychological factors that influence human decisions. However, with plant-based meat being considered a possible solution to the negative externalities of meat production and consumption, governments may need to implement policies that support plant-based firms. Whether it be increased spending on research and development, advertisement, or subsidies for crop farmers, the free market may take too long to accept plant-based alternatives as the standard. However, despite the concerns about the sudden halt of growth, many factors appear to be widespread and short-term, shedding a positive light on the issue.

Recommendations for Future Research:

The plant-based industry is just emerging, and like the products and firms, there remains significant work and areas to explore. As there is insufficient information within the field to confidently reach certain conclusions, I have proposed recommendations for future research based on the findings in this review.

1. A more balanced comparison of choice options between Beef and Beyond Meat Burgers:

a. As discussed in **Proposition 4: Familiarity Bias Figure 10**, the presentation of the ingredients list for both types of beef burgers is unjustly exaggerated, potentially leading to inaccurate results. A survey that takes into account all the ingredients within traditional beef patties in the same manner that plant-based meat was presented may lead to a more balanced comparison of the two products. This may increase the familiarity that consumers feel towards Beyond Meat as it would closer resemble traditional meat, leading to a greater, and more equitable change in favor of Beyond Meat burgers as an option. In addition to this fact, the images presented are also unjustly compared as different elements are present in the burgers, such as cheese being in the traditional burger. Therefore, a new survey with more variables being controlled would also be beneficial.

2. Evaluating the effectiveness of packaging and presentation of information to highlight important benefits of plant-based alternatives:

a. As discussed in **Proposition 4: Familiarity Bias Figure 12**, Beyond Meat implemented packaging that highlights the low saturated fat content, among other incentives to encourage the consumer to purchase the beef. As the survey from Kansas University and Purdue presented the nutrient contents and ingredients list in a linear and cluttered way, consumers may default to their habits as information was not appealing to read and not reflective of an the actual product at the grocery store. Instead, a survey with Beyond Meat's packaging should be compared to traditional meat's packaging to create a more accurate representation of consumer choice, while also allowing necessary information and comparisons to be highlighted for the consumer.

3. Understanding why consumers fail to integrate plant-based meat into their diets:

a. With around 67% of Americans having tried plant-based meats last year and only 20% who continue to consume it once a week, it would be important to understand why plant-based meat fails to remain in consumers' diets. Whether it be the product itself, the price, availability, or biases, there is insufficient available information to make necessary adjustments and changes. Therefore, a point of further research could be a survey that seeks to understand the reasons why respondents who have tried a plant-based product once opted not to do so again.

Conclusion

The current state of meat consumption is unsustainable, producing various negative externalities. As a result, numerous efforts have been made to shift consumer behavior towards more sustainable diets involving meat substitutes. However, as demonstrated through Beyond Meat's successes

and downturns, biases such as status quo, distinction, familiarity, anchoring, and confirmation, are extensive and often require immense efforts in choice architecture and nudging to create changes in pre-established habits such as meat consumption. Nevertheless, Beyond Meat has significantly impacted the industry by improving consumer taste and preferences for plant-based products. Behavioral economic theories such as advertised responsibility, framing, nudging, herd behavior, and FOMO, whether applied intentionally or not, can be used extensively to evaluate Beyond Meat's expansions—being conscious of such notions can lead to more effective changes moving forward. Looking into subsequent years, whether the decrease in sales of Beyond Meat and the plant-based meat industry is short-term or long-term will play a significant role in the future health of our environment and climate. As research in the field improves the quality and price of the products, and as the firms develop economies of scale, it could be expected that the demand would re-increase, considering that the environmental and health benefits are undeniable. However, considering barriers such as biases and the meat industry, the time needed for changes as immense as altering human nature, and the tradition of meat consumption, this change may take generations to form.

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