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The political economy of labeling

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ABSTRACT

Labeling arrangements are introduced to provide information and affect market outcomes. Mandatory labeling of products like genetically-modified organisms (GMOs) is subject to controversy and political debate. The exact outcome depends on the specific public decision-making process (direct vote by the public vs. voting by representatives), the political power distribution among groups, and the workings of legislative and regulatory processes. This paper presents a conceptual framework to assess the welfare implications of labeling decisions that are decided by political processes. We identify conditions under which there are gains from mandatory labeling compared to no labeling, and find that the gain from passing a mandatory labeling proposition is larger if the voluntary labeling option is not available. The conclusions suggest that when mandatory labeling is not feasible politically, promoters of labeling will introduce voluntary labeling. The paper uses the results of this conceptual framework to analyze different case studies of labeling propositions, including Proposition 37 that was voted on in California in 2012. The findings suggest that labeling decisions may evolve with new scientific knowledge, new information technologies, and changing attitudes.

1. Introduction

A key condition for efficiency of markets is availability of full information, and one role of government is to establish a legal framework that assures this (Mirrlees, 1974). Not only does this include price information, but has also recently expanded to include information about product contents and quality, especially as the share of packaged goods and complex equipment continues to increase (Dimara and Skuras, 2005). A key mechanism to providing information is labeling, and establishment of labeling policies and guidelines have been a major topic of debate for centuries (Kolodinsky, 2012). The nature of information sought by consumers is always changing, and industry and activists have used labeling as a mechanism to affect market outcomes and resource allocation. Thus, to understand labeling, one needs to view it from a political economic vantage point, where markets and political mechanisms interact in establishing a final outcome (Vigani and Olper, 2015). One of the areas in which labeling policy is playing a major role is in the bioeconomy, where labeling strongly affects the economics of GM technologies, organic farming, and ultimately the viability of other new technologies in the future.

This paper develops a conceptual model to understand voting outcomes about labeling and to assess their welfare implications. We address the welfare effects of both mandatory and voluntary labeling schemes on different groups of consumers. We use this model to identify conditions under which social welfare increases or decreases under different labeling arrangements. The welfare model is based on the notion of relative willingness-to-pay for "green" products vs. "brown" products. The brown products produce more perceived environmental and human health costs, and the consumer cannot distinguish between the two different products unless there is explicit information or they are labeled as such. Under reasonable assumptions, we are able to use the differential in willingness-to-pay between these two products to derive welfare outcomes under different labeling scenarios. We then use the results of this model to inform a discussion about several case studies relating to regulation of GM products, including Proposition 37, which was voted on in California in 2012.

The first section of the paper will review the evolution of the use of labeling and major considerations affecting private and public labeling choices, followed by a discussion of alternative mechanisms of political economy and their implications for labeling. This will be followed by an analysis of how political economic considerations have affected the economics of agricultural biotechnology. Finally, the paper will conclude.

2. Labeling over time

The need for labeling stems from the basic asymmetry of information about product quality between consumers and producers, which may lead to suboptimal resource allocation without intervention (Akerlof, 1970). The design of labeling policies balances considerations

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of consumer protection, industry profitability, consumer capacity to absorb information, and ability to monitor and enforce. As food technologies and product choices evolve, labeling mechanisms and enforcement have evolved as well.

Food labeling in the US and globally has evolved over time. From the 19th century until the 1970s, the focus of labeling policy was on food safety and packaging. Historically, consumers would purchase fresh products and process them at home. However, increased processing of foods introduced packaging and adulteration of products (for example, replacement of butter with margarine and grape sugar with beet sugar). A major political debate about food safety between activists and industry in the early 20th century resulted in the passage of the Pure Food Act of 1906. The publication of Upton Sinclair's *The Jungle* further steered the food safety debate, and contributed to the passage of the Federal Meat Inspection Act of 1907 (Kolodinsky, 2012). The Pure Food Act made it illegal to issue deceiving labels in terms of content, weight, and serving measures. However, implementation of the law was challenging and led to build-up of a bureaucracy that included the Food and Drug Administration (FDA), which is responsible for regulating food safety, and the Federal Trade Commission (FTC), which regulates food advertising, including labeling. The FTC initially emphasized regulation of commerce, not consumer protection, but this changed after the 1960s, especially with the passage of the 1966 Fair Packaging and Labeling Act (Golan et al., 2001).

The increased reliance on processed and packaged food driven by convenience and efficiency and the desire of businesses to differentiate their products led to proliferation of food products and increased uncertainty about their contents (Senauer et al., 1991). This, along with increased concern over healthy diets, led businesses to issue unsubstantiated health claims, resulting in the establishment of the Nutritional Guidelines in 1973 that over the years have grown to mandate specific nutritional contents and restrict health claims about food. The evolution of labeling policies during this period was affected by desire to reduce costs and reduce regulatory load, concern about information overload balanced with the desire to reduce negative side effects, as well as new discoveries in terms of food science and measuring technologies. In the 1980s there were attempts to deregulate food safety as well as emphasize precision in studying the health effects of different foods, culminating in the 1997 FDA Modernization Act, which emphasized the role of science-based policies in supporting health claims about food (Kolodinsky, 2012).

The 20th century has seen the build-up of the nutrition discipline, including the discovery of the role of vitamins and minerals in health. This led to nutritional and food labeling policies that emphasized improved health outcomes. During the first half of the century, much emphasis was devoted to preventing and controlling diseases attributed to nutritional deficiencies, while towards the end of the century, emphasis turned to chronic diseases. This was reflected in labeling policies that emphasized information about nutritional content and concern about carcinogens and toxins. Nutrition and labeling policies deserve some of the credit for preventing any major food catastrophe in the US during the second half of the century. However, newly discovered food pathogens have emerged as threats needing to be addressed (Nutrition Reviews, 1999).

Consumer concerns about the health attributes of food were augmented by concerns about food technology and production processes during the beginning of the 20th century. The food sector has been bifurcated, where most food production follows the industrial paradigm but with a growing emphasis on the naturalization paradigm that emphasizes concerns about climate change, animal welfare, labor conditions, and the environment. The naturalization paradigm is appealing to the more affluent segment of society and is growing as average income is increasing (Rausser et al., 2015). However, the attributes pursued by the naturalization paradigm lead to emphasis on credence goods whose quality attributes cannot be easily observed. Therefore, these goods often need to be identified using labels, and given asymmetric information, require a network of monitoring and enforcement to avoid cheating (McCluskey, 2000; Hamilton and Zilberman, 2006). Because many of the attributes pursued by the naturalization paradigm, including organic, non-GMO, or Fair Trade, are not necessarily healthier and are not valued equally among one another (i.e. non-GMO may be valued more than Fair Trade), there has been an emergence of private labeling and a system of organizations that aim to monitor accurate labeling. Defining the role of firms, organizations, and government regulators in this new environment is becoming a major policy challenge (Huffman and McCluskey, 2014b; Huffman and McCluskey, 2015; Sheldon, 2017).

There are multiple decisions that need to be made about labeling (Hemphill and Banerjee, 2015). Should they be mandatory, and if not, should one establish voluntary labeling? What should be labeled, and what are the quantitative limits of labeling? For example, what is the degree of purity of GMO-free grain? Who will do the certification? How should compliance be regulated, and what are the penalties for violation? These are some of the key questions that are required in establishing labeling regimes. These questions receive different answers depending on political systems.

3. Alternative approaches to political economy and implications for labeling

Political systems and markets provide alternative mechanisms to allocate resources. The political system sets constraints on markets by regulations, and at the same time, market forces are affecting the determination of rules and regulations that are produced by politicians. Political economic models aim to understand the basic mechanisms that establish political parameters. However, there are many political mechanisms and systems, and each has their own decision rules that are analyzed by different political economic models. We will analyze the political economy of different mechanisms of policy-making with regards to labeling. In each case, we will analyze which major parties affect each outcome, and some of the welfare implications of each potential outcome. First, we will analyze the political economy of voting for labeling by the public. Then, we will consider the outcome of systems where elected politicians either vote or establish regulation.

3.1. Voting for labeling by the public

A major mechanism for public decision-making is voting, where each voter decides whether or not to support a proposition, or abstain. Downs (1957) introduced the median voter model, which assumes that voters are heterogeneous and that results of a proposition are dependent on the median voter. The median voter model applies both to referendums, where the general public votes on a proposition, as well as parliamentary decisions, where politicians vote. Here, we will concentrate on referendums using a simple model of voting behavior and analyze the welfare implications.

Referendums have been used in various states in the US to make decisions about the introduction of mandatory labeling of GMOs. The literature on labeling assumes that there are two products: brown and green (Roe et al., 2014; Zilberman et al., 2014). The brown products produce more environmental and human health costs, but the consumer cannot distinguish between the two different products without additional information. Furthermore, there is heterogeneity among consumers in terms of their income as well as perception of damages from the brown vs. green products. We consider four potential institutional setups: the first is no labeling at all, the second is the introduction of a mandatory ban on brown products, the third is mandatory labeling on brown products, and the fourth is voluntary labeling on green products. We acknowledge that there may be a realistic scenario with both mandatory labeling on brown products and voluntary labeling on green products.

For simplicity, assume that there are N total consumers in the

market, and each consumer purchases one product (as in Rosen, 1974). Suppose it is a necessity, like food, which has a very low price elasticity of demand (here, we assume completely inelastic demand). There are two varieties in the market: brown and green products, and consumers cannot observe the difference unless the products are labeled as such. Under full information, all consumers have a non-negative willingness-to-pay for green vs. brown products, which varies across consumers. In order to define a baseline welfare from consumption (and to reinforce the assumption that all consumers purchase a product in this market), we assume that every individual derives a subsistence benefit S from food consumption that is larger than the cost of providing the food. For convenience, if the cost of providing the food is zero, $S > 0$, which suggests that everyone purchases food and the decision becomes whether to buy a brown or green product. In addition to the subsistence benefit S provided from food consumption, consumers receive an additional benefit from consuming the green product over the brown product, $V_h(x)$.[1] In other words, $V_h(x)$ denotes the extra willingness-to-pay for the green product over the brown product by consumer x in the consumption decision due to individual-specific health and other considerations (denoted by subscript h). Note that these individual-specific considerations do not include environmental considerations, which will be addressed later on. Since each consumer only purchases a single product, we index the consumers from $x \in [1,N]$, where a lower x corresponds to a consumer with higher additional willingness to pay for the green product. Let C_0 denote the difference in per unit costs between the green and brown products (we assume constant marginal costs for each product), which we assume to be positive. In the absence of fixed costs, this assumption implies that marginal cost is equal to per-unit cost. In the scenario with no labeling, all of the consumers will buy brown products, since there is no way for the consumer to differentiate between the products and the brown product is produced at a lower price than the green product. Let X_b and X_g be the amount of brown product and green product purchased, respectively, where $X_b + X_g = N$. Then, under scenario W (without labeling and no information), $X_{bW} = N$.

In an ideal world with full information, if both green and brown products are available, consumers with $V_h(x) \geqslant C_0$ will choose the green product, and the equilibrium level of green product sold will be X_{gF}, where subscript F represents the full information scenario. Looking at Fig. 1, the welfare gain from full information is the area denoted by ABC_0. Labeling is introduced because the consumers cannot distinguish between green and brown products, and it will require an additional cost to purchase the green product. The difference is that the producer and consumer of green products pay for the information cost under voluntary labeling, and the producer and consumer of brown products pay under mandatory labeling. We denote the mandatory and voluntary labeling scenarios as M and V, and the additional per-unit costs as C_V and C_M, respectively.

Before we discuss the impact of labeling, suppose we introduce a mandatory ban on brown products. We denote this scenario with A as the subscript. Thus, since we assume all consumers purchase one product, $X_{gA} = N$, and all consumers pay additional per unit cost C_0. In this case, consumers know they are buying a green product, and all consumers with $V_h(x) > C_0$ gain, while those with $V_h(x) < C_0$ lose. In Fig. 1, all of the consumers with $V_h(x) > C_0$ (to the left of B) will gain, and their total welfare gain is represented by ABC_0. The consumers with lower willingness to pay will lose, and their welfare loss is $BDNE$. A ban is beneficial if $ABC_0 > BDNE$, and vice versa.

When we consider labeling, we allow coexistence of the two technologies, and impose an extra cost on suppliers of one of the technologies. Suppose we introduce mandatory labeling. Then, the cost of labeling will be passed completely onto consumers of the brown product (since producers face a completely inelastic demand for the product). When a consumer determines whether to buy the green vs. brown product, she compares the net gain from the green product, which is $V_h(x)-C_0$ to the extra cost associated with the brown product because of labeling, which is C_M. Thus, the x^{th} consumer will buy green if $V_h(x) > C_0-C_M$. Let X_{gM} be the total quantity of the green product sold in the case of mandatory labeling, and is determined where $V_h(x) = C_0-C_M$. In Fig. 2, all of the consumers to the left of F will consume the green product, and all of the consumers to the right will consume the brown product.

Thus, the welfare effects of mandatory labeling compared to no labeling is a gain for buyers of the green product, represented by the area ABC_0 (which is identical to the gain for buyers of the green product under a mandatory ban of brown products), a loss of $HINX_{gM}$ for individuals who continue to buy the brown product, and finally a loss of BKF for the individuals that switch from brown to green products because of the additional cost imposed by labeling. The reason why the consumers of the green product continue to gain ABC_0 is because they continue to pay the same amount for the green product as before. The consumers that now switch from purchasing the brown product to purchasing the green product (those that fall in between X_{gF} and X_{gM}) lose BKF because they now must purchase the green product for an additional cost C_0, which is higher than their additional WTP for the green product, instead of purchasing the brown product. The welfare loss represented by $HINX_{gM}$ for individuals that continue to buy the brown product is due to the introduction of the cost of mandatory labels for these products.

Now, consider the introduction of voluntary labeling on green products (when the baseline is no labeling). In this case, the consumers of the green products pay the additional per unit cost of labeling, so the new price compared to the brown product is $C_0 + C_V$. The consumers that will buy the green product under this scenario are the ones with $V_h(x)-(C_0 + C_V) \geqslant 0$, and the quantity of green products sold is x_{gV}, where $V_h(x)-(C_0 + C_V) = 0$. In Fig. 3, the consumers buying the green product will be to the left of x_{gV}. The welfare gain from introduction of voluntary labeling compared to scenario W (no information) is the area denoted by $AJ(C_0 + C_V)$.

There is a social welfare gain from mandatory labeling relative to voluntary labeling if the welfare loss of brown product consumers under mandatory labeling, which is $BKF + HINX_{gM}$, is less than the additional welfare gain of green product consumers under mandatory labeling, which is the area denoted by $(C_0 + C_V)JBC_0$. This analysis suggests that the likelihood of a gain from mandatory labeling relative to voluntary labeling increases as the difference between C_V and C_M increases, and the larger is the share of the population with high willingness to pay for green vs. brown.

Now, suppose the population has to vote on mandatory labeling, and we consider two baselines. In the first scenario, the baseline is no information. Assume that everyone votes, and individuals vote according to the impact of mandatory labeling on their welfare. Individuals with high willingness to pay for the green product, i.e. $V_h(x)-C_0 \geqslant 0$, will benefit from mandatory labeling. But, the rest of the population will lose. The individuals between X_{gF} and X_{gM} will not be willing to pay for the additional cost of mandatory labeling, and thus will switch from buying the brown product to the green product, and the x^{th} individual in this region incurs a loss of $C_0-V_h(x)$. The individuals with willingness to pay that is lower than C_0-C_M will lose C_M per unit purchased. The proposition will pass if the median voter, denoted x_{MD} has high willingness to pay for the green product, $V_h(x_{MD}) > C_0$, and $x_{MD} \leqslant x_{gF}$.

Under the no information baseline, if there is a large share of the population that is willing to pay very little or nothing for the green product vs. the brown product, then the proposition is not likely to pass. The higher is the cost differential between the green and brown product, the less likely the proposition is to pass. Note, however, that under this scenario, the cost of mandatory labeling does not affect the

[1] When comparing the welfare effects of different labeling scenarios to one another, the subsistence benefit S cancels out.

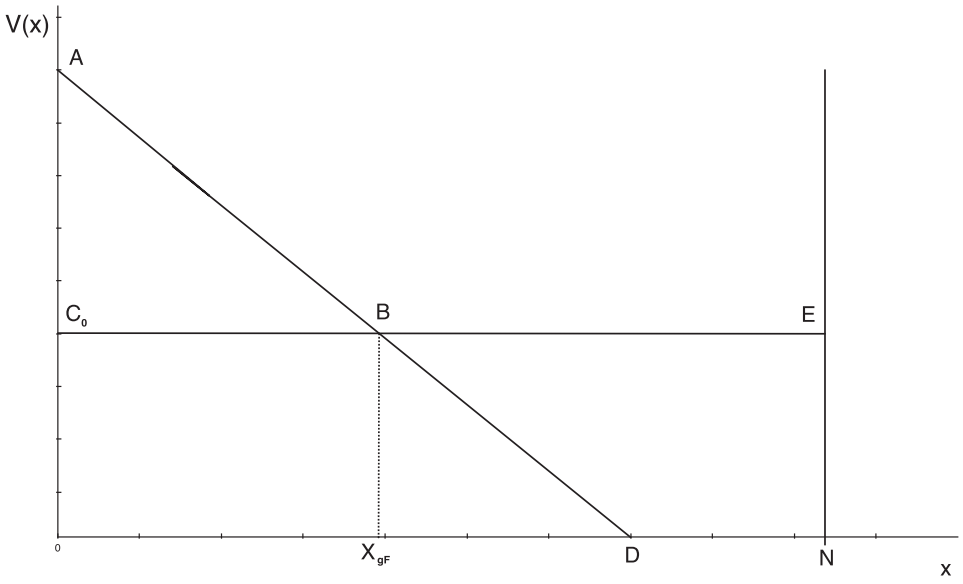

Fig. 1. Welfare impact of a ban on brown products.

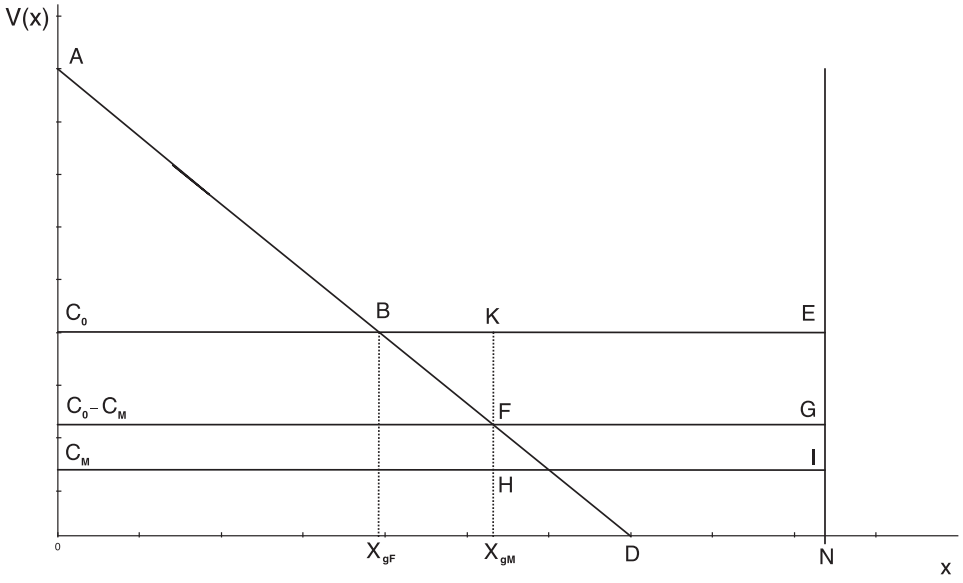

Fig. 2. Welfare impact of mandatory labeling on brown products.

outcome. Furthermore, there may be a situation where the proposition will pass, but it will result in a welfare loss. For example, this will occur when $x_{MD} \leqslant x_{gF}$, but where the aggregate gain of the individuals that now purchase the green product because their willingness to pay is greater than the cost differential, ABC_0, is smaller than the loss from those that purchase the brown product, $HINX_{gM}$, and those that switch from brown to green to avoid paying the extra labeling cost, BKF.

Now, consider the second situation, where the baseline is voluntary labeling, and if the proposition for mandatory labeling passes, there is a switch from voluntary labeling to mandatory labeling. Individuals that purchase the green product under voluntary labeling, with $x \leqslant x_{gV}$, will save C_V per unit if the mandatory labeling proposition passes, and they will vote for it. Individuals between x_{gV} and x_{gF} will switch to the green product because they will not need to pay C_V, and will also vote for the proposition. The rest of the population, who buys the brown product, will vote against the proposition. As in the previous case, the proposition will pass if the median voter's additional willingness-to-pay for the green vs. brown product is larger than the cost differential between the two products, i.e. $V_h(x_{MD}) > C_0$, and if $x_{MD} \leqslant x_{GF}$. However, the gain from voting for mandatory labeling is smaller when the benchmark is voluntary labeling than when the benchmark is no information. In this case, the gain is equal to the area denoted by $(C_0 + C_V)JBC0$, and it is larger the greater is the cost of voluntary labeling. The analysis suggests that individuals with high willingness to pay for the green product will benefit from the passing of the mandatory labeling proposition, while individuals with low willingness to pay will lose. The gain from the passing of the proposition is larger if the voluntary labeling option is not available.

3.1.1. Further political economic implications

Our analysis only considers the perceived health benefits from green vs. brown products. But in many cases, individuals will consider the environmental risks associated with brown products, which in their view may be substantial. Hamilton et al. (2003) show that these environmental considerations may affect voting behavior rather than purchasing behavior. Let $V_e(x)$ denote the per-unit willingness to pay for external (environmental) benefits from green vs. brown products. These are benefits accrued to the consumer independent of the consumption

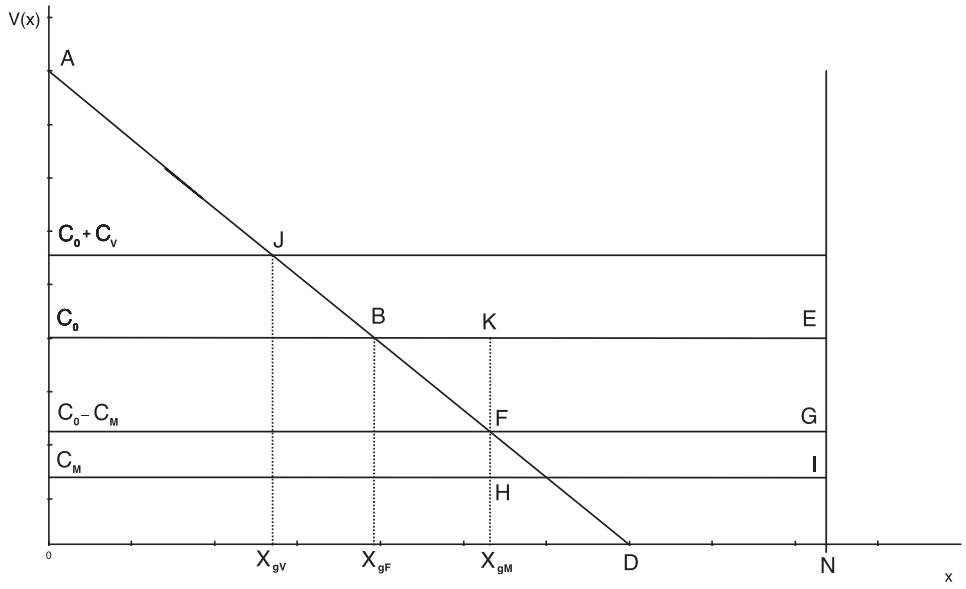

Fig. 3. Welfare impact of voluntary labeling on green products.

choice. Now, voters consider both the health gains from switching from brown to green as well as the environmental benefits. While the passage of the proposition will not change the consumption pattern once taking into account $V_e(x)$, it will affect voting outcomes. Individuals with high perceived health gains from green products, $V_h(x) > C_0$, will vote for the proposition solely based on personal health considerations. But, some individuals with lower perceived health gains may vote for it as well. Individuals who continue to buy brown products after the passage of the proposition (this is the group where $x > x_{gM}$) will vote for it as long as $V_e(x) > C_M$, since their consumption choice is unaffected by the passage of the proposition. Individuals that will switch from the brown to green product after the proposition will vote for the proposition if $V_h(x) + V_e(x) > C_0$, because in this case consumers' willingness-to-pay includes both the external benefits and from direct consumption. To apply the median voter theorem to this case will require constructing a new ordering of the population according to their willingness to vote for the proposition, which is beyond the scope of this paper.

There have been studies that have analyzed the welfare effects of labels, especially in how they affect different groups of consumers and producers (Bonroy and Constantatos, 2015). We acknowledge that the model presented in this paper abstracts away from important considerations that have to be accounted for in a more complete political economic analysis. We assume that the consumers have full information about the gains from the green product vs. the brown product, as well as the cost of labeling. The reality is that these two pieces of information are uncertain, and campaigning before the vote aims, to a large extent, to provide information about these benefits and costs to the voter (Graff et al., 2009; Huffman and McCluskey, 2014a). Consumers will be divided, and the individuals with higher preference for green products will contribute to the campaign to pass the proposition. The passing of the proposition will increase the sale of the green product, and therefore the manufacturers of the green products will contribute to the campaign to pass the proposition. On the other hand, the producers of the brown products will support the campaign against the proposition. Since the introduction of the proposition will require labeling, organizations that provide certification and verification will contribute to the passage of the proposition, especially when the baseline is no information.[2] Even if the proposition fails, it may raise awareness about the risk of the brown product, increasing the likelihood of voluntary labeling and benefitting the certifiers. Furthermore, if environmental considerations are important, then environmental groups will be strong supporters for the passage of the proposition. Thus, the political debate of propositions is, to a large extent, a debate on the consequences of implementing the proposition for different groups (Vigani and Olper, 2013; Banerjee and Murray, 2015).

Zilberman et al. (2014) analyze the debate prior to California's Proposition 37 in 2012 that would have required labeling of GM products in the state. Three months before the vote, polls showed a wide margin of support for the proposition (above 60%). During this stage, most of the debate was about the health and environmental impacts of the proposition. Once there was mention of the option to have voluntary labeling in lieu of mandatory labeling, support for Proposition 37 was slightly reduced. But during the final months, opposition to the proposition introduced evidence that it would be costly (about $100 per capita per year), and this seemed to have tipped the scales and contributed to the defeat of the proposition. The paper suggests that the opposition had more resources and deployed them more heavily towards the end of the campaign period, showing that intensity and timing of messaging matters. But, it is clear that providing clarity of impacts in quantitative terms matters quite a lot to voters. Zilberman et al. (2014) find that organic growers associations and environmental groups have been major supporters of the mandatory labeling propositions, while biotechnology firms were among the major contributors to the "No" campaign, just as the model in this paper predicts. Major food retailers also supported this campaign – to some extent to avoid the tough penalties that were associated with violation of the labeling mandate proposed in California. The anti-labeling campaign had much larger financial support than the pro-labeling side, but the latter relied more heavily on volunteers and labor-intensive campaigning.

Many studies have also looked at voting behavior and other implications associated with the results of Proposition 37 in California. Bovay and Alston (2016) find that given voting patterns for Proposition 37 in California, only Hawaii, Rhode Island, Vermont, and Washington D.C. would have passed the proposition had it been on their ballot in 2012. Additionally, while Proposition 37 was rejected by a narrow margin, it has spurred other state and municipal level initiatives regarding the regulation of biotechnology (Clark et al., 2014; Bain and Dandachi, 2014).

The political debate on labeling is not only whether or not to have mandatory labeling, but also a decision regarding the parameters of implementing and enforcing the mandatory labeling policy. These

[2] Even though a realistic baseline may include some information about product differentiation.

parameters include intensity of monitoring to detect cheating and the penalty for doing so. If the probability of being caught misrepresenting brown products as green products times the penalty for cheating is lower than the price premium of green over brown products, a risk neutral producer will elect to cheat. So, higher penalties and effective monitoring may deter cheating behavior. Supporters of mandatory labeling, including producers of green products, will support strict monitoring and enforcement. Green product producers will have an even stronger incentive to do so in cases where demand for the green product is price sensitive, and thus increased supply of green products by cheaters is likely to reduce its price (Hamilton and Zilberman, 2006). Since consumers are loss averse when it comes to being disappointed and cheated with regards to product quality, consumers that value the green products will strongly support tough monitoring and enforcement of labeling standards.

Other parameters determined in labeling policy-making are the type, size, prominence, and content of labels (Crespi and Marette, 2003). In the case of cigarettes, where there is ample scientific evidence of major health effects, the mandatory labels are prominent, very large, and often intimidating. But there is no scientific basis for the use of alarming, or even mildly deterring labels when it comes to GM products. The National Academies of Sciences have found GMOs to present no new risks compared to other forms of plant breeding, and their introduction has contributed to economic and even environmental benefits (Barrows et al., 2014; Klümper and Qaim, 2014; Paarlberg, 2009). Hemphill and Banerjee (2014) suggest that the labels proposed in major propositions for mandatory labeling of GMOs are frequently alarming, which may be misleading to consumers. Opponents of GMOs may use mandatory labeling as a mechanism to reduce demand for them. On the other hand, supporters may not oppose labeling as a source of information, per se, but are against labels used as a signal to alarm consumers and reduce demand. The efforts to establish alarming mandatory labels are conducted frequently as part of efforts to ban GMOs altogether. One solution proposed by Liaukonyte et al. (2013) is to provide secondary information (through access to detailed information sources about characteristics of the products) when mandatory labeling is introduced, yet there is a limit to consumers' ability to absorb information. McFadden and Lusk (2016) found that a large share of consumers may not be well-informed about GMOs, and prefer that decisions about GM food be taken out of their hands and put into those of experts. The recent US Safe and Accurate Food Labeling Act of 2015 US Safe and Accurate Food Labeling Act of 2015 required mandatory labeling of GMOs, but allowed companies to use scannable barcodes or toll-free numbers as a form of labeling. This middle ground allows consumers who feel strongly about GMOs in these products to learn more about them, while allowing others to trust decisions made by experts with regards to these products.

Propositions for mandatory labeling of GMOs have emerged in many US states between 2010 and 2016. Most have failed to pass, but when Vermont passed a proposition in 2014, it presented an implementation challenge due to the high cost and difficulty of complying with different labeling standards in different states. The Senate decided to interfere in order to create a uniform policy that combines a multitude of considerations. However, the political economy mechanisms that govern choices by legislators and regulators are different than the ones affecting the public when voting.

3.2. Labeling by legislators and regulators

Thus far we discussed labeling choices by voters, but many important voting decisions are made by regulators or legislators (i.e. the US Organic Foods Production Act of 1990 with similar acts in Europe like the EU-Eco-regulation no. 2092 of 1991). Legislatures frequently give executive agencies, like the USDA, the right to establish and enforce standards for labeling.

There are different structures of governance, and they result in varying models of political economic behavior. In the US and England, for example, the legislative branches consist of representatives who represent regions and vote on proposals. These representatives aim to increase their likelihood of staying in power, which will depend on their ability to appeal to different voting blocks and obtain resources for campaigns. Lobbyists are aware of this behavior, and provide campaign contributions accordingly (Peltzman, 1984). Therefore, in voting, legislators will weigh the interests of different groups (e.g. consumers, producers, environmentalists) differently based on their ability to garner voter and campaign contributions. For example, representatives of rural regions that grow GM products will not be inclined to support mandatory labeling, while representatives of regions with a large environmentalist constituency will support such labeling. In the United States, agricultural interests may gain relatively more weight in the Senate than the House of Representatives because they represent regions rather than people (Rausser et al., 2011). Therefore, we may expect that states with a majority of people who support environmental values will pass mandatory labeling, but the House and Senate, which have representatives from diverse regions and must balance different interest groups, may establish national policies like the Accurate Food Labeling Act that requires labels not to be alarming. This compromise respects the freedom of information, but takes into account the opinions of the National Academies of Sciences and is not damaging to the interests of farmers, agribusiness, and consumers that want to leave the decision to experts.

The explicit modeling of political economic behavior can be quite complex, but the outcomes can imply the representative weights of different groups in the political system (Grossman and Helpman, 1992). While the net change in welfare of different groups from labeling decisions can be quantified in dollar-equivalent units, actual political choices suggest that the political weights of groups are different. For example, according to Kuntz (2014), the restrictive policies of GMOs in France, especially after the election of Sarkozy in 2007, reflected the capacity of Green groups to obtain power and representation in policy-making and assessment forums compared to seed companies that were excluded from such forums. Herring and Paarlberg (2016) present the rich literature on political economy of GMOs, emphasizing the relatively significant powers of NGOs and other groups opposed to GMOs in policy debates that have led to bans and restrictions, especially on production of GM crops. Regions with tougher restrictions on GMOs are also more likely to have mandatory labeling.

4. Political economy of voluntary labeling

Mandatory labeling has been used to report weights and measures, nutritional content, and inform consumers about hazardous ingredients. When the introduction of mandatory labeling is politically infeasible, or the capacity to produce green products is limited and there must be coexistence between green and brown labels, voluntary labeling is established instead. Establishment of voluntary labeling requires the concurrent establishment of standards of purity and mechanisms of monitoring. A small portion of brown product characteristics may be present in a green product, so to declare a product as green, an authority has to determine the concentration threshold (e.g. the maximum fraction of GM grains qualified to be a GMO-free product), and enforce and certify it. The demand for green products is dependent on the trust in the certifiers and implementers of the standards (Golan et al., 2001). When public sector scientific and government institutions are sufficiently trusted, the initiator of establishing a green label is likely to prefer that government agencies be involved in establishing the standard and engage in monitoring and enforcement.

But government resources are limited; thus, obtaining government support for labeling is a challenge. Establishing such standards requires that supporters of the labeling, which may include producers of green products, environmental groups, consumers, and others, overcome objections of both producers of brown products as well as people

concerned about higher costs. The organic farming concept, pioneered by Sir Albert Howard in England in the 1940s, was popularized by Jerome Rodale in the US, and the diffusion of the approach and political savvy of the organic movement led to passage of the Federal Organic Foods Production Act in 1990 (which established the USDA-supported organic farming program) and laws behind USDA "Certified Organic" in 2002. The accreditation of the certified organic label by the USDA (where the products are subjected to an inspection by a USDA-accredited certifying agent) is a major political achievement for the organic movement (Heckman, 2006). It is consistent with Olson (1971) that relatively small groups of motivated individuals can lobby effectively in a democracy to achieve a shared political objective.

Most certified voluntary labels are not part of a government policy action but are privately managed arrangements. These labels frequently originate from an ideology or philosophy that identifies properties of desirable or undesirable products. These ideas are popularized and then implemented by defining concrete labeling criteria and establishing an NGO to provide certification of the label and, at times, monitoring adherence to it. Producers or distributers of the product pay fees for the right to display the label, and the fees are used to market the label as well as cover the costs of monitoring and implementing extra activities required by the label. Low and Davenport (2006) show that the history of "Fair Trade" is consistent with this dynamic pattern. Bartley (2003) analyzes the emergence of private regulations based on labeling and certification since the 1990s to address environmental and labor issues in forest products and apparel industries. He shows that these private arrangements are the results of campaigns by social movements, sometimes targeting major companies like Nike and the neo-liberal institutional context, which emphasizes free trade and an increased role for the private sector, including private regulation. Governments may support voluntary labeling by giving tax exemptions, research support, and preferential purchasing to the civil society organizations that manage the labels of these products.

Some of the most important food labeling schemes were introduced for food products produced in compliance with religious laws (e.g. Halal and Kosher). Several religious groups have succeeded in legalizing food preparation (in particular animal slaughter) based on the religious practices in many countries across the world. The certification of Halal and Kosher labels are done by religious authorities. Differences in demographics and politics explain differences in the involvement of the state in enforcing Kosher and Halal labels (Having 2010). In Holland and some other European countries, the religious authorities have full autonomy in monitoring and enforcement of Halal and Kosher labels. In the United States, the state plays a major role in the regulation of Kosher certification, and several states (especially those with large Jewish populations) have a special Kosher enforcement agency. In Israel, where religious parties are strong, there is han official government-sanctioned Kosher label, and there is mandatory enforcement of Kosher procedure by individuals in the army.

5. Conclusions

Labeling arrangements are introduced to provide information and affect market outcomes. The specifics of design of labels and labeling programs are subject to political activities affecting regulations and policies. Mandatory labels tend to be introduced to provide information about basic content (weight, size, and caloric content) and to warn against use of products that have been proven to cause harm under some circumstances. Mandatory labeling of products like GMOs, which are deemed safe by the majority of scientists but are held suspect by many environmentalist groups and others, is subject to controversy and political debate. The exact outcome depends on the specific public decision-making process (direct vote by the public vs. voting by representatives), the political power distribution among groups, and the workings of legislative and regulatory processes in different governments. In the case of GM varieties, production is practically banned in Europe, and mandatory labeling for these products is strictly enforced. On the other hand, new mandatory labeling schemes in the US are less strict and less intimidating. One reason for this dichotomy is the stronger Green lobbies and weaker industry commitment to the technology in EU.

This paper has developed a simple conceptual framework that utilizes a welfare approach to understand the impact of different labeling schemes on the well-being of different consumer groups. We find that mandatory labeling is more likely to be preferred to a baseline of no information the larger the share of people that prefer green to brown products, and the more they are willing to pay for these products. Additionally, we find that the gain from the passing of a mandatory labeling proposition is larger if the voluntary labeling option is not available. However, when mandatory labeling is not feasible politically, promoters of labeling will introduce voluntary labeling. They will strive for government oversight and management of the voluntary labels, and for as much government support as possible in terms of research, education, and an enabling legal environment. With increasing consumer awareness of food production practices and concerns about the growing role of government, the role of civil society in administering many aspects of voluntary labeling will increase. Labeling decisions may evolve with new scientific knowledge, new information technologies, and changing attitudes. Research quantifying the effects of labeling on demand and welfare of various groups, as well as the factors affecting labeling choices, are in early stages and should be expanded upon.

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