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Waiting for the invisible hand: Novel products and the role of information in the modern market for food

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ABSTRACT

This paper places the modern spread of diet-related chronic disease in the United States within the context of more than a century of innovation in food processing technology, discovery in nutrition science, and corrective policy measures aimed at improving public health. We ask whether the current state of affairs represents a market failure, and—if so—what might be done about it. We argue that while today's industrial food system has its advantages, the asymmetric information problems inherent to this system have resulted in a "lemons-style" breakdown in the market for processed foods. The appropriate policy response to such situations (namely, verifiable quality standards) is well known, but such policies are likely (in the short run) to reduce profits for existing large industrial producers of food. In light of the food industry's long history of success at regulatory capture, we propose the formation of a new independent food standards agency devoted to protecting the interests of the American consumer.

Introduction

Americans do not eat well. Increasingly, the American diet is being blamed for epidemic levels of obesity, diabetes, heart disease, and even cancer (Willet, 2005). Such criticisms generally stem from the observation that relatively rapid changes in dietary practice over the past century have been accompanied by concurrent changes in the prevalence of "diet-related" disease. Food historian Harvey Levenstein has observed that a rapid industrialization of the American food system took place over roughly five decades (1880–1930), during which the predominance of locally produced, freshly prepared, traditional meals was largely displaced by national markets for name-brand processed foods (Levenstein, 1988). Though the overall effects of this (still ongoing) transformation on public health have been mixed, it is becoming increasingly apparent that certain industrial-scale food processing technologies are, in part, responsible for the modern epidemic of diet-related chronic disease (Willet, 2005; Taubes, 2007).

This modern transformation of the American diet was driven by a series of technological innovations that made it possible to market food products on a scale never before possible: Expansion of railroads and the advent of the refrigerated boxcar made long-distance transportation possible. Newly popular national magazines made it possible to broadly promote brand name products. And advances in food processing made it possible for entrepreneurs to design novel food products that could withstand long-term storage and long-distance shipping without danger of spoilage. The gains in production efficiency were enormous, and this revolution in the way foods were produced and distributed would ultimately transform the way the world eats.

Given today's robust national market for food—with its many buyers and sellers and near-universal availability of a wide selection of products—it is tempting to view the US food system as exemplifying the virtues of a competitive marketplace. Indeed, the presumption of standard economic doctrine is that in spite of any unfortunate consequences for long-term health generated by today's highly processed foods, fully informed consumers will weigh these costs against their many benefits, such as price, taste, and convenience. However, this is a conjecture based on doctrine; whether it is true or not is an empirical question with significant implications for public policy. It raises important questions concerning the roles of consumer choice, technology, and markets, and, ultimately the important policy question of what—if anything—can and should be done about the current epidemic of diet-related disease.

This question—in short, whether the nutritional *quality* of the modern American diet should be viewed as the natural outcome of an efficient market (and, depending on the answer, what might be done to correct any market "imperfections")—is the subject of this essay. The answer we propose is somewhat novel, in that we do not emphasize the "usual suspects" such as federal subsidies to agriculture or the moral hazard associated with

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health insurance.[1] Rather, we will argue that the market outcome we observe is the product of an asymmetric information problem that has been exacerbated historically by the strategic actions of food producers.

A key historical change took place with the transition from a system of disaggregated local food markets toward a national market with specialized production and a long-distance distribution network: it became increasingly difficult for the typical consumer to observe the manner in which the foods he purchased were handled and prepared. This informational wedge between consumer and producer was exacerbated, not only by the physical distance separating market participants, but also by new production and processing technologies that changed nutritional quality in important ways.

It is our contention that—in certain market segments, and along certain dimensions of product quality—the industrial food revolution has resulted in a market breakdown akin to Akerlof's (1970) "lemons equilibrium," in which—in spite of a latent demand for nutritional quality—only low quality products are offered for sale. In order for this to be true, the following three conditions must be met:

1. Low quality foods must be less costly (or *more profitable*) to produce and sell.
2. The consumer must care about nutritional quality (in the simplest sense: he would be willing to *pay more* for a higher quality product), and
3. Nutritional quality must be unobservable to (or—more precisely—in practice quality is *unobserved by*) the individual consumer.

With respect to the industrial food system, the first condition is easy to confirm and not controversial. The second is sometimes minimized, with the observation that consumers seem to care more about palatability or convenience than about the health consequences of dietary choice. But this observation is (strictly speaking) irrelevant to establishing that consumers care about nutrition as an independent quality in their diets (Lancaster, 1966), and is also belied by historical events (detailed below) in which sudden and dramatic shifts in the composition of the American diet have been driven largely by health concerns.

The third condition is perhaps the most misunderstood, and deserves the most scrutiny. To say that a particular quality is unobserved by the consumer is a description of a market outcome. For example, the consumer might care about the vitamin content of the various brands of canned tomato sauce he contemplates purchasing, but the cost of actually measuring vitamin concentrations might exceed the marginal benefit of being more fully informed. There are many factors that affect the practicality and cost of such verification (e.g., the existence of labeling standards, the cost of laboratory analysis, prohibitions on false claims by producers, and the sophistication of the consumer, to name a few) and many of these are themselves market outcomes (Table 1). Indeed, in the history of American food we present below, it will become apparent that the consumer's relatively high *quality verification cost*, as well as certain strategic manipulations of that cost by food-producing firms, have played a key role in the evolving nutritional quality of the American diet.

Table 1
Factors affecting quality verification cost for processed foods.

Controlled by consumer
Education, research
Time spent reading labels
Food source (e.g., local vs. national brand, prepared vs. homemade)
Word of mouth (social externalities)
Controlled by producer
Information/claims on label
Advertising
Lobbying
Industry-funded (product-specific) nutrition research
Public relations
Word of mouth (sales externalities)
Complexity of product/process
Introduction of new processing technologies
Controlled by government
Mandatory labeling
Standardization of terms
Quality standards/certifications
Product safety warnings
Basic nutrition research
Public education programs/dietary guidelines

The paper proceeds as follows: first, we review the early history of the modern transformation of the American diet, in which food safety and vitamin content became important public health concerns. This history illustrates the role played by asymmetric information in the struggle to address these concerns in early 20th century America. Second, we consider—again in historical context—two dimensions of dietary quality (fatty acid composition and glycemic effects) that are thought to have important implications for public health today, and which we argue are also strongly influenced by asymmetric information with respect to product quality. We conclude with a discussion of implications for public policy.

Early history of industrial food

Mass production and industry consolidation

As compared to the traditional methods of food preparation and delivery available in 1900, the efficiencies of large-scale food production were impressive. Taking advantage of the westward expansion of the railroads in the late 1800s, entrepreneurs looking to market food products on a national scale could take advantage of lower production costs induced both by the resulting shift in agricultural production to the most productive regions of the country, and also by the considerable economies of scale in food processing. In 1879, for example, Gustavus Swift developed a system that allowed beef to be fattened and slaughtered in Chicago, then shipped east in refrigerated railroad cars fresh, dressed, and cheaper than beef on the hoof. By the mid-1880s it was said that the "Golden Age of American Beef" had arrived (Levenstein, 1988).[2] Similarly, the advent of the roller mill in 1870 made white flour affordable for working class households, with the nominal price dropping 56 percent between 1872 and 1897 (Davidson and Passmore, 1963).

The combination of economies of scale and falling prices made conditions ripe for market consolidation in these new national food markets. Swift joined with P.D. Armour and other large Midwestern meat packers to absorb or drive out of business a host of other packers, so that by 1905 the four largest packers slaughtered nearly 50% of the country's beef cattle, enough to make price-fixing

[1] While these "usual suspects" are sometimes mentioned in both the popular press and the scientific literature, their impacts are thought to be small. Alston et al. (2008), for instance, argue persuasively that US agricultural subsidies, though large, result in only very small distortions of the retail market. Rashad and Markowitz (2007) and Smith et al. (2009) provide estimates of the moral hazard effect of health insurance on health outcomes (obesity and weight gain, respectively); both find it to be negligible.

[2] This and other historical events relevant to our thesis are described in Smith et al. (2010).

agreements profitable (Chandler, 1962). Similarly, in the market for crackers and biscuits, a series of mergers by the large manufacturers ultimately led to the formation of the gigantic National Biscuit Company (known today as Nabisco), which accounted for 70% of national sales (Panschar, 1956, pp. 82–83). Washburn-Crosby (makers of "Gold Medal Flour") and Pillsbury came to dominate the flour milling industry. And in what would become a classic oligopoly, the Havermeyer family modeled the newly formed American Sugar Refining Company (maker of "Domino" brand white sugar) on John D. Rockefeller's Standard Oil trust (Eichler, 1969; Levenstein, 1988). Arguably, the predominance of proprietary brand names in these new national markets provided perhaps the most important and—in the long run—persistent source of profits. The canning and pickling industry was particularly notable in this regard, with names such as Heinz and Franco-American dominating the market. The price premiums commanded by these early producers facilitated investment in aggressive promotional campaigns and provided incentive for further innovation in processing technologies, advantages not shared by producers of traditional (and hence non-proprietary) foods (Eichler, 1969; Levenstein, 1988).

Food safety as hidden quality

An important consequence of the move to centralized production in agriculture and food processing quickly emerged. Though consumers had begun to rely upon the reputations of brand name producers to signal quality, many aspects of production could not be observed directly by the consumer. The problems this asymmetry of information spawned were brought into stark relief with the publication of Upton Sinclair's *The Jungle* (1906), a fictionalized exposé of the meatpacking business. Sinclair's vivid descriptions of the unhygienic conditions and chemical adulterants employed in slaughterhouses and processing plants struck a nerve with the American public, and the ensuing outrage eventually resulted in the passage of the federal *Meat Inspection Act* and the *Pure Food and Drug Act* later that year (Levenstein, 1988).

It is important to place these events in the context of economic theory. The conditions described by Sinclair were plausible (and indeed, evidently commonplace in some quarters) because they were largely unobservable to the individual consumer. For instance, poor hygiene on the factory floor could be compensated for by heat treatment or the addition of chemical sterilizers, often with little effect on the taste or appearance of the product. But consumers were understandably troubled by the notion that chemical poisons or rats or even human body parts might have found their way into the can of corned beef on the grocery store shelf. To the extent that such things remained invisible to the consumer, however, moral hazard (i.e., the absence of incentive for the individual processor to take precautionary measures) and adverse selection (i.e., the tendency of those processors with the lowest costs—and hence, presumably, the worst practices—to dominate the market) would be expected to drive the market toward a uniformly low standard of quality (Akerlof, 1970).

The issue of food safety provides a context for considering more closely the issue of unobserved quality. In economic theory, the distinction is sometimes made between *search qualities*, which are observed by the consumer before he makes his purchase (though perhaps after paying a small "search cost" such as traveling to the point of purchase), *experience qualities*, which are observed only after purchase (but before subsequent repeat purchases), and *credence qualities*, which are never observed by the consumer (Nelson, 1970; Darby and Karni, 1973).[3] These categories can be thought of as representing special cases of market outcomes characterized by increasing quality verification costs. If the cost of verifying quality prior to purchase is sufficiently low, the consumer will choose to pay this cost (making the quality in question a search quality).[4] If the verification cost is prohibitively high prior to purchase but sufficiently low after purchase, an experience quality results. But if verification is either technically infeasible or the verification cost is prohibitively high relative to the potential benefit, a credence quality results.

As noted above, market participants can take actions that affect the consumer's quality verification cost. Consider, for example, the consumer considering the purchase of a can of Brand X corned beef in 1906. If he is concerned that the can might contain toxins or pathogens that would cause him to fall ill, there are a number of ways he could obtain this information. Visual or olfactory inspection might settle the matter immediately. If not, he could purchase the product, eat it (or perhaps feed it to his dog) and weigh any ensuing health effects in future purchase decisions.[5] Alternatively, he could ask his friends and neighbors what they know of the product, or pay a laboratory to test for poisons, or hire an investigator to research the safety record of the producer. Any of these actions might be thought of as paying a verification cost that, once paid, allows the consumer to infer product-specific quality and to make subsequent purchase decisions accordingly.

The typical consumer, of course, is likely to have little knowledge of industrial food processing practices—much less their specific effects on the probability of illness—and no feasible way of obtaining such knowledge. This could limit the value of engaging in any of the above-mentioned methods of product-specific quality investigation. Nevertheless, if the primary concern is non-fatal food-induced illness, it might seem that experience could be a useful guide: simply consume the product (perhaps repeatedly) until it causes illness. But even such direct investigation will be of limited value if the product in question is consumed jointly with other foods or the health effects are sufficiently delayed so as to make the specific causal agent uncertain. Indeed, these are precisely the conditions specified by Darby and Karni (1973) in their pioneering study, in which they noted that "Credence qualities arise whenever a good is utilized...in combination with other goods of uncertain properties to produce measurable output." Though the archetypal example employed by the authors was automobile repair services (in which the measurable output is operability), their words also seem an apt description of the consumer's diet problem, in which many inputs (foods) contribute to a single output (health).[6] Indeed, even public health authorities can have difficulty tracing an outbreak of food poisoning back to its particular source. In 1906, this problem was evidently severe enough to justify the institution of the minimum quality standards and verification systems dictated by the new federal legislation.

Though problems with unobserved quality may have damaged the credibility of the large food processors in 1906 (indeed, this is evidently why passage of the new federal laws was ultimately

[3] For a recent review of the theoretical literature on credence goods, see Dulleck and Kerschbamer (2006).

[4] It should be noted that for our purposes, the distinction between "search cost" and "quality verification cost" is unimportant. As commonly used, a search cost is simply the cost of verification of a particular type of product quality, usually either price or existence of the product.

[5] This assumes product quality is consistent over time.

[6] Consumer advocate Arthur Kallet made this point quite directly many years earlier in a discussion of the perils of consuming canned foods: "Most of the poisons introduced into our food supply act slowly and indefinitely, and their results can seldom be traced to the source. There is therefore no particular compulsion upon producers to eliminate them" (Kallet, 1934, p. 31). The importance of time lag between dietary modification and health outcome is underscored dramatically by Diamond's (Diamond, 2003) observation that in the numerous "natural experiments" around the world in which traditional food cultures have been suddenly displaced by the Western diet, the onset of diabetes nearly always follows, but only after the passage of 18–22 years.

supported by the likes of the large meatpackers and canning mogul H.J. Heinz), the newly aroused suspicions of the populace also presented an opportunity. It is well known that when quality verification is costly in otherwise competitive markets, multiple equilibria will exist (Braverman, 1980).[7] A seller in this case has good incentive to take steps to increase the likelihood that his product is trusted by the consumer and consequently commands a price premium (Milgrom and Roberts, 1986; Robert and Stahl, 1993). And indeed, there was fierce competition in this regard, with Heinz sponsoring an ad campaign proclaiming its mincemeat to be "the exemplification of purity" because it was prepared "by neat uniformed workers" in "model kitchens" which were always open to visitors; while Franco-American Foods likewise declared its kitchens "always open to visitors;" and Blue Label Food Products promised that the "rich natural flavor" of their products stemmed from preparation "in clean kitchens under sanitary conditions." Similarly, aggressive and highly successful advertising campaigns by American Sugar Refining Company and by cereal products makers Kellogg's ("Corn Flakes") and Post ("Grape Nuts" and "Toasties") proclaimed the healthfulness and cleanliness of their products. Ironically, the collective effect of this stirring of the hysteria over "germs" (bacteria having been discovered in the 1880s) may have been to drive consumers even further *toward* the consumption of manufactured foods, and away from more "unhygienic" traditionally prepared cuisine (Levenstein, 1988, pp. 32–40).

A new concern: vitamin degradation in processing

Among the many novel foods adopted during this period were a variety of new alternatives to breastfeeding for infants. Convenient, inexpensive, and widely promoted as healthier for babies than mother's milk, the use of proprietary canned milk products or powdered "formula" mixtures was widespread by 1890 (Levenstein, 1988, p. 123). At the same time, however, some pediatricians began to note an increased rate of infant mortality among babies fed exclusively on these products. By 1911 sufficient evidence had accumulated to compel the journal *Pediatrics* to editorialize about this "sinister coincidence" (American Pediatric Society, 1911).

Today we know that heat treatment causes many of the vitamins in milk and other processed foods to degrade, and historians now point to the new feeding practices as the most likely cause for the epidemics of infantile scurvy (caused by vitamin C deficiency) and rickets (caused by vitamin D deficiency) reported during this period. At the time, however, the leading scientific theory (known as the "New Nutrition") was that developed by Baron Justus von Liebig, which held that the only nutrients of any importance in food were protein, carbohydrate, and fat. The first vitamin was not discovered until 1912, and reliable methods of quantifying vitamins in food were not available until the late 1920s (Levenstein, 1993).

During this period of scientific uncertainty, it may be informative to consider the role of food producers in influencing the debate. The first great commercial success, known as *Liebig's Soluble Food for Babies*, introduced in the United States as early as 1869, bore the imprimatur of the great scientist, and claimed to be nutritionally identical to breast milk—which it was, as far as anyone knew at the time. This was followed by a host of imitators, the most successful of which was the powdered *Mellin's Food*, whose advertisements claimed it was "the genuine Liebig's Food," and featured photographs of the chubby "*Mellin's* babies" (which became as well known as the Gerber babies of later years), often accompanied by a testimonial thanking *Mellin's* for saving apparently doomed babies' lives. Free samples were often sent to likely customers (primarily readers of middle class magazines), as were free handbooks on infant care and feeding, which explained the chemistry of infant feeding in clear but relatively sophisticated language (Levenstein, 1988, pp. 123–124). It is hardly surprising that firms would tout the latest in scientific findings when it supported purchase of their products, but their success in making believers of mothers (not to mention their doctors, who read the same magazines) is notable.

As the evidence against artificial feeding accumulated, the eminent pediatricians who attempted to sound the alarm found it exceedingly difficult to alter what had become the conventional wisdom. Indeed, in many instances their criticisms of proprietary infant foods were paired with equally withering condemnations of general medical practitioners for continuing to recommend these foods.[8] Even the 1911 *Pediatrics* ("sinister coincidence") editorial on condensed milk conceded that change was unlikely since "breast feeding seems to be falling more and more into disfavor," making it critical that "the most efficient substitute...be sought." The popularity of proprietary milk substitutes was driven by advertising campaigns that reflected the current scientific consensus, which in effect provided the consumer (and her doctor) with *costless* information about product quality. When new evidence refuting these early claims became available, no producer had any incentive to disseminate this information. Thus, for many years American mothers would be largely unaware of the evidence against artificial feeding.[9]

The problem of vitamin degradation was not limited to the new infant foods. The steam canning of meats and produce induced similar changes, as did the milling of white flour, from which the (vitamin-rich) germ and (fiber-rich) bran could now be removed with ever-increasing efficiency.[10] Like the use of proprietary infant foods, the widespread adoption of processed foods by the larger population is also thought to have had important consequences for public health. In 1907, the first systematic description of *pellagra* (a potentially fatal disease now known to be caused by niacin deficiency) was published in the *Journal of the American Medical Association*. Within months, thousands of cases had been diagnosed, but an effective treatment (via dietary modification) was not identified until 1914, and the specific cause (insufficient niacin in the diet) was not known until 1937 (Kiple and Ornelas, 2000).

Again during this period of scientific uncertainty, nutrition-related claims by purveyors of proprietary foods were widespread, and contrary information was slow to be discovered and disseminated. Examples included *Fleishman's Yeast*, which, called its yeast cakes "the richest known source of water-soluble vitamin," and claimed in advertisements that consumption of 2–4 cakes per day would rid the body of "poisonous waste matter," clear up skin disorders, and correct "run-down conditions," indigestion, and

[7] As an alternative to our nomenclature in which non-negligible "quality verification costs" yield "multiple equilibria," this reluctance of the consumer to change his diet can be captured more concisely with a single word: *habit*. While this descriptor may be more consistent with the subjective reports of consumers, we emphasize the costly information framework because it suggests environmental parameters—such as the opportunity cost of time, education, and ease of access to information—upon which the strength of habits might be expected to depend. For extended discussions of the proposition that habits might be an optimal response to costly search, see, e.g., Becker (1996), Smith (2004), or Smith and Tasnádi (2007).

[8] "The average practitioner does not care to give much time and study to infant feeding and readily accepts and prescribes formulas that the proprietary food manufacturers print on the label for him," wrote one pediatrician in 1905 (Levenstein, 1988, p. 125).

[9] It is worth noting that this outcome is a natural consequence of the public goods nature of information, together with the dispersed resources of consumers and the concentrated resources of producers.

[10] Processing was not the only culprit in these unseen nutritional alterations. Iceberg lettuce, a new variety introduced in 1903, was called "virtually indestructible," and could be shipped long distances without bruising or wilting (Levenstein, 1988). Unfortunately, much of the nutrient content had also been bred out (Table 2).

constipation; *Welch's Grape Juice* ads promised that the sweetened beverage would provide "the laxative properties you cannot do without;" while *Cream of Wheat* turned its lack of nutrients and fiber to its advantage by proclaiming that it contained "none of the harsh, indigestible parts of the grain" (Levenstein, 1988, pp. 153–159).

The growing consumer interest in—and skepticism about—the nutritional quality of processed foods led to the employment of leading nutrition scientists and advocates—some of whom had previously been vocal critics of processed foods—by the national magazines and large food processors. Dr. Harvey Wiley, for instance, was widely known as the "pure foods" advocate instrumental to the passage of the 1906 legislation and had declared at the end of World War I that wartime experience supported the use of foods that were "simple and as close to nature as possible," predicting a new era of simple cooking and less processing. By 1928, however, Dr. Wiley was perhaps best known for his work as a health columnist for *Good Housekeeping* magazine, in which capacity he assured readers that "Only those foods which have been fully investigated and found to be worthy are admitted to *Good Housekeeping* advertising columns." These foods, produced in the days before vitamin fortification, included many products (such as *Jell-O*) of dubious nutritional quality, which were nevertheless awarded the *Good Housekeeping* Seal of Approval. Similarly, Dr. Elmer McCollum—who in 1928 had warned that white flour had been deprived of most of its vitamin content—was hired in 1930 by *General Mills* to promote its use. In 1934 McCollum participated in a star-studded radio special hosted by Betty Crocker (a fictional character created by *General Mills* for the purpose of promoting the consumption of baked goods), in which he assured listeners white bread was a healthful diet food; and in 1935 he wrote a well-publicized letter to Congress denouncing "the pernicious teachings of food faddists who have sought to make people afraid of white-flour bread." In 1938 McCollum received an award from the Grocery Manufacturers Association for his contributions to knowledge of food (Schlink, 1935, pp. 15–22; Levenstein, 1993).

There are several lessons to be drawn from this critical period in the history of the American diet. First, the nature of the early marketing campaigns—and their phenomenal success in transforming American dietary habits—make clear that the role of diet in promoting health (or preventing illness) has long been a central concern of the American consumer. The powerful combination of well-funded promotional campaigns with scientific evidence of nutritional superiority increased the consumption of processed foods and made national brand name foods ubiquitous in American kitchens.

A second lesson stems from the belated discovery of nutritional deficiencies in newly developed food products. Because vitamins remained undiscovered for decades as the new food processing technologies were developed, it should not be surprising that vitamin content would be systematically (if unknowingly) sacrificed as new products were being optimized with respect to qualities that impacted either consumer acceptance or the costs of production and distribution. Even as evidence began to accumulate that vitamin deficiency was becoming an important public health problem, there existed little incentive for the individual producer to make adjustments to processing methods that would increase costs but affect only (credence) qualities that would be unobservable to the consumer. In other words, conditions favoring a "lemons" outcome persisted in the market for processed foods.

A third, deeper lesson is to be found in the defensive public relations campaigns mounted by the large food processors as evidence of nutritional deficiencies accumulated. By investing in the dissemination of seemingly credible messages about the quality of their products, the processors engaged in what is technically known as *obfuscation*. The net effect of obfuscation is to increase quality verification costs for the consumer (Verbeke, 2005; Gabaix and Laibson, 2006; Ellison and Wolitzky, 2009; Stivers, 2009). Though many experts were beginning to sound the alarm about the various nutritional deficiencies induced by food processing, the prominent presence of similar-sounding (and rarely demonstrably false) proclamations on the other side made it difficult for the ordinary consumer to know which products were, in fact, nutritionally superior. As noted above, this problem was exacerbated by the fact that the nutritionally-superior alternatives (minimally processed traditional foods) were non-proprietary, and therefore enjoyed no market-based mechanism for disseminating information about emerging scientific evidence.

Economic theory provides a relatively clear-cut solution to information-based market breakdowns: quality grades or certifications, validated by a credible third party. As long as the size of the market failure is large enough to justify administrative costs, a grading system can restore the market for high-quality goods or services, in a manner that increases allocative efficiency (Teisl and Roe, 1998). And indeed, this is exactly what was proposed for processed foods in the early 1930s. But in practice, there are necessarily large distributional effects of any such grading system, and the political debate over the proposed new rules was ferocious.

The political economy of product information: differing views on quality standards

> The product of the large, nationally advertising...canners is for the most part of mediocre quality; and this must be so, since the scale of their output does not permit them to select from the best...The companies have naturally resisted efforts to have all cans carry a grade mark indicating the quality of the contents. Imagine the effect on Del Monte advertising and prices, for example, of B and C grade marks on Del Monte cans. (Arthur Kallet, 1934, pp. 31–32)

As public skepticism about the safety and nutritional quality of canned goods grew in the 1920s, industry-wide demand for these products began to decline. An important source of this public perception was the revelation that unscrupulous fringe producers would sometimes employ dangerous chemical adulterants in the canning process. A coalition of the largest canners prevailed upon Congress to provide a legislative remedy in the form of the 1930 McNary-Mapes Amendment to the Food and Drugs Act, which established a minimum quality standard for canned goods, and a mandatory label ("Below US Standard Low Quality But Not Illegal") for edible products that failed to meet the standard (Lamb, 1936, p. 178).

The minimum quality standard prescribed in the McNary-Mapes Amendment naturally led to the idea that the establishment of grades for higher-quality canned fruits and vegetables could further improve transparency in the marketplace. In 1933, such a system—which would have mandated the use of A-B-C grades on canned food labels—was proposed by Assistant Secretary of Agriculture Rexford Tugwell. Enthusiastic support for the proposal was quickly voiced by a long list of consumer groups,[11] as well as by the Tri-State Packers' Association, a coalition of small canners located in New Jersey, Delaware, and Maryland (Lamb, 1936, p. 181).

Opposition to the new mandatory grades, however, was fierce. Opponents prominently included the 650-member National Canners Association (whose members were reportedly responsible for the production of 60% of all canned food except milk). The principle spokesman for the opposition at the congressional hearings,

[11] According to Lamb (1936, p. 183), those testifying at the public hearings in support of the new canning code included representatives of the *American Home Economics Association*, *National League of Women Voters*, *General Federation of Women's Clubs*, *National Council of Women*, *American Association of University Women*, *American Federation of Labor*, and *Consumers' Research*.

Table 2
Food processing and nutrition.

Processed food	Changes in nutritional quality induced by processing
White sugar[a]	98.8% decrease in calcium
(relative to brown)	98.8% decrease in iron
	98.5% decrease in potassium
	100.0% decrease in niacin
Iceberg lettuce[a]	43% decrease in fiber
(relative to Romaine)	58% decrease in iron
	35% decrease in zinc
	88% decrease in vitamin C
	63% decrease in riboflavin
	61% decrease in niacin
	43% decrease in vitamin B-6
	79% decrease in folate
	94% decrease in beta-carotene
Canned tomatoes[a]	27% decrease in vitamin C
(relative to fresh)	84% decrease in beta-carotene
	2760% increase in sodium
Dried tomatoes (dry wt.)[a]	27% decrease in vitamin C
(relative to fresh)	71% decrease in folate
Fresh tomatoes grown in 1999[b]	17% decrease in vitamin C
(relative to 1950)	43% decrease in vitamin A
	55% decrease in calcium
	25% decrease in iron
Canned apples (sweetened, drained)[a]	29% decrease in fiber
(relative to fresh)	91% decrease in vitamin C
	47% decrease in thiamine
	62% decrease in riboflavin
	20% decrease in niacin
	19% decrease in beta-carotene
	200% increase in sodium
	44% increase in sugar
White flour[a]	78% decrease in fiber
(relative to whole wheat flour)	70% decrease in iron
	73% decrease in thiamine
	81% decrease in riboflavin
	80% decrease in niacin
	87% decrease in vitamin B-6
	41% decrease in folate
	63% decrease in monounsaturated fatty acids
	47% decrease in polyunsaturated fatty acids
Enriched white flour[a]	78% decrease in fiber
(relative to whole wheat flour)	63% decrease in monounsaturated fatty acids
	47% decrease in polyunsaturated fatty acids
White rice[a]	56% decrease in iron
(relative to brown rice)	83% decrease in thiamine
	63% decrease in niacin
	72% decrease in vitamin B-6
	55% decrease in folate
	81% decrease in monounsaturated fatty acids
	84% decrease in polyunsaturated fatty acids
Beef (grain-fed)[c]	38% decrease in omega-3 fatty acids
(relative to grass-fed)	78% increase in omega-6:omega-3 ratio

[a] USDA 2008 and authors' calculations.
[b] Davis et al. (2004) and authors' calculations.
[c] French et al. (2000) and authors' calculations.

however, was not a canner but a publisher. By the mid-1930s, the food industry had become the single largest source of advertising revenue for the mass circulation magazines, and after some initial dissent—in which the editorial boards of both *Ladies' Home Journal* and *Good Housekeeping* magazine voiced support for the new grading system before being forced into embarrassing reversals—the publishers came out against the new regulations (Levenstein, 1993, p. 18). At the Senate hearings on the proposed legislation, Mr. Charles Coolidge Parlin appeared, representing 150 magazines with an aggregate circulation of some 50 million. Mr. Parlin claimed to be the "mouthpiece for consumers," on whose behalf he protested the quality grading provisions of the bill (Lamb, 1936, p. 180).

It is not difficult to see that these positions represented the economic interests of large producers. A system of transparent, meaningful quality grades would dramatically reduce quality verification costs for the typical consumer and facilitate price competition at each grade level. This would clearly benefit the consumer, who would enjoy both the lower prices induced by greater competition and the opportunity to purchase verifiably higher-quality canned food products. The *small* canner, likewise, would likely find market niches at high levels of quality in which the largest producers would be at a relative disadvantage. In the absence of such a system, consumers would be forced to continue to rely on brand reputation as the implicit guarantor of experience qualities, and would continue to pay the concomitant price premium.[12] When the bill finally passed after years of contentious debate, the tiered system of quality grades had been dropped, leaving consumers with only the single minimum quality standard (which the National Canners' Association continued to support) in the *Food, Drug, and Cosmetic Act* of 1938.[13]

Even as it was happening, the 1930s debate over the canners' code was not unique. A similar debate played out (mostly at the state and local levels) over the pasteurization of milk. Pasteurization ensures that fresh milk can be stored under refrigeration for extended periods of time without spoilage, and can prevent foodborne disease. But pasteurization is not the only option: milk can also be made safe by a combination of careful attention to hygiene during production and rapid distribution to the consumer. Shortly after the advent of commercial pasteurization in 1890, the Certified Milk movement began, led by H.I. Coit, who advocated against pasteurization because of its impact on both taste and nutritional value—though the latter claim was relatively unfounded at the time (Jay et al., 2005). Nevertheless, local laws requiring pasteurization were enacted in many localities, beginning with New York City in 1910 (Levenstein, 1988). The debate over whether to require pasteurization (as opposed to certification) to ensure the safety of fresh milk continued into the late 1930s, when a public relations campaign sponsored by large milk producers succeeded in establishing a widespread belief that raw milk is never safe to drink. Many states subsequently banned the sale of unpasteurized milk completely, making pasteurization the norm for interstate commerce (Schmid, 2009). The parallels to the canners' debate are striking: once again largest national players (primarily the National

[12] Evidence in support of the notion that brands signal food safety even today can be found in the fact that most major food safety incidents are attributable not to particular brands, but rather to commodity-level inputs. The US Centers for Disease Control and Prevention, for instance, reported four occurrences of food contamination or adulteration in 2008 that warranted nationwide alerts, three of which (dairy, jalapeño peppers, and peanut butter) occurred at the commodity level. The fourth might be considered the exception that proves the rule: a *salmonella* outbreak was traced back to cereal products marketed under the *Malt-O-Meal* label, which are promoted as low-cost (and less-advertised) alternatives to the major national brands (Centers for Disease Control and Prevention, 2009).

[13] Those who doubt that obfuscation was a primary objective of the large canners need look no further than an episode during the regulatory debate in which the industry was required to propose a quality grading system. The "comprehensive system of descriptive labeling" they proposed is exemplified by the following requirements for cream-style corn (as reported in Lamb (1936, p. 185)):

1. Description of texture as "Not Tender," "Firm, Not Tough," "Medium Tender" or "Very Tender";
2. Statement of the degree of freedom from dark kernels, cob, husk or silk, as "To a High Degree Free from Dark Kernels, Cob, Husk, or Silk" (a statement of this descriptive element shall not be required for any product meeting this highest requirement, but the use of such descriptive statement shall be optional with the packer), "Practically Free from Dark Kernels, Cob, Husk or, Silk"; or "Reasonably Free from Dark Kernels, Cob, Husk, or Silk".
3. Statement of the consistency of the product as "Very Thick Pack," "Thin Pack," or "Creamy Pack";
4. Specification of the sugar content or sweetness of the product, as "Very Sweet," "Medium Sweet," "Slightly Sweet" or "No Added Sugar."

Dairy Products Company—later re-named *Kraft*—and the Borden Company, who together controlled large shares of most urban markets) fought to prevent institution of all but the minimum quality standard required for safe industrial-scale production (Till, 1938). Note that again, the policy outcome (mandatory pasteurization) eliminated potential competition from niche producers of high-quality product (raw milk produced under sanitary conditions).

Does hidden quality matter today? Further progress in nutritional epidemiology

Happily, the advent of vitamin fortification (the first federal standard for "enriched" white flour was issued in 1941) largely eliminated the worst of the "diseases of malnutrition" (primarily pellagra, scurvy, and rickets), and ameliorated much of the public concern over the nutritional quality of mass-market foods. But the "hidden quality" problem in these foods would persist. New micronutrients—again, typically found to be inadvertently removed by food processing—continue to be discovered even today (see, e.g., Liu, 2004 and Rao and Rao, 2007), and the federal standard for enriched flour was amended as recently as 1998 (to include folic acid, a dearth of which is thought to cause birth defects) (Centers for Disease Control and Prevention, 2004). At the same time, changes in product formulation have made it increasingly difficult for the average consumer to distinguish high quality from low quality food products. Consider, for example, the sensory cues the consumer might rely upon to make inferences about the quality of a fresh tomato: he can visually observe blemishes or bruises, he can take a whiff and know whether the product is sufficiently (or overly) ripened, and—perhaps after making the purchase—he can take a bite as final confirmation of the quality of the fruit in his hand. Once this same tomato is processed and placed in a can—perhaps along with salt, sugar, and other additives—verifying the quality of the product and the nature of the processing it has undergone become much more difficult.

For many years, the extent to which processing could be used to mask the presence of low-quality ingredients or products was limited by a strong "imitation" provision in the 1938 legislation. A can of tomato sauce, for example, produced using methods or ingredients that significantly departed from traditional practice could only be sold if clearly labeled as "imitation tomato sauce." This provided a strong incentive for producers to avoid exotic product reformulations that might trigger the rule. In 1973, however, the Food and Drug Administration—in a move reportedly endorsed by the large food processors—issued a regulation repealing the 1938 rule (Lyons, 1973).[14] This seemingly minor regulatory change has been blamed by some as contributing to the dramatic subsequent rise in diet-related illness (Pollan, 2008). Today there are more than 3000 additives (many of which alter flavor, appearance, or tactile properties) used in processed foods sold in the US (Food and Drug Administration, 2009).[15]

Another way in which the food industry seems to have acted to make quality verification difficult for the consumer is the modern practice of barring the public from production facilities. Gone are the days in which the largest processors proudly opened wide their "model kitchens." A number of prominent journalists have published exposés on the American food industry in recent years (e.g., Schlosser, 2001; Pollan, 2006; Simon, 2006), and—though their specific target industries, production processes, and issues have varied—they speak as with one voice on the subject of industry secrecy. Filmmaker Robert Kenner, for instance, has described how in making the documentary *Food, Inc*. he set out to make a film about the divergent opinions on the industrial food system, but—after being repeatedly denied access to the companies he sought to film, and meeting employees or subcontractors of these companies who were afraid to speak on camera or even to tell him their own personal eating habits—the film wound up focusing mostly on issues of free speech and access to information (Kenner, 2009). Industry representatives have argued that such secrecy prevents "unnecessary" fear or panic on the part of consumers, but such claims are undermined by incidents like Kenner's discovery that chicken growers contracted by Purdue were feeding their birds arsenic, a toxic heavy metal—a practice that Purdue promptly discontinued when Kenner threatened to include it in his film (National Public Radio, 2009).

In spite of all the evidence that the market for processed foods has arrived at an equilibrium in which certain aspects of quality are difficult for the consumer to discern, the magnitude of the purported market breakdown (measured in lost social welfare) is likely to depend critically on real consequences for human health. Given that the populace no longer suffers from pellagra or scurvy, it might be argued that the concerns of consumers about health consequences have little basis in reality. In this case, efficiency might indeed simply dictate producing foods at the lowest possible cost. Below we briefly discuss two modern by-products of food processing technology that appear to have had large impacts on public health: *trans*-fats and refined carbohydrates.

Trans-fat century: hydrogenation and heart disease

The effects of particular dietary constituents on human health are both more complicated—and less well-understood—than the popular conception of nutrition would suggest. Consider, for instance, the historical (but still ongoing) debate over dietary causes of obesity, diabetes, and heart disease. While much of this debate has taken place at the level of macronutrients (protein/carbohydrate/fat), or the even more reductive "calories in vs. calories out,"[16] it is becoming increasingly clear that macronutrient *quality* is perhaps the most important dietary determinant of health outcomes. At the same time, a pattern is emerging: diet-related health outcomes have been linked repeatedly to particular food processing technologies long thought to be safe, or even nutritionally superior. To illustrate some of the critical subtleties of these findings, consider some of the evidence on dietary fat.

Although dietary fat has long been blamed as a leading cause of obesity and heart disease, there is now a growing consensus that *total* dietary fat intake has little demonstrable effect on health outcomes.[17] Rather, the strongest evidence from both clinical and epidemiological studies now points to the *trans*-fatty acids—found in many margarines and vegetable shortenings—is the form of dietary fat most conducive to heart disease.[18] And again, *trans*-fats are

[14] Ironically, the change was also supported by the American Heart Association, on the grounds that it would facilitate the reformulation of many foods to reduce levels of saturated fat.

[15] Some of these additives—notably, artificial sweeteners—have been approved for use despite suggestive evidence of acute negative health effects. Iuliano (2010) suggests that producers of proprietary sweeteners had undue influence on the FDA approval process.

[16] This last perspective has been a favorite in economic studies of obesity, which have tended to focus on the influence of changes in (various measures of) the implicit "price of a calorie" on body weight (e.g., Cutler et al., 2003; Chou et al., 2004).

[17] Taubes (2007) provides an excellent review of the scientific debate over the dietary causes of obesity, diabetes, and heart disease, which has been conducted historically on the basis of surprisingly weak evidence. Nevertheless, a consensus emerged—and was for a time incorporated into official US dietary guidelines encouraging consumers to "eat sparingly" of fats and oils—because of a desire to convey a simple message to consumers, and perhaps also for reasons of political economy (Nestle, 2007).

[18] *Trans*-fats are thought to increase low density lipoproteins ("bad cholesterol") while decreasing high density lipoproteins ("good cholesterol") in the bloodstream. Epidemiological estimates suggest that eliminating *trans*-fats from the US food supply could prevent between 6% and 19% of heart attacks and related deaths (Mozaffarian et al., 2006).

primarily a product of industrial food processing: nearly all *trans*-fats in the American diet are the product of the partial hydrogenation of vegetable oils, a process that generates a chemically stable, low-cost substitute for lard and butter (Unnevehr and Jagmanaite, 2008).

Another side effect of hydrogenation that has been attracting attention of late is the selective destruction of omega-3 fatty acids. While there is widespread scientific agreement that human health is harmed by current levels of *trans*-fats in the US food supply, there is also a growing body of evidence suggesting that health outcomes would be improved if omega-3s were *more* widely consumed. Omega-3 fatty acids are one of two types of polyunsaturated essential fatty acids (the other being omega-6), distinguished by their chemical structures. Both are essential components of the diet (i.e., they are necessary to sustain human life, and neither can be synthesized by the human body from other compounds), and are thought to affect blood lipids in a way that *decreases* the risk of heart disease (Mensink et al., 2003). Omega-3 fatty acids are also thought to be uniquely effective in preventing cardiac deaths (Valagussa et al., 1999; Leaf, 2007; Yokoyama et al., 2007). While the pre-industrial ratio of omega-6 to omega-3 in the diet is thought to have been on the order of 1:1, the modern ratio is around 11:1 (Eaton et al., 1997).[19] The reasons for this are related to the nature of omega-3s. They are found primarily in fish and green plants but also some nuts and seeds. Most significantly, omega-3 fatty acids are more susceptible to oxidation and spoilage than their omega-6 counterparts. For this reason, vegetable oils (such as soybean oil) containing significant amounts of omega-3s are not well-suited for use in mass-marketed processed foods (which often require long-term storage without refrigeration), and are typically hydrogenated for use as shortening (Allport, 2006). In other words, the shortage of omega-3s in the American diet appears to be yet another unfortunate—and apparently deadly—side effect of modern food processing technology.

Though reasonably definitive evidence on the effects of *trans*-fatty acids on human health was published by the early 1990s (see Mensink and Katan, 1990; Zock and Katan, 1992; Judd et al., 1994), industry resistance to a *trans*-fat labeling requirement was fierce. The eventual implementation of such a requirement[20] required changes beginning in 2006, however, stands as a prominent demonstration of both the American consumer's desire for a healthy diet and the ability of the industry to respond with new production technologies. This new rule requires all foods with a nutrition label to list grams of *trans*-fat per serving, and provides consumers with a simple decision rule (i.e., avoid all products containing *trans*-fats). It has resulted in the *en masse* re-formulation of virtually every *trans*-fat-containing food product on the market (Unnevehr and Jagmanaite, 2008). That this transformation took place nearly a century after the widespread adoption of partially hydrogenated vegetable oils is a lesson that should not be lost in future efforts to remedy the hidden quality problem with respect to novel food products.

Refined carbohydrates and the glycemic response

Proponents of the "glycemic hypothesis" suggest that rather than fats or sugars or calories, the most important dietary determinant of a number of chronic diseases (including obesity and diabetes) is *carbohydrate quality*, where quality is measured by blood sugar response in the minutes and hours following ingestion. Experimental studies have demonstrated that following consumption of refined carbohydrates,[21] human subjects experience a predictable sequence of physiological events: first, blood sugar levels rise dramatically; followed by a proportional increase in circulating levels of insulin, which in turn induces a number of physiological changes that have the collective effect of bringing blood sugar back into the normal range. In extreme cases, this sequence of events can lead paradoxically to a period of *low* blood sugar many minutes or hours after the meal, during which the subject typically reports feelings of hunger or cravings for sweets. The strength of the glycemic response can vary from person to person. Moreover, no simple formula predicts the glycemic effect of a particular food, though it is known to vary with fiber content, particle size, preparation method, chewing speed, and even the combination of foods included in the meal (Ludwig, 2002). Nevertheless, this physiological response has been documented repeatedly in both animal and human studies, and chronic consumption of low-quality (i.e., high-glycemic index) carbohydrates has been shown in large epidemiological studies to be associated with insulin resistance (diabetes) and obesity (Willett et al., 2002; Isganaitis and Lustig, 2005).

This phenomenon is remarkable in part because it represents a clear example of the endogeneity of dietary intake with respect to dietary quality (i.e., the consumption of high-glycemic index foods appears to cause people to ingest more calories, *ceteris paribus*). But more importantly, a consumer who lacks schooling in the endocrinology of digestion might not correctly attribute his feelings of hunger to the carbohydrate meal ingested hours earlier, not to mention the possibility that it might be related to the development of diabetes many years later. It also represents yet another instance in which food processing technologies appear to degrade nutritional quality: refined white flour, for instance, with its small particle size and lack of fiber (Table 2), tends to induce a stronger glycemic response than simple stone ground whole grain flour (Ludwig, 2002). Efforts to develop a labeling standard for glycemic effects have thus far met with little success.

Toward a more efficient market for processed foods

> Consumption is the sole end and purpose of all production; and the interest of the producer ought to be attended to only so far as it may be necessary for promoting that of the consumer. (Smith, 1776, p. 159)

> . . .the restoration of biological normality by the removal of an abnormal exposure (e.g., stopping smoking, controlling air pollution, moderating some of our recently-acquired dietary deviations); here there can be some presumption of safety. (Rose, 1985, p. 38)

Placed in historical context, it becomes apparent that the modern American epidemic of diet-related chronic illness is—at least in part—the product of a fundamental failure of the mass market to deliver high-quality foods to the consumer. While developments in food processing have provided benefits such as lower costs, pathogen reduction, long-term storage, and wide distribution, these benefits have come with concomitant costs. To be sure, there have been a number of notably successful food quality standards implemented over the years—witness, for example, the resounding recent successes of both the national organic standard and the mandatory inclusion of *trans*-fats content on product labels. But the speed and magnitude with which the market has reacted to

[19] Some researchers argue that the *ratio* of these two types of fats is more important than absolute intakes, implying that a reduction in omega-6 might be beneficial under current circumstances (see Allport (2006) for an extended discussion). Others, however, have failed to detect such an effect in epidemiological studies (Mozaffarian et al., 2005; Willett, 2007).

[20] *Food Labeling: Trans Fatty Acids in Nutrition Labeling, Nutrient Content Claims, and Health Claim Rule* was issued by the US Food and Drug Administration in 2003.

[21] *Refined carbohydrates* are generally understood to include sugar- or starch-containing foods such as sugar, flour, and white rice that have been machine-processed to make them more easily digestible (Taubes, 2007).

the implementation of these rules can also be taken as evidence that in the absence of policy interventions (in the form of credible third-party quality verification), lemons problems will persist.[22]

Given our diagnosis of the nature of the market failure in the American retail market for food, we now turn to the question of an appropriate policy response. We begin by proposing two broad principles for such an undertaking.

1. First, any new food policies should take seriously the above-quoted words of Adam Smith, and place the interests of the consumer first. We mean this not in the focus group, ask-them-what-they-like-to-eat sense, but rather we would argue that policymakers should take seriously the evidence that the American consumer has always gravitated toward healthy foods when convinced they were so. If an efficient market is the goal, then priority should be placed on revealing (in an easily accessible manner) to consumers product qualities that are most likely to be conducive to long-term good health.
2. Second, adopt the "precautionary principle."[23] Food policy should be conservative, as suggested by epidemiologists Peter Cleave (1956) and (later) Geoffrey Rose (1985 quoted above), who emphasized the dangers of adopting population-level public health policies that might have unanticipated negative effects. By conservative, we mean what Rose meant: when the scientific questions are unresolved, err on the side of what is natural.

Our arrival at these two principles seems, we admit, somewhat anti-climactic. After delving into the many technicalities and historical particulars of the political economy of food and health in America, our advice boils down to simple common sense: markets should serve consumers, and care should be exercised when imposing novel foodstuffs on the populace.

It is unsurprising that we are not the first to arrive at these commonsense principles. In many ways they echo the intentions of the 1906 and 1938 US food laws, and they are explicitly applied in many specific regulations in Europe.[24] But in practice, at the federal level, American food quality standards have tended to target only the lowest of quality levels, and in some cases enforcement of standards has become weaker over time (e.g., the 1973 relaxation of the "imitation" rule).

Indeed, we suspect that what may be most surprising to many readers is the manner in which food policy has diverged from our commonsense directives. Asymmetric information appears to have long been a key strategic objective for many players in the American food industry, and history is replete with examples of powerful interests affecting the rules and regulations under which food products are produced and sold. We conclude, therefore, by speaking directly to the systemic problem of industry influence in the coming debate over an improved national food policy.

Among the central lessons of the worldwide financial crisis of 2008 was the danger posed by purveyors of complex financial products in the marketplace. We see strong parallels between this problem—in which even very sophisticated buyers found themselves purchasing financial products laden with hidden costs and risks of which they were unaware—and the problem with the American market for food. Just as banks have competed to market ever-more-complex credit card contracts (containing ever-more-difficult-to-discern contingencies and fees), food companies have endeavored to create ever-more-complex food products, with implications for human health that the typical consumer has little chance of discerning. In both cases, an absence of standards has given sellers incentive to engage in obfuscation, and may have played a significant role in generating a "lemons" outcome characterized by uniformly low levels of quality.

In response to the financial crisis and the problems of obfuscation and regulatory capture in the market for financial products, consumer advocates called for—and the US Congress recently established—a new Consumer Financial Protection Bureau.[25] In justifying the new bureau, advocates noted that the conflicted dual mission (i.e., protecting the interests of both the consumer and the banking industry) of our previous regulatory regime had facilitated agency capture and resulted in a general neglect of consumer protections (Warren, 2007). Given the strong parallels to our present system of regulating retail food markets (in which the US Department of Agriculture and the Food and Drug Administration are tasked with serving both the consumer and the producers of foods. . .and have often seemingly favored the latter), we are making an analogous proposal: the establishment of a new Food Quality Standards Agency. The mission of such an agency should, in the interest of restoring efficiency to our food markets, be built upon the two principles discussed above. By focusing on ensuring that consumers have easy access to clear and honest information about the potential health implications of consuming particular classes of processed foods, such an agency would give consumers the opportunity to make better informed choices. If successful, the labeling rules that stem from such a process will necessarily be simple. For example, the agency might reinstate and enforce something like the 1938 "imitation" rule, or develop a product certification program akin to the national organic standard but more closely aligned with health outcomes. A "heritage foods" standard for minimally-processed foods might go a long way toward facilitating competition in production of higher-quality foods within the industrial production and distribution system.

In order to insulate the new agency from the possibility of future capture by industry interests, it should be endowed with the same four attributes endorsed by advocates of an independent financial agency (Garofalo, 2010):

1. A leader appointed by the president and confirmed by the Senate.
2. Independent budget authority.
3. Independent rule-making authority; and
4. Independent enforcement powers.

These measures will collectively ensure that the new "food watchdog" agency we propose will be protected from the whims of Congress or future administrations, and will have the power to enact reforms that will facilitate both innovation and price competition in markets for higher-quality food products. It is not often that enactment of a single public policy has the potential to both

[22] Another telling symptom of a sizable "missing market" for high-quality foods is to be found in the burgeoning "buy local" movement—in which consumers are increasingly choosing to opt out of the national market in search of higher quality and increased transparency (US Department of Agriculture, 2010).

[23] The precautionary principle has been widely adopted in food and health policy (e.g., GMO foods) and environmental policy (climate change) when there are significant scientific uncertainties and large, potentially irreversible risks. A widely used definition of the precautionary principle is found in Article 15 of the Rio Declaration of 1992: "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent [environmental degradation]."

[24] For example, Regulation (EC) No 258/97 of the European Parliament and of the Council of 27 January 1997 requires that novel foods for which there is no history of consumption in the E.U. must undergo a pre-market approval process that seeks to address the potential long-term effects of consumption. Similarly, Regulation (EC) No. 1925/2006 of the European Parliament and of the Council of 20 December 2006 regulates the addition of vitamins and minerals and of certain other substances to foods. We thank an anonymous referee for pointing us to these examples.

[25] The *Dodd–Frank Wall Street Reform and Consumer Protection Act* was signed into law July 21, 2010.

improve market efficiency and prevent millions of premature deaths, but after more than a century of neglect, the modern American market for food presents just such an opportunity.

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