



US-Based Food and Agricultural Value Chains and Their Relevance to Healthy Diets

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This article examines the structure and health implications of two industries, chicken and tomatoes, that play prominent roles in US food and agricultural competitiveness. Both industries have become more concentrated over time, with powerful “lead firms” driving geographical, technological, and marketing changes. Overall, a processed food revolution has taken place in agricultural products that transforms the types of food and dietary options available to consumers. The nature of contemporary food and agricultural value chains affects the strategies and policies that can be effectively employed to address major health goals such as improved nutrition, food safety, and food security.

KEYWORDS *global value chains, governance, food and agriculture, healthy diets*

INTRODUCTION

Our diets are influenced by multiple factors, including the price, availability, convenience, and safety of the food available to us. The research on health outcomes related to food choices, however, is dominated by a focus on individuals. Recently, it has been argued that to most effectively counter health problems like the childhood obesity epidemic, interventions should take place at multiple levels—individual, household, group, society, and

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global.¹ This multilevel approach advocates changing our structural environment, because individual choices are part of a social context that places constraints, inducements, and pressures upon the individual's ability to make independent dietary choices.

This article explores the global and societal dimensions of the multilevel model. Using the global value chains (GVC) perspective, it addresses how large transnational corporations are expanding their roles in determining where food comes from and how it is produced, marketed, and made available for individual consumption. A GVC analysis examines the structure of food production and consumption systems and identifies leverage points that can bring change at a structural level. Two food value chains in the United States—chicken and tomatoes—are studied to understand the contemporary dynamics of food supply chains and their implications for healthy diets.

We use the chicken and tomato comparison to explore three sets of issues regarding US food and agricultural value chains. First, what is the structure of the chicken and tomato value chains and how has it changed over time? Second, who are the drivers of change in these chains and how is their power used? Lastly, what are the leverage points within the chains where change toward healthier food options can be pursued? Though the consumption of both chicken and tomatoes has increased sharply in the United States, the implications for healthy diets are mixed due to the predominance of highly processed foods, a proliferation of standards with regard to food quality and safety, and the limited effectiveness of public and corporate marketing campaigns to induce consumers to eat more nutritious and balanced meals.

ANALYTIC FRAMEWORK: GLOBAL VALUE CHAINS AND HEALTHY DIETS

Global value chains are defined as “the full range of activities, including coordination, that are required to bring a specific product from its conception to its end use and beyond.” (p. 77)² The merit of the GVC framework lies in its ability to analyze the entire structure of an industry from the production to consumption of a specific end product (in food, from “farm-to-fork”) and the global spatial scale of that process. By so doing, it seeks to capture the complexities of contemporary agricultural and industrial supply chains, as well as the globally dispersed and locally embedded nature of the chains.³

Before discussing the relevance of GVCs to current health and food issues, we need to identify the key dimensions of a GVC analysis and its core concepts. Four elements are central in the analysis of a particular value chain: its input-output structure, geography, governance, and institutions.³

1. **Input-output structure:** This refers to the entire process that brings a product or service from initial conception to the consumer's hand. The main components typically entail research and development (R&D), production, distribution, marketing, and sales.
2. **Geography:** The geographical layer of GVC analysis links value chain activities to the physical locations where these activities are carried out. Relevant geographies could be global, regional, national, or local.
3. **Governance structures:** They highlight the authority and power relationships that control and coordinate exchanges—not only goods but also capital, technology, standards, and brands—between buyers and suppliers in a value chain. The typology of GVC governance structures we use in this article identifies 5 categories (defined by how the main interfirm relationships in an industry are organized): markets (coordination by price) and hierarchies (coordination through ownership, also known as vertical integration) constitute the end points of the governance continuum, along with 3 types of networks that involve increasingly explicit forms of coordination—these are modular, relational, and captive networks.⁴
4. **Institutions:** Various institutions, including governments, unions, trade associations, nongovernmental organizations (NGOs), multilateral agencies, and regulatory bodies, shape the rules, norms, and standards in which a value chain is embedded.

The conceptual building blocks of the GVC framework are applicable to the macrolevel dynamics of various health issues and can assist in devising and effectively implementing strategies for promoting healthy diets.⁵ Healthy diets encompass 3 complementary domains: nutrition, food security (or availability), and food safety and quality.⁶ Good and balanced nutrition is the cornerstone of healthy eating. Food with such attributes should be available, accessible, and affordable across social groups of varied economic and social status. It also should meet strict requirements for food safety and quality.

Achieving all of these goals, however, is not easy without understanding the changing macrolevel dynamics of food systems. Big branded food manufacturers and fast food giants have a significant influence on what types of food are produced. A processed food revolution driven by these firms has shaped Americans' habits, incentives, and expectations of what, when, and where to eat. Assisted by increased productivity, food can be made more nutritional, as well as affordable and plentiful. At the same time, the widespread availability of low-price, energy-dense processed food has been blamed for nutritional imbalances and as a contributing factor in overweight and obesity individuals.⁷

Stringent standards for safer food with better quality are imposed by private actors like multinational supermarket chains, supplementing existing public food regulations. Without these firms' leverage within complex food

supply chains, private standards would not be effective.⁸ However, the proliferation of private and public standards creates the potential for significant regulatory confusion. Thus, lead firms in global agrifood value chains play a powerful role in food provision and they can exert pressure for change in both positive and negative ways.

In the next two sections, the US-based chicken and tomato value chains are examined to uncover who the lead firms are and how they govern the chains, in order to set the stage for discussing how GVC analysis contributes to promoting healthy diets.

THE U.S. CHICKEN VALUE CHAIN

Chicken is America's favorite meat today, surpassing beef and pork.⁹ Chicken consumption per capita has nearly doubled in recent decades, whereas consumption of beef and pork has declined or stagnated. In 2007, 36 billion pounds of chicken were produced in the United States, whereas beef and pork output tallied 26 and 21 billion pounds, respectively.^{10,11}

With soaring production and consumption, more Americans now eat chicken outside the home than in the past and generally they consume processed chicken. In 2005, restaurants accounted for 45% of chicken consumed (up from 25% in 1970). Over half of the away-from-home consumption was in fast-food restaurants.¹² Demand for processed chicken has also shifted sharply. Processed chicken—cut-up parts and further processed products (eg, patties, breaded strips, and nuggets)—holds an overwhelming share of the domestic market, pushing out the whole fresh chicken that was once dominant.¹³

Far from being automatic, these changes are the consequence of technological and organizational innovations that have made chicken products cheaper, abundant, and more diverse over the last century.^{14,15} This transformation is directly related to the rise of new lead firms and governance structures in the chicken value chain. The increased sophistication of processed chicken has given rise to a set of firms known as *integrators*, which vertically integrate through ownership a wide range of activities from breeding to processing and distribution. The shift to away-from-home consumption favored fast food giants like KFC and McDonald's, whose mass demand for processed chicken required higher levels of explicit coordination by the integrators.

Indeed, delivering chicken to the dinner table has become a lot more complicated. In the past, chickens were raised in small backyard flocks and sold in local markets with little coordination between growers and buyers. Today, as presented in Figure 1, the chicken value chain consists of several discrete steps—inputs, growing, processing, distribution, and retail—and the entire chain process is managed by fewer and larger lead firms.

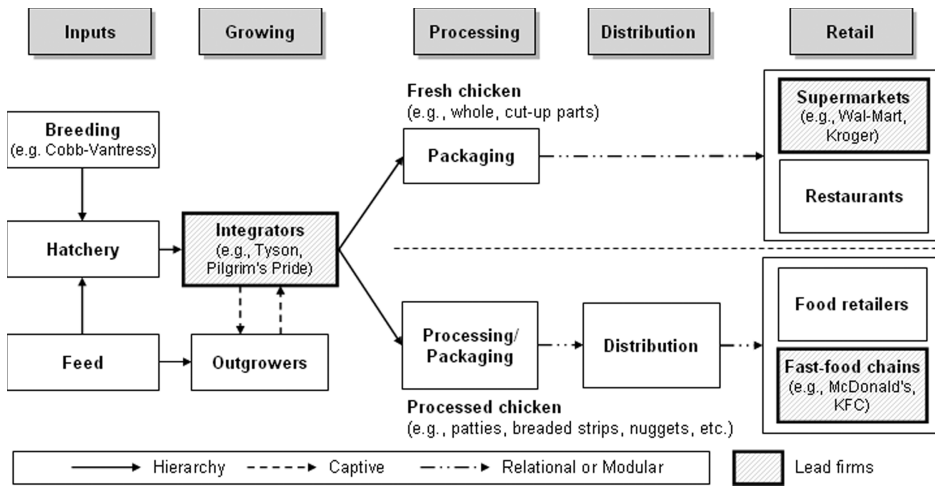


FIGURE 1 The US chicken value chain and its governance structures.

Source: authors' diagram.

The chicken value chain is characterized by a hierarchical governance structure made up of a few large integrators and tight coordination between them and large food retailers and fast food chains (see Table 1). The integrators have become highly concentrated as well. Two leading integrators, Pilgrim's Pride and Tyson Food, accounted for 48% of the US market in 2006, up from 30% in 1996.¹⁶ They exert great power over the entire value chain by connecting a wide array of activities from inputs to distribution.

The relationship of these integrators with other firms varies considerably in the chicken value chain, thus generating multiple governance structures.⁴ Their linkages with thousands of contract growers, mostly

TABLE 1 Governance Structures and Key Corporate Players in the US Chicken Value Chain

Value chain box	Governance structures	Key corporate players (US market share, %)
Input (breeding, feed, hatchery)	Hierarchy (with integrator)	Pilgrim's Pride (Pilgrim's Feed), Tyson Foods (Cobb-Vantress, breeding), Perdue
Outgrower	Captive (with integrator)	No dominant firms
Integrator	Hierarchy (with processing/packaging)	Pilgrim's Pride (25), Tyson Foods (23), Perdue (6), Wayne Farms (4) ^a
Supermarket (fresh chicken)	Relational or modular (with supermarkets and restaurants)	Wal-Mart (20.4), Kroger (7.1), Supervalu (4.2), Safeway (4.1), Publix (2.7) ^b
Fast food chain (Processed chicken)	Relational or modular (with fast food chains and food retailers)	McDonald's (23.4), Yum! Brand (KFC, 10.0), Burger King (6.8), Wendy's (6.6), DAI (Subway, 6.5) ^c

^aBased on ready-to-cook (RTC) output (2006). Source: Shane.¹⁶

^bGrocery retailers (2007). Source: Euromonitor International.³⁸

^c2007. Source: Euromonitor International.³⁹

small farm owners, can be portrayed as a *captive* relationship, where the growers heavily depend on the integrators for market access and resources. Meanwhile, the integrators have *relational* or *modular* linkages with large food retailers and fast food chains, which are now highly concentrated. The top 5 brands accounted for over half of the US fast food market in 2007 (see Table 1).

Breeding and Feed Production: Concentration and Integration

Breeding and feeding are the key inputs to chicken farming. These operations are highly consolidated and owned by the integrators. Most integrators are engaged in the hatching and feeding side of the industry. The top 4 chicken breeders (which handle female birds) accounted for 97% of the market in 1994.¹⁵ Pilgrim's Feed, Tyson, and Perdue are the leaders in global feed production, which is dominated by large agribusinesses.¹⁷ Their expansion into breeding operations has resulted in greater vertical integration between inputs and processing.

Increased integration is motivated by the use of R&D in feeding and breeding to increase the efficiency of chicken processing. Research and development activities have sought to produce chickens characterized by standardized size and quality, more live weight, a shorter maturation period, abundant white meat, disease resistance, and higher feed efficiency. Such innovations as year-round, intensive indoor confinement, specially formulated feeds, and the "designer chicken" significantly boosted US chicken production, improved the quality of meats, and enabled growers to yield desired characteristics (eg, larger breast size). For example, Tyson's joint venture with (and later acquisition in 1994 of) Cobb-Vantress gave Tyson access to a new female breed line capable of forming a large, easily deboned breast, the part most amenable to fast food restaurants.¹⁸ Through vertical integration, Tyson eased knowledge exchange between breeding and processing while controlling its intellectual property.⁴

Outgrowing: Decentralization With Captive Governance

Integrators also play a powerful role in the growing phase of the value chain but with a different type of governance. Their linkage with chicken growers is largely captive, which is a means to maintain control over the growing process with minimal ownership. Nowadays more than 90% of chickens are raised for large integrators by thousands of outgrowers, who are independent farmers working under formal contract with the integrator.¹³ Generally, the integrator provides the grower with baby chicks, feed, transportation, medication, and technical assistance, and outgrowers are responsible for the land, facilities, litter, and other expenses associated with raising chickens.

In their formal contracts, outgrowers are in a weak position vis-à-vis the large integrators. They are only paid for labor and facilities, while the integrator retains ownership of the birds during the outgrowing phase. Outgrowers are not only dependent on the key inputs provided by the integrator, such as baby chicks and feed, but they also adhere to strict requirements imposed by the integrator with respect to input purchases, production methods, and safety and quality standards. In fact, concentrated integrators have left the farmers with a narrow range of tasks, significant switching costs, and dependence on the integrators for market access.¹⁹ In contrast, the integrator can take advantage of its outgrowing contracts to experiment with new innovations (e.g., advanced breeds and feed) without running the biological risks that are highest in the grow-out phase.¹⁴

Processing and Retail: Close Coordination Between Integrators and Retailers

The capital-intensive nature of modern chicken processing has favored large integrators over small processors. The capacity of a modern processing plant has nearly tripled over the last 15 years,²⁰ and increased upstream productivity allows the integrator to expand and mechanize its facilities.¹⁸ In 1996, the top 5 integrators accounted for 48% of the US chicken market, but in 2006 the same portion of the market was controlled by just the top 2 firms (Pilgrim's Pride and Tyson Foods).¹⁶ Lead firms have actively pursued the "growth-by-acquisition" strategy. In the 1980s Tyson built its capacity by acquiring competitors, and the same path was followed by Pilgrim's Pride, which increased its market share from 5% to 25% through several major acquisitions in the last decade.

Meanwhile, increased sophistication of processed chicken involved varied forms of coordination between integrators and their major buyers (fast food chains and retail grocers), leading to the rise of relational or modular governance structures. Integrators have expanded into downstream activities, such as further processing and packaging. Tyson alone produces approximately 4600 different chicken products for fast food chains and other buyers as well as for its own brands.¹⁴ Integrators do additional processing for the fast food industry under contract. Chicken nuggets are served but not prepared by fast food companies; instead, integrators send the nuggets ready to fry in the fast food restaurants (D. Harvey; Poultry Specialist, US Dept of Agriculture; oral communication; March 2008).

Food retailers and fast food chains have increased their power in the chicken value chain. Viewed from the final consumer's standpoint, the share of foodservices—fast food chains, restaurants, and hotels, along with noncommercial channels (eg, hospitals and school)—in total chicken consumption grew from 29% in 1980 to 45% in 2005, reflecting a trend toward away-from-home consumption. Moreover, fast food restaurants represented

55% of foodservice consumption in 2005, making fast food chains key lead firms in the chicken value chains.¹²

Chicken consumption has grown amidst increased consolidation in both retail grocery and fast food restaurants. By 2005, 61% of total US grocery sales were made by the 20 largest food retailers, up from 41% in 1995.²¹ Wal-Mart alone accounted for 13% of Tyson's 2007 sales. Fast food restaurants are increasingly consolidated as well, now that Americans consume chicken outside the home as much as at home. The top 3 fast food chains—McDonald's, Yum! Brand (including KFC), and Burger King—account for more than 40% of the US market (see Table 1).

In sum, chicken production and consumption have significantly increased in recent decades. The growth is due to high productivity driven by R&D, economies of scale in growing and processing, and the development and marketing of diversified processed products. Three types of lead firms in the chicken value chain have been responsible for making processed chicken products cheaper, abundant, and more diverse: integrators, supermarkets, and fast food chains. For all 3 categories of firms, the market has become highly concentrated with fewer players that control what types of chicken are produced, sourced, marketed, and sold. However, these lead firms have different leverage points within the chain. Though the integrators own most of the upstream nodes from inputs to distribution, the latter 2 have a greater influence on the consumption of fresh and processed chicken. All 3 types of lead firms have significant brand power, but it varies by product: integrators retail their own brands in fresh and processed formats; supermarkets use private-label store brands; and fast food chains sell processed fast food items.

THE US TOMATO VALUE CHAIN

Tomatoes have become more popular in recent decades. Tomato consumption grew significantly in 1980–1991, from 76 to 92 pounds per capita, and it has remained steady ever since. Though Americans still consume more processed tomatoes than fresh tomatoes (by a ratio of 3.2 to 1 in 2006), the consumption of fresh tomatoes has steadily gone up for two decades, from 13 to 20 pounds per capita in 1980–2006.²² There are widely advertised health benefits of fresh (and now organic) tomatoes, and the growing popularity of pizzas, pasta dishes, and salsas as away-from-home dining items has also led to high demand for processed tomatoes, such as ketchups, sauces, and canned tomatoes. In terms of setting, 70% of fresh tomatoes are consumed at home, and grocery retailers are the primary market channel, and 34% of processed tomatoes are consumed outside the home (only ketchup is consumed outside the home more than inside).²³

As with chicken, the high consumer demand for tomatoes has been sustained by dramatic productivity gains. The adoption of new varieties and improved irrigation and harvesting technologies has led to higher yields in both fresh and processing tomatoes. Yield per acre of tomatoes in the United States increased by 51% (fresh) and 53% (processed) in 1980-2005. The domestic output of both fresh and processed tomatoes increased over the period, despite the decline or stagnation of the harvested acreage of tomatoes. In 2006, the farm value of tomato production amounted to \$2.3 billion and 12.7 million tons by volume.²⁴

There are distinct value chains for fresh and processed tomatoes. They differ in terms of production locations, varieties used, technology employed, and governance structure. Florida is the leading producer of fresh tomatoes, and California dominates the processed tomato industry. Making tomato paste, the basis for most processed items, requires particular varieties of tomatoes with a high level of soluble solids (the concentrated content of tomato fruit). Though fresh tomatoes are hand-picked, harvesting processing varieties of tomatoes is highly mechanized. Imports from Canada and Mexico play a growing role in fresh tomatoes, eliminating seasonality as a factor, but imports are insignificant in processed tomatoes.²⁵ As illustrated in Figure 2, market-based transactions are the major, albeit declining, governance form in the fresh tomato chain, whereas the processed tomato chain relies on hierarchical or modular coordination among fewer players.

In both tomato and chicken value chains, similar types of lead firms—big processors or integrators, supermarkets, and fast food chains—drove production innovations and consumption patterns. Large processors have increased their involvement in inputs (particularly seeds) and growing, as chicken integrators do for breeds and feed. Concentration has intensified in

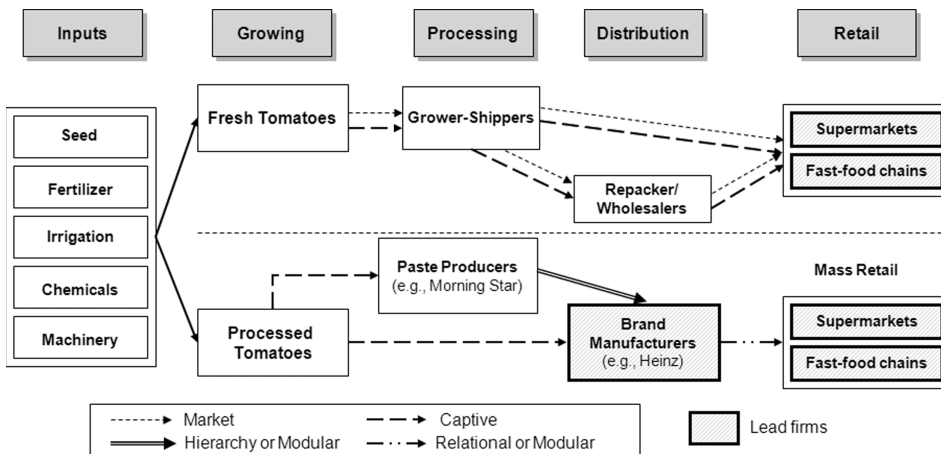


FIGURE 2 The US tomato value chains: fresh and processed. Source: authors' diagram.

most of the chain nodes, as fewer grower–shippers of fresh tomatoes and paste producers encounter a smaller number of big supermarkets and fast food chains. Thus, a handful of very large companies in these food chains play a major role in shaping our diets. Though the fresh products in the chicken and tomato value chains have many nutritional benefits, the processed foods and fast foods are often less healthy choices, yet these value chain segments typically generate the most growth and profits for the firms.²⁶

Fresh Tomato Value Chains: From Markets to Contracts

Most fresh tomatoes are sold on the open market with prices set by supply and demand. They are channeled into retail sales via shippers or grower–shippers.²⁷ When necessary, they are sorted by repackers or wholesalers before being supplied to grocery retailers or food services, including fast food chains.

Captive forms of linkage have become important in the fresh tomato value chain along with traditional markets, as shown in the upper part of Figure 2. Contract-based transactions are replacing open market sales, and retail buyers are supplied directly by fewer and larger grower–shippers.^{27,28} Contract-based sales entail preferred supply relationships or deals, partnerships, and programs between buyers and sellers. These arrangements provide protection from an unexpected spike or drop of prices and supply. Retailers generally benefit when a market price goes higher than the contract price, but a lower-than-contract price gives shippers the advantage. To avoid risk from price volatility, retailers seek to guarantee consistencies in quality, size, and volume of products supplied by shippers through various contract arrangements.

Contract-based transactions are particularly favored by buyers from consolidated retail segments. Mass merchandisers (e.g., supercenters and club stores) and food service outlets (e.g., fast food restaurants) are more likely to pursue a contract-based procurement than retail buyers and wholesalers.²⁷ These lead firms favor a smaller number of big shippers for several reasons. First, consolidated procurement increases efficiency and permits lower prices. Second, larger suppliers are more capable of providing a variety of products on a year-round basis, which has become a key competitive advantage for food retailers. Finally, consolidated supply networks facilitate heightened safety standards and traceability.

Processed Tomato Value Chains: Interventions in Growing and Global Ties

Unlike fresh tomatoes, nearly 100% of processing tomatoes are produced and sold under contract between growers and processors. These processors

(paste producers and branded manufacturers) have great control over tomato growers, leaving the latter in a captive position. Meanwhile, the linkages branded manufacturers have with paste producers are characterized as modular (outsourcing) or hierarchical (in-house production), whereas their relation with retail buyers are modular (private label) or relational (manufacturer's brand).

One of the major developments in recent decades is the divergence between bulk paste producers and branded manufacturers in the processed tomato value chains. Independent paste suppliers have emerged as tomato paste became a standardized commodity thanks to improved storage technologies, such as aseptic packaging that eliminated seasonality. As bulk tomato paste became storable for 18 months and international competition intensified, its production was sourced to global suppliers with lower costs.^{29,30} These developments made processed tomato products cheaper and readily available. Since 2001, paste producers have increased their production capacity by 25%, and branded manufacturers have declined by 46%.³¹ A tilt toward specialized producers in paste production is evident in California, the world's leading paste producer.

H. J. Heinz illustrates how leading global branded manufacturers respond to this commodification and specialization of paste production. In recent years, the company has exhibited greater flexibility in outsourcing first-tier products, particularly paste. Prior to the late 1990s, in-house production was dominant; now Heinz buys more tomato paste from specialized external suppliers, such as Xinjiang Tunhe, China's leading paste exporter, which sells bulk paste to Heinz in Asia.³⁰

Heinz's sourcing flexibility is a by-product of its increasing influence on growers through its control over inputs, particularly seeds. To develop standardized tomatoes that are best suited to industrialized processing, Heinz has expanded its intervention in on-farm activities. First, like many other tomato processors, Heinz acquires tomatoes through pre-season contracts with growers that require them to plant particular hybrids.³⁰ Second, it controls seed operations through its subsidiary, HeinzSeed, which was established in 1992. Along with its rival, Campbell Soup Co, Heinz is one of the few food producers that breeds its own crop varieties. This increases the manufacturer's direct control over the type and quality of tomatoes it produces.

In response to soaring corn syrup prices, Heinz is working to develop sweeter tomatoes through its well-funded seed research. Newly developed proprietary seeds will be sold to its contract growers for sole use by Heinz.³² This mimics the integrator-grower relationship in the chicken value chain, where the integrators supply particular types of chicken breed and feed to the outgrowers.

In short, US tomato value chains contain distinctive subchains for fresh and processed tomatoes. Both chains have been supported by applied innovations in growing, processing, and storage. Though open market transactions

still prevail in the fresh tomato chain, production contracts driven by large buyers increase the leverage of lead firms—supermarkets, fast food chains, branded manufacturers—vis-à-vis other chain actors, including growers. In response to the specialization of paste processing, brand manufacturers have expanded their role in the growing of processing tomatoes by controlling key inputs, such as seeds, just as chicken integrators have with feed and breeds. Though this deepens farmers' dependence on the buyers, it can also increase the reliability and quality of our food supply.

IMPLICATIONS FOR HEALTHY DIETS

Our chicken and tomato case studies highlight several trends related to food production and consumption and particularly healthy diets. Broadly defined, healthy diets include nutrition, food safety and quality, and food availability. Changes in the chicken and tomato value chains impact all of these dimensions of healthy diets but not in simple ways that allow us to say whether the outcomes are inherently good or bad. The easiest generalization is that food availability has increased, but the industrialization of food production has also resulted in very high firm-concentration ratios in various segments of the chicken and tomato value chains. This consolidation has permitted the introduction of advanced technologies into the US food and agricultural systems, which has lowered costs and created more consistent quality in chicken and tomato products, but it has also marginalized small farmers and growers and made those firms that survive highly dependent on large processors, supermarkets, and fast food chains.

Large firms can more easily adopt and implement standards that improve food safety. However, there is now a proliferation of public and private standards that can lead to regulatory confusion and uncertainty about food safety levels. The processed food revolution raises many questions about the health risks of additives and chemical treatments used in the fields, farms, and factories where chickens and tomatoes are grown and sold and that have generated higher yields and increased productivity. Nutrition is the most contested component of healthy diets. Despite widely publicized marketing campaigns by fast food companies and other food retailers touting the importance of more nutritious meals and new healthy items on their menus, the most popular choices continue to be fatty or calorie-laden foods with the lowest nutritional value.

These trends and tradeoffs are clearly reflected in our chicken and tomato case studies. Production and consumption have increased dramatically for both chicken and tomatoes. The industrialization of both industries made every stage of the value chain from farm to retail more efficient and cost effective. High productivity and efficiency was captured through the streamlining of production and economies of scale that accelerated

concentration. At one level, these developments fostered healthy diets by making chicken and tomatoes more abundant and affordable. The industrialization of food production was also associated, however, with the rise of concentrated producers (integrators, processors, and grower–shippers) and a parallel concentration in the retail segment.

These associated phenomena brought mixed results in terms of healthy diets. First, concentration positively allowed for the diffusion of food safety and quality standards that can be channeled toward healthy food choices. Also, it might bring fresh tomatoes to local supermarkets and various retail venues in more plentiful forms at lower unit prices. The buying power of concentrated supermarkets, particularly Wal-Mart, pushed this phenomenon. But, a downside of concentration can be a lack of alternative options. Consumers may have cheaper items at supermarkets, but local producers are being pushed out of the value chain, thus making it harder for consumers to locate alternative suppliers that cater to their health and nutritional concerns.

Second, though consumption of chicken and tomatoes rose, the form of consumption that increased the most was toward less nutritious, highly processed items. For chicken, it was away-from-home, processed chicken mostly sold through fast food outlets. For tomatoes, processed tomatoes are staple items in snack foods, like pizzas and salsa, and are consumed in far greater quantities than fresh tomatoes. From the healthy diets perspective, the nutritional value of these processed food varieties is suspect.

There are several related concerns. One is nutritional deprivation; that is, when nutritional value is being sacrificed during food production for reasons such as cost-cutting and efficiency. Another is the potential for overconsumption; that is, the abundance of cheap processed food with lower prices, which can lead an individual to increase caloric intake to an unnecessary level, resulting in unhealthy outcomes like excessive weight and obesity. Finally, increased processing raises food safety concerns. Processed food requires multiple stages of processing, often carried out by diverse suppliers in different places. Thus, products can be exposed to the risk of contamination when adequate standards are not in place.

However, there are upsides as well, particularly with regards to food availability. Processing makes food more portable and available for longer periods and more widely accessible in places that are otherwise underserved. Also, food processing, when properly conducted, can protect food from contamination risks that pertain to unprocessed, raw food items.

Another trend coming out of both value chain studies is higher standards for quality control, but this also has mixed results pertaining to health. Retailers (supermarkets and fast food chains) impose stringent requirements for packaging, preparation, and inputs on the products they sell. Integrators and processors then push those standards onto the farmers who supply them. Regulatory bodies like the Food and Drug Administration also have a

mandate to improve food quality. All of these engagements can have positive outcomes for health if the standards are coordinated and they reduce the use of unhealthy inputs, such as hormones for chickens, pesticides for tomatoes, or oils with trans-fat for food preparation. However, there is potential for regulatory confusion regarding the dissemination of standards coming from multiple actors. Furthermore, the increase in ecolabeling or the “organic” label is often pursued more for marketing than meaningful dietary change, apart from debatable claims regarding the health implications for the organic label. In addition, increased demand of high quality standards can squeeze out smaller producers and suppliers who cannot afford to implement the requirements, thus further concentrating the industries. Thus, standards have advantages and disadvantages.

Finally, our chicken and tomato value chain studies have identified key actors in the production and retail segments of the chain that have a great deal of influence over healthy diets in terms of the types of processing carried out, the ingredients used, and the final products they sell. These leading companies include the integrators (e.g., Pilgrim’s Pride, Tyson Foods), brand food manufacturers (e.g., Kraft, Unilever, Heinz), fast food chains (e.g., McDonald’s, Yum! brands), and supermarkets (e.g., Wal-Mart, Kroger, Supervalu, Safeway). Due to their size, brand power, and influence in diverse chain segments, lead firms have leverage for healthy diets as drivers of change in the value chain. Market concentration may narrow consumers’ choices to a handful of consolidated suppliers and retail outlets, but at the same time big suppliers and retailers can use their market power to make positive changes for healthy diets more effectively than small and fragmented producers.

Lead firms in the consumer-oriented segments of the value chain (food retailers and fast food chains) probably have the upper hand in terms of leverage, especially large supermarkets. First, supermarkets are branching into private label or store brands, hence competing directly with the top food manufacturers’ branded products while also buying from them.³³ Second, supermarkets are continuing to consolidate, with growing market shares for the top firms. This can be linked to the “Wal-Mart effect.”³⁴ Since entering the grocery trade with their Wal-Mart superstores in the mid-1990s, Wal-Mart, the world’s largest global retail brand, has often been cited as precipitating numerous supermarket mergers and closures.³⁵ Third, by having direct access to consumers, retailers are better able to set standards and prices and determine what consumers want to buy. For these reasons, we hypothesize that though branded manufacturers still hold considerable power and leverage, they will lose ground to the growing strength of big retailers.

Notwithstanding our prediction, there are very interesting corporate social responsibility (CSR) initiatives being pursued by firms in both the downstream and upstream segments of food value chains that can affect

healthy diets. These programs were spurred on by public pressure and advocacy, since nongovernmental organizations (NGOs), public policies, and the media also have significant external clout in pushing for change. Heinz started a Global Health Taskforce, and KFC posts nutritional information in restaurants and on their Web site, and it began product testing with healthier options like oven-roasted chicken. McDonald's introduced salads, low-fat desserts, and a wider choice of chicken and fish burgers. If Wal-Mart adds a stronger health component to its environmental sustainability initiative, the outcome can have lasting effects, particularly for their low-income shoppers. It remains an open question, however, to what degree these firms are truly committed to better nutrition or whether they are merely practicing "nutriwashing."³⁶

CONCLUSION

The adoption of a GVC framework advances our understanding of healthy diets in several ways. First, it shows how the organization of US-based food and agricultural value chains shapes the availability, safety, quality, and nutritional value of the food we eat. It also identifies striking patterns of industrial consolidation and the trade-offs this entails for smaller firms in these chains. Second, GVC analysis identifies the lead firms that have the most power in directly and indirectly influencing other chain actors. Big and small firms are knit together in multiple governance structures in the chicken and tomato value chains, and these have an impact on economic as well as health outcomes. Third, GVC analysis helps one understand which companies could be targeted by external actors, such as health, labor, or other social advocates and interest groups, to make changes in the products they offer and the practices they employ in order to generate healthier food options for consumers.

Research is still needed to address more specific issues, such as the global pandemic of childhood obesity. Though there has been a dramatic shift in how food is produced and consumed in the United States, low-income children, in particular those from select racial and ethnic minorities, are disproportionately overweight or obese.³⁷ These communities confront different constraints in their daily lives from those faced by higher income communities that put them at greater risk of making unhealthy food choices for themselves and their children. We need to better understand the connections between food choices and food availability (for instance, cheap but less nutritious foods) and how lead firms are impacting both in low-income communities.

The globalization of food and agriculture is of growing importance. Modern industrialized food production is tied to international trade, foreign direct investment, and Western firms' marketing campaigns. Though this

article focuses on the United States, our cases clearly have a global dimension. Many chicken and tomato products, both fresh and processed, are internationally traded. Local food manufacturers and retailers in the developing world are mirroring the business strategies of large Western firms and creating their own versions of the supermarket and processed food revolutions that originated in the advanced industrial nations. We need more studies on how this will change local diets and health outcomes. Hopefully we can discover ways to use these global–local linkages to make improved health and good business compatible rather than contradictory objectives.

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