Food Production Systems, Trade, and Transnational Corporations:

A Global Value Chains Approach to Consumption and Healthy Diets*

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(1) Introduction

Today childhood obesity is widely recognized as a major global health problem in both developed and developing societies. The growing awareness of childhood obesity over the last several decades gathered pace in the early 2000s as manifested by a crescendo of international conferences, non-governmental organization (NGO) initiatives, and public pronouncements. Alarming data show the dramatic rise of childhood obesity rates in developed countries since the 1960s and in developing countries since the 1980s.

The spread of obesity, particularly in developing countries, appears to be linked with concomitant changes in major global economic processes. The interrelated expansion of trade, foreign direct investment, and transnational corporations (TNCs) is particularly important. Around the world, TNCs receive particular attention as purveyors of fast foods, snacks and other highly processed foods. In this paper we outline how the global value chain (GVC) approach, a method used to understand global industry structure in the social sciences, can also be applied to study the linkages between global economic processes and obesity, mainly via shifting food consumption patterns. GVC researchers focus on the role of "lead firms" in global industries, such as the large food and agricultural TNCs like Pepsi, McDonald's, Kraft, Cargill, and others.

Within the literature on childhood obesity, the forces of globalization are viewed as changing food systems around the world and hence the consumption patterns that may lead to childhood obesity. The availability and diversity of internationally traded food products transform local agricultural and food systems, which are affected by broad "globalization" shifts including urbanization, the rise in incomes, fluctuation in the supply and price of agricultural inputs, and the adoption of Western technologies (Kennedy, Nantel, and Shetty 2004). The expansion of urbanization around the globe is linked to uneven trade and tariff regimes, export dumping, and agricultural subsides in developed economies (Murphy 2002; Pinstrup-Anderson 2001). As the gross national product in developing countries rises due to economic development, the burden of childhood obesity shifts from groups with higher to lower socioeconomic status (Monteiro et al. 2004).

Furthermore, globalization is changing agriculture in developing economies in various ways associated with the switch to modern technologies, including: agrochemicals and hybrid plants; genetically modified foods; the use of food processing designed for uniformity and long shelf-life; and imported oilseeds and vegetable oils with artificial caloric sweeteners (Lang 2004;

Popkin and Gordon-Larsen 2004). These forces are leading to price reductions in wheat, rice, maize, and meats, which are bolstered by export-enhancing subsidies for these products in developed countries.

Interestingly, economists are now predicting that the recent surge in demand for bio-fuels produced with feedstocks (e.g., sugar, maize, and soybeans) will jack up prices for these commodities and hence the processed foods that incorporate them (Schmiduder 2007). Drenowski et al. (2007) argue that this phenomenon could lead to a "Giffen effect": even if energy-dense (calorie-intensive) processed foods become more expensive due to higher agricultural prices, low-income families may rely on processed foods more, not less, because the prices of "healthy" foods will also increase. However, all of these studies that use a global dimension to understand changing consumption patterns at the local level lack a detailed theoretical framework that situates why and how global economic processes are transmitted, and what is driving this phenomenon. The GVC approach outlined below helps to fill this void.

We structure the paper as follows. First, we define and describe the main concepts and methods of GVC analysis. Second, we outline how this approach can be used to analyze changes in food consumption patterns. We then show how the GVC framework can be applied to identify the direct and indirect linkages between the global economic processes of trade, foreign direct investment, and food consumption. Finally, we present evidence to highlight how selected TNCs are shaping food production and consumption around the world.

(2) Concepts and Methods of Global Value Chain Analysis

Global value chain analysis examines the broad globalization story in terms of the actors and the mechanisms that shape and transform global economic processes and various types of inter-firm relationships (see http://www.globalvaluechains.org/concepts.html). GVC researchers incorporate and analyze the full range of activities lead firms and their suppliers undertake to bring a product from its initial conception to the consumer. Their activities are spread far and wide across geographic space. These dynamics allow us to understand the consequences of globalization, including the structural environment that sustains unhealthy diets.

Since the second half of the twentieth century, the global economy has been described as increasingly fragmented and dispersed. Firms are breaking apart the vertically integrated business model and procuring parts and services from a growing variety of suppliers, traders, and sellers around the world. This network achieves a global reach with predominately Western-based TNCs sourcing production to countries that boast weak regulatory environments and inexpensive labor costs. GVC analysis integrates the details of jobs, technologies, standards, regulations, products, processes, and markets in specific industries and places (Gereffi 2005).

GVC research has its foundation in world-system theory, which posits that countries are located in the core, periphery, and semi-periphery of the global economy, with their position reflecting their development capabilities. World-system theory argues that power and hierarchy are embodied in the relations between nation-states, but it lacks an appreciation of the powerful role of TNC lead firms, which operate fluidly across borders. Building from core principles of the world system while shifting the focus to firm behavior, the first incarnation of GVC analysis was the global commodity chains (GCC) framework. Global commodity chains evolved into global value chains when researchers who studied industry clusters in specific geographic spaces sought to understand how local economic processes are conditioned by global arrangements (Gereffi and Kaplinsky 2008). Furthermore, by putting the term "value" into the framework, researchers were able to show where value is captured in a particular industry, which firms have that value and where they are located, and how firms (and the countries they are based in) can move to a higher value position in their industries.

Traditionally, GVC analysis was applied to manufacturing industries such as apparel (Gereffi 1999), electronics (Sturgeon 2002), and automobiles (Humprey and Memodovic 2003). Within these studies, researchers used the approach to explain the location of the industry and how particular countries are incorporated in it; the hierarchical arrangements between countries and firms; and the institutional underpinnings of global value chains that influence firm behavior. The GVC framework analyzes why and how an industry is globally organized and where change is most likely to happen. Its integrative conceptual scheme connects the global and local levels of analysis so that anyone interested in reform – researchers, firms, policy-makers, or NGO activists – can search for leverage points whereby specific business practices and development conditions can be championed or criticized, and pathways for change can be sought.

Countries that wish to upgrade into higher value segments of an industry, or to switch to an entirely different one, can use the framework to understand their competitive strengths, along with the challenges they must overcome to improve their position. Labor unions or activists can use the framework to identify why firms move offshore and to exert pressure on firms to provide better labor rights and protection at home and abroad. GVC analysis can also be applied by environmental and health groups to show how global economic processes interact in local contexts to environmentally degrade land, water, and air quality, or change the types of foods available in schools and communities, all which can have adverse impacts on health outcomes.

The GVC model employs specific methodological tools to discover how the chain is organized. We highlight these as a series of discrete research steps. First, we identify the stages and actors in the value chain. We begin by tracing the entire input-output process that brings a product or service from initial conception to the consumer's hand. The main segments in the value chain typically entail: design → production → distribution → marketing → sales. After we determine the stages of the chain, we identify the actors in each segment, their relative size and importance, and how their roles may be changing. These actors include the lead firms of each industry and their suppliers.

The second step is to determine the geography of the chain. The relative ease with which companies are able to relocate their production facilities in order to gain access to raw materials, new markets, and lower labor costs reflects major advances in the world's communications and transportation technologies. Developing countries are under constant pressure to devise strategies to maintain their position in existing production networks or to upgrade to higher value-added segments of global value chains.

Third, after identifying the input-output structure and the geographical spread of a value chain, we can analyze the ties between firms in the industry. These relationships are described as "governance" structures that dictate how the chain operates and who controls the diffusion of technology, standards, and brands within the chain. Traditionally, value chains were characterized as either "producer driven" or "buyer driven." A producer-driven chain tends to be vertically integrated and it connects firms through ownership or tightly knit production alliances. A buyer-driven chain is characterized by lead firms (retailers, marketers, and manufacturers without factories) that utilize a wide array of independent suppliers, which are linked to one another through complex global sourcing networks and intermediary firms (Gereffi 1999; 2005).

Recently, a more comprehensive typology of GVC governance structures has been put forward, with five distinct kinds of relationships: markets, hierarchies, and three types of networks – modular, relational, and captive (Gereffi, Humphrey, and Sturgeon 2005). This typology recognizes that there are new network forms of organization within global value chains that involve some "explicit coordination" beyond simple market transactions, but which fall short of vertical integration (“hierarchies”). Researchers are also addressing the increased complexity of global value chains by showing how an industry can have multiple governance structures over time and across varying segments of the chain (Dolan and Humphrey 2004; Gereffi et al 2005; Sturgeon forthcoming).

Lastly, the coordination, power, and linkages of global value chains would not be complete without an analysis of the governments, unions, trade associations, NGOs, multilateral agencies, and regulatory bodies – that is, the institutions – that influence the activities of the chain. Global value chains are embedded in multiple ways in these institutional arrangements. Frequently, the lead firms or “drivers” of global value chains exhibit more power in influencing behavior in an industry than government laws and regulations. The latter are typically hindered by enforcement difficulties, whereas if suppliers do not comply with lead firm standards, they face harsh penalties or can be dropped from the chain by the lead firms placing the orders.

(3) A GVC Framework for Analyzing the Linkages between International Economic Processes and Food Consumption

The GVC approach we highlight here is industry and firm-centric, but global value chains do not operate in a vacuum. The role of government policies, social context, and external forces like NGOs all matter in the operation of the chain. The strength of the GVC framework is that all actors can try to take advantage of their position in the chain to influence business practices or government policies in a manner that seems favorable to them. This is where a public health agenda can come into play, particularly as it relates to food consumption and childhood obesity. Concretely, researchers can examine global value chains related to specific food systems to understand why and how diets are changing through global economic processes that shape or constrain the food options available to consumers. Below we highlight specific examples of how the GVC framework can be applied to understand food consumption by addressing the linkages between firms on a global scale.

- *GVC analysis shows how food production systems shape the availability of food*

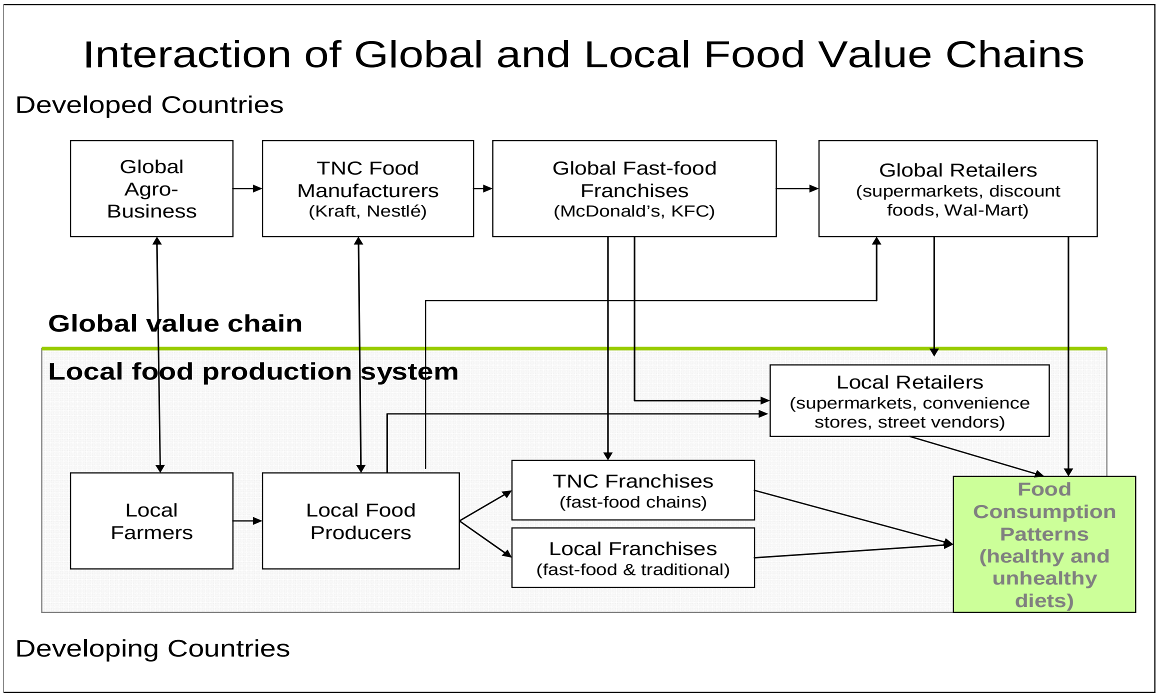
GVC research identifies every segment of food production systems, following products from “farm to fork.” We can broadly identify three stages in food production systems: (1) farm and harvest; (2) processing and manufacturing; and (3) retail. Within these three categories, there are variations depending on what type of product is examined. For example, if we were to follow a french fry through its various stages, we would begin with russet potato seeds and the companies that supply them. Next, we would examine the firms that grow the russet potato, followed by the manufacturers that process the potato into cut, frozen french fries, which then move to final sale. At the retail end, restaurants, supermarkets, and institutions like governments and schools all buy large quantities of frozen french fries. In addition, restaurants purchase the fat needed to fry the potatoes before they are consumed.

At each segment of the chain, there are dominant firms that play key roles. The lead-firm buyers of french fries (e.g., McDonald's, Wendy's, Wal-Mart) are supplied by large manufacturers of french fries (e.g., McCain Foods, J.R. Simplot), which purchase russet potatoes from big growers/shippers (e.g., United Fresh Potato Growers of Idaho) that receive seeds, herbicides and pesticides from crop science firms (e.g., Bayer Crop Science). Understanding the french fry chain helps us to explain the nutritional properties of french fries, how they are marketed to different sets of consumers, and at what price. However, "lead firms" aren't necessarily present in every segment of the chain. Lead firms must have a critical marketing, technological, or financial edge that permits them to set the standards or specifications for other companies they deal with. Absent this advantage, even quite large companies may find themselves relegated to the role of commodity suppliers of bulk products, with relatively thin profit margins and little capacity to influence the activities of other firms in the supply chain.

- *GVC analysis maps the interaction between global and local value chains*

Each stage of the food production system connects countries on a global scale, and these connections are driven by the practices of lead firms in developed countries. In Figure 1, we highlight the interaction of global and local food value chains in developed and developing countries. Within the global value chain in developed countries (the top four boxes), we find global agro-businesses, TNC food manufacturers, global fast-food franchises, and global retailers. These segments of the chain are linked to each other at the global and local levels. Global agro-businesses, like chicken, potato and lettuce farms, operate transnational subsidiaries across the world or they buy crops from small and medium-sized farms in local economies. They then supply TNC food manufacturers, which in turn sell their processed goods to fast-food chains and global retailers.

Figure 1



Source: Authors' diagram.

The interaction between the global and local categories may be direct, such as setting up large farming operations and producing for local markets in developing countries, but it often is captured through indirect effects. For example, continuing with french fries, in 2007 China was the world's leading potato producer, growing 72 million tons of potatoes, which is 23.3 percent of the world's supply of spuds (FAO 2008). China's domestic potato growers run their own farms, but they also sell to developed-country food manufacturers that operate divisions or subsidiaries in developing economies. Interestingly, McCain Foods, the largest manufacturer of frozen french fries, is also the second largest manufacturer of ethnic Chinese foods. McCain initially brought their food technology expertise overseas to change the way food is produced and presented to consumers in Taiwan. In addition to their consumption of modern processed foods from the West, the developing world is also creating processed versions of traditional dishes, such as dumplings, steamed buns, and rice rolls in China. These interactions are changing the traditional diets of developing countries by making more meals available for consumers in the fast food, calorie-rich format of developed countries, while utilizing the technological prowess of modern food processing to make these foods both abundant and cheap.

- *Lead firms exist in diverse segments of the value chain*

At various stages of the food production value chain, one can find lead firms that dominate the outcomes and linkages within the chain. The power relationships these lead firms have with their competitors and suppliers determine the governance structure of the chain. For example, KFC is one of the world's largest buyers of chicken, and it dictates what type of chickens farmers should raise and the product and process standards these chickens must meet in order for KFC to purchase them. Because these standards call for a high level of technological sophistication and efficiency, only the largest agro-businesses, such as Tyson's and Pilgrim's Pride, can become a supplier for KFC.

Similarly, TNC manufacturers like McCain that buy russet potatoes for McDonald's french fries dictate product standards to the potato growers that supply them. McCain may choose to have more vertical control (i.e., direct ownership) over the processing, packaging, and distribution stages of the supply chain for their french fries because these practices may entail sophisticated production techniques that are best performed in-house. Alternatively, transnational manufacturers may peg their business practices to the demands of global retail buyers. In fact, retail giants such as Wal*Mart are likely to refuse to sell McCain's or J.R. Simplot's frozen french fries unless they meet specific pricing and packaging requirements.

Determinants of childhood obesity can be associated with the behavior of lead firms in global food production systems. Researchers have adopted the "energy in" and "energy out" model of childhood obesity (Glass and McAtee 2006; Cutler et al. 2003). "Energy in" refers to the reasons why children consume specific foods, and "energy out" relates to behaviors related to an active or sedentary lifestyle. Factors highlighted by the "energy in" literature, such as a corporate food culture, marketing to youth, and the availability of unhealthy snack foods, can be linked to the behavior of food TNCs. Their reach and power include the influence they have over children and parents in providing "instant food" options that cater to a modern culture, busy lives, and youth perceptions. TNCs are drivers of the global fast-food technology, processed foods, and Western cultural norms that have become so prevalent in developing countries. The global-local interactions they spark accelerate the speed with which local food producers, manufacturers, and retailers are adopting transnational businesses strategies and tailoring them to domestic needs.

- *Governance structures are important for upgrading*

The GVC framework allows us to identify the lead firms within the agribusiness, manufacturing, and retail segments, their influence upon the rest of the chain, and the avenues for change or upgrading within the chain. The fact that domestic manufacturers and fast-food firms in developing countries have been able to position themselves within global food chains and establish their own "brands" demonstrates that developing countries can upgrade to higher value-added segments in the chain.

The instant noodle phenomenon is a revealing case. Instant noodle technology was first developed by Japan. However, Taiwan has been the leader in adopting advanced technology in instant noodles and bringing it to Asia, particularly China, the world's biggest market for instant noodles. Tingyi, a Taiwan-based firm with its Master Kong brand, has a 43 percent share of the market in China, beating the Japanese joint venture Nissin Hualong, which has 14 percent of China's instant noodle sales (Dobson 2008). Taiwan has used the technology pioneered by developed countries to be the leader in providing instant foods for the Chinese market. They are also conforming to the business practices of concentration and brand marketing. In addition to Tingyi, Taiwan is home to Uni-President Enterprises, the country's largest food conglomerate, which encompasses several stages of the food and agriculture value chain. The company procures commodities such as soybeans and corn, and processes them into animal feed. They also manufacture products such as instant noodles, frozen foods, baked goods, and soft drinks (Google Finance 2008).

Understanding GVC governance structures allows researchers to identify the leverage points within value chains. Once we know who the lead firms are in global value chains, we expect these lead firms to define the standards for conduct and performance in an industry. Many food TNCs have already been compelled by government regulations or induced by consumer preferences to change certain practices along the food value chain, such as procuring healthy products and imposing stricter standards upon their suppliers. However, we need to ask whether new business practices are only "skin deep." While firms may be promoting more nutritional foods in their marketing campaigns, they also may be lobbying against government health regulations or moving to countries with looser regulatory environments.

(4) How Do International Trade and Foreign Direct Investment Affect Food Consumption?

Trade and foreign direct investment (FDI) are international economic processes used by researchers to connect the global and local levels of a GVC analysis. When examining trade and FDI statistics, however, researchers must look beyond standard assumptions about large-scale flows of foodstuffs or the diffusion of Western fast-food restaurants to explain changes in consumption leading to unhealthy diets. Of particular relevance are the traded inputs in specific food value chains and the adoption at the local level of Western food practices.

FDI as a measure of foreign capital in a region is not a reliable indicator of foreign penetration in the fast-food industry. The prevailing wisdom is that FDI in fast-food chains promotes unhealthy diets in developing countries, but most fast-food TNCs operate under the "franchise model." Franchising is a relatively inexpensive way for individuals to use the main components of the TNC's fast-food business model (i.e., the corporate name, full product range, brands, and business strategies) without putting up large amounts of capital. The "franchisee" is the owner who bears the initial costs. In 2007, Yum! brands (which includes KFC, Pizza Hut, Taco Bell, Long John Silver's, and A&W) had total worldwide sales of $34 billion dollars, of which $24.4 billion came from franchise sales (Yum! 2007).

FDI in global supermarkets is also increasing around the world and contributing to the consumption of processed or Western foods. However, there is only indirect evidence of the effects of supermarkets on childhood obesity. The diffusion of supermarkets in developing countries is still quite limited, and traditional retail markets remain popular (Readon et al. 2007). The impact of FDI on food consumption in developing countries is primarily indirect, and it is captured at the national and local levels through the adoption of Western products and practices by domestic food systems.

The trade of intermediate products is key to understanding how food consumption patterns may be shifting toward less healthy items at the local level. The trade of processed foods from developed to developing countries is often linked to rising obesity rates, yet the reality is that processed food is only a small portion of developing countries imports. A 2005 U.S. Department of Agriculture report highlights that only 10 percent of the $3.2 trillion in global processed food sales in 2002 were traded products (Regmi and Gehlar 2005). Most processed foods are created "in-country" and connected to local supply chains and production facilities. Local supply chains are typically augmented by imported inputs that go into a wide array of food products. The cases of soybeans in China, overall food trade in Trinidad and Tobago, and corn in Mexico illustrate this phenomenon.

Trade liberalization and China's accession to the WTO have had a profound impact on China's agricultural system and domestic food supply. Soybeans are emblematic of the modern redefinition of Chinese agriculture. Soybeans, along with grains and sugar, are land- and labor-intensive crops grown in the western and northern regions of the country. Exports of these commodities have fallen while products of higher value, such as horticultural and animal products in the eastern and southern regions of China, have increased. While soybean exports have decreased, China has imported large quantities of soybeans rather than use its domestic supply. Before 2000, the soybean tariff rate was as high as 114 percent, but it was lowered to 3 percent and then 1 percent. In 2007, soybean imports were estimated at 31 million tons, and up to 50 million tons if you include oil made from soybeans (Xinhua News 2008).

Imported soybeans have altered the food value chain in China. The sharp increase of imports spurred by liberalization is a response to rising demand for soy-based oils and animal feed based on soy (Tuan et al. 2005). Imports are highly sought because imported soybeans are cheaper and contain higher oil content, partly due to the bioscience techniques employed by foreign growers. Soybean oil is replacing traditional rapeseed oil in China. The crushing of soybeans has become a profitable segment of the value chain. Crushing creates numerous fat products that are integral to many styles of cooking. Partially and fully hydrogenated soybean oil are used in pan frying, deep frying, and baking. Soybeans are also crushed into soymeal, which is fed to animals in China's booming livestock industry. Cooking techniques have changed with the use of soy oils, and soymeal has made livestock cheaper and more abundant.

There are soybean processors in Heilongjiang, Shandong, Jiangsu, Guangdong, and Sichuan provinces. Xinhua News (2008) estimates that 80 percent of soybean processing facilities in China are subsidiaries or joint ventures of foreign firms. Archer Daniels Midland (ADM) is the largest soybean processor in China. ADM Hong Kong/Shanghai is a wholly foreign-owned subsidiary that engages in import/export trade and wholesale distribution, while ADM Tianin provides vegetable oil concentrate and ADM Dalian creates soymeal.

Soybeans as an input commodity have led to FDI in manufacturing and the adoption of foreign food-processing practices, and they have impacted several food supply chains, especially livestock. Chinese firms are emulating foreign business practices. Following the path of developed countries, hog and poultry plants in China have become more concentrated, and large specialized household operations and large commercial operations are expanding (Tuan et al. 2007). China is reorienting its agricultural system to cultivate products they can export, such as horticultural goods, rather than meeting the domestic demand for food, thus sparking higher local prices for vegetables and potential grain shortages (Tuan et al. 2007). All of these factors affect the availability and price of healthy food options in Chinese cities and rural communities. According to Pingali (2006: 281), these globalization trends in China will stimulate a "diet transition characterized by increased consumption of wheat, temperate fruit and vegetables, and high protein and energy-dense food."

The Caribbean islands of Trinidad and Tobago show how an entire country's food supply can be dependent upon imports. Yet Trinidad and Tobago's domestic manufacturers still play a key role in the foods available on the islands, further demonstrating the interaction effect between global and local food systems. Trinidad and Tobago is a net food importer. They have a high overall level of import dependence, reaching 100 percent for products like corn oil, infant food, wheat, potatoes, many fruits and vegetables, chocolate products, tea, black pepper, milk, and cheese (Lovendal et al. 2007). The United States is the largest supplier for Trinidad and Tobago's imports of meat, dairy, fresh vegetables and fruit, cereals, fats, and grains (Logan 2006). The imported products go directly to retail outlets or they are inputs for local manufacturing facilities.

The agro-processing sector accounts for almost half of Trinidad and Tobago's manufacturing gross domestic product and it is a large contributor to non-oil exports (Lovendal et al. 2007). Most of their trade goes to other Caribbean Community countries, with Trinidad and Tobago being the lead exporter within the region. According to Logan (2006), the structure of the food processing industry within the Eastern Caribbean region is categorized in five groupings: transnational firms, large, medium, and small-scale domestic firms, and micro-sized enterprises. Although Nestlé Trinidad and Tobago Ltd. is the largest food-processing company in the country, the domestic market for food is dominated by large local firms, such as Erin Farms Ltd., Hummingbird Rice Mills, and Willie's Homemade Ice cream. However, reliance on imported intermediates for food products is high: only 20 percent of inputs that go into local manufacturing facilities are procured domestically, while 80 percent come through imports.

Trinidad and Tobago illustrate the complex ways in which the food system in a small nation may be reliant on imports. Nonetheless, the country has established a competitive niche by adopting global food-processing techniques to utilize imported intermediates in locally owned facilities, rather than having foreign firms dominate the domestic food business. Because Trinidad and Tobago are so reliant on imported inputs, however, they are very susceptible to fluctuations in international markets, placing it in a precarious position for ensuring the availability of foods essential for a healthy diet, such as fruit and vegetables. Food consumption in the country is already dominated by cereals and sugar crops, and this reliance will only increase if the prices for processed-food inputs stay low, while fresh produce prices rise.

Our last example of the impact of imported inputs on local food systems is corn in Mexico. Corn is a traditional crop in Mexico that has cultural, religious, political, and economic significance for the indigenous groups in the country. Since the North American Free Trade Agreement (NAFTA), the rapid expansion of U.S. corn exports has transformed the cultivation of corn in Mexico to mimic those types available in the United States. Between 2003 and 2004 U.S. corn exports to Mexico increased by 240 percent (Zahniser and Coyle 2004). As of January 1, 2008, all tariffs on corn were abolished after a decade-long phase out. This change is expected to further accelerate the segmentation of the corn market in the region, with dire consequences for the farmers, processors, and sustainable diversity of Mexican-based corn varieties.

Yellow corn, which is primarily used as an input for animal feed, is the dominant U.S. corn export that supplements and competes with Mexican production. The increase in demand is attributed to the growing livestock industry, particularly hog and poultry that use corn-based feed, as opposed to soybeans in China. It is projected that Mexico's livestock industry will become more consolidated, similar to the structure of U.S. livestock producers. White corn, which goes into tortilla production, is still mostly based in Mexico, although exports of white corn have risen since 2000.

Corn in Mexico is grown on small farms, where farmers typically have around 10 hectares of farmland and less access to tractors and irrigation. In comparison, corn in the United States is grown on farms with a typical size of over 270 hectares and it is highly mechanized. Corn in Mexico goes to one of the country's 10,000 corn millers and 45,000 tortilla producers. Due to government support for the tortilla industry, Mexican producers have an advantage in the market. Corn flour production in Mexico is very concentrated, with the Mexican companies

Gruma and Grupo Minsa controlling more than 90 percent of domestic corn flour production (Zahniser and Coyle 2004).

While Mexico has its own large companies in the tortilla and corn flour production segments of the market, the reduction in tariffs associated with NAFTA has brought a flood of cheap corn from the United States and stiff competition for local farmers. It is estimated that Mexico's corn imports may reach 14 million metric tons by 2013. The corn being imported is mostly a genetically modified U.S. variety, and Monsanto is hoping to bring their genetically modified seeds to Mexico for local farmers to use. These seed varieties will require pesticides and fertilizers manufactured by transnational chemical companies (Ross 2007).

The survival of many of the *ejidos* (community farms) in Mexico is in jeopardy because of the new tariff phase-out. According to Ross (2007), in the first 13 years of NAFTA, 6 million Mexican farmers abandoned their farms, potentially making 59 distinct Mexican corn varieties extinct. Overall, tariff changes, continuing urbanization, and a complex distribution system are driving further structural changes in Mexico's food system that could lead to future economic and social problems.

The above examples from China, Trinidad and Tobago, and Mexico show how the global value chains of food products connect developed and developing countries in direct and indirect ways. China has substantial amounts of FDI in its food manufacturing sector, but trade liberalization has increased the availability of key agricultural commodities like soybeans, with significant impacts on China's local agricultural and food systems. While Trinidad and Tobago and Mexico have strong local firms, these companies have adopted the food-processing practices of TNCs in developed countries. These practices then have a ripple effect throughout the countries in changing the types of foods available for consumption. The recent evolution of global food and agricultural value chains favors the adoption of Western supply chain dynamics in developing countries. The story at the local level is one where global economic processes influence food consumption in ways that can be positive or negative for healthy diets.

(5) Drivers of Food Consumption: Transnational Corporations as Lead Firms

GVC researchers use a variety of tools to gather data on the structure of global industries. One of the most effective techniques are case-based comparisons of lead firms in global value chains. A close look at specific companies facilitates the analysis of broad corporate strategies as well as inter-firm linkages in the value chains we are studying. Once linkages are identified between a lead firm and its suppliers, we can then begin to define the governance structure for the value chain at the global and local levels.

In this section we present our findings for five lead firms in the global food value chain: three from the food and beverage manufacturing category, and two from the fast-food category. We highlight the companies' size, scope of activities, brands, and global expansion. The food and beverage manufacturing firms we examine are Kraft, Nestlé, and PepsiCo, and in the fast-food category, Yum! (KFC) and McDonald's. This preliminary analysis points to the global strength of these firms and their influence on consumption patterns around the world. Moreover, a new and growing trend in the food companies' strategies is the adoption of "healthy choice" and nutritional initiatives. Whether these programs are launched just to appease critics or whether they represent significant nutritional upgrades is a topic for future research.

In Table 1, we present brief company profiles of these firms. Yum! Brands (which includes KFC), McDonald's, Kraft, Nestlé, and PepsiCo had combined global sales of about $320 billion in 2007. Because of different methods of reporting by the firms, this estimate is based on total sales for some firms (Yum!, McDonald's , PepsiCo, and Nestlé) and net revenues for others (Kraft). Moreover, McDonald's and Yum!'s figures combine company and franchise sales. These multibillion dollar corporations are engaged in global, multi-branding strategies across the world and together they employ more than 3 million workers. Yum! and McDonald's are located in over 100 countries, while the manufacturers Nestlé, and PepsiCo are in over 200, and Kraft in over 150. For all of the corporations, international sales play a key role in their overall profitability.

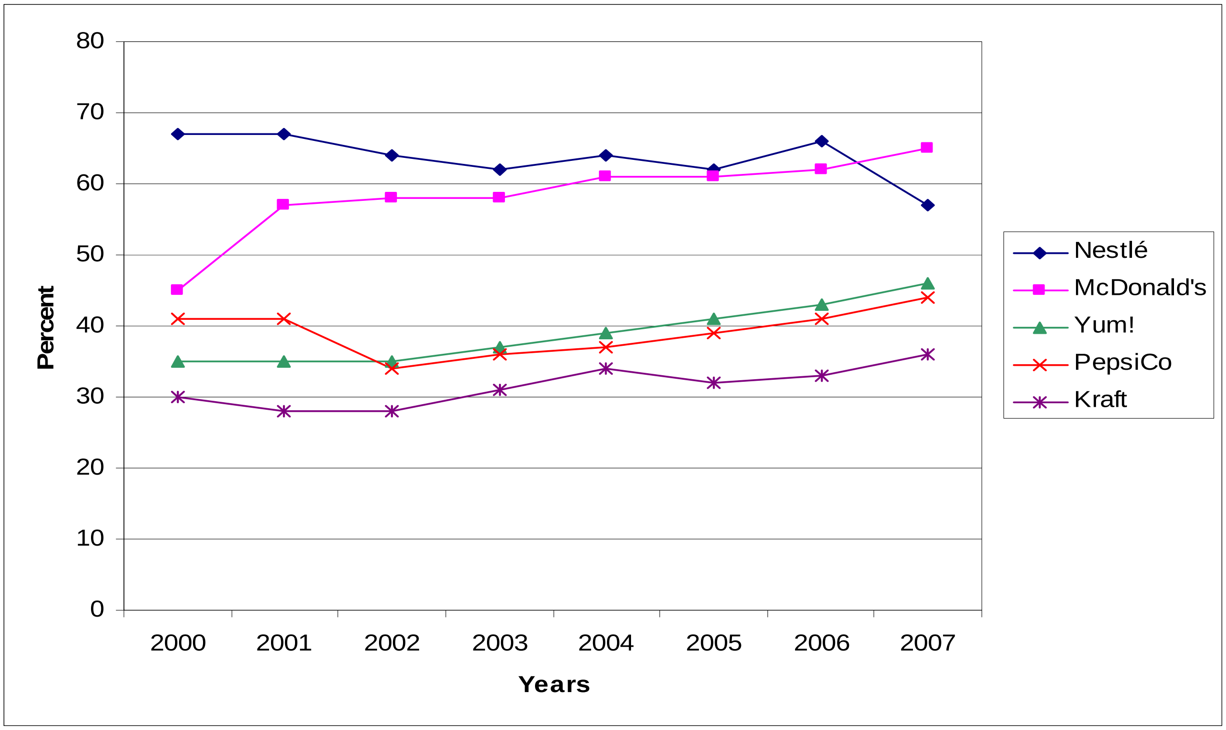
Table 1: Profiles of Leading Food Transnationals, 2007

Companies	Global Sales	Employees	Main Brands	# of Countries
Yum! (based on total company sales and franchise sales and employees)	$34 billion	1 million+	KFC, Taco Bell Pizza Hut, A&W	100+
McDonald's (based on total company sales and franchise sales and employees)	$47 billion	1.6 million	Has Owned: Chipotle Boston Market, Donatos Pizzeria	118
Kraft (based on net revenues)	$37 billion	104,000	Nabisco, Oscar Mayer, Post Cereal	155
Nestlé (based on total sales)	$90 billion	276,050	Nescafe, Hot Pockets, Crunch, Kit Kat	Almost world-wide
PepsiCo (based on total sales)	$98 billion	185,000	Pepsi, Frito-Lay, Gatorade, Tropicana	200

Source: Company Annual Reports and Web Sites

In Figure 2, we show the percentages of international sales compared to total sales for the companies since 2000. All of the corporations have a strong global presence, with international sales close to or over 40 percent of their totals for 2007. (International is defined as everything but the United States for all the companies except Nestlé, where it is everything but Europe.) Nestlé's international sales went down slightly due to the strength of their performance in Europe, but total sales have increased. McDonald's has consistently high figures since 2000. The global share for McDonald's would be even higher if we could include the total sales of international franchise units and not just the corporate licensing revenues. For Kraft and PepsiCo as well, their total sales would be much higher than their net revenues.

Figure 2: Global Sales of Food and Beverage Transnationals (as % of total sales), 2000-2007



Source: Company Annual Reports
Note: International is everything other than the U.S. except for Nestlé which is everything other than Europe. For McDonald's, "Corporate" and "Other" sales are counted as U.S. For Nestlé, "Pharma" and "Other Food & Beverages" are counted as International. Nestlé sales since 2002 only include Food and Beverages. McDonald's 2000 includes franchise sales and not solely franchise revenue

We provide below a more detailed examination of McDonald's and PepsiCo's global expansion, marketing campaigns, and lead-firm status in the fast-food and manufacturing food sectors. As countries undergo the process of development and globalization, they become exposed to Western products and brand diffusion, and the technologies that are needed to support these burgeoning forms of food consumption. However, the corporate social responsibility initiatives and nutrition and wellness programs that all the food TNCs are embracing may be a key leverage point where interventions can be made, although further analysis is needed to understand their effectiveness and the companies' actual commitment to healthy products.

Academics and activists have questioned the commitment of TNCs to providing healthier food options for consumers and to revamping their business practices. Brownell writes that while companies may be making limited food changes, they vocally espouse and fund a "politics of private regulation" that portrays companies as "blameless" and "victims," whereas obese individuals are remonstrated for the unhealthy choices they make (Brownell 2004; 2005). For critics of the food companies, eating and physical activity are personal choices but "the overall eating and activity of the population are a function of an environment that undermines personal control" (Brownell 2004: 958).

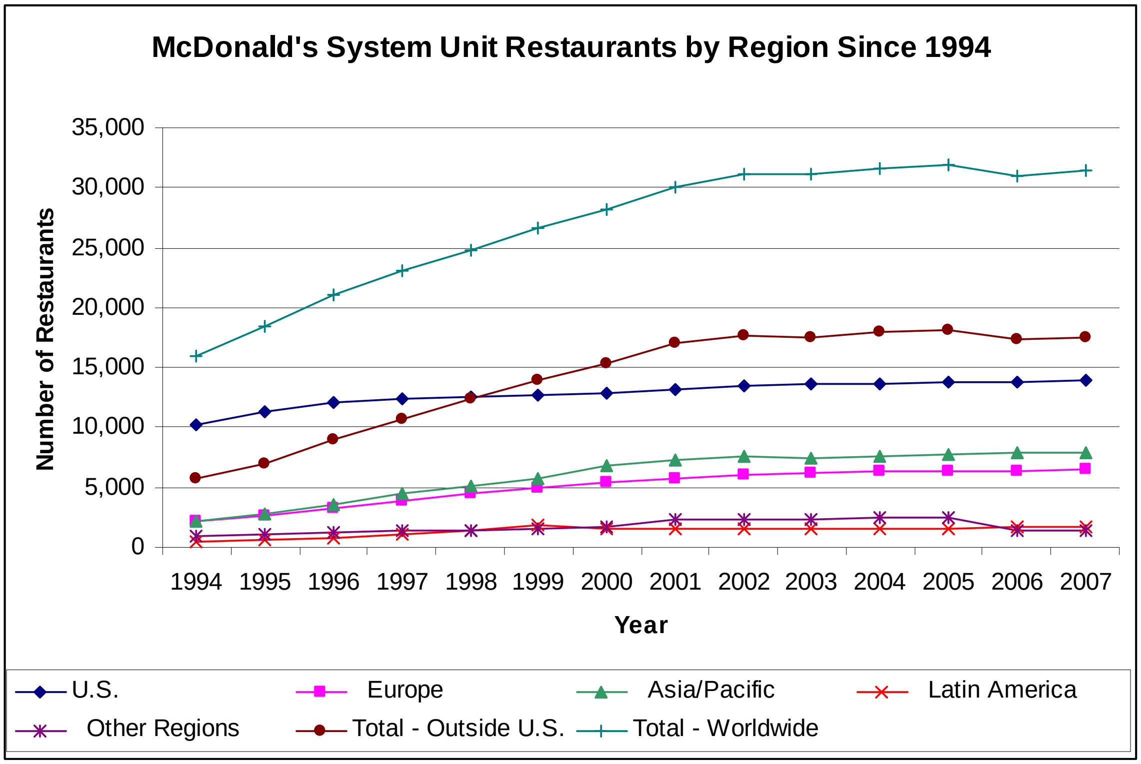
Marketing to children is a widely cited example of corporate malfeasance along with the phenomenon of "nutriwashing," (i.e., making products seem healthier than they are) (Simon 2006). Children are directly targeted through commercials, in-store events, sponsored school programs, sports and youth star sponsorship, internet promotion, and text messaging (Lobstein 2007). Companies have minimized the negative impact of youth marketing, while maintaining business practices that appear to undermine their healthy food initiatives. Moreover, some studies have shown that even when healthier products are put on a fast-food menu, they are not being consumed (Darvin 2007). Understanding fast-food TNCs' new strategies in the context of pervasive global production networks is needed. However, we should not ignore the possibility that food TNCs are making changes that are, or could, have a positive effect on the consumption habits of children.

McDonald's

Unlike their competitors, McDonald's has chosen to focus solely on a one-brand image, their McDonald's restaurant chain. Formerly, they owned Chipotle, Boston Market, and Donatos Pizzeria, but over the last five years they used their corporate strength solely for the McDonald's restaurant brand. Although they have maintained a one-brand force, they were one of the original fast-food multinational to aggressively pursue overseas expansion.

In Figure 3, we see the rapid escalation in the number of McDonald's restaurants outside the United States since 1994. Growth in the Asia-Pacific region is particularly strong. In 1994, the company had just over 2,000 restaurants in the region, but by 2000 that number had tripled. Europe has expanded as well, while Latin America has remained relatively steady. Overall, these figures show the strength of McDonald's operations. As of 2007, they had a total of 31,377 system unit restaurants with nearly 18,000 of those in international localities. In 2008 they expect to open 550 traditional restaurants worldwide.

Figure 3: McDonald's Global Restaurants, 1994-2007



Source: McDonald's Annual Reports

China is a key emerging market for McDonald's and its performance to date is positive, with strong new unit growth, including drive-thrus, as it looks to tap into rising levels of car ownership. Currently McDonald's has more than 800 restaurants on the mainland, and in 2008, they plan to open 125 more restaurants in China. McDonald's main competitor in China is KFC (a subsidiary of Yum! Brands), which benefited from first-mover status and the fact that chicken is more widely consumed by Chinese than beef. McDonald's is trying to cater toward a more chicken and fish friendly menu in order to tap into local consumer preferences.

McDonald's also promotes local sourcing. DaChan Food, the Dalian-based integrated chicken meat and feed producer in China, is the largest broiler supplier of KFC and the major supplier of McDonald's, Dicos and other local outlets in China. The standards the chicken must meet based on demands by Western firms like McDonald's is being transmitted into the type of chicken provided by non-Western outlets too, as the example of Dicos, a Taiwan-based company, shows.

McDonald's has been a front runner in providing more extensive nutritional information on their menu items and promulgating health-friendly, balanced-lifestyle campaigns. Starting in

2000, they introduced salads, low-fat desserts and a wider choice of chicken and fish burgers; and they also included more regional menu variation and began experimenting with new formats, such as cafes and kiosks. In 2004, after much publicized consumer and government concerns regarding the obesity crisis, McDonald's discontinued its super size option and began a new range of salads. They are addressing the claim that they are contributing to the obesity crisis directly through their corporate social responsibility strategies highlighted in their Worldwide Corporate Responsibility Report (McDonald's 2006).

McDonald's launched a number of programs in keeping with their new "balanced lifestyles" platform that focuses on three areas: food choice, education and physical activity. One of the key components is "Go Active!" which was tied-in with sponsorship of the Athens 2004 Olympic Games. In 2006, they began a large-scale roll-out of printing nutritional information directly on their packaging, the first major restaurant company to do so. The format is icon-based and can be understood independent of language; the icons represent calories, protein, fat, carbohydrates and sodium. Lastly, in 2006 McDonald's announced a collaboration with Scripps Research Institute (QSR 2007). McDonald's will financially support research that focuses on understanding solutions to childhood obesity and Type 2 diabetes, with an initial contribution of $2 million. This amount, however, is very small in comparison to McDonald's total profits or the magnitude of the health problem being addressed.

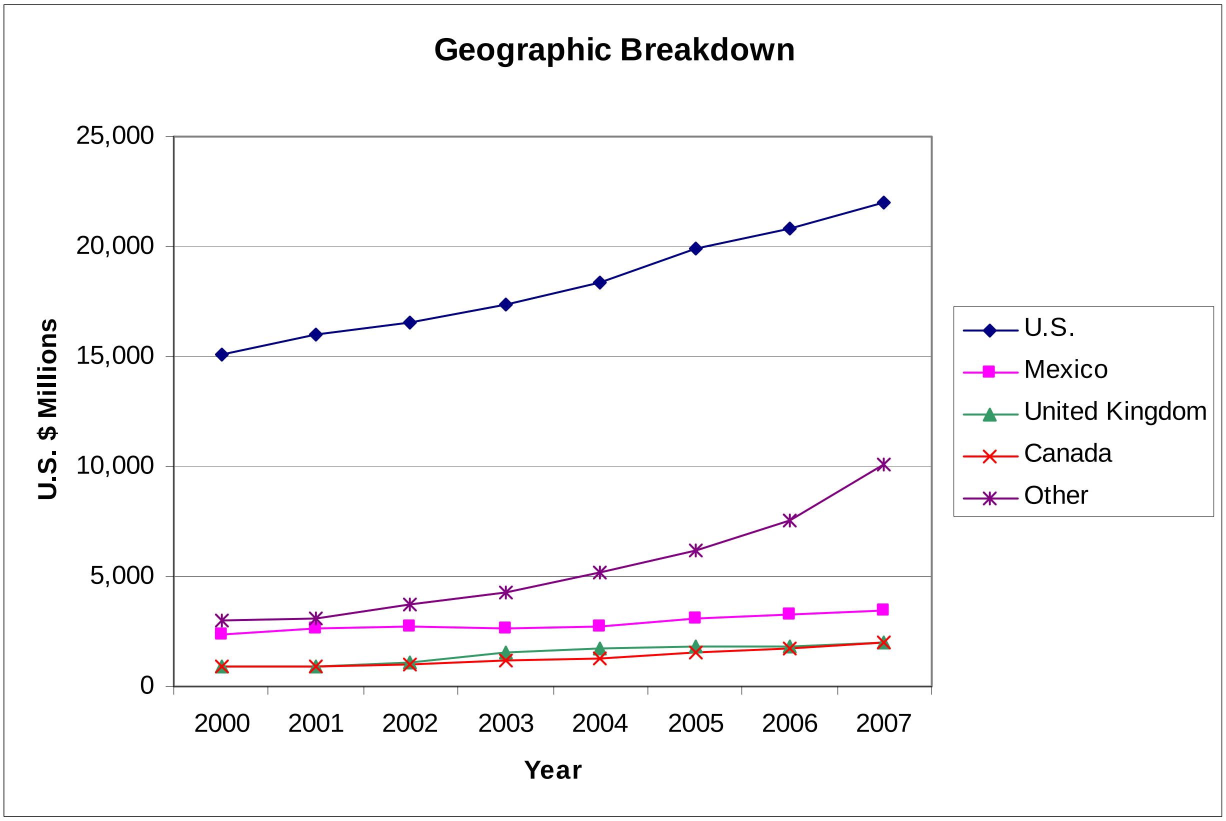
These initiatives are promising starts toward addressing the healthy diets and childhood obesity challenges. However, more analysis is needed to understand how effective these initiatives are and the degree to which consumers are buying these healthier products in comparison to the traditional menu items.

PepsiCo

PepsiCo merged with Frito-Lay in 1965 to create PepsiCo Inc. It is now the second largest soft drink company in the world behind Coca-Cola. PepsiCo's main brands are Pepsi Cola, Frito-Lay, Tropicana, Gatorade, and Quaker. Its two core brands are Pepsi Cola in the soft drink market and Frito Lay in the packaged-food industry. The United States and Mexico remain two of the top markets for PepsiCo soft drinks and snack food products. However, PepsiCo has more than doubled its net sales in non-North American countries from 2000 to 2007. Figure 4, is a breakdown of PepsiCo's global net sales since 2000 for the United States, Mexico, the United

Kingdom, Canada, and all other countries. Net sales in the United States are still the strongest, but international markets are increasing.

Figure 4: PepsiCo Global Sales (Net), 2000 – 2007



Source: Annual Reports

FDI Magazine (2002) reported that in 1982 PepsiCo was one of the first TNCs to set up operations in China after the Open Door policy, but the venture was not always a smooth transition. Investing in China involves joint ventures with Chinese partners in order to enter the highly competitive market. In 2002, PepsiCo terminated a joint venture with a Chinese bottling firm after eight years of operating together because the local Chinese partners wanted a larger share of profit margins and expansion outside of their contractual regions. The profit-sharing issues with Chinese partners were exacerbated by government protection of domestic beverage makers. Moreover, the Chinese government controls the location of foreign plants in order to spread competition across the country. PepsiCo claimed that it was pouring money into advertising and marketing, with investment liabilities still outweighing revenues after 20 years.

PepsiCo now has 40 joint and solely owned ventures in China, which is its second largest soft drinks market outside the United States. PepsiCo owns 25 bottling plants and 4 packaged food factories, and their new strategy is to double the Chinese workforce over the next five years in order to match growth potential in that market. Their aggressive marketing tactics in the past decade have included brand building by using celebrity endorsements and sports sponsorships. In a survey by A.C. Neilsen in 2002, Pepsi had a 44 percent market share in major Chinese cities (FDI 2002).

An important strategy that has solidified Pepsi's global strength is their belief in localization. A PepsiCo spokesperson stated to *Beverage Daily*: "It is very clear based on our experience that to succeed in the food and beverage market around the world our products, as well as our marketing, must be locally relevant… that means they must reflect the local culture, as well as local taste preferences and ingredients" (Merret 2007). Investment in China alone totals over one billion dollars, and PepsiCo plans to expand its Chinese market by investing an additional $850 million between 2006 and 2009.

In order to penetrate emerging markets, PepsiCo adapts its products to local preferences (Brush 2006). The company has expanded using joint ventures and it has hired local managers who have expertise in the preferences of that market. Frito-Lay in Mexico sell chips with chili flavors, while Frito-Lay in China sells crab- or duck-flavored chips. By utilizing partnerships with local bottlers and local suppliers, PepsiCo also appeals to consumers' nationalistic sentiments while also impacting local food production systems. Sabritas in Mexico and Yazhou in China are both popular brands sold by PepsiCo with regional-sounding names. To increase understanding of their target market, PepsiCo opened its first research and development site outside the United States in Shanghai in 2006.

PepsiCo was ranked #1 globally in 2005 for sweet and savory snacks, and 80 percent of the company's net sales is from packaged foods. In 2003, trans fat was removed from all chips as they switched to using corn oil. By 2006, Lay's and Ruffles chips were made using sunflower oil. PepsiCo also strove to reduce sugar and sodium in their snack foods and expanded their product range to more nuts and healthy snacks. In the snack foods sector, the pressure to shift from focusing on the sweet and high fat snacks market led PepsiCo to explore two potential development paths. The company can pursue the "impulse channel" or move towards acquiring more healthy and organic snack options. The impulse channel refers to moving toward convenient, on-the-go foods which dominate food markets today.

PepsiCo launched their "Smart Spot" marketing campaign in 2004, which includes labeling "healthy" products as well as exercise campaigns to promote smart lifestyle choices. All products labeled with a "Smart Spot" sign meets nutrition criteria set by the Food and Drug Administration and the National Academy of Science. By 2006, more than 40 percent of PepsiCo's annual revenues in the United States and Canada came from Smart Spot eligible products, which include Baked Cheetos, Baked Lays, and Diet Pepsi. PepsiCo was also the first to voluntarily restrict advertising to children in its Children's Food and Beverage Advertising Initiative (CFBAI). They partnered with the Alliance for a Healthier Generation to limit direct advertising to children under 12 to only Smart Spot products.

Developing countries like India and China are seeing the emergence of a middle class that can now purchase inexpensive consumer products. Urban Chinese children are spending more on snacks and play items as well as influencing the spending of their parents (McNeal and Yeh 1997). PepsiCo's sales figures and profit margins should continue to expand in developing markets because they have already established strong domestic partnerships and a solid infrastructure.

(6) Conclusions

Applying a GVC framework to food production and consumption patterns around the world is a valuable tool that researchers can use to understand how the global context influences dietary and health outcomes, including increasing rates of childhood obesity. The GVC perspective incorporates economic and political factors at the global, national, and local levels that have been ignored in much of the previous medical and epidemiological literature on this topic (Glass and McAtee 2006). The severity of the global childhood obesity pandemic calls for innovative research agendas and theoretical approaches that do not discard the macro factors and social contexts that affect consumption patterns and might help to ameliorate this public health crisis.

In this paper we have outlined the essential features of GVC analysis. Researchers employ a series of steps in the investigation phase. First, they identify the stages and key actors involved in the value chain; second, they determine the relevant geography of these economic activities; third, they look at the governance structures that define the inter-firm networks in the chain; and lastly, they determine the institutional arrangements, such as the role of government and regulatory policies, in which the value chain is embedded. With those research steps and analytic concepts, we showed how the GVC framework helps us to understand food production and consumption, and their interrelationship at the global and local levels.

The international economic processes of trade and FDI create global and local linkages between firms and countries. These processes tell a story about how trade affects consumption through imported inputs for manufactured foods, and we showed how developing countries are changing their local food production systems to cater to manufactured products using these inputs. The examples of soybeans in China, food imports in Trinidad and Tobago, and corn in Mexico demonstrated this phenomenon in detail. Lastly, we presented evidence about leading TNCs in food GVCs, which exhibit the global strength, branding, and business strategies that are driving changes in food consumption.

This paper outlines how a GVC framework can help us to understand global health and food consumption. Future studies of food and agricultural value chains may eventually be able to identify avenues where key interventions, such as policy recommendations to require the selling of healthier food, or placing limits on the chemicals and artificial flavors that can go into processed foods, can garner the support of food TNCs, governments and consumers alike. The GVC approach is well suited to linking the global and local levels of analysis, with a focus on both production and consumption. However, we also need to identify win-win scenarios whereby the major food and agricultural TNCs see healthier diets and reductions in childhood obesity as central to their future business models in a more socially responsive global economy.

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