Ultra-processed and fast-food: towards the configuration of a hybrid food pattern

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Abstract

With the implementation of the North American Free Trade Agreement (NAFTA), Mexico experienced a rapid expansion in highly industrialized food and beverage products. This has transformed supply and distribution structures and led to changes in dietary patterns. The objective of this paper is to explain how these transformations led to the configuration of a hybrid distribution and consumption scheme that affected the expenditure, frequency and quantities of ultra-processed and fast foods consumed in Mexican households during the period 2000-2020. This hybrid model is associated with an increase in diseases such as obesity and chronic degenerative diseases.

Keywords: food and beverage industry; ultra-processed products; fast-food; food consumption; obesity.

1. INTRODUCTION

Since the mid-20th century, Mexico has undergone significant changes in its dietary pattern, gradually incorporating industrialized products into its regular diet, which clearly threatens public health today. In other words, the consumption of ultra-processed fast-food products predominates (inside and outside the home), which has an impact on household spending across all social classes, is a trigger for excess weight and obesity, and is also responsible for the increase in chronic degenerative diseases, cardiovascular disease and diabetes, among others, which influenced the mortality rates during the Covid-19 pandemic.

The increase in the consumption of those products not only affected public health data but also had an impact on changes in the economic structure: its impact on the agro-industrial chain led to the configuration of a new hybrid scheme of distribution and consumption of food and beverages, dominated by a greater supply and high intake of hypercaloric industrialized products, "designed" to adapt to the conditions demanded by the mobility of goods in today's global market and thus satisfy an accumulation of segmented demands, linked to digital technology through electronic platforms.

Research on the implications of the new scheme in terms of ultra-processed products and fast food, or the corporate control of the supply-distribution circuits by global companies, is still relatively new in literature. Equally recent is the impact of the hybrid scheme on the pattern of food consumption, in terms of the health effects of the dominant supply of highly industrialized products or the technological capacity of companies to achieve greater proximity to the consumer through online supply.

This study attempts to answer the question of how the new hybrid scheme of distribution and consumption of food in Mexico is taking shape and leading to increases in the expenditure, frequency and quantities consumed of ultra-processed and fast-food products, as well as their indirect repercussions on the health of Mexicans during the period 2000-2020.

The hybrid scheme represents the total integration of the food and beverage industry's production with the services area through the corporate control of distribution channels and devices, the merger of ultra-processed products into other fast-food meals, and the spaces for their consumption.

The study's hypothesis is that the supply of ultra-processed foods and beverages is expanding through the control that agrifood companies exercise over distribution circuits and their integration with industrial companies dedicated to the supply of inputs used in processing. This has led to an increased closeness to consumers and has also influenced their purchasing decisions.

Based on this reasoning, the increase in the expenditure, frequency and quantities consumed of ultra-processed and fast-food products in Mexico can be explained by transforming the conventional food supply and configuring a hybrid scheme that merges production, distribution and consumption. The objective is to describe the conceptual characteristics and empirical determinants that make up this hybrid scheme and their influence on the transformation of the food pattern in Mexico during the referenced period.

The quantitative methodology examines the reproductive circuit (production-circulation-consumption) of food and beverages in Mexico from 2000-2020. Production-circulation integration considers the restructuring of the food and beverage industry in terms of growth, expansion and spatial dynamics of supply by degree of processing, as well as changes in the territorial structure, patterns, circuits and proximity-density of establishments for supply and distribution. In the case of changes in consumption, we measure the magnitude of spending, frequencies, and quantities of ultra-processed products and fast food consumed in Mexican households over the same period.

Following the introduction, this paper is composed of four sections. The first section presents the conceptual basis of the hybrid scheme in food. The second section shows the methodological structure. The third section shows the empirical evidence regarding the presence of the hybrid model of food distribution and consumption in Mexico. The last section presents the conclusions.

2. CONCEPTUAL BASIS OF A HYBRID SCHEME FOR FOOD

Studies that have analyzed changes in consumption and the transformation of the dietary pattern of households in Mexico base their analysis on the consumer demand theory (Barquera *et al.*, 2001; Marrón-Ponce *et al.*, 2019; Moran *et al.*, 2019; Sandoval and Camarena, 2012; Santos, 2014; Sierra, 2010). These studies identify budgetary restrictions and non-monetary factors as determinants of food and beverage consumption, with the degree of urbanization, the lack of time to buy,

prepare and cook food, the length of the working day, and information on food content, among others, standing out. Thus, changes in the consumption of food and beverages represent the choice of consumers and, as a result, the consumer is held directly responsible for the effects they have on their state of health.

Nevertheless, dietary conditions and damage to the health of Mexicans are not the sole responsibility of consumers. It cannot be argued that the consumer, consciously and with perfect knowledge -as dictated by the theory of consumer demand-, buys food and beverages that are harmful to their health in excess. In other words, the consumer cannot be the only one responsible for being sick when the food supply on the market is homogeneous, standardized, highly processed and in proximity to the consumption of the population.

Therefore, the responsibility for a social problem cannot be reduced to the individual level since an essential feature of human nutrition is its adaptation to changes arising from new forms of economic and social organization. In particular, those resulting from an increased concentration of population, leading to transformations in supply of the product and its processing and distribution mechanisms, which in turn influence changes in the structure of consumption.

As far as supply is concerned, changes in socioeconomic dynamics are driving the food and beverage industry to develop innovation processes in the food chain to meet increasingly complex demands. External and internal factors modify all the links that make up food chains to adapt to the dynamics imposed by market structures.

During the current development phase, these changes - driven by the global economy - are more accelerated and are strongly reflected in consumption and distribution. Both companies and consumers are more quickly adapting to the technological progress achieved in other productive branches and sectors. Through them, production, distribution, purchasing and food preparation times and economic resources are optimized and the availability, mobility and quality of supply are focused in real-time.

Currently, the supply of companies in the food and beverage industry covers diverse, highly complex individualized and segmented demands, territorial and sociocultural diversity of preferences, and new virtual spectra of demand. To address the above, the design of accessible electronic platforms was promoted in response to people's mobility and the prolonged amount of time they spent in the home, which made them dependent on external agents for food supply.

Thus, transportation structure and the relationship between transporters and distribution channels, mainly controlled by large companies, have changed. The production or location of supply is not rigid; instead, it generates multiple distribution channels and an atomization of routes or forms of food supply and transportation, including informal ones.

Traditional distribution channels or supermarkets established in shopping malls, which up until the COVID-19 pandemic were the symbol of urban modernity for the sale of fresh and processed foods, began to decline. These same channels created their own platforms for home delivery and, in terms of supply, challenged other competitors specifically created for that purpose. There are several examples, but global companies such as Amazon, Mercado Libre and Cornershop stand out.

The distribution structure is changing in the same way as supply since consumers do not go to a single supply point. Supply is flexible, consistent, universal and oriented to the needs of captive consumers in homes or offices. Informal channels also adapt to this format as a survival mechanism in local environments. However, the dynamic base of this scheme is ultra-processed products and ready-to-eat fast food or packaged food.

Monteiro and Cannon (2012) and the Pan American Health Organization (PAHO) (2015) developed the "NOVA" system to classify foods according to their nature, purpose and degree of processing. It classifies four groups of foods (raw or minimally processed, culinary ingredients, processed foods and ultra-processed products), taking into account both the primary production processes of the agricultural sector and the processed foods of the food and beverage industry (see Table 1).

Table 1. Food and beverages by degree of processing according to the "NOVA" classification system

"NOVA" food and beverage classification system	*Selection of food and beverages by degree of processing*
Raw or minimally processed	Fresh, refrigerated, frozen and vacuum-packed vegetables and fruits; grains (cereals), including all types of rice; beans and other legumes, fresh, frozen and dried; roots and tubers; mushrooms; dried fruits and freshly prepared or pasteurized non-reconstituted fruit juices; unsalted nuts and seeds; fresh, dried, refrigerated or frozen meats, poultry, fish and shellfish; powdered, fresh, whole, partially or fully skimmed, pasteurized, and fermented milk, such as plain yogurt; eggs; flours, raw pastas made from flour and water; teas, coffee and herbal infusions; tap, filtered, spring or mineral water.
Culinary ingredients	Vegetable oils; animal fats; starches; sugars and syrups; salt.
Processed foods	Canned or bottled vegetables and legumes, preserved in brine or pickled; peeled or sliced fruits preserved in syrup; whole fish or fish pieces preserved in oil; salted nuts or seeds; processed, salted or cured and non-reconstituted meats and fish such as ham, bacon and dried fish; cheeses made from milk, salt and ferments; and bread made from flour, water, salt and ferments.
Ultra-processed products	Chips and many other types of sweet, fatty or salty snack products; ice cream, chocolates and candy or sweets; French fries, hamburgers and hot dogs; poultry or fish nuggets or sticks; packaged bread, buns and crackers; sweetened breakfast cereals; pastries, doughs, pies, cake mixes, cakes; energy bars; jams and jellies; margarine; packaged desserts; noodles, canned, bottled, dehydrated or packaged soups; sauces; meat and yeast extracts; carbonated beverages and energy drinks; milk-based sweetened beverages, including fruit drinking yogurt; fruit drinks and nectars; beer and non-alcoholic wine; prepared meat, fish, vegetable, pasta, cheese or pizza dishes; infant formula, supplemental maternal milk preparations and other baby products; and "healthy" and "slimming" products, such as powdered or "fortified" meal replacements.

Source: Prepared by the authors based on Monteiro and Cannon (2012), Monteiro *et al.* (2013) and PAHO (2015).

Raw or minimally processed foods have undergone little or no processing, while culinary ingredients include spices, fats, salt and sugar combined with the above. Processed foods are industrialized products made by adding fats, oils, sugars, salt and other culinary ingredients to minimally processed foods through preservation

methods. On the other hand, Ultra-processed products are foods produced using complex industrial processes; in other words, products are designed based on the combination of components with additives, sweeteners, flavorings and texturizers (PAHO, 2015).

The rapid acceptance and high demand for ultra-processed products and fast food, as well as their increased presence in the global food supply, is due to the pragmatism of their easy accessibility since they are frozen, canned or ready to be cooked, heated up or eaten. This allows them to be consumed anywhere, such as at home, in the office, in restaurants, in the car or on the street. They can even be consumed on the move or while standing, do not require cutlery and, in some cases, do not require a table or plate since the packaging is limited and disposable (paper, cardboard or plastic) for their consumption (Flores, 2007; Moss, 2013).

These characteristics have permitted the development of a hybrid distribution and consumption scheme, linking the production and distribution spheres. Hybridization considers extending the sphere of production to the business and service sector and integrating with companies dedicated to supply and distribution, including platforms specialized in fast food (Hirvonen *et al.*, 2020; Macri *et al.*, 2012).

The concept of hybridization embodies the total integration of the production of the food and beverage industry with services, through the corporate control of distribution channels and equipment, spaces for preparing processed foods and ultra-processed products in fast food and spaces for their consumption. Although this hybrid model began at the end of the 1990s, its expansion occurred at the end of the 20th century.

The assumption is that the hybrid model emerged in global agri-food activity in the 19th century when British dominance consolidated a colonial agro-export food regime. From this emerged the notion of the agri-food system, with the participation of other dominant countries that followed the same scheme (Friedmann and McMichael, 1989).

Those countries consolidated the implementation of neoliberal policies and established a corporate food regime to strengthen corporate power (Friedmann and McMichael, 1989). This led to the gradual imposition of the shaping of supply and control of consumption by the food and beverage industry on a global scale.

Some of the dominant features of the current corporate food regime include its extreme dependence on energy, the use of some grains for the production of biofuels, financial speculation on raw food materials (especially in wartime conflicts), the concentration of power in distribution companies, the development of platforms for the sale of food for home delivery, and the vertical integration of agrifood companies (Rodriguez, 2011).

This corporate regime has been consolidated in different historical periods and corresponds to relative stability in international power relations, in which the combined action of the global agrifood economy, State strategies, population mobility and corporate openness converge. In reality, these are productive adaptations of companies to the dynamics of demand, thus shaping the control of supply in distribution and consumption. The characteristic feature of the strategies is the addition of value, regardless of the quality of the product.

This corporate agro-industrial regime established the parameters for configuring and consolidating today's agrifood systems. This intensified corporations' power to decide what and how to produce and what food a society consumes (Rodríguez, 2011). Corporate dominance gave rise to the hybrid model, in which digital technology plays a role in integrating production, processing and distribution in a single direction.

The combination of free market force and weak State regulation allows companies to dominate supply with products of low nutritional value, high added value and low standards, which forms a captive market within a universe of controlled supply. In this context, the consumer can choose but not decide on the characteristics of the product they consume, regardless of the effects on health, the environment or other components of life.

Products designed for adaptation to a specific distribution system form the node of a global distribution system that generates standardized supply, establishing international standards adapted to the new forms of product distribution. As a result of the hybridization of the food and beverage industry, agri-food companies have succeeded in globalizing food, beverages and meals from any part of the world. They are presented as ready-to-eat prepared dishes (hamburgers, pizzas, pasta, tacos, chilaquiles, tlacoyos, sushi, etc.), semi-prepared dishes (flour for hot cakes, atole, waffles, crepes, cake, etc.), or ready-to-eat products (cake, yogurt, cookies, soft drinks, juices, etc.).

In Mexico, changes to production processes, supply-distribution schemes and consumption dynamics favored the predominance of ultra-processed products over minimally processed industrialized products (Monteiro *et al.*, 2013). At the same time, the demand for these products increased compared with fresh foods such as cereals, meats, dairy products, pulses or vegetables (Garza-Montoya and Ramos-Tovar, 2017).

The PAHO places Mexico in second place among Latin American countries in terms of the sale and consumption of highly processed products (PAHO, 2019). Since the beginning of the 21st century, this type of food supply has replaced home-prepared meals and the regional diets of Mexican families (Ares *et al.*, 2016; Gálvez, 2018; Kroker-Lobos *et al.*, 2014; Moreno-Altamirano *et al.*, 2014; Shamah-Levy *et al.*, 2014).

According to Monteiro and Cannon (2012), Monteiro *et al.* (2019) and Patel (2016), diets based on foods and beverages with high levels of sugar, sodium, meat products and saturated fats have an impact on the nutritional status of the population due to their low quality and hypercaloric content. This increases the vulnerability of people to non-transmissible diseases or mortality levels in pandemic environments such as the SARS-Cov-2 coronavirus (Covid-19) and any other disease that originates from a weak food structure (Ascensio and Ferrer, 2021; Kroker-Lobos *et al.*, 2014; Moreno-Altamirano *et al.*, 2014; Ortega *et al.*, 2021; Popkin *et al.*, 2012).

Some empirical evidence indicates that in 2020, chronic malnutrition affected 2.8% of children under five years of age. In the case of excess weight and obesity, for that same year, 22% of children were at risk of being overweight (INSP, 2022). With respect to the adult population over 20 years of age, today, 8 out of every 10 Mexicans suffer from some degree of excess weight or obesity (INSP, 2022). During the period 2000-2020, deaths from cancer, osteoarthritis, cardiovascular problems and diabetes mellitus increased by 44.5, 44.1, 154.8 and 287.1%, respectively (INSP, 2022).

As a result, the epidemiological profile in Mexico shifted from a situation in which malnutrition and infectious diseases represented the most significant public health problems to one dominated by obesity, diabetes, and cardiovascular diseases, as well as other non-communicable chronic diseases related to the consumption of highly processed foods (Hernández-F. *et al.*, 2019). The deterioration of food quality and its effects on public health in the country is associated with a new hybrid distribution scheme and the increased consumption of highly industrialized foods and beverages.

3. METHODOLOGICAL STRUCTURE OF THE PAPER

The methodology used to demonstrate the existence of the hybrid model is quantitative and measures the expansion of the supply of ultra-processed products and fast food, the growth in the number of supply and distribution establishments, and the increase in spending, frequency and quantities of these products consumed

during the period 2000-2020.

The information used comes mainly from the National Institute of Statistics and Geography (INEGI), with data from the Monthly Industrial Survey of the Mexican Classification System of Activities and Products (CMAP) and the Monthly Survey of the Manufacturing Industry (EMIM), which uses the North American Industrial Classification System (SCIAN) version 2018 (INEGI, 2018) and the Statistical Directory of Economic Units (DENUE) and the National Survey of Household Income and Expenditure (ENIGH). All information was grouped based on the food classification system by degree of processing "NOVA" (PAHO, 2015).

In order to analyze the expansion of food and beverage supply by degree of processing, a production volume growth index was prepared by grouping the production branches based on the "NOVA" system. The index contains the following procedure:

Management of microdata from the Monthly Industrial Survey (EIM) and the Monthly Manufacturing Industry Survey (EMIM), which generated a database with information regarding the volume of production for each class of activity in the food and beverage industry for the period 2000-2020.

Database with annual information on the production volume of each food and beverage industry activity.

Harmonization of the CMAP and SCIAN classifiers, version 2018, used in the Monthly Industrial Survey (EIM) and EMIM with the "NOVA" food classification system by degree of processing.

The food and beverage industry comprises four food groups: raw or minimally processed foods, culinary ingredients, processed foods, and ultra-processed products.

Construction of the index of growth of production volume for Mexico's food and beverage industry, according to the "NOVA" classification, using 2008 as the base year, with reference to the following mathematical formula:

Let X_{t-1} and Xt be the observed values of a variable X at two consecutive moments; the chain index corresponding to the value Xt is presented by IC^t and defined as follows:

$$IC^t = \frac{Xt}{X_{t-1}} * 100$$

Determination of the participation of each food group in total production for the period 2000-2020.

In the case of supply and distribution, the DENUE data allowed for the specific identification of the location and number of establishments dedicated to the retail and wholesale food and beverage business in the federal states of Mexico, in addition to fast food, both in traditional and corporate channels. Thus, the growth in the number of establishments grouped by channel type was analyzed; in other words, those focused on traditional and corporate supply and distribution.

To analyze food expenditure, we used the metadata from the expenditure module on food and beverages inside and outside the home provided by the ENIGH 2000 and 2020 (INEGI, 2001 and 2021). We worked with the "expenditure" modules, which include weekly monetary expenditure on food and beverages.

Frequency of expenditure is defined as the number of times households reported spending for each product, group or item in the "NOVA" system. The food expenditure frequency ratio is the ratio for each food item between the total frequency of food and beverage expenditure. The expenditure ratio is the monetary expenditure for a given product, food group or NOVA item.

The period 2000-2020 was selected to capture long-term variations in spending, quantities and frequencies of food and beverage consumption. The year 2000 was taken as the beginning of the period since, at that time, the effects of the change in the economic development model, trade liberalization, and the then North American Free Trade Agreement (NAFTA) began to be reflected in Mexico.

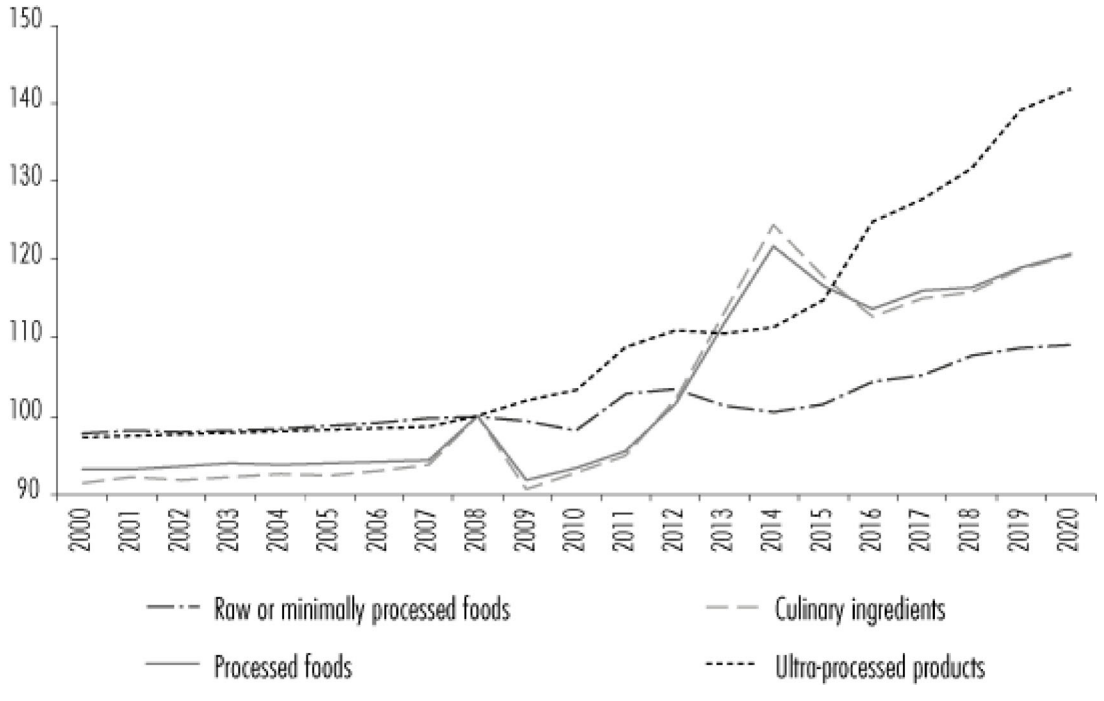
4. EMPIRICAL EVIDENCE REGARDING THE PRESENCE OF THE HYBRID MODEL FOR FOOD DISTRIBUTION AND CONSUMPTION IN MEXICO

The data obtained from the sources of information referred to in the previous section were structured based on the concept of hybridization of the food and beverage industry, which is the extension of the productive sphere to the area of food supply and distribution services. Overall, this process impacts the new dynamics of consumption and the transformation of the dietary pattern.

Regarding supply, the EIM and EMIM data, grouped according to the "NOVA" classification of foods by degree of processing, show similarities in the composition of total food and beverage production. From 2000 to 2020, processed food and ultra-processed product groups grew more than raw or minimally processed, packaged or frozen foods in Mexico.

Based on information from the EIM and EMIM, an index of food and beverage production growth by degree of processing was developed using the "NOVA" system classification. The index's results show that for the period 2000-2020, processed foods and ultra-processed products grew more than raw or minimally processed, packaged or frozen foods (see Figure 1).

Figure 1. Mexico: annual growth rate of food and beverage industry production based on the "NOVA" system, 2000-2020 (percentage, 2008=100)



Source: The authors compiled this based on EIM (https://www.inegi.org.mx/programas/eim/1994/), EMIM (https://www.inegi.org.mx/programas/EMIM/2018/) and PAHO (2015).

Meanwhile, in 2000, raw or minimally processed foods accounted for almost one-third of total production, with 32.1%, while culinary ingredients, processed foods and ultra-processed products represented 13.1%, 15.3% and 39.5%, respectively. For the same year, foods with a higher degree of processing represented more than half of the production of the food and beverage industry, with 54.8% (see Table 2).

Table 2. Mexico: composition of the production of the food and beverage industry grouped according to the "NOVA" system, 2000-2020 (percentage)

Group of foods/year	*2000*	*2002*	*2004*	*2006*	*2008*	*2010*	*2012*	*2014*	*2016*	*2018*	*2020*
Raw or minimally processed foods	32.1	31.8	31.3	31.1	30.5	30.3	29.7	28.1	27.6	27.4	26.9
Culinary ingredients	13.1	13.0	12.9	12.7	13.3	12.4	12.8	13.7	13.0	12.8	11.8
Processed foods	15.3	14.7	14.7	14.9	15.4	14.5	14.7	15.7	15.2	14.9	14.7
Ultra-processed products	39.5	40.5	41.1	41.3	40.9	42.7	42.8	42.5	44.3	44.9	46.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: The authors compiled this based on the EIM (https://www.inegi.org.mx/programas/eim/1994/), the EMIM (https://www.inegi.org.mx/programas/EMIM/2018/) and PAHO (2015).

In 2020, the share of raw or minimally processed foods fell by 5.2% with respect to 2000, from 32.1% to 26.9%. Culinary ingredients had a negative variation in the same period, dropping from 13.1% to 11.8%; processed foods registered a minimum negative variation of 0.5%, decreasing their share from 15.3% to 14.7% (see Table 2).

An increase in the production of ultra-processed products offset the lower production of raw or minimally processed foods. The latter increased their share of total food industry production by 7.1%, from 39.5% to 46.6%. In 2020, ultra-processed products accounted for almost half of total food and beverage production in Mexico (see Table 2).

This information shows that the productive dynamics of the food and beverage industry have shifted towards processed foods and ultra-processed products. At the same time, it shows the importance of culinary ingredients in fast food production. The negative variation in the peak year of the pandemic was due to the decline in food prepared at home. Companies that carried out these classes of economic activity increased their productivity and boosted the growth of the industry as a whole (Amaro and Natera, 2020).

Although this type of food supply is predominantly located in urban areas with high demographic concentration, food and beverage supply and distribution channels have allowed its expansion throughout the country. The development of sales through internet websites, apps or electronic distribution of food and beverages is a vital part of the hybrid scheme. This is why urban consumers demand that the location of retail channels be as close as possible, in addition to being functional with their shopping needs, appropriate to their eating habits and to changes in their travel and time availability (Bodini and Zamoli, 2001; Boyd *et al.*, 2003; González-Alejo *et al.*, 2019; Fritz, 2007).

The transition to new forms of distribution based on technological innovations incorporates other activities derived from commercial dynamics, which establish consumer markets in open economies and organize distribution differently. Thanks to competition between firms for concentrated demand, the regional-national level now incorporates the international-global level while introducing other products that modify the pattern of consumption.

At present, the country still has a pattern of food and beverage supply and distribution represented by convenience stores, supermarkets and restaurants, which respond to the industrialized food supply and are present throughout the country (Gasca and Torres, 2014). Convenience stores, supermarkets and fast-food restaurant chains changed functionally by incorporating logistical, organizational and technological innovations that allowed them to expand their service hours, make

home deliveries, facilitate means of payment and develop consumer credit mechanisms in periods of income restrictions. A few transnational chains control fast food supply, distribution and sale in the Mexican food market (see Table 3).

Table 3. Fast-food companies with a presence in Mexico, 2020 (millions of dollars)

Company	*Country*	*Value of establishment*	*Sales*	*Value of the company*
McDonald's Corporation	USA	165.0	22 283	157 951
Restaurant Brands International Limited Partnership	CAN	60.7	4 829	36 531
Yum Brands, Inc.	USA	81.0	5 832	34 668
Restaurant Brands International Inc.	CAN	60.8	4 829	28 575
Dairy Farm Int. Holdings Limited	USA	287.4	2 949	15 256
Yum China Holdings, Inc.	CHN	40.3	7 439	14 086
Chipotle Mexican Grill, Inc.	USA	469.2	4 556	12 511
McDonald's Holdings Company (Japan), Ltd.	JPN	54.1	2 445	7 154
The Wendy's Company	USA	17.7	1 318	6 847
Alsea, S.A.B. de C.V.	MEX	3.1	2 392	3 300
AmRest Holdings SE	POL	118.2	1 641	2 918
Jubilant FoodWorks Limited	IND	20.0	464	2 582
Domino's Pizza Group plc	GBR	4.5	641	2 301
Xiabuxiabu Catering	CHN	2.0	565	1 950
Shake Shack Inc.	USA	69.0	381	1 899
Arcos Dorados Holdings Inc.	URU	7.1	3 388	1 875
Café de Coral Holdings Limited	HKG	2.5	1 042	1 352
MTY Food Group Inc.	CAN	37.7	215	1 135
Ohsho Food Service Corp.	JPN	56.3	736	1 018
Famous Brands Limited	RSE	8.3	597	994
Pepper Food Service Co., Ltd.	JPN	45.4	399	933
MOS Food Services, Inc.	JPN	29.8	672	833
Herfy Food Services Company	KSA	12.6	312	882
Westlife Development Limited	IND	5.1	174	814
Telepizza Group, S.A.	ESP	6.7	446	809
Restaurant Brands New Zealand Limited	NZL	5.5	560	788
Carrols Restaurant Group, Inc.	USA	13.3	1 120	727
Collins Foods Limited	AUS	4.1	531	589
Dairy Farm Int. Holdings Limited	HKG	3.9	350	423

Source: compiled by the authors based on S&P Capital IQ (https://www.spglobal.com/marketintelligence/es/sp-capital-iq-pro).

This process led to the concentration of food and beverage production, supply and distribution in approximately 30 domestic and foreign companies with a strong presence in the country, whose logistical capacity permits this type of supply throughout the country (see Tables 4 and 5).

Table 4. Mexico: number of fast-food outlets in traditional and corporate channels, 2010-2020

Federal State	*Fast-food (services, preparation of food and beverages)*		
	2010	*2020*	*Growth rate (%)*
Aguascalientes	5 841	8 624	47.6
Baja California	8 314	13 824	66.3
Baja California Sur	2 888	4 932	70.8
Campeche	3 817	5 515	44.5
Coahuila de Zaragoza	8 026	12 261	52.8
Colima	3 889	6 689	72.0
Chiapas	16 019	27 904	74.2
Chihuahua	9 274	13 572	46.3
Mexico City	809	58 491	7 130.0
Durango	6 147	9 069	47.5
Guanajuato	18 698	30 810	64.8
Guerrero	16 079	21 378	33.0
Hidalgo	9 535	16 623	74.3
Jalisco	30 746	46 219	50.3
Mexico	48 120	76 573	59.1
Michoacán de Ocampo	18 641	31 285	67.8
Morelos	9 857	15 391	56.1
Nayarit	5 697	12 136	113.0
Nuevo León	13 862	22 095	59.4
Oaxaca	18 254	33 194	81.8
Puebla	20 972	47 756	127.7
Querétaro	7 021	37 791	438.3
Quintana Roo	5 797	30 393	424.3
San Luis Potosí	9 866	45 312	359.3
Sinaloa	8 957	44 796	400.1
Sonora	8 993	37 854	320.9
Tabasco	6 980	35 658	410.9
Tamaulipas	11 357	44 532	292.1
Tlaxcala	3 838	24 102	528.0
Veracruz de Ignacio de la Llave	32 600	139 671	328.4
Yucatán	10 715	49 452	361.5
Zacatecas	5 575	24 582	340.9
National	387 184	1 028 484	165.6

Source: compiled by the authors based on the DENUE of INEGI (https://www.inegi.org.mx/app/mapa/denue/default.aspx).

Table 5. Mexico: leading companies in the agri-food sector, 2020

Location	*Company*	*Sector*	*Sales (millions of pesos)*	*Sales (variation 2000-2020)*	*Employees*
3	Walmart de México	Retail and self-service	646 846	4.90	238 972
11	Grupo Bimbo	Food	291 925	0.90	133 815
18	Coca-Cola FEMSA	Beverages and beer	194 471.90	6.70	82 227
20	FEMSA Comercio (OXXO)	Self-service business	184 810	10.40	197 410
24	Área Continental	Beverages and beer	165 041	3.80	63 498
26	Organización Soriana	Self-service business	155 774	1.50	96 355
34	Sam's Club	Self-service business	131 880	5.70	300 000
35	Grupo Comercial Chedraui	Self-service business	129 442	11.60	50 894
36	Sigma Alimentos	Food	124 497	2.10	45 000
45	Grupo modelo AB-InBev	Beverages and beers	90 459	7.70	30 993
53	PesiCo Alimentos México	Food	80 699	8.20	43 163
54	Heineken	Beverages and beers	78 000	9.90	18 000
55	Gruma	Food	77 387	4.50	20 785
58	Grupo Lala	Food	75 784	0.50	40 316
65	Nestlé México	Food	61 800	10.40	16 000
66	Industrias Bachoco	Food	61 658	1.00	28 218
71	Alsea	Restaurants	58 154	28.30	81 126
75	Sukarne	Food	537 540	6.30	12 750
82	Costo México	Self-service business	50 000	4.20	10 400
118	H E B México	Self-service business	35 000	9.40	13 500
131	José Cuervo	Beverages and beers	29 704	5.50	6 836
133	Danone México	Food	28 609	5.10	6 500
137	Mondeléz México	Food	27 951	2.20	6 000
141	Pilgrim's Pride México	Food	26 746	2.00	11 000
163	Grupo Herdez	Food	22 420	-6.90	10 477
164	Alpura	Food	22 048	8.10	5 309
168	La Comer	Food	21 591	12.90	12 200
177	Mar México	Food	20 000	11.10	3 817
188	Grupo Bafar	Food	18 782	3.60	13 066

Source: compiled by the authors based on Statista.

Technological progress, its appropriation and expansion by retail food distribution companies, including fast food, through digital platforms, as well as the emergence of new forms of mobility of goods beyond territorial restrictions and scales of consumption, form the basis for the irradiation of the hybrid model. An increase in consumer access to electronic devices accompanied this process. As smartphones and their penetration of websites and digital platforms increased, they became the most essential tool for consolidating the hybrid model.

The expansion of the hybrid model is not dependent, as in previous models of urban food and beverage distribution, on income level. Nor does it imply the total elimination of prior models, including the more traditional ones. For example, the collection of goods through a dominant geographic point or urban distribution from a central market is maintained. Instead, they can coexist and complement each other to exert greater territorial dominance in the distribution of ultra-processed products and fast food.

The expansion of digital systems toward daily purchases, which includes agrifood products, regardless of territorial environments or the stratification of consumer segments, constitutes the basis of the new hybrid model, which involves circulation and consumption. Thus, it forms a virtual model superimposed on the previous territorially based models, which included intense consumer mobility for their supply.

In 2005, a fact supporting the above statement is that just over 540,000 users in Mexico made purchases over the Internet, 65% from the domestic market and around 35% from abroad. By 2012, the figure had doubled and domestic points of sale had a more significant share. Most of the products purchased came from global companies based in the country, which had begun to migrate to electronic platforms and had established links with external digital distribution companies such as Amazon (INEGI, National Survey on the Availability and Use of Information Technologies in Households, various years).

By 2020, the consumer population had reached almost 23 million and domestic points of sale were dominant with just over 58%; external points of sale plummeted 8%, but unspecified points of sale achieved up to 33%. Therefore, based on this indicator alone, a larger than expected number of small or informal establishments dedicated to home food distribution are included in this modality (INEGI, National Survey on the Availability and Use of Information Technologies in Households, various years).

Other numerical evidence shows the prospects for expansion and consolidation of the hybrid scheme. The Covid-19 pandemic forced prolonged home confinement for people, restrictions on eating outside the home and an increased distrust of products without sanitary measures. Processed, ultra-processed foods and fast food covered urban demands under this scheme.

If we take the most representative indicators as a reference, we find that in 2005, the highest percentage of Internet shopping took place in goods and services, reservations and tickets, books, music and videos, as well as electronic devices. Food and beverages were at the lowest level that year (2.8%), with the following ten years showing a relative stagnation (INEGI, National Survey on the Availability and Use of Information Technologies in Households, various years).

Since 2015, food and beverages have shown a significant upturn, reaching 21.9% and 31.1% in 2019 and 2020, respectively. In doing so, they surpassed the categories of reservations and tickets, books, music and videos, electronic devices, computers and software (INEGI, National Survey on the Availability and Use of Information Technologies in Households, various years).

This upturn was due to the prolonged presence of the Covid-19 pandemic, which contributed to the transformation of the forms of supply, purchasing habits and structure of household consumption, as well as to a greater intensity in incorporating electronic platforms by supermarkets and self-service stores. However, it should also be considered as the final trigger for the hybrid model that was already present.

Although demand intensified for fast food, this knock-on effect was also seen in the case of ultra-processed products and high-calorie beverages since, due to their packaging and packing characteristics, they were better adapted to home delivery and had an increased presence in supermarkets.

The exponential growth of self-service stores, convenience stores and supermarkets that incorporated electronic food sales, larger chains such as Walmart, Soriana, OXXO and Sam's Club is evident. However, this growth is concentrated in the states with the largest number of metropolitan areas.

The main drivers of the hybrid model undoubtedly include some of the large national and international producers and distributors of ultra-processed foods and beverages, as well as fast-food chains that reproduce the same market model established in the last two decades of the 20th century. These include Sam's Club, Soriana, Chedraui, Coca-Cola FEMSA, OXXO, and Bimbo, among others.

If we analyze the evidence found in terms of household monetary spending on food and beverages, we also demonstrate the consolidated presence of the hybrid model and find that spending on processed foods and fast food has increased at rates of up to 360% over 20 years (INEGI, 2001 and 2021).

More specifically, rotisserie chicken increased by 127%, purified water by 153%, as did all products high in refined sugar and saturated fats. In contrast, other products, which are tentatively prepared at home and are not clearly identified with distribution through platforms, such as fresh chicken, fresh cheese, potatoes, red tomatoes, steak or beef (INEGI, 2001 and 2021), decreased by expenditure category.

The same trend is evident in the growth rates of frequency of expenditure by food group. For example, during the period 2000-2020, ultra-processed foods and fast food were above 50%, which places them above foods consumed outside the home with 34% and are also part of the expansion of the hybrid model (INEGI, 2001 and 2021).

Considering the profile of consumers and the configuration of the consumption model itself, which demand a structure of ready-to-eat products, spices, prepared dressings and non-alcoholic beverages, are dynamic components of the new consumption and circulation model. In contrast, those that form part of essential household consumption, such as vegetables, legumes and seeds, are clearly relegated with only 6.7%. The rest of the products classified as such show a drop that can be explained, among other factors, by the fact that they require processing at home or direct sourcing in local stores by families. The latter includes fruits and cereals, meats, fish and seafood, oils and fats, and sugars (INEGI, 2001 and 2021).

Although for a long time it was considered that, due to their greater added value, processed and ultra-processed foods were in demand in higher income groups, as the hybrid model consolidates, the intensity of consumption is practically independent of income levels, and this indifference becomes more evident in 2020. This fact is worrying because of the influence of this type of consumption and the proliferation of diseases such as diabetes and other coronary diseases. Ultra-processed foods, which include high-density energy beverages, already have a higher level of importance than processed foods, and their level of consumption is similar to that of raw or minimally processed foods in both rural and urban households.

5. CONCLUSIONS

It is well known that transforming the natural content of foods deteriorates their nutritional value. Since the end of the 1990s, there has been a positive correlation in Mexico between the increased supply and consumption of ultra-processed products and fast food and changes in the dietary pattern that have damaged the health of Mexicans. The country's current dietary structure represents one factor that contributed most to the vulnerability and high mortality rates due to COVID-19.

The dynamics of the expansion of the food and beverage industry show a break from traditional production towards highly industrialized and hypercaloric foods. The expansion of ultra-processed products and fast food impacts social and territorial preferences because supply dominates the market. This results in consumers having few options and being forced to increase consumption of these products, which affects their health.

This break from traditional production to highly processed food, as well as the conditioning of consumption, has been made possible by the greater integration of the food and beverage industry with other branches of economic activity and its transition to the service sector through corporate control of supply and distribution. The excess supply and high consumption of ultra-processed foods and fast food explain the damage to health and the high mortality rate associated with COVID-19, which the country faced during the pandemic.

The dominance of the industrial food scheme is expanding because this type of supply meets consumer requirements in terms of pragmatism and also facilitates new forms of business accumulation. Therefore, the hybrid scheme creates a new relationship between production and consumption, where food supply and distribution play a decisive role by allowing consumption to be resolved more quickly within the framework of the new production processes of the food and beverage industry.

Nowadays, consumers want to meet their food requirements easily, quickly and conveniently. Highly processed foods and beverages meet these requirements because they are easy to consume despite their harmful effects on health. Today, consumers can decide what to eat within a framework of actions conditioned by the food and beverage industry. Therefore, the hybrid scheme is functional in the current economic and territorial structure.

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Alimentos ultraprocesados y comida rápida: hacia la configuración de un patrón alimentario híbrido
Ultra-processed and fast food: towards the configuration of a hybrid food pattern

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