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Theoretical Linkages: Sugar Trade and Obesity

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Abstract

This paper examines the link between international sugar trade and rising obesity rates through the lens of sugar demand dynamics in sugar-importing and exporting countries. We develop a theoretical framework illustrating how trade-induced reductions in sugar prices shift consumption patterns, particularly among price-sensitive consumers, resulting in higher aggregate sugar intake. Our model theorizes that importing countries exhibit systematically higher sugar consumption than exporting countries, contributing to elevated Body Mass Index (BMI) scores and increased obesity prevalence. Empirical analysis supports the fact that the majority of the 50 countries with the highest obesity rates are net importers of sugar, highlighting the adverse health consequences of global trade flows of sugar.

Keywords

Sugar Trade, Obesity, Import, Body Mass Index (BMI)

1. Introduction

The relationship between the international sugar trade and rising obesity rates can be understood through the lens of domestic demand dynamics in sugar-importing countries. Trade liberalization, particularly the importation of sugar at reduced global prices, significantly alters consumption patterns, making sugar more accessible and affordable to broader segments of the population. As a result, importing countries tend to exhibit higher levels of sugar consumption compared to their exporting counterparts (Emran et al., 2025).

To explore this phenomenon, we develop a theoretical framework that links trade-induced price effects to domestic sugar consumption behavior and, ultimately, to health outcomes such as obesity. Our model posits that sugar-importing countries experience a structurally different domestic demand relative to

sugar-exporting countries. Specifically, lower import prices in increase domestic demand, particularly among price-sensitive consumers, leading to higher aggregate sugar intake. We hypothesize that this divergence in consumption patterns has significant health implications. In particular, excessive sugar consumption in importing countries contributes to increased caloric intake and elevated BMI scores across the population, thereby heightening the prevalence of obesity. In contrast, sugar-exporting countries, which may have higher domestic prices due to export incentives or limited local availability, tend to consume relatively less sugar per capita. Empirical evidence supports our hypothesis. An analysis of global obesity data reveals that among the 50 countries with the highest obesity prevalence, which is measured as the proportion of the adult population classified as obese, the overwhelming majority are net importers of sugar.

2. Background

The leading sugar-producing countries of the world vary significantly in terms of geographic location, population size, and overall economic scale. Their participation in the global sugar trade also exhibits considerable heterogeneity, with distinct trade patterns shaping their domestic sugar consumption. Given these differences, domestic sugar consumption levels also vary across countries according to their sugar trade pattern. Since sugar consumption is a key determinant of obesity, we hypothesize that countries with a strong export orientation in the sugar market exhibit lower average BMI levels compared to those that primarily rely on sugar imports.

The disparities of top sugar-producing countries extend to their participation in global sugar trade, with some countries primarily serving as net exporters while others are heavily reliant on imports. This divergence in trade patterns influences domestic sugar availability and consumption, which, in turn, has important implications for public health. Since excessive sugar consumption is a well-established driver of obesity, we hypothesize that sugar-exporting countries exhibit different national BMI levels compared to sugar-importing countries. The underlying mechanism may stem from variations in domestic market policies, price distortions, and dietary habits shaped by trade structures. Exporting countries may prioritize international demand, leading to lower domestic availability and potentially curbing excessive sugar consumption. Conversely, importing nations might experience greater sugar availability at lower prices, fostering higher per capita consumption and a greater risk of obesity-related health issues.

3. Literature Review

A growing body of research has examined the intersection of globalization, trade liberalization, and public health, with particular attention to how international food trade influences dietary patterns and obesity outcomes (Kennedy et al., 2019; Lakkakula & Schmitz, 2019). Central to this discourse is the argument that individuals in highly globalized countries exhibit a stronger propensity to demand,

import, and consume greater quantities of imported sugar and processed foods compared to those in less globalized nations (Lin et al., 2018). This tendency reflects the deeper integration of global food markets into domestic consumption systems, leading to increased exposure to calorie-dense, nutrient-poor products.

One of the most illustrative cases of this phenomenon is Mexico, where over the past two decades, the United States has substantially increased its direct and indirect exports of corn, soybeans, sugar, snack foods, and meat products. This surge in agri-food trade has been closely associated with rising caloric availability and significant dietary transitions in Mexico, contributing to the escalating obesity rates (Clark et al., 2012).

More broadly, globalization has transformed the global food system, facilitating the proliferation of poor-quality diets worldwide. According to Hawkes et al. (2009), the structural processes of globalization such as trade and investment liberalization, foreign direct investment, and the expansion of multinational food corporations have promoted the widespread availability and consumption of processed and sugar-rich products, contributing to the global rise in obesity. The liberalization of trade and investment regimes has also accelerated the market penetration of sugar-sweetened carbonated beverages (SSCBs), which are strongly linked to elevated obesity and related non-communicable disease risk factors (Ferretti & Mariani, 2019; Schram et al., 2015).

Empirical studies further support the notion that trade openness is associated with adverse nutritional outcomes. An et al. (2019) find a positive correlation between a country's openness index and obesity prevalence. Their findings suggest that higher levels of economic integration are associated with increased exposure to globalized food markets and shifts in consumption patterns that favor high-calorie, low-nutrient diets. Baggio and Chong (2020) employ a difference-in-differences methodology that exploits the staggered timing of countries entering free trade agreements (FTAs) with the United States between 1990 and 2016. Their analysis reveals a statistically significant and economically meaningful increase in national obesity rates following FTA adoption. This evidence underscores the role of trade agreements not only in altering economic landscapes but also in influencing public health trajectories.

4. Theoretical Framework

4.1. Exporting Versus Importing Country

Figure 1 illustrates the relationship between sugar trade and domestic sugar consumption. Panel A depicts the impact of trade on a sugar-exporting country, while Panel B presents the corresponding effects on an importing country. In panel A, D_d represents the domestic demand while S_d is the supply of the exporting country. In the absence of trade, the domestic equilibrium price and quantity are denoted as P_d and q_d, respectively. When trade is introduced, an exporting country experiences an increase in the domestic price to P_t, leading to a reduction in domestic consumption to q_t. The higher domestic price reduces con-

sumer surplus by the area $(P_t beP_d)$, with the remaining consumer surplus represented by the area (abP_t). On the other hand, the producer surplus expands to the area $(P_t deP_d)$ reflecting the gains accrued by domestic producers as a result of elevated prices in the local market and the possibility of export. These dynamics emphasize the redistributive effects of trade, where producers benefit at the expense of consumers in sugar-exporting economies.

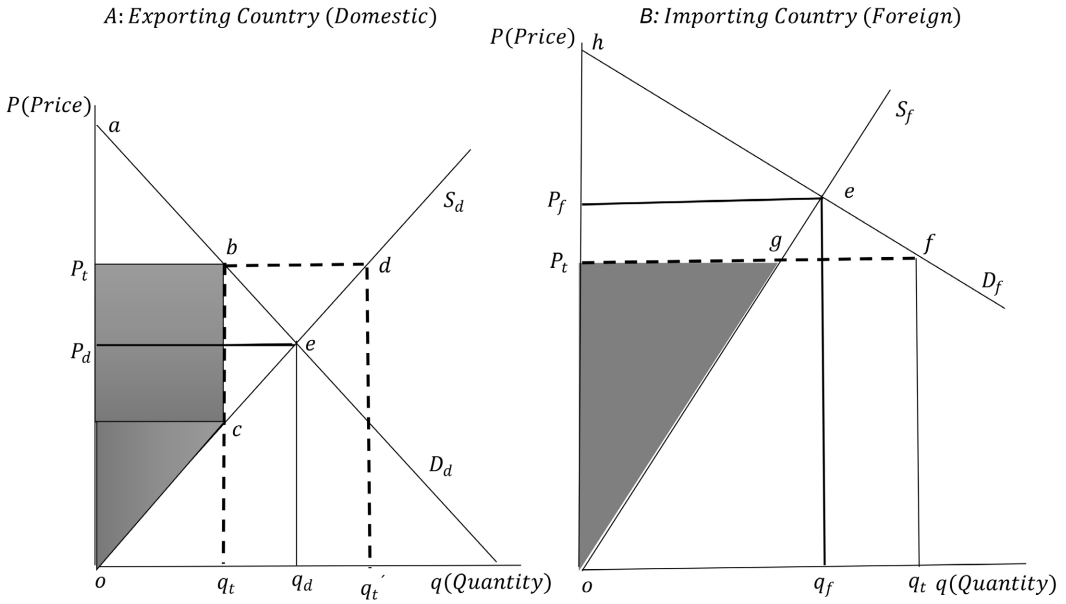

Figure 1. The effect of sugar trade on domestic consumption of sugar.

In panel B, D_f represents the domestic demand while S_f is the supply for the sugar importing country. Without trade, the domestic equilibrium price is P_f and quantity imported is q_f. Allowing trade pushes the price down to P_t and domestic consumption increases to q_t. As a result, consumer surplus increases to (hfP_t) and producer surplus is reduced to $(P_t go)$.

The findings of this model suggest that trade has significant implications for the sugar market and public health in the importing country. Specifically, trade leads to a reduction in the price of sugar especially for importers, making it more affordable and thereby stimulating domestic consumption. This increased sugar consumption, in turn, has potential adverse consequences for public health, particularly by exacerbating the prevalence of diet-related diseases such as obesity and diabetes.

From a theoretical perspective, the price reduction induced by trade can be understood through the standard supply and demand framework. In the absence of trade, domestic producers supply sugar at a higher equilibrium price, which constrains consumption. However, once trade is introduced, the influx of lower-priced imports drives down the domestic market price, increasing consumer surplus while reducing producer surplus. The resulting expansion in sugar consumption is consistent with standard consumer behavior, where lower prices incentiv-

ize greater consumption of normal goods, including sugar.

The public health implications of this trade-induced price decline are particularly noteworthy. A growing body of literature in health economics and nutritional epidemiology has documented the strong link between excessive sugar consumption and adverse health outcomes, including obesity, Type 2 diabetes, and cardiovascular diseases. By making sugar more affordable, trade may unintentionally contribute to overconsumption, thereby worsening health in the importing country. These effects are particularly pronounced in economies where dietary habits are already shifting toward higher consumption of processed and sugar-rich foods.

4.2. Heterogeneity in Domestic Demand

There exists significant heterogeneity in sugar demand within the domestic consumer base of importing countries, particularly along the income spectrum. Specifically, consumer responsiveness to price changes i.e., price elasticity of demand varies notably between high- and low-income groups. The price elasticity of demand of sugar for high-income consumers is inelastic demand for sugar; their consumption patterns remain largely unchanged in response to price fluctuations. In contrast, low-income consumers face a more elastic demand: reductions in sugar prices lead to disproportionately larger increases in consumption among this group. Consequently, as trade liberalization or other policy changes lead to lower domestic sugar prices, the burden of increased sugar intake and its associated health consequences, such as obesity more prevalent among poorer segments of the population. This divergence in price sensitivity offers a potential explanation for the observed socioeconomic gradient in obesity prevalence, wherein lower-income individuals are more adversely affected.

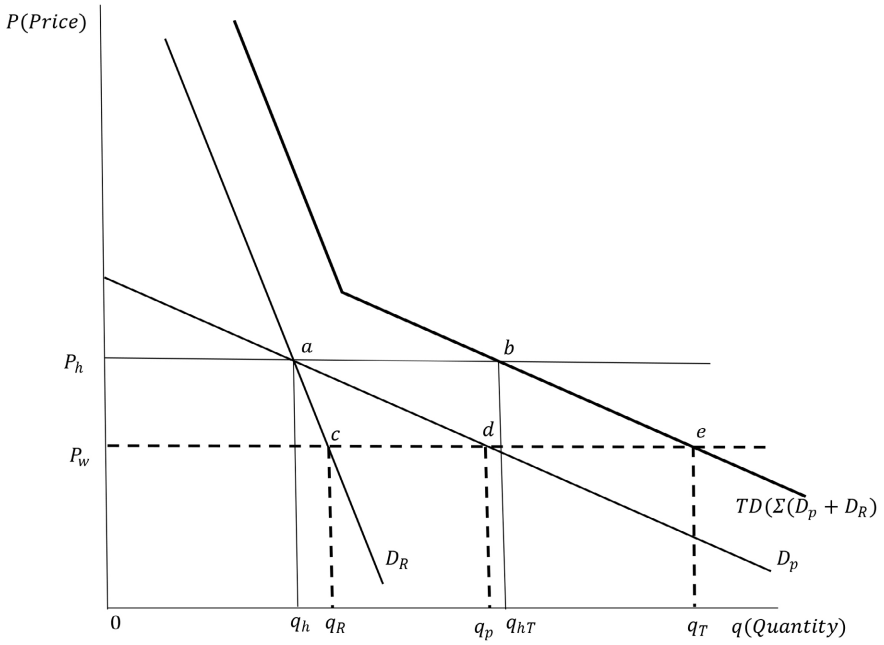

Figure 2. Heterogeneity in domestic demand (importers).

Figure 2 illustrates the heterogeneity in domestic sugar demand by disaggregating consumers into two representative groups based on economic status: low-income (the "poor") and high-income (the "rich") households. The demand curve labeled D_P reflects the relatively elastic demand of low-income consumers, while D_R represents the inelastic demand of high-income consumers. Let P_h denote the autarky (pre-trade) domestic price of sugar, and P_w the lower world price under free trade conditions. For a sugar-importing country, trade liberalization reduces the market price from P_h to P_w. As a result, the quantity demanded by low-income consumers expands substantially from $0q_h$ to $0q_p$. In contrast, the increase in sugar consumption among high-income consumers is relatively modest, from $0q_h$ to $0\,q_R$. This differential response emphasizes the greater elasticity of demand among the poor, suggesting that trade-induced price reductions may disproportionately elevate their sugar consumption and potentially increase the related health risks like higher BMI score.

4.3. Differential Domestic Demand Structure: A Stylized Illustration

Figure 3 presents a stylized comparison of sugar demand structures between two countries, i.e., country A and country B, highlighting the role of income-based population heterogeneity in shaping aggregate demand. In country A, the population is predominantly composed of low-income (or poor) consumers, whose demand for sugar, denoted by D_p, is more price sensitive. A relatively small segment of the population belongs to the high-income group, with their corresponding demand represented as D_R. Accordingly, the total demand for sugar in Country A is given by $TD\left(\Sigma\left(D_p + D_R\right)\right)$, reflecting the weighted contributions of these two distinct income groups.

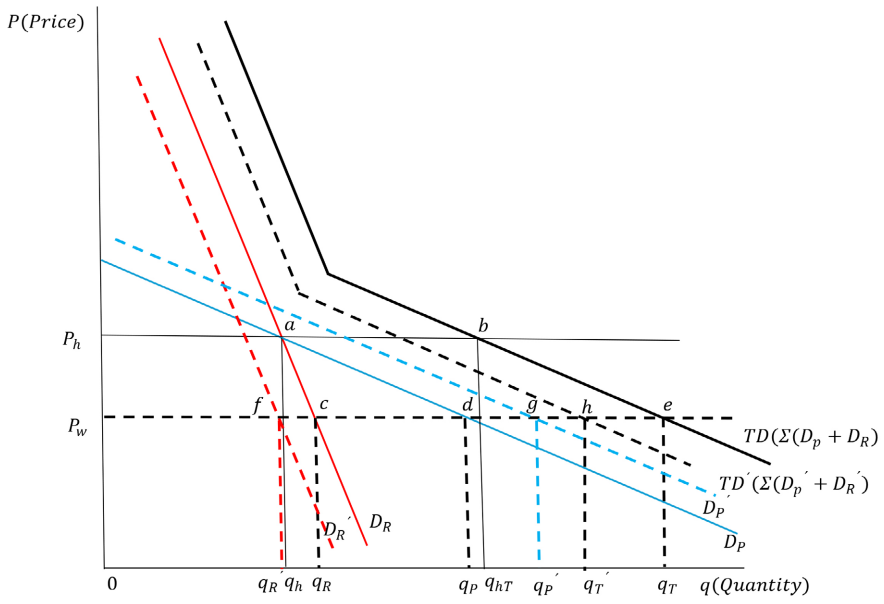

Figure 3. Structural differences in sugar consumption patterns in importing nations.

In contrast, Country B exhibits a different demographic composition, characterized by a larger proportion of high-income consumers. In this case, the sugar demand of poor and rich individuals is denoted by D'_P and D'_R respectively. Consequently, total sugar demand in Country B is represented by $TD'\left(\Sigma\left(D'_p + D'_R\right)\right)$. The structure and magnitude of domestic demand TD differ markedly from that of TD' due to the differing price elasticities and consumption behaviors inherent in each income group.

As illustrated in Figure 3, the aggregate quantity of sugar demanded in Country A exceeds that of Country B, primarily due to the dominance of poor consumers in Country A who tend to consume larger quantities of staple commodities like sugar due to their preference. This differential behavior emphasizes the critical role of income distribution in determining the structure and level of commodity demand at the national level.

4.4. Endogenous Demand Shocks: Price Support for Export Producers

The left panel of Figure 4 illustrates the domestic demand $\left(D_X\right)$ and supply $\left(S_X\right)$ curves for sugar in the exporting country, where the equilibrium price in the domestic market is denoted by P_X, and the corresponding equilibrium quantity is Q_X. D_M is the domestic demand and S_M is the domestic supply in an importing country, as shown in the right panel. The equilibrium price in importing country is P_I and equilibrium quantity is Q_M.

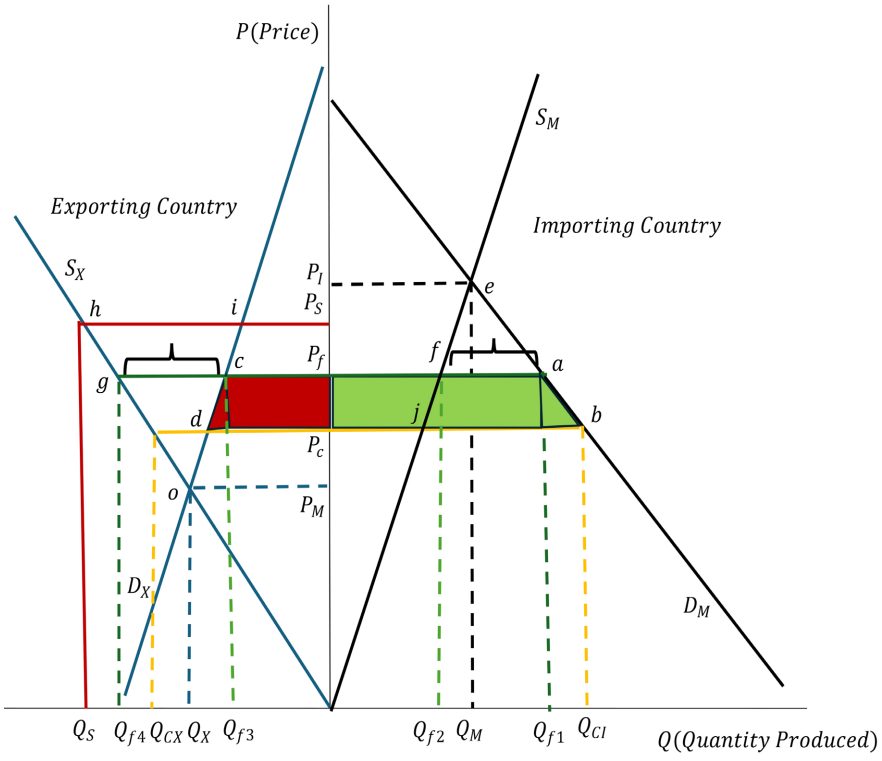

Figure 4. Export sugar producer price supports: consumption and trade.

Under free trade conditions, the domestic price in the exporting country rises to P_f. Domestic consumers demand a quantity q_{f3} at this elevated price level, while domestic producers supply a greater quantity Q_{f4}. The resulting surplus, which is defined as the difference between domestic supply and domestic demand at the free trade price, is allocated to international markets in the form of exports.

Conversely, in the importing country, free trade leads to a decline in the domestic market price. This price reduction stimulates an increase in domestic demand to Q_{f1}, while domestic producers respond by supplying a lower quantity (Q_{f2}), at the new market price. The resulting shortfall between domestic demand and supply is met through imports sourced from abroad.

When the government introduces a price support policy at a level P_s (where $P_s > P_f$), it encourages higher domestic production of sugar in the exporting country due to price incentives. As a result, the market-clearing sugar price becomes P_c, where quantity demanded matches with external sector. This intervention affects consumer and producer surplus in both the exporting and importing countries. When we account for heterogeneity in domestic demand structures, the distribution of gains from trade, particularly consumer surplus, can vary significantly. The consumer surplus in exporting country is $\left(P_f P_c dc\right)$ while the consumer surplus in the importing country is $\left(P_f abP_c\right)$. The consumer surplus in importing country $\left(P_f abP_c\right)$ is much higher than the consumer surplus in the exporting country $\left(P_f P_c dc\right)$. The greater consumer surplus in the importing country reflects the enhanced access to cheaper sugar. Conversely, the consumer surplus in the exporting country is smaller as more sugar is diverted toward the export market and less is available for domestic consumption at the supported price. The producer surplus in exporting country increases to $\left(P_s 0h\right)$ while the producer surplus in the importing country reduces to $\left(P_c j0\right)$.

The analysis highlights the role of price support policies not only in enhancing domestic production and exports but also in redistributing welfare between consumers and producers, and across trading partners. The magnitude and direction of these welfare effects are intricately tied to the relative slopes and shifts in domestic and foreign demand, the elasticities of supply and demand, and the degree of market integration. In this context, policymakers should evaluate both aggregate welfare effects and distributional outcomes across the countries to ensure effective and relative gains from trade. This analysis also holds for almost all agricultural commodities that receive price support (Emran & Schmitz, 2023).

5. Empirical Evidence

While the highest obesity prevalence rates in 2022 were recorded in small island nations such as American Samoa, Nauru, Tokelau, the Cook Islands, Niue, Tonga, Tuvalu, Samoa, and French Polynesia (Global Obesity Observatory, 2022), these countries represent a relatively small share of the global population. To contextualize obesity within a broader demographic and economic dynamics, **Table 1** focuses on countries with substantial population sizes that also rank among the top

25 globally in terms of obesity prevalence. Furthermore, the table links each country's obesity ranking with its status in the international sugar trade, offering insights into the relationship between trade flows and public health outcomes in more populous economies.

Table 1. Countries with high obesity and their status of sugar trade (2022).

	Percentage of People Obese	Ranking in Terms of Percentage of People Obese in 2022	Status of Sugar Trade
United States	41.64	10	Importer
Qatar	40.79	11	Importer
Romania	38.34	16	Importer
Saudi Arabia	38.13	17	Importer
Hungary	36.43	21	Exporter
Argentina	35.53	24	Exporter
Croatia	34.8	25	Importer

Source: Global Obesity Observatory & The Observatory of Economic Complexity (OEC) (2023).

Table 2. Top 5 countries with daily per capita sugar consumption and status of sugar trade in 2024.

	Per capita sugar consumption daily (in grams)	Status of sugar trade
United States	126.4	Net Importer
Germany	102.9	Net Importer
Netherlands	102.5	Net Exporter
Ireland	96.7	Net Importer
Australia	60	Net Exporter

Source: World Population Review (2025).

Sugar imports play a significant role in increasing the availability and consumption of sugar in multiple forms, including processed foods and sweetened beverages. This heightened accessibility often leads to excessive caloric intake, thereby contributing to weight gain and elevating BMI levels among consumers. For example, the United States ranks as the highest global consumer of sugar, with an average per capita intake of 126.4 grams per day that exceeds the minimum recommended daily limit of 11 grams by more than tenfold. Health experts note that a substantial portion of this sugar consumption stems from added sugars incor-

porated into processed foods and beverages. These added sugars are present in various forms, including but not limited to white and brown sugar, high-fructose corn syrup, sucrose, dextrose, molasses, and honey. Table 2 reports on the countries with top per capita sugar consumption daily and status of sugar trade. It presents the evidence that top sugar importing countries are also heavy consumers of sugar.

Among the top sugar-consuming nations, the United States leads with a daily per capita intake of 126.4 grams, followed by Germany (102.9 grams), the Netherlands (102.5 grams), and Ireland (96.7 grams). One notable aspect is that most of these countries including the United States, Germany, and Ireland are net importers of sugar.

6. Conclusion

This paper provides both theoretical and empirical evidence that international sugar trade, by lowering prices and increasing accessibility, plays a significant role in shaping consumption patterns. Free trade reduces the consumption of sugar in exporting countries and increases consumption in sugar-importing countries. However, in the case of sugar price supports for exporting countries, world consumption of sugar increases, but the increase in sugar consumption of exporters is small compared to that of importers. The observed disparity in sugar intake between importing and exporting nations suggests that trade flows are not merely economic exchanges but also key determinants of public health. These findings call for a critical reassessment of trade policies, with greater attention to their nutritional and health implications, particularly in countries heavily reliant on imported sugar.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

An, R., Guan, C., Liu, J., Chen, N., & Clarke, C. (2019). Trade Openness and the Obesity Epidemic: A Cross-National Study of 175 Countries during 1975-2016. *Annals of Epidemiology, 37,* 31-36. https://doi.org/10.1016/j.annepidem.2019.07.002

Baggio, M., & Chong, A. (2020). Free Trade Agreements and World Obesity. *Southern Economic Journal, 87,* 30-49. https://doi.org/10.1002/soej.12447

Clark, S. E., Hawkes, C., Murphy, S. M. E., Hansen-Kuhn, K. A., & Wallinga, D. (2012). Exporting Obesity: US Farm and Trade Policy and the Transformation of the Mexican Consumer Food Environment. *International Journal of Occupational and Environmental Health, 18,* 53-64. https://doi.org/10.1179/1077352512z.0000000007

Emran, S. J., & Schmitz, A. (2023). Impact of COVID-19 (2020–2022) on Cotton and Garments Market of Bangladesh: A Small Country Case. *Journal of Agricultural & Food Industrial Organization, 21,* 89-98. https://doi.org/10.1515/jafio-2022-0027

Emran, S. J., Fang, D., Schmitz, A., & Devadoss, S. (2025). *Sugar Trade and Obesity: Does Sugar Trade Accelerate Weight Gain?* Working Paper, FRE, IFAS, UF.

Ferretti, F., & Mariani, M. (2019). Sugar-Sweetened Beverage Affordability and the Prevalence of Overweight and Obesity in a Cross Section of Countries. *Globalization and Health, 15,* 1-14. https://doi.org/10.1186/s12992-019-0474-x

Global Obesity Observatory (2022). https://data.worldobesity.org/tables/ranking-obesity-by-country-adults-1.pdf

Hawkes, C., Chopra, M., & Friel, S. (2009). Globalization, Trade, and the Nutrition Transition. In *Globalization and Health* (pp. 257-284). Routledge.

Kennedy, P. L., Schmitz, A., & DeLong, K. L. (2019). Biotechnology and Demand Concerns: The Case of Genetically Modified US Sugar Beets. *AgBioForum, 22,* 1-13.

Lakkakula, P., & Schmitz, A. (2019). U.S. Sweeteners: Combating Excess Consumption with an Excise Tax? *Agricultural Economics, 50,* 543-554. https://doi.org/10.1111/agec.12508

Lin, T. K., Teymourian, Y., & Tursini, M. S. (2018). The Effect of Sugar and Processed Food Imports on the Prevalence of Overweight and Obesity in 172 Countries. *Globalization and Health, 14,* 1-14. https://doi.org/10.1186/s12992-018-0344-y

Schram, A., Labonte, R., Baker, P., Friel, S., Reeves, A., & Stuckler, D. (2015). The Role of Trade and Investment Liberalization in the Sugar-Sweetened Carbonated Beverages Market: A Natural Experiment Contrasting Vietnam and the Philippines. *Globalization and Health, 11,* 1-13. https://doi.org/10.1186/s12992-015-0127-7

The Observatory of Economic Complexity (OEC) (2023). https://oec.world/en/profile/bilateral-product/raw-sugar/reporter/deu

World Population Review (2025). https://worldpopulationreview.com/country-rankings/sugar-consumption-by-country#10-countries-with-the-highest-sugar-consumption