Global assessment of climate change and trade on food security

Aggarwal, Sakshi

Indian Institute of Foreign Trade

25 April 2023

Global assessment of climate change and trade on food security

Sakshi Aggarwal
Indian Institute of Foreign Trade
Email – sakshi230391@gmail.com

Abstract

The rise in global trade has led to improvements in the standard of living and lifted many out of poverty, but not all countries have been able to fully integrate into the world trading system due to lack of resources. Access to food supplies is critical for those with inadequate access to food for sustainable consumption. The evolving trade dynamics and climate change will result in winners and losers for the global food system, with some regions experiencing double exposure to economic and climate-related shocks and stressors. Trade openness can significantly reduce vulnerabilities and enhance food security, if necessary, infrastructure is in place. Although global trade can play a crucial role in ensuring that the global food system adapts to a changing climate, this potential will only be realized if trade is managed to maximize the benefits of broadened access to new markets and minimize the risks of increased exposure to international competition and market volatility. For regions like Africa, enhanced transportation networks, combined with greater national reserves of cash and enhanced social safety nets, could reduce the impact of double exposure on food security.

Keywords International trade, food security, climate change

Introduction

Rise in global trade has been observed to be twice the rate of the global economy since 1990's, thereby lifting majority of population out of poverty, enhancing international competitiveness, expanding industrial relations between the economies, and improving standard of living (WTO, 2016; Aggarwal and Chakraborty, 2021, 2022). The world economy has been shaped by the "threads" or phases of global integration - each one driven by underlying changes in transport and communication technologies that had reduced trade costs over the period of time, led to even wider and deeper levels of connectivity among national economies, and required new forms of trade cooperation, institutional reforms to consolidate and reinforce these structural trends at the global level (Aggarwal, 2017a, 2017b; WTO, 2018). Indeed, it is the critical interplay between technology-driven structural change, on the one hand, and the ability of the world trading system to manage these adjustments, on the other, which has largely determined the impact of global integration on further trade expansion (Basu and Fernald, 2002; Fisher, 2006; Aggarwal et al., 2021, 2022, 2023).

Although progressive liberalization of world trade through, for example, successive rounds of General Agreement on Tariffs and Trade (GATT) negotiations, has created opportunities for developing countries to access developed country markets more easily, however, many developing economies have struggled to become fully integrated in the world trading system (Henson and Loader, 2001; Aggarwal and Chakraborty, 2020a, 2020b, 2020c) due to lack of resources to participate effectively in the institutions of the WTO, and thus may be unable to exploit the opportunities provided by these agreements (Aggarwal, 2020, 2023b, 2023c). This urge of participation is particularly acute amongst those groups that suffer inadequate access to food for sustainable consumption, since availability of food supplies in a deficit area at the right time may significantly help in reducing the local commodity prices. Over the next decade, evolution of global trade will form the basis for food security among hundreds of millions of people, particularly in the developing nations (Aggarwal and Chakraborty, 2017, 2019).

The evolving trade dynamics witnesses the modifications in existing vulnerabilities to climate change due to on-going processes of economic globalization. In the contemporary analysis, it is believed that both of these global processes, occurring simultaneously, will result in new sets of winners and losers for the global food system. Winners are considered those countries, regions or groups that are likely to benefit from the dual processes of climate change or globalization, while losers are those that are disadvantaged by the processes and likely to experience negative consequences by increasing vulnerable people's 'double exposure' (O'Brien and Leichenko, 2000). By double exposure, we refer to the fact that economic, climate-related shocks and stressors act together to increase overall vulnerabilities of regions, sectors, ecosystems and social groups. The present analysis advocates that if necessary physical and institutional infrastructure are set forth in the respective countries then trade openness can significantly reduce both individual and institutional vulnerabilities by (i) enhancing future food security and (ii) reducing climate change-induced food availability shocks in the ecosystem.

Food security and the food system

Food security exists when "all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 1996). Food security is almost always a matter of "access" instead of "availability". Analyzing food security entails differentiating the concepts of food availability and food accessibility. Availability refers to the physical presence of adequate food supplies that depends on effective agricultural production. Accessibility, on the other hand, refers to the ability of people within a particular country or region to actually receive or gain access to the food. Broadly speaking, food security is comprised of four main dimensions: physical food availability, food access, food utilization, as well as the overall stability of the other three dimensions over time. A household is considered food secure if it has the ability to acquire the food needed by its members for attaining self-sufficiency (Pinstrup-Andersen, 2009). Availability of food supplies is determined by the size of market, costs of distribution channels and transport, amount of food production, storage facilities for food stocks, and other logistical constraints such as risk of being undercut by other traders and surpluses available for resale (Devereux, 1988).

Attainment of food security does not assure nutritional security. The extent to which individual food security results in good nutrition depends on a set of non-food factors such as climate, access to primary health care, better sanitary conditions, and an individual's ability to utilize food for body nourishment. The food system involves a network of interactions between physical and biological environments as food moves from production to consumption. For instance, rising carbon dioxide can directly influence nutritional content of foods, warmer temperature can result in greater food spoilage, and extreme climate events can disrupt food distribution (Kim, 20016). Integrity to this food security component relies heavily on the affordability of food products to social groups that govern the allocation of available food within a society, including intra-nation and intra-household. Affordability of food refers to the price of a particular food and the relative price of substitute foods, which is generally impacted by the budget constraints faced by consumers, who takes into account the prices of different foods as well as the prices of other necessities to meet their individual requirement (Ver Ploeg et al., 2009).

Finally, in the long run, stability of each pillar shapes food security outcomes in an economy. Therefore, it is asserted that overall stability of these pillars does not adversely affect food security status in the event of unpredictable situations, such as extreme weather and political unrest (FAO, 2014). However, it has been argued that climate change, and especially increased climate variability, is one of the greatest challenges to food security, particularly via its effects on the livelihoods of low-income individuals and communities, which have less capacity for adaption and depend on highly climate-sensitive activities, such as agriculture, may affect food security by introducing instabilities in one or more components (Vermeulen et al., 2012).

Access, availability, utilization and the stability of these three pillars take shape in the context of the global food system. This system facilitates the movement of food from producers to consumers. An access to global food chain market helps to smooth out local price shocks and lower the cost of production and transportation, facilitating greater mobilization and choice to most people within this system (Baltzer, 2013).

Climate Change

It is well noted that anthropogenic greenhouse gas emissions have contributed to a change in the climate conditions, and that such trends will continue in the future unless precautionary measures are adopted (Houghton et al., 1998). There is a broad recognition that these changes will be associated with both winners and losers, located in wide-ranging territories, it is quite clear that magnitude of their distribution will be varied, reflecting the diversity of climate change impacts. The physical and social impacts of climate change are not considered to be unvarying for two reasons. First, global circulation models project spatial differences in the magnitude and direction of climate change. Second, even within a region experiencing the same characteristics of climate change, the causal impacts are likely to vary because different ecoystems, sectors or social groups may be more vulnerable to extreme weather conditions than others.

Appendini and Liverman (1994) emphasized that the most vulnerable people may not be in most vulnerable habitats - for instance, poor people can live in productive biophysical environments and be vulnerable, and wealthy people can live in fragile physical environments and still reside relatively well (Liverman, 1990).

This analogy suggests that assessments of vulnerability should not be limited to third world countries or countries with precarious physical surroundings.

Climate change has affected major agricultural regions in the world. These changes have multiple implications for the prevailing global food system. The effect of global climate change on food production (and therefore availability) is well-documented (Sivakumar, 2006; Challinor et al., 2007; Wang et al., 2009; Rosenzweig et al., 2014). The effects of changes in climate on crop yields tend to be gradual until a threshold is reached. As the planet warms, more regions may experience yield stagnation and eventual declines, thereby affecting overall food production adversely. Moreover, these risks even extend beyond agricultural production to other elements of food systems - including storage, processing and packaging - that are very likely to be affected by increase in temperature. An example is stocking perishable food products in a cooling environment to extend their shelf life requires vast storage capacity as well as entails higher energy costs (Moretti et al., 2010; Vermeulen et al., 2012).

Logistic and packaging companies work in collaboration with farmers, who seek to reduce food waste, to develop suitable packages that provide ventilation and controlled temperature for their fresh produce. Further, the recent usage of cosmetic preservatives in food products to enhance their longevity may have far-reaching repercussions on public health (Schwensen et al., 2015). Climate change not only poses challenges for optimum utilization of food but also increases food safety risks throughout various stages of the food supply chain (Jacxsens et al., 2010; Tirado, 2010; Verghese et al., 2015).

It is evident that climate change impacts the availability of food production to the end consumers. There is no doubt that the price of a food is a crucial factor in determining food access, it is hardly the only factor, and in some cases, may not be the most important factor. It is often intriguing that market interactions dictate which group has access to food and how the possibility of food insecurity occurs even in places where prices are low or result in distribution of food in circumstances where food prices spike (Bellemare, 2015).

Furthermore, rise in sea level and changing frequency of weather extremes such as heat waves, drought and tornado may impede the movement of food from places with surplus food stock to deficit areas. Such global impact may shape the availability and utilization of food in particular places. Hence, infrastructure results in local shortages and impacts the availability of food products for the inhabitants.

Impact of international trade and environmental changes on food security

Enhancing access to sufficient calories and nutritious food is crucial for those who are most affected by climate change. Trade serves as a crucial avenue to achieve this. The food system has undergone significant developments in terms of technology, management practices, and globalization, including international trade and market connectivity. These have led to the widespread diffusion of new technologies, as well as regional agricultural specialization and intensification, resulting in adequate calorie production to feed the entire population (Flynn et al., 2009; Garnett et al., 2013; MacDonald et al., 2015; Aggarwal, 2023a).

Currently, and it seems likely for the upcoming future, the primary challenge with food security lies in the equitable distribution of food across nations, regions, and households, rather than inadequate food production at a global scale. Transporting food to areas where it is required necessitates physical transportation means, absence of trade impediments, and the financial resources to procure sufficient nutrition. Trade serves as a crucial factor driving economic growth, employment, and poverty reduction, and is often instrumental in increasing food availability and stability. However, the effects of trade on food security may vary based on different socio-economic scenarios, such as those outlined by the shared socioeconomic pathways (SSPs) developed by climate impact and vulnerability researchers. Under SSP1 and SSP5, where world markets are highly interconnected and trade flows effortlessly between countries and regions, markets can effectively facilitate the transfer of food from surplus areas to those experiencing deficits. Such scenarios are likely to mitigate challenges associated with food availability resulting from climate change (Lybbert and Sumner, 2012; Brown and Kshirsagar, 2015; Wiebe et al., 2015).

According to Wiebe et al. (2015), a world where the climate remains stable under current conditions has higher price increases in high-emissions/low-international-cooperation scenarios with restricted levels of global trade, as opposed to low-emissions/high-international-cooperation scenarios with moderate-to-high levels of global trade. In general, reduced trade results in higher prices, which in turn increase the number of food-insecure people.

International trade can have both advantages and disadvantages for poor and remote households, some of which are already evident, and some that may become more significant as climate change continues. These include the vulnerability of local food affordability to international price shocks, lack of competitiveness in the global marketplace, and isolation due to inadequate infrastructure. Although access to international markets provides opportunities, it also introduces new sources of volatility in areas that would otherwise not be affected by distant markets or climate stresses. The benefits of international trade to low-income countries and agricultural exporters are often evaluated at the national or regional level, but when analyzed at lower spatial scales, the impact can be more complex. For instance, the 2008 global food price hike led to a sharp increase in food costs in Burkina Faso, despite above-average domestic agricultural production that year (FAO, 2016). Addressing these downsides of trade is crucial to ensure the long-term sustainability of the national and global food system, and it is essential for donors and states to take necessary measures.

Although international trade can provide countries with access to food in a general sense, it cannot on its own improve food availability within isolated communities, address the needs of socially marginalized and poor people, or solve health problems associated with inadequate food utilization (Handa and Mlay, 2006). Due to inadequate infrastructure in many foods' insecure African nations, there is little to no formal trade between land-locked countries in North-central Africa and the more developed regions in the East and South. High transport costs lead to higher local producer prices and reduce competition from cheaper imports, resulting in restricted access to food for the most vulnerable households (Lee et al., 2012).

It is important to approach these concerns with caution. The world rice price tripled in just four months during the 2008 food price crisis, primarily due to export restrictions imposed by major rice-exporting countries (Anderson et al., 2014; Bellemare, 2014; Aggarwal, 2016). While restricting trade (import or export) may provide short-term protection from regional and global economic shocks, it can have long-term consequences. When trade is restricted, producers are unable to adjust production effectively, resulting in higher prices, reduced uptake of technology, and difficulty in adapting to changes. Moreover, food security can be further exacerbated by the effects of climate change (Brown et al., 2015).

Conclusion

Productive policies that address future food security require evaluation of food security outcomes, which is the product of linked economic and environmental changes now as well as in the future. When considering food security as the outcome of double exposure, different parameters need to be explored apart from climatic variables such as temperature and rainfall. Some future societies and economies may be more vulnerable to associated climate change than others, while in the coming decades, it might be presumed that some societal changes are likely to be more influential for food security outcomes than climate. These include population growth, change in income structure, change in tastes and preferences, and the affordability of food, that will largely determine the individual's ability to purchase and consume food.

Efficient and open markets supported by trade can enhance agricultural producer income and long-term food security in low-income countries. By selling surplus production, producers can benefit from trade while also improving productivity through the provision of lower-priced or more diverse production inputs such as seed, fertilizer, pesticides, and machinery. However, farmers in low-income countries often lack the physical, financial, and government infrastructure required to compete with producers in other countries who have better infrastructure and superior access to markets. Therefore, supporting small producers and effective government policies along the food chain is essential for linking producers to efficient and open markets, which is crucial for long-term food security.

References

Anderson, K., Ivanic, M., Martin, W., Chavas, J. P., Hummels, D., & Wright, B. D. (2014). The economics of food price volatility. *National Bureau of Economic Research Available at: https://www. nber. org/system/files/chapters/c*, *12818*, c12818.

Aggarwal, S. (2016). Determinants of money demand for India in presence of structural break: An empirical analysis. *Business and Economic Horizons* (BEH), Prague Development Center (PRADEC), 12(4), 173-177.

Aggarwal, S. (2017a). Smile curve and its linkages with global value chains. *Journal of Economic Bibliography*, 4(3).

Aggarwal, S. (2017b). Sectoral Level Analysis of India's Bilateral Trade over 2001-2015. *MPRA Paper No 80099,* University Library of Munich, Germany. Retrieved from https://mpra.ub.uni-muenchen.de/80099/ (Accessed on March 10, 2023)

Aggarwal, S. (2020). Determinants of Intra-Industry Trade and Labour Market Adjustment: A Sectoral Analysis for India (Doctoral dissertation, Indian Institute of Foreign Trade).

Aggarwal, S. (2023a). Machine Learning Algorithms, Perspectives, and Real - World Application: Empirical Evidence from United States Trade Data. *International Journal of Science and Research*, 12(3), pp. 292-313. https://www.ijsr.net/getabstract.php?paperid=SR23305084601

Aggarwal, S. (2023b). The empirical measurement and determinants of intra-industry trade for a developing country. *MPRA Paper No. 117112*, University Library of Munich, Germany. Retrieved from https://mpra.ub.uni-muenchen.de/117112/ (Accessed on April 21, 2023).

Aggarwal, S. (2023c). LSTM based Anomaly Detection in Time Series for United States exports and imports. *MPRA Paper No. 117149*, University Library of Munich, Germany. Retrieved from https://mpra.ub.uni-muenchen.de/117149/ (Accessed on April 26, 2023).

Aggarwal, S., & Chakraborty, D. (2017). Determinants of India's bilateral intra-industry trade over 2001–2015: Empirical results. *South Asia Economic Journal*, 18(2), 296–313.

Aggarwal, S., & Chakraborty, D. (2019). Which factors influence India's intra-industry trade? Empirical findings for select sectors. *Global Business Review*. Retrieved from https://journals.sagepub.com/doi/10.1177/0972150919868343 (Accessed on April 23, 2020).

Aggarwal, S., & Chakraborty, D. (2020a). Labour market adjustment and intra-industry trade: Empirical results from Indian manufacturing sectors. *Journal of South Asian Development*, 15(2), 238-269.

Aggarwal, S., & Chakraborty, D. (2020b). Determinants of vertical intra-industry trade: Empirical evidence from Indian manufacturing sectors. *Prajnan: Journal of Social and Management Sciences*, 49(3), 221-252.

Aggarwal, S., & Chakraborty, D. (2020c). Is there any relationship between Marginal Intra-Industry Trade and Employment Change? Evidence from Indian Industries. *Working Paper, No. EC-20-44*, Indian Institute of Foreign Trade, Delhi.

Aggarwal, S., Chakraborty, D., & Bhattacharyya, R. (2021). Determinants of Domestic Value Added in Exports: Empirical Evidence from India's Manufacturing Sectors. *Global Business Review*. https://doi.org/10.1177/09721509211050138.

Aggarwal, S., & Chakraborty, D. (2021). Which factors influence vertical intra-industry trade in India? Empirical results from panel data analysis. *Working Paper, No. EC-21-54*, Indian Institute of Foreign Trade, Delhi. Retrieved from http://cc.iift.ac.in/research/Docs/WP/EC-21-54.pdf (Accessed on March 20, 2023)

Aggarwal, S., Chakraborty, D. (2022). Which Factors Influence India's Bilateral Intra-Industry Trade? Cross-Country Empirical Estimates. *Working Papers 2260*, Indian Institute of Foreign Trade, Delhi.

Aggarwal, S., Mondal, S., & Chakraborty, D. (2022). Efficiency Gain in Indian Manufacturing Sectors: Evidence from Domestic Value Addition in Exports. *Empirical Economics Letters*, 21(2): 69-83.

Aggarwal, S., Chakraborty, D., & Banik, N. (2023). Does Difference in Environmental Standard Influence India's Bilateral IIT Flows? Evidence from GMM Results. *Journal of Emerging Market Finance*, 22(1), 7–30. https://doi.org/10.1177/09726527221088412.

Appendini, K., & Liverman, D. (1994). Agricultural policy, climate change and food security in Mexico. *Food Policy*, *19*(2), 149-164.

Baltzer, K. (2013). *International to domestic price transmission in fourteen developing countries during the 2007-08 food crisis* (No. 2013/031). WIDER working paper.

Basu, S., & Fernald, J. G. (2002). Aggregate productivity and aggregate technology. *European Economic Review*, 46(6), 963-991.

Bellemare, M. F. (2014). Comment on" Food Price Spikes, Price Insulation, and Poverty". In *The Economics of Food Price Volatility* (pp. 339-344). University of Chicago Press.

Bellemare, M. F. (2015). Rising food prices, food price volatility, and social unrest. *american Journal of agricultural economics*, *97*(1), 1-21.

Brown, M., Antle, J., Backlund, P., Carr, E., Easterling, B., Walsh, M., ... & Tebaldi, C. (2015). Climate change, global food security and the US food system.

Brown, M. E., & Kshirsagar, V. (2015). Weather and international price shocks on food prices in the developing world. *Global Environmental Change*, *35*, 31-40.

Challinor, A., Wheeler, T., Garforth, C., Craufurd, P., & Kassam, A. (2007). Assessing the vulnerability of food crop systems in Africa to climate change. *Climatic change*, *83*, 381-399.

Devereux, S. (1988). Entitlements, availability and famine: a revisionist view of Wollo, 1972–1974. *Food Policy*, 13(3), 270-282

FAO. (1996). *World food summit: Rome declaration on world food security and World Food summit plan of action*. FAO.

FAO. (2014). *State of Food Insecurity in the World 2013: The Multiple Dimensions of Food Security*. FAO.

FAO. (2016). *FAO Statistical Database*.

Fisher, J. D. (2006). The dynamic effects of neutral and investment-specific technology shocks. *Journal of political Economy*, 114(3), 413-451.

Flynn, D. F., Gogol-Prokurat, M., Nogeire, T., Molinari, N., Richers, B. T., Lin, B. B., ... & DeClerck, F. (2009). Loss of functional diversity under land use intensification across multiple taxa. *Ecology letters*, 12(1), 22-33.

Garnett, T., Appleby, M. C., Balmford, A., Bateman, I. J., Benton, T. G., Bloomer, P., ... & Godfray, H. C. J. (2013). Sustainable intensification in agriculture: premises and policies. *Science*, *341*(6141), 33-34.

Handa, S., & Mlay, G. (2006). Food consumption patterns, seasonality and market access in Mozambique. *Development Southern Africa*, *23*(4), 541-560.

Henson, S., & Loader, R. (2001). Barriers to agricultural exports from developing countries: the role of sanitary and phytosanitary requirements. *World development*, 29(1), 85-102.

Houghton, J. T., Meira Filho, L. G., Callander, B. A., Harris, N., Kattenberg, A., Maskell, K., & Wall, G. (1998). The science of climate change. *Environments*, *25*(2/3), 133.

Jacxsens, L., Luning, P. A., Van der Vorst, J. G. A. J., Devlieghere, F., Leemans, R., & Uyttendaele, M. (2010). Simulation modelling and risk assessment as tools to identify the impact of climate change on microbiological food safety–The case study of fresh produce supply chain. *Food Research International*, *43*(7), 1925-1935.

Kim, E. J. (2016). The impacts of climate change on human health in the United States: A scientific assessment, by us global change research program. *Journal of the American Planning Association*, *82*(4), 418-419.

Lee, J., Gereffi, G., & Beauvais, J. (2012). Global value chains and agrifood standards: Challenges and possibilities for smallholders in developing countries. *Proceedings of the National Academy of Sciences*, *109*(31), 12326-12331.

Liverman, D. M. (1990). Vulnerability to global environmental change. *Understanding global environmental change: The contributions of risk analysis and management*, *26*, 27-44.

Lybbert, T. J., & Sumner, D. A. (2012). Agricultural technologies for climate change in developing countries: Policy options for innovation and technology diffusion. *Food policy*, *37*(1), 114-123.

MacDonald, G. K., Brauman, K. A., Sun, S., Carlson, K. M., Cassidy, E. S., Gerber, J. S., & West, P. C. (2015). Rethinking agricultural trade relationships in an era of globalization. *BioScience*, *65*(3), 275-289.

Moretti, C. L., Mattos, L. M., Calbo, A. G., & Sargent, S. A. (2010). Climate changes and potential impacts on postharvest quality of fruit and vegetable crops: A review. *Food Research International*, *43*(7), 1824-1832.

O'Brien, K. L., & Leichenko, R. M. (2000). Double exposure: assessing the impacts of climate change within the context of economic globalization. *Global environmental change*, 10(3), 221-232.

Pinstrup-Andersen, P. (2009). Food security: definition and measurement. *Food security*, 1(1), 5-7.

Rosenzweig, C., Elliott, J., Deryng, D., Ruane, A. C., Müller, C., Arneth, A., ... & Jones, J. W. (2014). Assessing agricultural risks of climate change in the 21st century in a global gridded crop model intercomparison. *Proceedings of the national academy of sciences*, *111*(9), 3268-3273.

Schwensen, J. F., White, I. R., Thyssen, J. P., Menné, T., & Johansen, J. D. (2015). Failures in risk assessment and risk management for cosmetic preservatives in Europe and the impact on public health. *Contact Dermatitis*, *73*(3), 133-141.

Sivakumar, M. V. (2006). Climate prediction and agriculture: current status and future challenges. *Climate research*, *33*(1), 3-17.

Tirado, M. C., Clarke, R., Jaykus, L. A., McQuatters-Gollop, A., & Frank, J. M. (2010). Climate change and food safety: A review. *Food Research International*, *43*(7), 1745-1765.

Ver Ploeg, M., Breneman, V., Farrigan, T., Hamrick, K., Hopkins, D., Kaufman, P., ... & Tuckermanty, E. (2009). *Access to affordable and nutritious food: measuring and understanding food deserts and their consequences: report to congress* (No. 2238-2019-2924).

Verghese, K., Lewis, H., Lockrey, S., & Williams, H. (2015). Packaging's role in minimizing food loss and waste across the supply chain. *Packaging Technology and Science*, *28*(7), 603-620.

Vermeulen, S. J., Campbell, B. M., & Ingram, J. S. (2012). Climate change and food systems. *Annual review of environment and resources*, *37*, 195-222.

Wang, J., Mendelsohn, R., Dinar, A., Huang, J., Rozelle, S., & Zhang, L. (2009). The impact of climate change on China's agriculture. *Agricultural Economics*, *40*(3), 323-337.

Wiebe, K., Lotze-Campen, H., Sands, R., Tabeau, A., van der Mensbrugghe, D., Biewald, A., ... & Willenbockel, D. (2015). Climate change impacts on agriculture in 2050 under a range of plausible socioeconomic and emissions scenarios. *Environmental Research Letters*, *10*(8), 085010.

World Trade Organization (2016). The Global Enabling Trade Report 2016, *available at:* https://www.tradefacilitation.org/ *(Accessed on January 5, 2023).*

World Trade Organization (2018). World Trade Report 2018. The future of world trade: How digital technologies are transforming global commerce, *available at:* https://www.wto.org/ *(Accessed on February 1, 2023)*.