Environmental sustainability

Trade policies have environmental implications

https://doi.org/10.1038/s43016-021-00342-5

Minghao Li, Assistant Professor, Department of Economics, Applied Statistics, and International Business, New Mexico State University, minghao@nmsu.edu

Wendong Zhang*, Assistant Professor, Department of Economics and Center for Agricultural and Rural Development (CARD), Iowa State University, wdzhang@iastate.edu, http://orcid.org/0000-0002-1244-3357

*: Corresponding Author

Invited News & Views Article

Forthcoming in Nature Food

US-China trade relations have implications for global nitrogen and phosphorus surpluses, and increasing blue water demand. The case shows that trade policy analysis needs to integrate environmental considerations.

In agriculture, what farmers produce and how they produce depends on the international market; and, in turn, farmers' production decisions have significant consequences for water quality and other ecosystem services[1,2]. The ongoing trade war between the United States and China has large impacts on the international market, especially for agricultural commodities[3,4]. Soybean, pork, ethanol, and other agricultural commodities were among the primary targets of China's retaliation after the United States imposed large tariffs on Chinese products. Outside the United States and China, countries such as Brazil also experienced large changes in agricultural production and trade due to the trade war[3]. In response, researchers have sounded the alarm that the trade war could have negative impacts on the environment[5,6].

In this issue of *Nature Food*, Yao et al.[7] estimate the potential impacts of the U.S.-China trade war on nitrogen (N) and phosphorus (P) surplus and demand for blue water. At the national level, China's retaliatory tariffs will cause U.S. farmers to reduce the production of targeted crops, especially soybean. To fill the gap, soybean production in China and South America will expand . Since soybean is an N-fixing crop, shifting soybean production from the United States to South America would increase N surplus in the former by 105 million kg and decrease N surplus in the latter by 200.5 million kg, leading to a net reduction in global N surplus . Regarding P surplus, since soybean in South America[8] and crops that replace soybean, such as wheat in the United States, demand more P,P surplus in these two regions would increase, driving up global P surplus. In terms of blue water consumption, the increase of non-soybean oilseeds that replaces U.S. soybean drives up global water demand. These results are robust to a range of parameter values in the trade model and the environmental stressor intensities. Disaggregating the national impacts, Yao et al. find heterogeneous regional impacts that sometimes deviate from the national impacts, creating hot-spots with elevated levels of environmental stresses.

As the trade war persists, several developments in trade and domestic policies can create additional shifts in global agricultural production. China's corn imports from all sources reached 11.3 million metric tons in 2020, exceeding its long-standing corn tariff rate quota for the first time[9]. Also, China announced a mandate for 10% ethanol blending in vehicle fuels, then withdrew the mandate due to insufficient feedstock supply. In terms of trade policy, in the U.S.-China Phase One trade deal China promised to purchase an additional $31 billion worth of agricultural products from the United States in 2020 and 2021. To fulfill this promise, China has already imported record amounts of pork, corn, and beef from the United States and other countries[9]. If China increases demand for corn, ethanol, and meat products simultaneously, how would that change world agricultural production? What would be the environmental impacts? The framework established by Yao et al. can be used to answer these questions: these policies can be modeled by computational general equilibrium models, and their land use impacts can be estimated using the stressor intensity databases employed by Yao et al.

Yao et al.'s study is an example of how international trade in general[10], and U.S.-China trade in particular[11], has important environmental implications, and that trade policies can harm the environment[12]. Future studies could extend Yao et al.'s environmental impact analysis in several directions. First, impact analysis could go beyond N, P surplus, and water consumption, to include other environmental stressors such as greenhouse gas emissions. Second, in addition to changing crop mix, farming practices and technology may also change in response to trade policies. Third, local changes in environmental stressors could diffuse to other regions from transboundary movements of pollutants. Fourth, the impact analysis can be generalized to non-agricultural sectors.

In most cases, environmental considerations are still not included in trade policy analysis and policymaking. For policy analysts, integrated economic-environmental analysis can produce more comprehensive and accurate welfare estimates; and, for trade policymakers, environmental considerations should be an integral part of trade negotiations. However, there are recent promising developments in this aspect: the European Union proposed a carbon border adjustment mechanism in which a carbon price is imposed on imports of certain goods from outside the EU[13].The United States expresses the intention to include climate change and other environmental considerations in trade negotiations[14]. Policies like this have the potential to correct existing environmental biases[12] in trade policies.

Competing Interests:

The authors declare no competing interests.

Acknowledgement:

The authors gratefully acknowledge support from Iowa Agriculture and Home Economics Experiment Station Hatch Project IOW05511 the USDA National Institute of Food and Agriculture (NIFA) Hatch Project 101,030 and grant 2019-67023-29414. We also thank editor Yufang Gao and Nate Cook for feedback on an earlier draft.

Image:

https://www.gettyimages.com/detail/photo/soybean-and-corn-field-royalty-free-image/83287246?adppopup=true

References

[1] Mateo-Sagasta, J., Zadeh, S. M., Turral, H., & Burke, J. United Nations https://www.unwater.org/water-pollution-from-agriculture-a-global-review/ (2017).

[2] Hendricks, N. P., Sinnathamby, S., Douglas-Mankin, K., Smith, A., Sumner, D. A., & Earnhart, D. H. *J. Environ. Econ. Manag.* **68**, 507–526 (2014). https://doi.org/10.1016/j.jeem.2014.09.002.

[3] Li, M., Balistreri, E. J., & Zhang, W. *J. Asian Econ.* **69**, 101216. https://doi.org/10.1016/j.asieco.2020.101216 (2020).

[4] Amiti, M., Redding, S. J., & Weinstein, D. E. *J. Econ. Perspect.* **33**, 187–210. https://doi.org/10.1257/jep.33.4.187 (2019).

[5] Fuchs, R., Alexander, P., Brown, C., Cossar, F., Henry, R. C., & Rounsevell, M. *Nature* https://www.nature.com/articles/d41586-019-00896-2 (2019).

[6] He, R., Zhu, D., Chen, X., Cao, Y., Chen, Y., & Wang, X. *J. Clean. Prod.* **227**, 578–588. https://doi.org/10.1016/j.jclepro.2019.04.192 (2019).

[7] Yao, G., Zhang, X., Davidson, E., Taheripour, F., & Tyner, W. E. Agricultural and Applied Economics Association 2020 Annual Meeting 304646 (2021).

[8] Roy, E. D. et al. The phosphorus cost of agricultural intensification in the tropics. Nature 657 plants 2, 16043 (2016).

[9] Xi, H., Hayes, D., & Zhang, W. Center for Agricultural and Rural Development, Iowa State University https://www.card.iastate.edu/products/publications/synopsis/?p=1303 (2021).

[10] Cherniwchan, J., Copeland, B. R., & Taylor, M. S. *Annu. Rev. Econ.* **9**, 59–85. https://www.annualreviews.org/doi/abs/10.1146/annurev-economics-063016-103756?journalCode=economics (2017).

[11] Lin, J., Pan, D., Davis, S. J., Zhang, Q., He, K., Wang, C., Streets, D.G., Wuebbles, D.J., & Guan, D. *Proc. Natnl. Acad. Sci.* **111**, 1736–1741 https://doi.org/10.1073/pnas.1312860111 (2014).

[12] Shapiro, J. S. *Q. J. Econ.* **136**, 831–886 https://doi.org/10.1093/qje/qjaa042 (2021).

[13] Jadot, Y. European Parliament https://www.europarl.europa.eu/doceo/document/A-9-2021-0019_EN.html (2021).

[14] U.S. Trade Representative. https://ustr.gov/about-us/policy-offices/press-office/press-releases/2021/april/remarks-ambassador-katherine-tai-trade-policy-environment-and-climate-change (2021).