# Extended Abstract
## Please do not add your name or affiliation

| Paper/Poster Title | The environmental bias of trade policy through the virtual water content of agri-food products |
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**Abstract prepared for presentation at the 98th Annual Conference of The Agricultural Economics Society will be held at The University of Edinburgh, UK, 18th - 20th March 2024.**


| **Abstract** | ***200 words max*** |
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| Considering the importance of virtual water trade in the sustainable transformation of the global agri-food industry and the critical importance of trade to face challenges on global food security, this paper aims to understand if trade barriers may drive or restrain the consumption of lower water intensive products in the agri-food sector. Using global data from years 2001, 2004, 2007 and 2010 it was found that the differences between trade policies for high water intensive products versus low water intensive products create an implicit subsidy benefiting the importation of agri-food products with high water footprint (green and blue). | |



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| **Keywords** | Trade policy, virtual water, water footprint, agri-food products |
| **JEL Code** | F13; Q56; Q17; Q18<br>see: www.aeaweb.org/jel/guide/jel.php?class=Q |


| **Introduction** | ***100 – 250 words*** |
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In 2010, the United Nations acknowledged water as a fundamental human right, yet a significant lack of awareness persists regarding the water impact embedded in consumed products. Virtual water, the water required for production, transformation, and distribution, is a critical concept linked to water footprint (WFP). WFP categorizes water into green (rain-derived) and blue (from rivers, lakes, or underground sources). Agriculture, accounting for 70% of global blue water use, is both a cause and victim of water scarcity. The strong link between food and water security underscores the importance of national policies for effective water resource management. Consumer preferences, as emphasized by the IPCC, play a key role in mitigating the environmental impact of food systems. The global spread of food supply chains intensifies the exchange of virtual water, impacting global water resources. Current international supply chains and consumption trends heighten vulnerabilities to water-related risks, contributing to food insecurity. This paper, building on Shapiro's work, investigates how trade barriers influence the consumption of less water-intensive products in the agri-food sector, aiming to understand the relationship between trade policies and water footprints. The analysis utilizes statistical linear regression and multi-regional input-output tables to identify implicit "taxes" on water-intensive products, contributing to a deeper understanding of current trade policies and their economic impact on water usage.

| **Methodology** | ***100 – 250 words*** |
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Analysis and methodologies are based on Shapiro (2021). Using first an OLS econometric strategy then a 2SLS approach, the analysis focuses on the relation between trade policies and the water footprint of imported agri-food products. Hence, the dependent variable is the import tariff rate or ad valorem NTM that the importer country j imposes on agri-food product p during year y. The main explanatory variable is the weighted total water footprint of imported product p during year y by county j. We include country and year fixed effects to controls for country and time trends. Thanks to these variables, regression compares trade policy across different agri-food products within a country-year, aiming a more in-depth analysis on the different trade policies applied to more and less water consuming products that are imported. Similar to Shapiro (2021), the calculation of WFP is based on multi-region input-output tables which implies potential measurement errors. To address this problem, the Total WFP is instrumented with the direct WFP of the 10 smallest countries from which each importer is trading the p specific product. This definition is used because importers have different combinations of exporters depending on products. The analysis is performed for both, “Blue” and “Blue + Green” water footprints. To deeply analysis the drivers, we also look at other explanatory variables such as: upstreamness, intra-industry trade, import penetration, average wage, labour share and labour intensity, supply-utilization variables and a measure of water stress of importers.

| **Results** | ***100 – 250 words*** |
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The statistical regressions, accounting for each country's specifics, unveiled the potential implicit tax or subsidy imposed by trade barriers on water consumption intensity. The analysis of total Water Footprint suggested a negative tax on water-intensive products, ranging from 0.1 to 0.3 euros per thousand $m^3$. Conversely, the analysis of blue water footprint implied a positive tax of around 49 euros per thousand $m^3$ for water-intensive products, particularly driven by NTM. Variances in results may stem from the significance of green water consumption, especially in countries with ample rainfall. Comparing total trade protection coefficients for total water, Germany, Canada, and Austria exhibited the highest implicit subsidies, ranging from 98 to 111 euros per thousand $m^3$. For blue water, most countries lacked strong, significant coefficients, with tariffs implying more positive taxes on high water-intensive products than NTM. Despite extensive analysis, no specific driver or explanation for implicit taxes or subsidies on water-intensive products was identified. Variables like water scarcity of importers and the share of food allocated to feed or further processing did not elucidate initial regression results. Interestingly, water scarcity of importers wasn't a significant variable for trade policies concerning total water and blue water footprints. This finding is notable, as some papers recommend trade policies to support the importation of water-intensive products in regions with high water stress. Although not fully explanatory, coefficients of shares going to feed and further processing reduced the significance of implicit subsidies of NTM for products with high total water footprints (blue + green).

| **Discussion and Conclusion** | ***100 – 250 words*** |
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This study underscores the substantial variation in trade policies related to water-intensive products, with a pronounced reliance on differing trends within the agri-food

industry and variations in water endowments across countries. Despite the undeniable impact of international trade on the agri-food sector, significant disparities persist in trade policies, particularly concerning environmental considerations. Notably, the current decision-making process for trade flows does not prioritize water availability. However, the asymmetry in water resources among countries and the escalating impacts of climate events on both water availability and agri-food production could increase the significance of water in future trade dynamics. The findings highlight the critical need to go deeper into the potential advantages of fostering a more consistent and coordinated trade policy environment. Such an environment should be geared towards optimizing the utilization of global water resources and facilitating a sustainable transformation within global agri-food value chains. This approach becomes increasingly relevant given the growing awareness of environmental sustainability and the potential repercussions of climate change on global water resources and food production. Consequently, a more unified trade policy framework can play a key role in addressing these challenges and promoting a resilient and sustainable future for the agri-food sector.