Trade agreements, trade patterns, and nutrition security

(Three research Proposals)

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The impact of Free Trade Agreements on trade diversification

# Motivation

The number of FTAs has increased rapidly, particularly during the 2000s, thereby boosting a country's trade. However, FTAs are expected to alter the trade patterns of countries. They can enhance trade diversity in terms of products and country links if they reduce the cost of establishing new trade links, provided that this increase does not outweigh the potential reduction in the number of already established trade links. Additionally, FTAs may lead to an increase in the concentration of trade activities within the countries involved in the FTA, potentially resulting in a significant reduction in trade with already established links. Consequently, the impact of FTAs on the diversity of trade links requires empirical assessment.

# General and Specific Objective

This study particularly looks at the impact of the number of countries' FTAs’ and FTAs depth on countries' trade diversification. Furthermore, it analyzes the impacts concerning different characteristics of FTAs, including the size of FTAs and whether FTAs are bilateral or involve multiple countries.

# Regression specifications

To identify the impact of the number of FTAs for each country i at time t () on trade diversity (**)** we specify the following regression,

**X** : A vector of control variables

FEi : Country-fixed effects

FEt : Time fixed effects

The diversity in each country will be calculated based on the Shanon index. The diversity is affected by the cumulative number of effective FTAs, FTA\_count, until a given year. Table 1 indicates how the number of FTAs for a hypothetical country A at a point in time can be taken into the analysis.

**Table 1**. Calculation of countries' cumulative FTAs.

|  |  |  |  |
| --- | --- | --- | --- |
| **Country** | **Time** | **Number of FTA signed** | **FTA\_Countit (Cumulative FTA count)** |
| A | 1995 | 3 | 3 |
| A | 1996 | 2 | 5 |
| A | 1997 | 4 | 9 |
| A | 1998 | 3 | 12 |

We also specify the following regression to identify how the diversity in each country is influenced by the cumulative depth index of the FTAs until a given year, .

Table 2 indicates the calculation procedure for the depth of FTAs (FTA\_depth). The depth of FTAs is reported in DEFTA database and the depth is calculated based on two ways: Depth index and Depth Rasch. The former is an additive index of the key provisions of FTAS. This additive index combines seven key provisions: Full Trade Agreement type, standards (sanitary and phytosanitary provisions, technical trade barriers), investments (investment chapters, references in services, bilateral investment treaties), services (specific liberalization provisions), procurement (public procurement provisions), competition (competition chapters), and intellectual property rights (various aspects like national treatment, most-favoured nation treatment, specific provisions for standards and enforcement). The latter is a PCA score of the 49 variables associated with the depth of FTAs, such as services liberalization, investment measures, intellectual property rights, and standards. This variable measure is based on latent trait analysis, specifically the Rasch model. The Rasch model deals with correlated data and varying item importance in determining depth.

**Table 2**. Calculation of the depth of FTAs

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Country** | **Time** | **Number of FTAs and their depths in (\*)** | **FTA\_Count**  **(cumulative FTA count)** | **FTA\_depth\_total\_per\_year** | **FTA\_depth\_weighted (cumulative count)** |
| A | 1995 | 3 (2,2,1) | 3 | 5 | 5 |
| A | 1996 | 2 (4,3) | 5 | 7 | 12 |
| A | 1997 | 4 (3,2,5,1) | 9 | 11 | 23 |
| A | 1998 | 3 (2,3,4) | 12 | 9 | 32 |

We apply the above concept once to all FTAs, once to bilateral FTAs, once to the FTAs of medium size, and once to FTAs of below medium size. The Medium of FTA size is to be calculated based on the number of countries in each FTA.

The control variables that can be taken are:

**GDP of a country**: A higher GDP often leads to greater trade diversity as countries with stronger economies have more resources to engage in diverse trade activities (Helpman, Melitz and Rubinstein, 2008)

**Income Inequality**: Income inequality as given by the Gini index, within a country can impact trade diversity, as more equitable distribution of income may result in a broader range of goods and services being produced and consumed. In countries with high income inequality, a large segment of the population often has limited purchasing power, restricting them primarily to purchasing necessities. This leads to a smaller and less diverse domestic market for goods and services. On the other hand, countries with more evenly distributed income generally have a larger middle class. This results in a broader and more varied domestic market, encouraging the growth of diverse industries enhancing trade opportunities, and leading to higher trade diversification (Martínez-Zarzoso and Vollmer, 2016)

**World Bank's Logistics Performance Index (LPI)**: The LPI assesses the efficiency of customs and border clearance, quality of trade and transport-related infrastructure (including roads, ports, and rail), ease of arranging shipments, quality of logistics services, and ability to track and trace shipments. It provides a comprehensive view of a country's logistics and infrastructure quality. A higher Logistics Performance Index (LPI) score in the areas of customs and border clearance efficiency and quality of trade and transport infrastructure significantly contributes to trade diversification. Enhanced efficiency in customs and border clearance speeds up the import and export processes, reducing trade-related delays and costs. This improvement makes international transactions more feasible for businesses, encouraging them to venture into new markets and diversify their trade activities. Meanwhile, well-developed trade and transport infrastructure, including efficient roads, ports, and rail systems, facilitate smoother and more cost-effective transportation of a diverse range of goods. This robust infrastructure supports the trade of various product types, especially those requiring special handling or time-sensitive delivery, thereby fostering greater trade diversification (Anderson and Van Wincoop, 2004)

**Political Stability Index**: The World Bank's Worldwide Governance Indicators (WGI) include a Political Stability and Absence of Violence/Terrorism index. It assesses perceptions of the likelihood of political instability or violence within a country (Engemann, Jafari and Heckelei, 2023).

**Population Size**: The size and demographic composition of a country's population can influence the types of goods and services demanded, affecting trade diversity. Larger countries often exhibit greater trade diversification, primarily due to their expansive internal markets that accommodate a wide array of consumer preferences. This larger market size leads to a higher degree of product differentiation, catering to diverse tastes and demands. Consequently, larger nations typically experience increased demand for diversified goods, reflecting the varied preferences of a larger population. This scenario underscores the correlation between a country's population size and the breadth of its trade activities, where larger populations contribute to a more dynamic and diverse trading environment (Cadot, Carrère and Strauss‐Kahn, 2013).

**Resource Endowments and Human Capital**: Resource endowment and human capital significantly influence a country's trade diversity. Rich natural resources can lead to specialization in certain commodities, but they might also limit the variety of exports if a country becomes too dependent on these resources. Conversely, a high level of human capital, indicated by skilled labor and educational attainment, encourages innovation and the development of diverse industries. This diversification can expand a country's range of exportable goods and services, leading to a more varied and robust trading profile (Parteka and Tamberi, 2008).

**Exchange Rates:** Exchange rates can significantly impact import diversification. A stronger domestic currency makes imports cheaper, encouraging a country to diversify its imports as a broader range of foreign goods becomes more affordable. Conversely, a weaker currency makes imports more expensive, which might limit the variety of imported goods and push the country to seek alternative, potentially less diverse sources. Thus, exchange rate fluctuations can directly influence the range and diversity of products a country imports (Clark, Dollar and Micco, 2004).

**Income Levels (GDP per Capita):** The paper examines how a country's income level influences its export diversification. It considers the idea that countries may experience an "inverted U-shaped" relationship between income and export diversification, often referred to as the "hump." A higher GDP per capita typically indicates greater wealth and purchasing power within a country. This increased wealth allows for a more varied demand for goods, as consumers can afford a wider range of products, including luxury and specialized items. Consequently, countries with higher GDP per capita often have more diversified import portfolios, as they seek to satisfy the diverse preferences of their wealthier population. Conversely, countries with lower GDP per capita might focus more on essential and affordable imports, leading to less diversification in their import profiles (Cadot, Carrère and Strauss-Kahn, 2011)

**Table 3.** Summary of control variables to be used in the regression analysis

|  |  |  |  |
| --- | --- | --- | --- |
| **Control variables** | **Reason** | **Variable definition** | **Source** |
| GDP of a country | A higher GDP often leads to greater trade diversity as countries with stronger economies have more resources to engage in diverse trade activities. | GDP of a country | World Development Indicators |
| Income Inequality | Income inequality, as indicated by the Gini index, impacts trade diversity. More equitable income distribution leads to a broader range of goods and services being produced and consumed. | Gini Coefficient of the Income Inequality | World Development Indicators |
| Logistics Performance | The LPI assesses the efficiency of customs and border clearance, quality of trade and transport-related infrastructure, etc., significantly contributing to trade diversification. | World Bank's Logistics Performance Index (LPI) | LPI Index by World Bank |
| Political Stability Index | Assesses the likelihood of political instability or violence. Commonly used to measure political stability. The more the countries are politically stable, democratic, there is a more conducive environment for trade diversification. | Political Stability Index | Political Stability Index (part of the Worldwide Governance Indicators (WGI) published by the World Bank) |
| Population Size | The size and demographic composition of a country's population can influence the types of goods and services demanded, affecting trade diversity. | Total Population | World Development Indicators |
| Resource Endowments and Human Capital | Rich natural resources can lead to specialization in certain commodities, , but they might also limit the variety of exports if a country becomes too dependent on these resources while a high level of human capital encourages innovation and diverse industries. | Agricultural Land (% of land area): Indicates the extent of land used for agriculture and can be a proxy for agricultural resource endowment.  Skilled Labor Force (% of Labor Force): Proportion of the labor force with advanced skills or training, often measured by the presence of tertiary education or vocational training. | World Development Indicators |
| Exchange Rates | A stronger domestic currency makes imports cheaper, encouraging a country to diversify its imports as a broader range of foreign goods becomes more affordable and vice versa. Thus, exchange rate fluctuations can directly influence the range and diversity of products a country imports. | Exchange Rate | World Development Indicators |
| Income Levels (GDP per Capita) | Explores the influence of a country's income level on its export diversification, considering the 'inverted U-shaped' relationship between income and diversification. | GDP per capita | World Development Indicators |

Countries integration to the trade network and its impact on Nutrition Security

# Motivation

Countries' integration into the trade network can significantly improve nutrition supply and stability, particularly in the face of domestic production shocks and seasonal non-availability of certain products. However, heightened connectivity can also transmit international shocks to the domestic economy, directly and indirectly impacting the nutrition status of nations. The overall impact of connectivity to the trade network may hinge on the strength of direct connections, as well as indirect connections (involving partners, partners of partners, and so forth). The diversity of countries' connectivity within the trade network and the specific nations engaged in trade emerge as crucial factors influencing the likelihood of shock transmission to the domestic economy. This, in turn, can affect various dimensions of food security and lead to changes in the nutritional security of nations. A deeper understanding of the impact of connectivity structure aids in formulating policies to enhance the nutrition supply of countries.

# Objective

* To analyze the evolution of the structure of countries' connectivity of different orders in terms of trade links and trade intensity
* To analyze the impact of connectivity measures on the diversification of connectivity on the nutrition security status of countries

# Methodology

To address the first objective, we calculate the countries' connectivity of different order (first order, second order, and eigenvector) based on trade intensity/value (**)** and also extensive margin of trade, that is the number of trade links per country and product (**)**. We also consider the interaction of the two to inform the impacts of trade connectivity and diversity.

To address this objective, we specify the following regression

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We plan to apply this regression specification based on 3 measures of connectivity from two different trade perspective (See Table 3). Three different orders of connectivity of the trade network are once calculated from the country product link trade matrix and once from the trade intensity network. refers to different orders of connectivity calculated from the trade intensity matrix and refer to different orders of connectivity calculated based on the trade links per country and product.

**Table 4**. Measures of connectvity

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Trade network** | |
|  | **Connectivity measures** | **Trade links (per country and product)** | **Trade Intensity (per country)** |
| Order of connectivity | First order |  |  |
| Second order |  |  |
| Eigenvector |  |  |

The control variables (**X**) that can be used are:

**GDP per capita:** GDP per capita is often used as an indicator of a country's economic well-being, and it can have implications for factors such as food affordability, access to healthcare, and overall living standards, which in turn can affect nutritional security (*Reference:* Explaining Child Malnutrition in Developing Countries: A Cross- Country Analysis).

**Democracy of a country:** We account for the political context within which child malnutrition is determined by using democracy as an indicator. As for national income, we hypothesize that democracy plays a facilitating role in all of the underlying factors considered. The more democratic a government is, the greater the percentage of government revenues that may be spent on education, health services, and income redistribution. A more democratic government may also be more likely to respond to the needs of all of its citizens, women's and well as men's, indirectly promoting women's relative status. With respect to food security, the work of (Drèze and Sen, 1991)and others clearly points to the expected importance of democracy in averting famine (Haddad and Smith, 2000)

**Income Inequality:** Inequality indices, such as the Gini coefficient or the Human Development Index (HDI), are often used to assess the disparities in income, education, and healthcare within a population. These disparities can have a direct impact on nutritional security. High income inequality in a country can adversely affect its nutritional security. In societies with significant income disparities, lower-income groups often struggle to afford a balanced and nutritious diet, leading to issues like undernutrition and malnutrition. Conversely, higher-income groups may have excessive caloric intake, potentially leading to obesity and related health issues. This unequal access to quality food can result in widespread nutritional imbalances across different segments of the population, impacting the overall nutritional security of the country (Das, 2021). (can be taken under country-specific effects to be discussed)

**Weather shocks and Natural Disasters:** Research indicates that climate change causing weather shocks, characterized by rising temperatures and changing precipitation patterns, significantly affects food and nutritional security worldwide. The impacts of climate change and weather shocks on crop yields and food supplies are well-documented, with evidence showing substantial reductions in yields of major crops like maize, wheat, and rice under increased temperatures. These changes in agricultural productivity directly influence food availability and accessibility, posing a challenge to nutritional security (Center for Strategic and International Studies., undated; Hirte, Lessmann and Seidel, 2020;Felbermayr and Gröschl, 2014).

**Table 4.** Control variables to be used in the regression analysis

|  |  |  |  |
| --- | --- | --- | --- |
| **Control variables** | **Reason** | **Variable definition** | **Source** |
| Income Levels (GDP per Capita) | Explores the influence of a country's income level on its export diversification, considering the 'inverted U-shaped' relationship between income and diversification. | GDP per capita | World Development Indicators |
| Democracy of a country | The more democratic a government, the greater the percentage of government revenues that may be spent on education, health services, and income redistribution. | The Economist Intelligence Unit's Democracy Index: This index provides a score based on five categories: electoral process and pluralism, civil liberties, the functioning of government, political participation, and political culture. | Our World in Data, which provides comprehensive datasets, including the Democracy Index by the EIU, weighted by population |
| Income Inequality | Income inequality, as indicated by the Gini index, impacts trade diversity. More equitable income distribution leads to a broader range of goods and services being produced and consumed. | Gini Coefficient of the Income Inequality | World Development Indicators |
| Natural disasters | Natural disasters can lead to considerable crop losses. These losses, in turn, diminish the food supply derived from domestic production and exert significant pressure on farm earnings. | The number of large natural disasters that caused 1000 or more deaths or affected 100,000 or more persons | Emergency Events database of CRED “Emergency Events Database.” |
| Armed conflict | Its impact on food diversity and nutrient adequacy is manifested through reduced preferences for market participation, income losses, and disruptions to transportation, trade, and markets, thereby causing significant upheavals in domestic food chains. | The number of armed conflicts (domestic and international conflicts/wars) each resulted in more than 1000 deaths. | UCDP/PRIO Armed Conflict Dataset |
| Population | As the population increases, the demand for food also rises, potentially resulting in a decrease in the per capita availability of food. | Total population | World Development Indicators |
| Rural population | The rural population represents the percentage of the total population residing in rural areas. Given that the poorest nations often exhibit a higher proportion of rural populations, coupled with the fact that food insecurity is more prevalent in rural areas, an elevated percentage of rural residents may correlate with lower national food security. Additionally, this demographic characteristic signifies a crucial aspect of domestic resource endowments—specifically, the rural population's contribution, particularly the agricultural labor force, which can have a positive impact on food production and availability. | Percentage of rural population over total population | World Development Indicators |
| GDP per capita | It serves as a gauge for average real income, determining food security by influencing economic access to food. | GDP (PPP) per capita in constant term USD | World Development Indicators |
| Consumer Price Index | Higher prices may affect consumers' purchasing power, potentially limiting their ability to access an adequate and diverse supply of food. Additionally, inflationary pressures can influence production costs and supply chains, indirectly impacting food availability. | Consumer price index (normalized for 2010) | World Development Indicators |
| Agricultural TFP | Increased agricultural productivity is expected to have a positive impact on the domestic food supply. | Cereals yield per hectare | World Development Indicators |
| Arable land | The arable land variable quantifies the extent of land available for agricultural production. | Total arable land in hectares | World Development Indicators |

Countries trade patterns and its impact on nutrition Security

# Motivation

The integration of countries into the global trade network is crucial, and it can be viewed from both import and export perspectives. The ability of nations to import goods helps alleviate domestic production shocks, ensuring a steady supply of a diverse range of products throughout various seasons and often at more affordable prices. While reliance on imports enhances resilience, it also poses the risk of translating negative shocks to the domestic economy. Moreover, the opportunity for countries to engage in export activities opens up a larger market size and potentially higher prices for their goods. However, dependence on exports makes nations susceptible to global demand shocks and the import policies of trading partners, which can significantly impact export revenues.

As countries integrate into the global trade network, the dynamics of import and export activities can shape the availability, affordability, and diversity of food products, directly and indirectly influencing the overall health of populations. Examination of the impact of trade on the nutritional status of countries is crucial as trade policies must ensure that economic development aligns with the imperative of maintaining nutritionally secure environments.

# Objective

We explore the impact of countries' import and export activities, along with their overall trade engagement and the diversification of these activities, on the nutritional security status of nations.

# Regression Specification

To address this issue, we define the following regression and apply it separately to both the import and export activities of countries, as well as the overall trade of nations.

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Connectivity measure will be calculated from the trade network from the importers' perspective, from the exporters’ perspective, and from the unidirectional trade matrix that considers overall trade values.

: Accounts for the diversity of connectivity along the intensive margin of trade. We use the Shannon diversity of trade values across countries.

: Accounts for the diversity of connectivity along the extensive margin of trade. We use the number of trade links (per country, per product).

Control variables: The same as above

# References:

**Anderson, J.E. & Van Wincoop, E.** 2004. Trade Costs. *Journal of Economic Literature*, 42(3): 691–751. https://doi.org/10.1257/0022051042177649

**Cadot, O., Carrère, C. & Strauss-Kahn, V.** 2011. Export Diversification: What’s behind the Hump? *Review of Economics and Statistics*, 93(2): 590–605. https://doi.org/10.1162/REST\_a\_00078

**Cadot, O., Carrère, C. & Strauss‐Kahn, V.** 2013. Trade Diversification, Income, and Growth: What Do We Know? *Journal of Economic Surveys*, 27(4): 790–812. https://doi.org/10.1111/j.1467-6419.2011.00719.x

**Center for Strategic and International Studies.** undated. Beyond Yields: Mapping the Many Impacts of Climate on Food Security. https://www.csis.org/analysis/beyond-yields-mapping-many-impacts-climate-food-security

**Clark, X., Dollar, D. & Micco, A.** 2004. Port efficiency, maritime transport costs, and bilateral trade. *Journal of Development Economics*, 75(2): 417–450. https://doi.org/10.1016/j.jdeveco.2004.06.005

**Das, M.** 2021. Vulnerability to Food Insecurity: A Decomposition Exercise for Rural India using the Expected Utility Approach. *Social Indicators Research*, 156(1): 167–199. https://doi.org/10.1007/s11205-021-02625-7

**Drèze, J. & Sen, A.** 1991. *Hunger and public action*. Oxford, Clarendon.

**Engemann, H., Jafari, Y. & Heckelei, T.** 2023. Institutional quality and the duration of agri‐food trade flows. *Journal of Agricultural Economics*, 74(1): 135–154. https://doi.org/10.1111/1477-9552.12491

**Felbermayr, G. & Gröschl, J.** 2014. Naturally negative: The growth effects of natural disasters. *Journal of Development Economics*, 111: 92–106. https://doi.org/10.1016/j.jdeveco.2014.07.004

**Haddad, L. & Smith, L.** 2000. *Explaining child malnutrition in developing countries a cross-country analysis*. https://www.ifpri.org/publication/explaining-child-malnutrition-developing-countries-1

**Helpman, E., Melitz, M. & Rubinstein, Y.** 2008. Estimating Trade Flows: Trading Partners and Trading Volumes \*. *Quarterly Journal of Economics*, 123(2): 441–487. https://doi.org/10.1162/qjec.2008.123.2.441

**Hirte, G., Lessmann, C. & Seidel, A.** 2020. International trade, geographic heterogeneity and interregional inequality. *European Economic Review*, 127: 103427. https://doi.org/10.1016/j.euroecorev.2020.103427

**Martínez-Zarzoso, I. & Vollmer, S.** 2016. Bilateral Trade Flows and Income Distribution Similarity. *PLOS ONE*, 11(5): e0128191. https://doi.org/10.1371/journal.pone.0128191

**Parteka, A. & Tamberi, M.** 2008. Determinants of Export Diversification: An Empirical Investigation. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1345728