

Food Safety and Democracy: What interactions?

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ABSTRACT

In this paper, five different case studies were carried out to analyze and examine the presence and prevalence of food safety related disease, the economy and the political situation of fourteen different developing countries. The studies' goal was to determine if there is a correlation or connection between the country's level of democracy and food-related health issues.

The research methods included extensive gathering and analysis through descriptive statistics of the documentation and data provided from Non-Governmental Organizations and health organizations.

Articles, academic analyses and third party on-the-ground reports were used too. The political section focuses on the institutional democracy (structural level) and on the civil rights and personal freedoms (social level). For the health-issues part, it was decided to focus on the most relevant indexes of food safety status among the population: diarrheal diseases, intestinal infectious diseases, liver cancer and malnutrition.

This research concludes that there is a connection between the level of democracy and food-related health issues. As the democracy level increases, the prevalence of the aforementioned diseases decreases, but it also highlights that other economic factors could play a crucial role as well. Lastly, the paper suggests that democracy alone cannot address some health issues (such as malnutrition) and other ways need to be found.

Key Words: Food safety; democracy; Non-Governmental Organization.

INTRODUCTION

In the period between 1980 and 2000, in the global context of solving food-related issues, the business, institutional, and media attention focused almost solely on the topic of food security: namely, to guarantee access to enough *quantity* of food especially in the developing

countries. Many actions against world hunger were taken, particularly from non-governmental organizations such as the FAO. As the population living in poverty started decreasing consequentially with the rise of BRICS countries, it is only in the last decade that the focus has slowly shifted towards *food safety*. But what is “food safety”?

Food safety is, in other words, the aim to guarantee the availability of safe food from a hygienic, qualitative and microbiological perspective in order to prevent food-borne illness and diseases. To be able to prosper, a country's population not only needs to have a sufficient caloric daily intake, but it must also have the right safety standards to provide food that is allowable for human consumption. In developed economies there is an extensive scientific literature on the topic especially from a microbiological and technical point of view. However, in the developing part of the world and new economies, this is not completely applicable; in some regions of the globe, poor food safety is a result of the violation of basic human rights due to the lack of a democratic and/or unlawful political system. Due to this, the food safety problem cannot be considered just from a scientific perspective, but it weaves together with economics, politics and sociology. This paper is based on the initial idea of five different case studies carried out by the first year 2018 SMEA class (Catholic University of Sacred Heart of Cremona, Italy), and takes an in-depth look at the issue, providing useful insights and econometrical analyses on the support of the thesis that democracy and food safety are interrelated.

LITERATURE REVIEW

Evaluating the correlation between food safety and democracy is a relatively new concept. The current scientific literature on the topic focuses more on issues in advanced economies, such as consumer demand or choice in relation to food safety intended as “quality” and regulation or policy making. On the other hand, there is

quite a broad literature on *food security* and political risk. For *food security* we intend the “availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices” (United Nations, 1975). Even though the two ideas are quite different, the research “*Food security and democracy: do inclusive institutions matter?*” (Rossignoli & Balestri, 2017) will be used further in this paper to determine what is democracy and how we can measure it. Due to the lack of literature on the topic proposed in this paper, it is possible to say that this research is one of a kind and can be taken as a starting point for future research.

METHODOLOGY

For this project, fourteen developing countries from three different continents have been chosen based on a subjective preference, displayed as in the following list:

- South America: Argentina, Brazil
- Africa: Benin, Egypt, Morocco, Nigeria, Somalia, South Africa, Uganda
- South East Asia: Cambodia, Laos, Myanmar, Singapore, Thailand

Furthermore, for the creation of a unique health indicator, Norway has been used as a benchmark country since it is considered by the Global Food Security Index provided by the Economist Intelligence Unit (EIU) as one of the nations with the highest level of food safety and quality and, the lowest level of political risk. Three main variables have been examined: health issues, political situation, and openness to international relations.

Health Issues

For data regarding food-related health diseases the GBD Compare Data Visualization tool⁽²⁾ provided by IHME (Institute for Health Metrics and Evaluation (IHME), 2016) has been used. The indicators taken into account are four issues that have been considered the most important regarding the impact on human health in relation to food consumption. For this purpose, for food we intend “any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans. “Food” includes drink, chewing gum and any substance, including water, intentionally incorporated into the food

during its manufacture, preparation or treatment.” (European Parliament, 2002).

The indicators are:

1. Diarrheal diseases (both sexes, all ages, prevalent cases per 100.000 people);
2. Intestinal infectious diseases (both sexes, all ages, prevalent cases per 100.000 people);
3. Liver cancer excluding cases related to hepatitis B, C and alcohol abuse (both sexes, all ages, prevalent cases per 100.000 people);

Nutritional deficiencies comprehensive of protein/energy deficiency, iodine deficiency, vitamin A deficiency, dietary iron deficiency, and other deficiencies (both sexes, all ages, prevalent cases per 100,000 people).

For each country, a panel time series was created starting from the year 1999 up to 2016 (last reliable data) where for each year all the prevalent cases per 100.000 people were summed, creating a historical dataset called “*Diseases*”. Then, for further purposes, another indicator called “*Diseases_FS*” was created: the previous data was scaled on a range from 0 to 100 where 0 is the worst theoretical condition possible (100.000 prevalent cases on 100.000 people) and 100 is the best condition possible using Norway as benchmark (5725 total prevalent cases on 100.000, Institute for Health Metrics and Evaluation (IHME) 2016), using the following scaling formula:

$$Diseases_{FS} = \frac{100 * (Diseases - Diseases_{worst})}{(Diseases_{norway} - Diseases_{worst})}$$

Where “*Diseases_{worst}*” and “*Diseases_{Norway}*” are respectively the aforementioned worst-case scenario (100.000) and best scenario (5725).

Political Situation

The definition of democracy can be very broad and variegated, making it very difficult for us to define exactly what is a “democracy” especially considering all the socio-economic and cultural differences around the globe that contribute to diversify its perception. For this purpose, the attention has been focused on three main criteria to achieve a more precise definition. The first indicator used is the “*Polity IV*” (Center for Systemic Peace, 2017), which offers a broad yearly coverage and a robust definition of the *structural* characteristics of the political regime in a country. This is achieved by measuring the overall authoritarian and democratic spectrum: the system ranges from -10 to +10, from full autocracies to full democracies. For practical reasons,

it has been rescaled to 0-10. However, due to the so-called “Third wave of democratization” (Huntington, 1991; Rossignoli & Balestri, 2017) the Polity score generates a “[...] categorical bias toward democracy [that] has restricted our ability to fully understand the societal dynamics associated with the consolidation and maintenance of democratic authority patterns” (Marshall MG, Jagers K, Gurr TR, 2011; Rossignoli & Balestri, 2017; Rossignoli & Balestri, 2017; Rossignoli & Balestri, 2017). To avoid this, a second indicator has been used, the “Freedom in the World” elaborated by Freedom House, which “[...] assesses the real-world rights and freedoms enjoyed by individuals, rather than governments or government performance per se. Political rights and civil liberties can be affected by both state and nonstate actors, including insurgents and other armed groups.” (Freedom House, 2018). The rating goes from 7 (worst case) to 1 (best case). For this research, the system has been re-scaled from 0 (worst) to 10 (best). In order to provide more reliability and final robustness to the data, a third indicator has been used, the V-Dem’s “v2x_polyarchy” which considers whether political and civil organizations can operate freely, elections are clean without systematic irregularities and lastly, the elections affect the composition of the establishment of the country. In addition, it takes into account the independence of the media and its freedom of speech (Coppedge et al., 2018). This indicator uses a 0-1 decimal system that has been adjusted to a 0-10 spectrum. For our purposes, this system is also considered the most reliable one.

Openness to international relations

As it will be further demonstrated in the results section, the democracy indicators alone are not such a valid regressor to be used to validate the correlation between the political situation with food security. For example, in 2014 Myanmar and Thailand had an average political score of 2.8 and 2.5 out of 10, indicating the presence of an autocratic regime (where 3.5 is the threshold level for anocracies)

Table 1: *Political situation score, year 2014*

Country	Polity IV	FIW	V-Dem	Average
Myanmar	3.5	1.4	3.6	2.8
Thailand	3.5	2.1	1.9	2.5

Even if Myanmar performed slightly better and both nations had at the time a tremendous military influence on the regime; by looking at their GDP per Capita, the level of import and export, the advancement of the service sector and the level of rural population, it is clear how Thailand is a much richer and more advanced economy (World Bank, 2018): this means that there are other variables (which can be result of political decisions) that contribute to food safety. These indicators have been identified in two potential datasets provided by the World Bank:

- Net ODA received per capita (current US \$): namely, “[...]disbursements of loans made on concessional terms by official agents of members of the Development Assistance Committee (DAC), by multilateral institutions, and by non-DAC countries to promote economic development and welfare [...]” (World Bank, 2018).
- Taxes on international trade, % of revenue: namely, “Taxes on international trade include import duties, export duties, profits of export or import monopolies, exchange profits, and exchange taxes.” (World Bank, 2018).

Net ODA demonstrates how a country is open or willing to be open to international foreign aid and collaboration with international NGOs. In the case of Myanmar, humanitarian help and foreign capital was refused or denied by the country due to its isolationist policies until 2011 (except capital inflows from China). Only with the USDP government the nation “[...] welcomed support from the international community in pursuit of development and modernization. [...] the international community took several steps to normalize aid relations, including significant debt forgiveness, the reentry of large, multilateral funding organizations, and the proliferation and expansion of bilateral aid programs.” (Carr, February 2018), thus, increasing the economic status of the population, guaranteeing higher possibilities to the access to safe food.

While ODA directly indicates the level of a political openness to other government or institutions, the dataset “Taxes on international trade” demonstrates:

- That countries will tend to export the commodity whose production is relatively intensive in the factor in which the country is relatively abundant (Whalley, 2002). In the case of food products, it

highlights the presence of a developed and effective agricultural production system;

- The ability to compete on the global markets against other players;
- The compliance to international high-quality food safety standards or, in other words, the presence of an advanced agricultural and food industry that implements microbiological and mycotoxins control protocols, Good Manufacturing Practices (GMPs) and Good Hygiene Practices (GHPs) assuring the safety of the food through all the production chain and distribution line.

Unfortunately, the World Bank database does not provide complete data series for some of the countries taken into consideration. As a result of this, the “taxes” regressor has been applied only to a panel composed of countries where the consistency of the data is satisfactory enough; this difference will be pointed out further in the paper. The countries where it is possible to apply the tax variable are Argentina, Brazil, South Africa, Cambodia, Singapore, Thailand.

RESULTS

To determine whether if there is a correlation as stated in the introduction, two different OLS regressions have been carried out. The sample includes information regarding the years from 1999 up to 2016. In all the regressions, the dependent variable is “Diseases_F” as described previously. Firstly, the time series has been analyzed comprehending only the indicators regarding democracy and net ODA received per capita mainly due to the completeness of the database.

Table 2: Results of OLS Regression

Covariates	Coefficient
<i>Polity IV</i>	-2.3734 ***
<i>Freedom in the World</i>	4.0180 ***
<i>V-Dem</i>	0.0384
<i>Net ODA per Capita</i>	-0.0003 ***
const	78.8973 ***
Adjusted R-Squared: 0.49	
Levels of significance: * 0.10; ** 0.05; *** 0.01	

Even though the R-Squared is not satisfactory, such a low p-value (and high significance) still indicates that there is a real relationship between the significant predictors and the response variable. Looking more into the details, it is interesting to notice that political coefficients are negative while other are positive. For example, *Polity IV* and *Freedom in the World* maintain a highly significant p-value and a strong coefficient, but they have opposite sign. It is important to remark the difference between these two indicators: the first one describes the political situation just at the structural level, and its values can be distorted by the “third wave of democratization” (Huntington, 1991) cited before in this paper, while the second one describes the situation more from personal and civil-oriented perspective. Different coefficient signs are not contradictive (Frederick Mosteller, 1977) and, in some cases, can imply confounding.

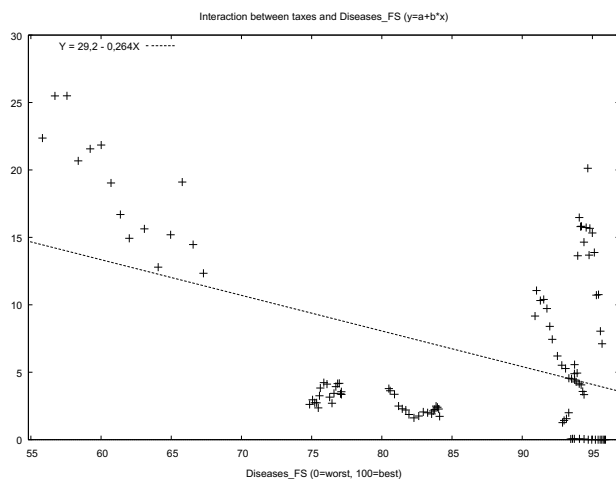
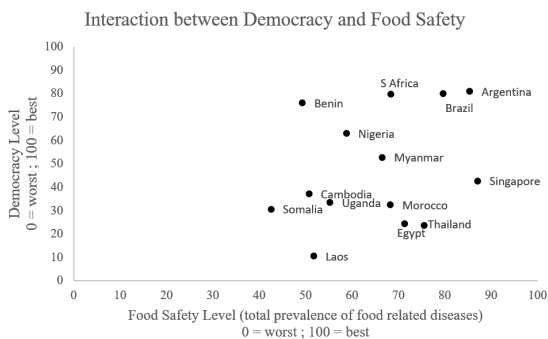
These results are not enough for our purposes, and to fully comprehend whether if the international markets can influence food security, a second OLS regression was carried out by taking into consideration only the countries that have enough data on taxes on international trade.

Table 3: Results of OLS Regression 2

Covariates	Coefficient
<i>Polity IV</i>	-1,1999***
<i>Freedom in the World</i>	2,1927**
<i>V-Dem</i>	-1,6713***
<i>Net ODA per Capita</i>	-0,0006***
<i>Taxes on international</i>	0,2626***
const	96,8852***
Adjusted R-Squared: 0.82	
Levels of significance: * 0.10; ** 0.05; *** 0.01	

In Table 3, the R-squared of 0.82 denotes a strong positive relationship supported by the presence of very high significance. It is safe to assume that the tax variable plays a crucial role in support to the initial thesis. To better analyze the assumption, a simple X-Y graph was created to visualize the relation between the political indicator and the food safety level.

Figure 1: Graph showing interaction between taxes and diseases



It is possible to see from figure 1, that as the level of international taxes decreases (equal to more open markets), the score of Diseases_FS increases indicating better food safety conditions.

CONCLUSIONS

Democracy and food safety are two very complex entities that are dependent on a wide number of exogenous variables, especially regarding the policy-making side, the economic environment, and the agricultural situation. Implying a *ceteris paribus* situation, it is possible to narrow down this broad number of factors to the small selection of indicators analyzed in this paper. As the first regression shows, democracy alone is not sufficient to ensure high quality standards and acceptable food safety levels. It may play a role in it, but there are other influential factors.

Regarding the second OLS regression, unfortunately at least in this case there is no sufficient data available for most of the countries taken into account, and only a few

of them satisfied the criteria. There could be many reasons behind this, government unavailability to release the data, the inefficiency of the central administration and/or technical difficulties for database providers to calculate tariffs. However, in cases where it was possible to execute the computation, taxes on international trade play a crucial role in the advancement of the country's food safety.

Figure 2: Graph showing interaction between democracy and food safety

For example, in the case of Singapore, where an almost-autocratic political system is adopted but, due to the absence of an agricultural sector, the country is forced to develop its trade with foreign nations and to comply with very high quality and food safety standards both for exogenous and endogenous reasons (such as public safety).

An almost opposite example is Benin, where the political situation allows the thriving of personal/civil freedoms and the development of democratic institutions, but the impoverishment of its economy and the relatively non-existent trade with neighboring country decreases food quality and, consequentially, increases health diseases prevalence. High trade volumes of food and low tariffs applied towards other markets imply the compliance to international higher quality food safety standards. In case these criteria is not observed, it is safe to assume that a substantial drop in the demand and a deep economic loss could be the consequence (due to consumer choices or public safety reasons).

In conclusion, this research denotes that there is a positive interaction between the level of democracy of a specific country and its food-related health issues, but it also highlights that other economic factors, such international trade and openness to global relations, play a key role in determining food safety. This paper focuses solely on a macro perspective, and it can be taken as a starting point to further deepen the subject with new indicators and a micro-focused approach.

References

Carr, T. (February 2018). *Supporting the Transition: Understanding Aid to Myanmar Since 2011*. 4-5. Center for Systemic Peace. (2017). *INSCR Data Page*, INSCR. (Center for Systemic Peace) Retrieved July 2018, from <http://www.systemicpeace.org/inscrdata.html>
Coppedge, M., Gerring, J., Knutsen, C. H., Lindberg, S. I., Skaaning, S.-E., Jan Teorell, D. A., . . . Ma, K. L.

- (2018). *V Dem: Varieties of Democracy*. July 2018.
Retrieved from: https://www.v-dem.net/media/filer_public/64/ad/64ad9308-45fa-473e-8e2b-e1c0c4e421e6/v-dem_codebook_v8.pdf
- Domenico Rossignoli, S. B. (2017). *Food security and democracy: do inclusive institutions matter?* *Canadian Journal Development Studies / Revue canadienne d'études du développement*, 8.
doi:10.1080/02255189.2017.1382335
- European Parliament, C. o. (2002, 01 28). *EUR-Lex*.
Retrieved August 2018
- Frederick Mosteller, J. W. (1977). *Data Analysis and Regression: A Second Course in Statistics*. Pearson.
- Freedom House. (2018). *Freedom in the World 2018*.
Retrieved July 2018, from
<https://freedomhouse.org/report/methodology-freedom-world-2018>
- Huntington SP. (1991). *The Third Wave: Democratization in the Late Twentieth Century*. University of Oklahoma Press, Norman.
- Institute for Health Metrics and Evaluation (IHME). (2016). Retrieved July 2018, from *GBDCompareDataVisualization*.
- Marshall MG, Jaggers K, Gurr TR. (2011). *Political Regime Characteristics and Transitions 1800-2010*. Polity IV Project. Center for Systemic Peace.
- the Economist Intelligence Unit (EIU), D. (2017, September). *Global Food Security Index*. Retrieved July 2018, from
<https://foodsecurityindex.eiu.com/Country/Details#Norway>
- United Nations. (1975). *Report of the World Food Conference*. New York.
- Whalley, J. (2002, September). *Taxes and Trade*. Retrieved August 2018
- World Bank. (2018). *World Bank Data*. Retrieved from
<https://data.worldbank.org>