LARGE AGRI-FOOD CORPORATIONS IN THE GLOBAL STAPLE AND CASH CROPS MARKETS: A QUANTITATIVE ANALYSIS OF RICE AND COFFEE THROUGH THE VIRTUAL WATER PERSPECTIVE

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Research framework

- **Large agri-food corporations** play a crucial role in international food systems: direct food supply, vertical integration strategies along the value chain (from providing seeds and fertilizers for farmers to the management of manufacturing processes), lobbying by national trade organizations, and influencing global trade infrastructures, as well as finance and hedging solutions (Sojamo et al., 2012; Oxfam, 2013; Flach, 2016; Chemnitz et al., 2017; Rama, 2017; Folke et al., 2020; Scoppola, 2021; Bellemare et al., 2022; UNCTAD, 2023).
- Given that the **food** sector accounts for a substantial **majority of water consumption** (70-90%), these companies are crucial in managing water resource and virtual water associated with food production, processing, and distribution (Sojamo et al., 2012; Oxfam, 2013; Folke et al., 2019; Folke et al., 2020; D'Odorico et al., 2018).
- The four largest agribusiness corporations (Archer Daniels Midland, Bunge, Cargill, and Louis Dreyfus – the so-called ABCD group) control from 70% to 90% of the international trade of staple food. Since staple crops contribute the most in percentage terms to total international virtual water flows (about 60%), large agri-food enterprises can be considered major actors of global virtual water flows (Sojamo et al., 2012; D'Odorico et al., 2018).

- Two **gaps** in the literature:
  - the need for more focus on **environmental impacts** in agri-food value chains (World Bank, 2019; Ponte, 2020; Bellemare et al., 2022),
  - the relatively **unexplored study of virtual water fluxes at the company level** (Dalin et al., 2012; D'Odorico et al., 2018; Vallino et al., 2021). All food-related virtual water analysis are focused on cells, States or regions (exception: De Petrillo et al. 2023).

- Large corporations are engaging in sustainability initiatives, and their role is investigated in the food system literature (Scoppola, 2021), however they are **less considered in institutional analyses of water governance and stewardship** (Sojamo et al., 2012; Folke et al., 2019, 2020; De Petrillo et al., 2023).

=> Analyzing virtual water at the company level allows us to investigate the **concentration of water use in the hands of large enterprises** and their **influence on resource allocation.**

- Due to their significant involvement in national and international food value chains, from production to retail management, these enterprises could be specific **targets** for water governance **policies**. This helps to move beyond generic water-related recommendations for regions or states.
- The enterprises themselves could engage in **sustainable practices**, becoming actors of positive change for sustainability (Oxfam, 2013; Rudebeck, 2019; De Petrillo et al., 2023).
- Choices pertaining the cultivation of **staple *versus* cash crops** by large enterprises have a significant impact on land, food, and water security worldwide (Barbier, 1989; Oxfam, 2013; Piyapromdee et al., 2014; Chemnitz et al., 2017).
- Similarly to the corporate role in reducing GHG emissions or preserving biodiversity and forests (Oxfam, 2013; Folke et al., 2019; De Petrillo et al., 2023), large enterprises strongly influence also the **economic water productivity of crops** (Aldaya et al. 2010).

Research questions

- We examine the role of **large enterprises** in the food sector: **rice** and **coffee** markets, **2013 – 2022**. Quantitative analysis of the sale volumes of rice and coffee across all large companies.
- We estimate the **virtual water** associated with the rice and coffee that these companies sell in all countries worldwide.
- We study the **concentration** of volumes and virtual water of the two crops in the two markets.
- Staple crops group (rice) and cash crop group (coffee) => to encompass the diverse market dynamics of foods with varying roles in human nutrition and agricultural value chains (Tosh, 1980; Barbier, 1989; Achterbosch et al., 2014; Piyapromdee et al., 2014; Falsetti et al., 2020; Elsby, 2020).
- **Novelty:**
  - dynamics of large companies in the agri-food sector by exploiting granular data **on firm sales of single products** in numerous countries over time (**Euromonitor International,** 2023) (beyond the simple information on the total company revenues).
  - Estimation of the **virtual water associated to those sales** (**CWASI** - Tamea et al., 2021), to provide insights into environmental impacts along international food value chains beyond monetary and volume-related analyses.

Recap

- **Water footprint**: indicator of water use that provides information on both direct and indirect water use per product unit of a consumer or producer (Aldaya et al., 2010).
- **Virtual water**: the amount of water consumed for the production of a commodity (Allan, 1998; Hoekstra and Mekonnen, 2012).
- **Virtual water trade**: volume of water associated to the production of internationally traded goods (Hoekstra and Chapagain, 2011).
- Trade of agricultural goods: about 90% of the total VW displaced for human consumption (D'Odorico et al., 2019).
- VW embedded in traded food globally is about 25% of the total amount of water utilized for agriculture, and it has doubled from 1986 to 2007 (D'Odorico et al., 2019).
- The quantity of food exchanged on international markets from the 1990s to 2015 has increased almost three times faster than food production (Traverso and Schiavo, 2020).

Data and methods

- **Euromonitor Passport** dataset (2023 release): financial information on rice and coffee sales by each company with a market share above 0.1% , 2013-2022.
  - Rice: 77 countries, 350 companies. Ex: Camilo Alimentos (Brazilian), COFCO (Chinese), Wilmar (Singapore) , …
  - Coffee: 99 countries, 419 countries. Ex: Nestlé, Lavazza, Tchibo, Kapal Api (Indonesia), …
- **CWASI** dataset (Tamea et al., 2021): unit water footprint of supply (uWFs) for the items 'rice milled' (UWF29) and 'coffee roasted' (UWF657).
- The unit water footprint of supply (uWFs) is proportionally constituted of local production and of trade, including information on the relative contribution of every country from which the goods originated, considering re-exports and processing of goods, when necessary (Kastner; Tamea et al. 2021).
- 1960 – 2016 => 2013 - 2022.

- With these datasets, we calculate

1) the volume of rice and coffee sold by each company globally and within individual countries,

2) the volumes of water footprint (WF) associated with the sales of these two items by each company in every country.

- 2) => company *uWF (c, t)*: average of the uWFs of the countries where the company operates, weighted by the volumes it sells in those countries.

=> proxy for the amount of water associated with the sales of rice and coffee by each company, considering both production and processing, and both domestic production and imports (Tamea et al. 2021).

- $uWF\ (c,t) \quad = \sum_{i=1}^{N} uWFs\ (i,t) \quad * \ Volume\ (c,i,t) \quad / \sum_{i=1}^{N} Volume\ (c,i,t)$

uWFs (i,t): unit water footprint of supply of country *i* where the company sells its product (coffee or rice) in year *t.*

- WF associated with the quantity of rice or coffee each company *c* sells in country *i* in time *t:*

*WF (c,i,t) = volume (c,i,t) * uWF (c,t)*

volume (c,i,t): quantity of rice or coffee sold by company *c* in a given country *i* in year *t*.

- global WF associated with the food item (rice or coffee) that each company *c* sold in year *t*:

$WF\ (c,t) \quad = \sum_{i=1}^{N} WF\ (c,i,t)$

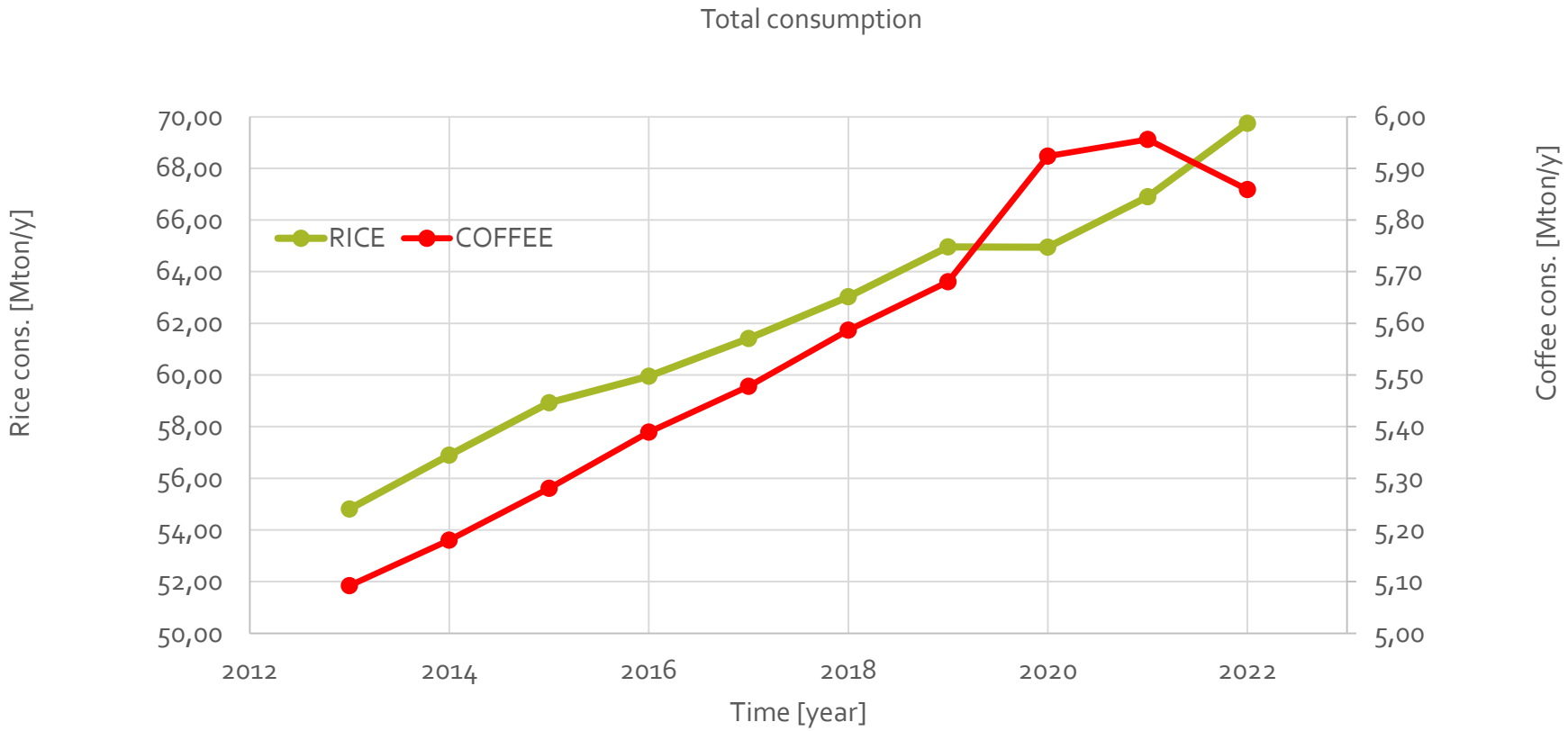


Figure 1. Trends in global volumes of rice and coffee consumption (2013-2022)
Totals are calculated including "others" and "private labels" categories that encompass also small companies (with a market share below 0.1%) in each country.

	Rice market			Coffee market		
year	Volume (10^3 tonnes)	WFs (km^3)	uWFs (m^3/ton)	Volume (10^3 tonnes)	WFs (Km^3)	uWFs (m^3/ton)
2013	54,807	98,840,158	1,803	5,092	80,064,201	15,724
2014	56,897	102,872,482	1,808	5,180	79,823,372	15,409
2015	58,927	104,719,426	1,777	5,280	85,122,220	16,120
2016	59,946	108,452,741	1,809	5,389	84,725,055	15,721
2017	61,413	111,694,954	1,819	5,478	86,405,014	15,773
2018	63,030	115,089,793	1,826	5,587	88,177,656	15,784
2019	64,961	119,116,218	1,834	5,681	89,677,611	15,787
2020	64,944	119,068,631	1,833	5,923	92,744,925	15,657
2021	66,904	123,240,235	1,842	5,956	93,434,872	15,688
2022	69,740	128,930,054	1,849	5,859	92,435,612	15,777

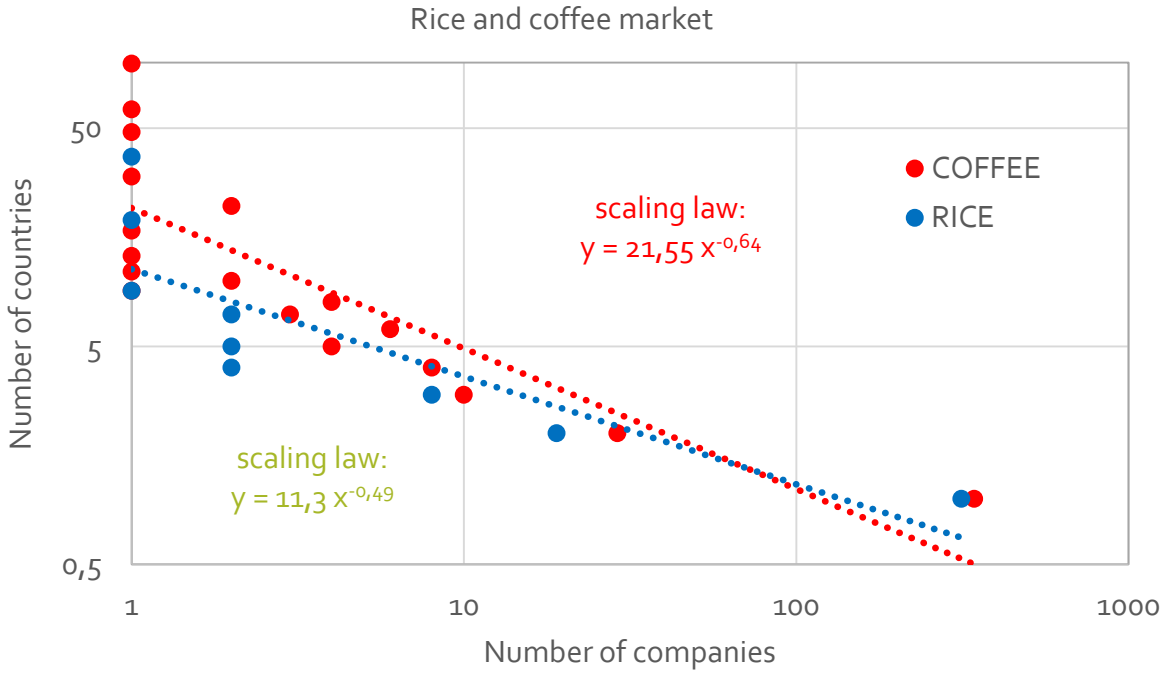
Source: authors' elaboration from Euromonitor International (2023) and Tamea et al. (2021). Totals are calculated on all companies in the sample (see Section 2 and Table 2), including "others" and "private labels" categories that encompass also small companies in each country (market share below 0.1%). The average uWFs of these two products for the world is calculated as the ratio between total WF and total volume associated to the sales of all companies of our sample.

Table 1. Total volume and total water footprint of supply for rice and coffee.

The average unit water footprints (uWFs) of coffee is higher compared to that of rice.
However, despite rice's lower uWF, the total virtual water (VW) associated with rice in the hands of private companies globally exceeds that of coffee.

Companies presence

- Rice market: largest market share 3.35% (Wilmar International).
- Coffee market: largest market share 11% in 2013 and increased to 13% in 2022 (Nestlé).
- On average, the coffee market is dominated by larger players.



Rice market

About 10% of companies operate in more than 1 country

2% of them operate in more than 5 countries.

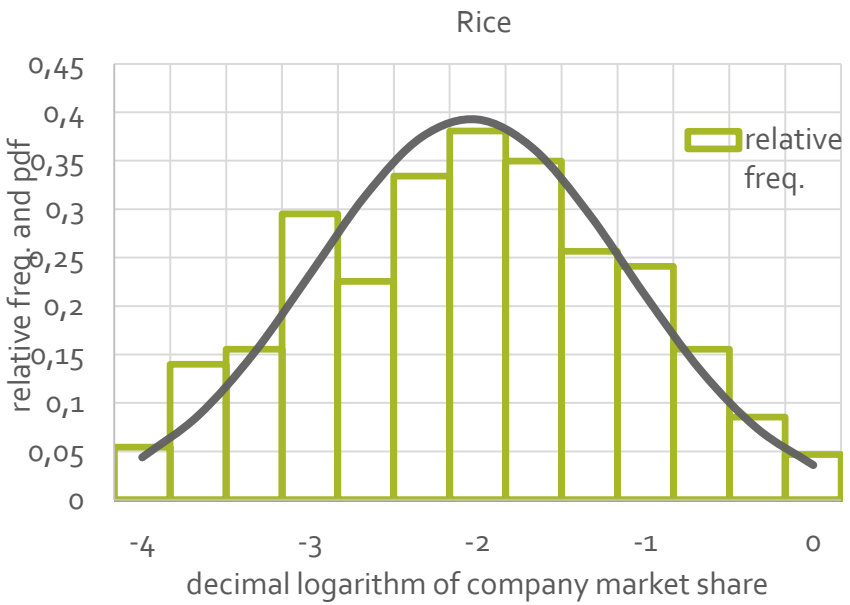
Scotti Riso (9 countries), Ebro Foods (19 countries), and Mars (37 countries)

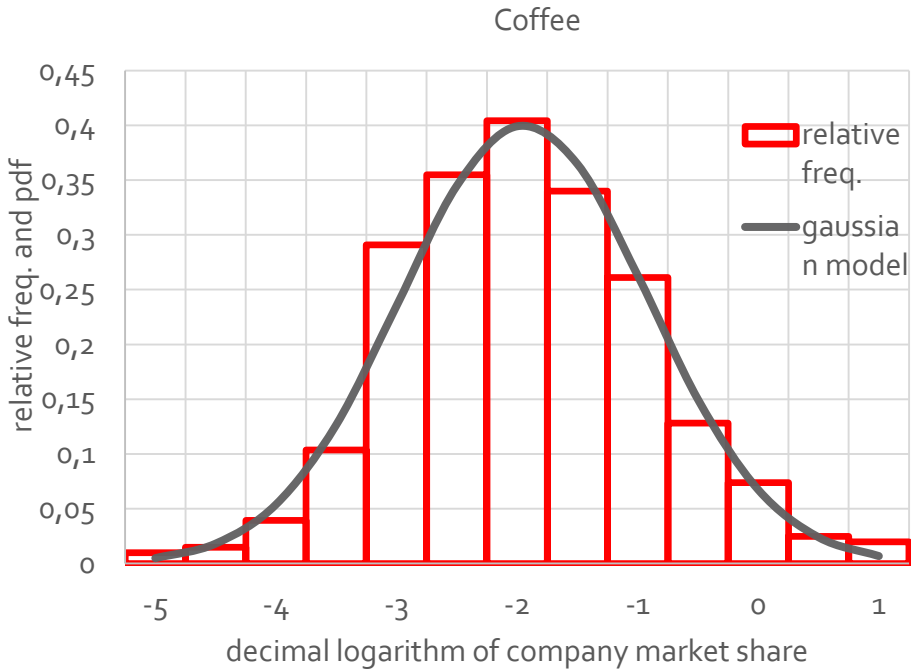
Coffee market: higher international presence

18% of companies operate in more than 1 country

6% are active in more than 5 countries.

Illycaffè (30 countries), Lavazza (48 countries), JDE Peet's BV (61 countries), and Nestlé, present in all 99 countries in our sample.



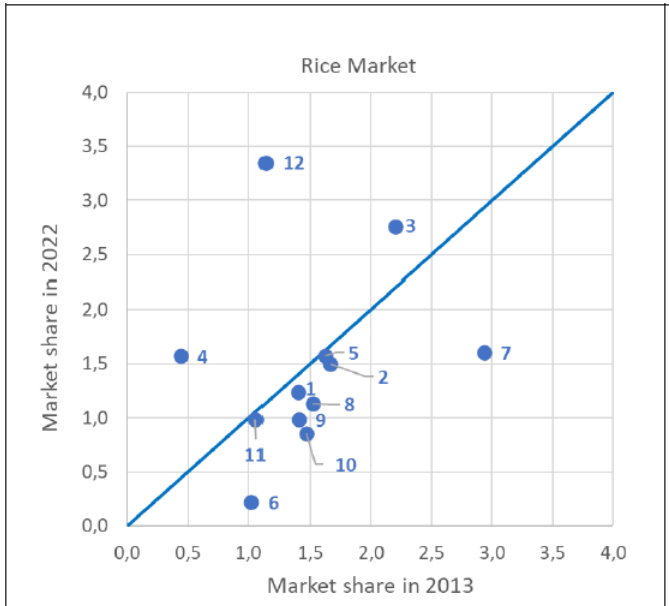


Companies' shares in the rice and coffee markets (2022).

Rice: 2% of the companies in the rice market held a share of the world total greater than 1%. Ebro Foods (1.58%), JA Group (Japan Agricultural Cooperatives, 1.60%, it sells only in Japan), China National Cereals, Oils & Foodstuffs Imp & Exp Corp (COFCO, 2.76%, only China). Wilmar International (3.35%). In contrast, Mars (37 countries, only 0.9%), Riso Scotti (9 countries, only 0.1%). Among the significant cross-national players, Ebro (operating in 19 countries) is the only one with a share of the world total exceeding 1%.

Coffee: 2.5% of companies held a share greater than 1%, but with a higher level of concentration. Nestlé (13.5%), JDE (10.3%), Kapal Api Group (6% , mainly Indonesia). Nestlé and JDE Peet's lead also in cross-national presence.

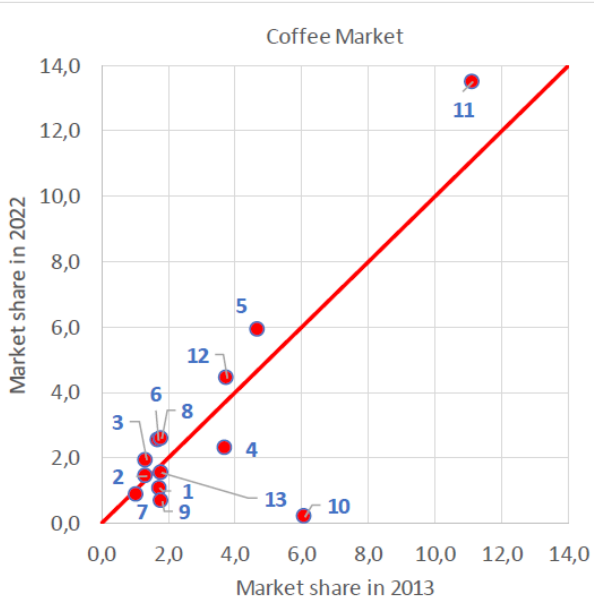
Internationalization and concentration. Rice: companies with the highest market concentration dominate in one single country each, while many more internationalized companies hold a low market share. Coffee: large companies with the highest market shares operate in a significant number of countries. Both: changes overtime = expansion in more countries. But stable distribution overtime.



	Company Name
1	Al Doha Co for Processing & Distribution
2	Camil Alimentos SA
3	China National Cereals, Oils & Foodstuffs Imp & Exp Corp (COFCO)
4	China Resources Enterprise Ltd
5	Ebro Foods SA
6	Heilongjiang Agriculture Co Ltd
7	JA Group (Japan Agricultural Cooperatives)
8	Josapar-Joaquim Oliveira SA Participações
9	Mars Inc
10	National Agricultural Cooperative Federation
11	Pirahy Alimentos Ltda
12	Wilmar International Ltd

Figure 4. Changes between shares in 2013 and 2022 of relevant companies in the rice market

Source: authors' elaboration on Euromonitor International (2023). Shares are calculated on totals including "other" and "private labels". Only companies with a sale share greater than 1% either in 2013 or in 2022 are included in the Figure. Correlation coefficient between shares in 2013 and in 2022: 0.2.



	Company Name
1	Dongsuh Foods Co Ltd
2	Indústrias Alimentícias Maratá Ltda
3	Java Prima Abadi PT
4	JM Smucker Co, The
5	Kapal Api Group
6	Lavazza SpA, Luigi
7	Massimo Zanetti Beverage Group SpA
8	Mayora Indah Tbk PT
9	Melitta Unternehmensgruppe Bentz KG
10	Mondelez International Inc
11	Nestlé SA
12	Strauss/São Miguel
13	Tchibo GmbH

Figure 5. Changes between shares in 2013 and 2022 of relevant companies in the coffee market

Source: authors' elaboration on Euromonitor International (2023). Shares are calculated on totals including "other" and "private labels". Only companies with a sale share greater than 1% either in 2013 and in 2022 are included in the Figure. Correlation coefficient between shares in 2013 and in 2022: 0.8.

Evolution of companies' share of world total over 2013-2022

- **Rice**: decrease in market share, while some saw a significant expansion. China Resources Enterprise: from 0.44% to 1.57%. Wilmar International (Singapore): more than doubling from 1.14% to 3.35%.
- **Coffee:** Half decrease in market share, the other half saw increase. Nestlé SA: from 11.14% to 13.52%. Lavazza and Mayora Indah: from 1.71% to 2.54% and from 1.81% to 2.59%.
- Coffee market showed less change in companies' shares over time with respect to the rice market.

Table 3. Evolution of the HHI index for the world markets of rice and coffee.

	Rice		Coffee	
year	*hhi vol*	*hhi WF*	*hhi vol*	*hhi WF*
2013	38	32	281	316
2014	41	33	285	334
2015	39	32	335	371
2016	41	33	323	377
2017	43	34	346	394
2018	43	34	370	418
2019	44	35	373	422
2020	45	33	376	417
2021	44	32	377	421
2022	43	31	380	429

Source: authors' elaboration from Euromonitor International (2023) and Tamea et al. (2021).

Concentration in the rice and coffee markets: Herfindahl–Hirschman Index (HHI) : How much of the total world market volume and WF are controlled by a small number of companies.

$$HHI = \sum_{c=1}^{n} s_c^2 \ldots$$

s_c : market share of firm c on total world volume and WF.

The HHI is maximized when one firm has a monopoly and minimized when all firms have equal market shares at the world level. Range: 0-10,000.

below 1500: low concentration level;

1500-2500: moderate concentration level;

above 2500: high concentration level.

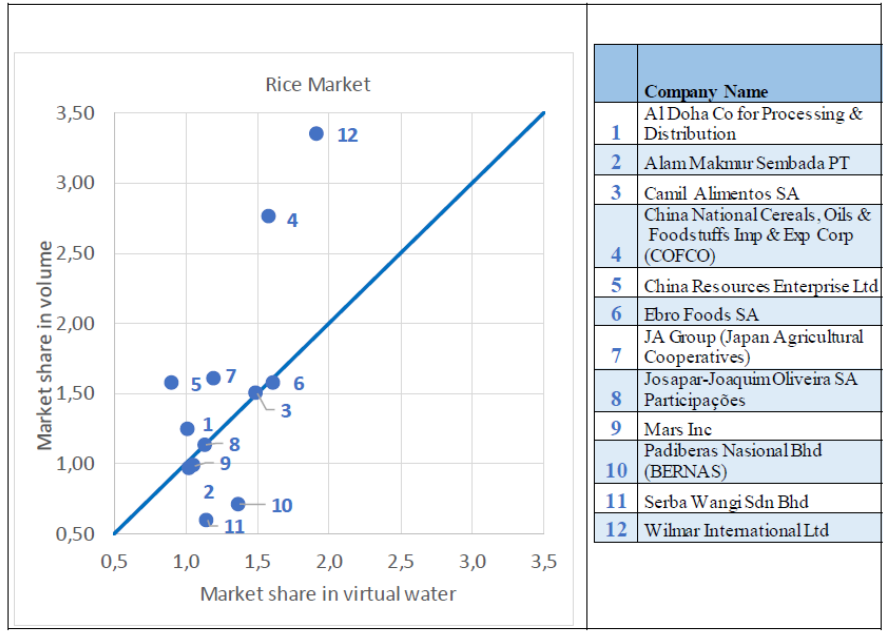
above 8000: dominant player

Coffee market is clearly more concentrated than the rice market.

Uncertainty checks

- Our knowledge about the rice and coffee market distribution is incomplete (category labelled “others” and “private companies”)
- => we evaluate also the upper bound of HHIs => relations proposed by Naldi (2003) and Naldi and Flamini (2014): they provide rigorous bounds without assumptions about the statistical distribution of shares.
- We obtain very small increases compared to the HHI values calculated on the basis of known shares.
- Reason: although the overall unknown market share is significant, it is made up of companies with very small shares and, therefore, not capable of significantly altering the value of the HHI.
- => the HHI values reported can be considered practically coincident with the values that would have been obtained if the shares of the entire market had been known.

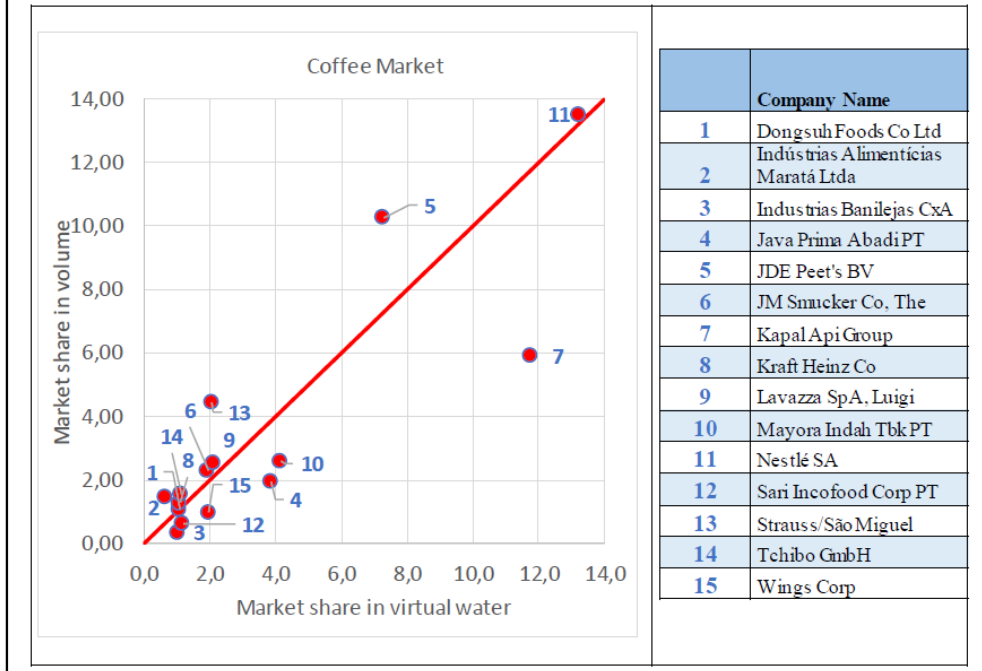
Virtual Water analysis



	Company Name
1	Al Doha Co for Processing & Distribution
2	Alam Makmur Sembada PT
3	Camil Alimentos SA
4	China National Cereals, Oils & Foodstuffs Imp & Exp Corp (COFCO)
5	China Resources Enterprise Ltd
6	Ebro Foods SA
7	JA Group (Japan Agricultural Cooperatives)
8	Josapar-Joaquim Oliveira SA Participações
9	Mars Inc
10	Padiberas Nasional Bhd (BERNAS)
11	Serba Wangi Sdn Bhd
12	Wilmar International Ltd

Figure 6. Correlation between companies' share on world rice WF and volume, 2022

Source: authors' elaboration from Euromonitor International (2023). Shares are calculated on totals including "other" and "private labels". Only companies with a sale share greater than 1% are included in the Figure.



	Company Name
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3	Industrias Banilejas CxA
4	Java Prima Abadi PT
5	JDE Peet's BV
6	JM Smucker Co, The
7	Kapal Api Group
8	Kraft Heinz Co
9	Lavazza SpA, Luigi
10	Mayora Indah Tbk PT
11	Nestlé SA
12	Sari Incofood Corp PT
13	Strauss/São Miguel
14	Tchibo GmbH
15	Wings Corp

Figure 7. Correlation between companies' share on world coffee WF and volume, 2022

Source: authors' elaboration from Euromonitor International (2023) and Tamea et al. (2021). Shares are calculated on totals including "other" and "private labels". Only companies with a sale share greater than 1% are included in the Figure.

Resource concentration among large companies is often more pronounced in terms of virtual water than in terms of food volumes.

- **RICE**
- Padiberas Nasional holds a share of 1.38% of the world water footprint, notably higher than its 0.71% share in the world rice volume.
- Serba Wangi exhibits a 1.15% share in the world water footprint, more than double its 0.60% share in the world rice volume.
- Ebro Foods, Mars Inc, and Alam Makmur Sembada also show higher shares of water footprint compared to volumes.
- Conversely, companies like Wilmar, COFCO, and China Resource Enterprise present an opposite situation => they have a large share but they operate in one or very few countries, with a lower WF of rice (?)

COFFEE

- Industrias Banilejas holds a 0.30% share in total volume but commands a 1% share in total water footprint, more than three times higher. => operations in the Dominican Republic, a country with a high unit water footprint (uWF) for coffee of approximately 50,000 m^3/ton.
- Other companies exclusively operating in countries with elevated uWF values (Wings Corp, Java Prima Abadi, and Kapal Api Group), also demonstrate higher shares in water footprint than in volume. => they are all present in Indonesia (uWF of around 30,000 m^3/ton in 2022).
- Mayora Indah: 4.1% share in water footprint and a 2.5% share in volume. => multiple countries, including China, Malaysia, Indonesia, and the Philippines, maintaining a uWF of 25,000 m^3/ton.
- Kapal Api Group: share in water footprint that is double with respect its share in volume.

In the coffee market a higher number of companies exhibit a higher share in water footprint than in volume with respect to the rice market, with this gap being, on average, larger.

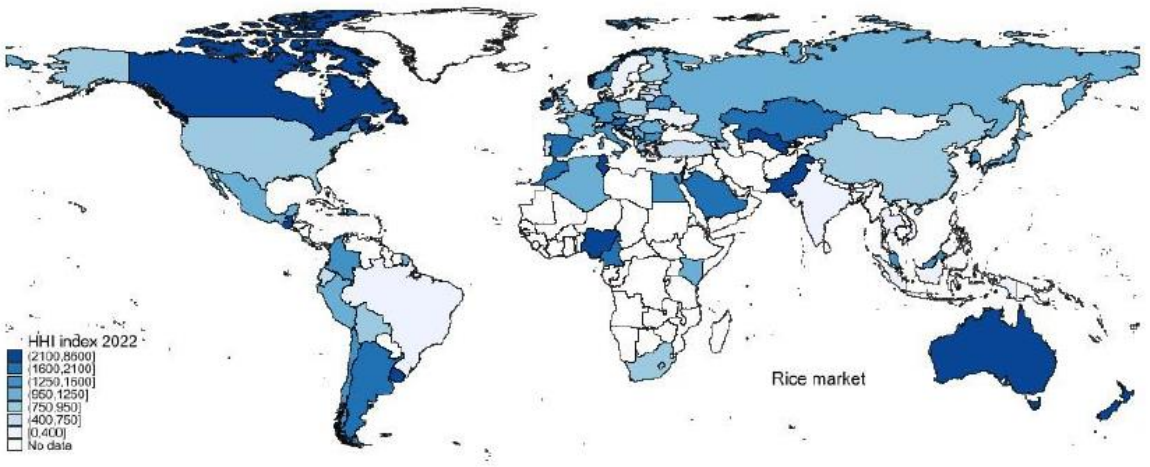

Figure 8. Countries HHI Index (rice market, 2022).

Source: authors' elaboration from Euromonitor International (2023) and Tamea et al. (2021).

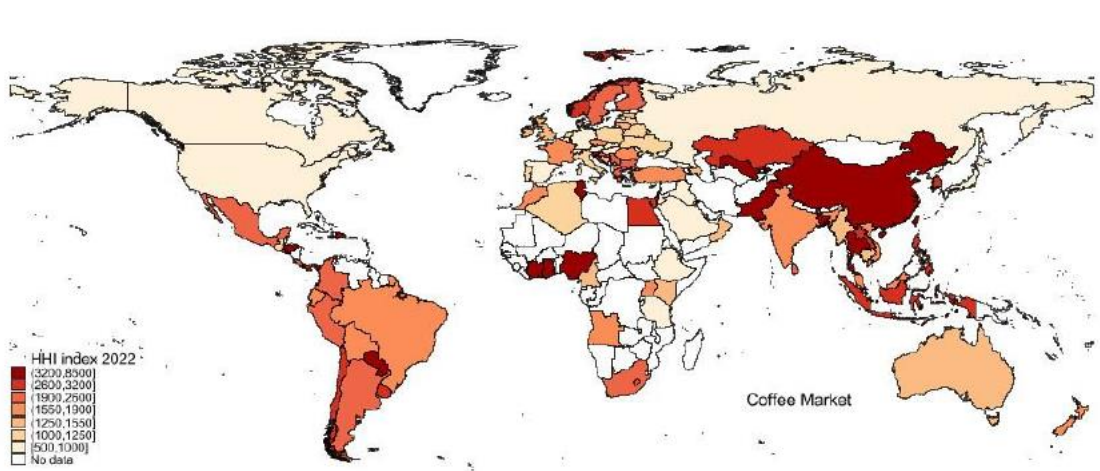

Figure 9. Countries HHI index (coffee market, 2022)

Source: authors' elaboration from Euromonitor International (2023) and Tamea et al. (2021).

Herfindahl-Hirschman Index (HHI)

$$HHI = \sum_{c=1}^{n} s_c^2 \ldots$$

s_c = market share of firm *i* on total country's WF.

The HHI index is derived from the shares of firms in the total virtual water associated with the volume of rice and coffee sold within a country. It quantifies the level of concentration of virtual water within that country.

High HHI values (above 2500): a few firms dominate the control of water resources associated with rice or coffee sales on a national scale.

Low values (below 1500): more evenly distributed control of water among all active firms in the country.

RICE

- 14% of the countries: HHI exceeding 2000 (medium-high concentration level).
  - Nigeria, New Zealand, Canada, North Macedonia, and Spain: HHI 2000-3000.
  - Australia, Pakistan, and Tunisia: 3000-4000 range.
  - Guatemala: 6700
  - Uzbekistan: 8500.
- Countries with HHI > 2000 (2022): all these countries show at least 1 company's market share on the total rice WF sales exceeding 40% => very high market power and concentration.
  - Guatemala: Arrocera Los Corrales => over 80% of total rice sales.
  - Uzbekistan: Generics => 90% share of the rice market.
- Half of the countries with an HHI over 2000 increased their rice market concentration from 2013 to 2022.
  - Israel more than doubled its HHI score from 2036 in 2013 to 4079 in 2022.
- In 2022, 13 countries had an HHI between 1500 and 2000 (moderate market concentration): ex Egypt, Cameroon, and Morocco.
- Most countries worldwide increased their concentration index over time (exceptions: India, Vietnam, and Taiwan => rise in the diversification of enterprises active in the rice market in these countries).

COFFEE

- 40% of countries: HHI > 2000
- 20% of countries: HHI > 3000 (China, Honduras, and Côte d'Ivoire).
- Markets with the highest concentration levels: Nigeria (HHI: 8549), Ghana (HHI: 7657), and Bangladesh (HHI: 6776).
- Nigeria has maintained a very high level of concentration since 2013, Ghana increased its HHI score from 2013 to 2022, while Bangladesh experienced a decrease overtime.
- Countries where the HHI exceeds 3000 in 2022 => Many of these nations have a company's market share on the total WF associated with coffee sales exceeding 50%.
  - Bangladesh: Nestlé dominates the market (over 80% of total coffee sales).
  - Ghana: Nestlé 87%
  - Nigeria: Nestlè 92%
- Some companies holding a share higher than 50% in a single country: Industrias Banilejas (Dominican Republic), Gabriel Kafati (Honduras), Casa Luker (Panama), Atlantic Grupa (Slovenia), Dongsuh Foods (South Korea), Amen Group (Tunisia), Food Empire Holdings (Uzbekistan).
- The majority of countries decreased their HHI index from 2013 to 2022 (exception: Ghana's and Paraguay's indexes saw a massive increase).
- 35 countries have a HHI score between 1500 and 3000, indicating a medium market concentration.

- The coffee market country HHI indexes present more diverse values compared to those in the rice market.
- In the coffee market changes over time are more dynamic than in the rice market.

Virtual water concentration

Despite few companies hold a share of total world volume higher than 1%, they wield considerable influence.

- **Rice**: 16% of the total WF associated with rice worldwide (20,017,000,000 m^3 of virtual water) was controlled by the top 12 companies selling the highest rice quantities in our sample countries (2022): ex Wilmar International, Ebro Food, Camil, and Mars.
- **Coffee**: the concentration of water resources in the hands of large companies is much more pronounced. The top 15 companies held together 55% of the total WF associated with roasted coffee worldwide (50,507,400,000 m^3 of virtual water, 2022): ex Nestlé, Lavazza, Tchibo, Kapal, JDE, and Kraft Heinz.
- Findings remain consistent over the 2013-2022 period => stable water concentration trends at the large company level for both products.

Comparing the role of large companies to states' figures

- **Coffee** 2022: the virtual water associated with coffee sold by Nestlé alone worldwide (over 12 billion m^3) is 6 times higher than the total virtual water quantity associated with coffee imports for France (about 2 billion m^3), the largest importer.
- the virtual water amount related to Kapal is 5 times higher than France's coffee import quantity.

- **Rice** 2022: less in the hands of one or two enterprises, but the amount associated with the large rice companies group (the top 12 companies with a world share in sales higher than 1%, encompassing about 20 billion m^3) is approximately one and a half times higher than the virtual water quantity associated with the three largest rice importers (Philippines, China, and Iraq => about 15.5 billion m^3 for the three countries combined).

Differences in volumes and virtual water

- In the coffee market a high number of companies hold a higher product share in terms of WF than in terms of volumes.
- This number of companies is higher than the one in the rice market presenting an analogous situation.
- The group of large companies for coffee (having a respective world share of sales above 1%) holds a share of WF that is 7.5% higher than the share in volumes => higher gap with respect to the large companies of the rice case.
- However, this average gap reveals larger differences if single cases are observed. Industrias Banilejas (coffee processing and trade, founded in 1945 in the Dominican Republic), holds a world share of WF associated to its sold coffee that is almost 4 times higher than its corresponding share in volumes.

- Java Prima Abadi, Wings, Sari Incofood, and Kapal have their respective shares in WF that are double than their corresponding shares in volumes
  - Kapal: 6% of the volumes of coffee sold in the world, but a 12% of the WF associated to the sold coffee worldwide.

=> large companies in the coffee market hold on average larger shares of virtual water associated to the product they sell with respect to rice companies

=> lower degree of water-related sustainability along the value chain and a stronger control directly and indirectly exerted on water resources.

- The coffee market is more concentrated than the rice market (2022).
- Coffee: concentration in the hands of few large companies is more pronounced in terms of virtual water than in volumes, and this gap increased from 2013 to 2022 | Rice: opposite.
- Coffee: 40% of countries have a high concentration degree internally | Rice: only 14% of countries.
- Coffee: higher number of countries with a moderate HHI | Rice only 13 countries
- Coffee: more dynamicity in terms of country increasing and decreasing sale concentration by large companies overtime.
- Countries with very high HHI in the coffee market => Nestlè dominates (market shares from 2.63% in the Dominican Republic and 92% in Nigeria).
- Results on market concentration for coffee are in line with previous research (Bulte et al. 2018, Falsetti et al. 2020).

HHI and country features

- Loose negative correlations

-Rice: HHI and GDP

-Coffee: HHI and GDP per capita

Limitations and future research

Limitations

- limited data currently available on the actual place of production of the rice and coffee that is sold by the multinational companies, that typically obtain their products from multiple production sites.

=> delving deeper into individual cases of large corporations or specific products, as done in the TRASE project (SEI, 2019).

- lack of information on the trends of the companies in the categories of "others" and "private labels."

Future research

- Econometric analysis of the correlations between each country's HHI index for food volumes and the associated WF and some country features that may influence the level of food market concentration for staple and cash crops:
  - domestic level of economic freedom
  - trade policies
  - anti-trust policies
  - structure of the food and agricultural value chains.
- Environmental impact of large corporations operating in the rice and coffee markets.
- Other food items, in terms of volumes and WF, future trends.

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