The Breakdown of Final Consumption of Agrifood Products Into Values Added. Attempting a Europe-Wide Comparison

Philippe Boyer* and Jean-Pierre Butault**

Abstract – This article proposes an intra-European comparison of the breakdown of consumption expenditure on agrifood products into values added induced for the different branches, taxes and imports. It focuses in particular on the level of the share of agriculture in this consumption, along with its determinants. This study makes use of the calculations first proposed by W. Leontief, tailored to the available data (Eurostat input-output tables), and builds upon two measures which already exist at national level: the "*euro alimentaire*" in France, and the "food dollar" in the USA. The results show that those countries with high imports and high taxes stand apart from those countries where the distribution of consumption expenditure is more favourable towards value added. Countries also vary in the way this value added is distributed between the trade and service sectors, on the one hand, and agriculture and the agrifood processing industry, on the other. In France, compared with other European nations, the breakdown of expenditure is fairly favourable to value added, while the share taken by agriculture is close to the European mean.

JEL: M21, M41
Keywords: input-output tables, value added, food supply chain, agricultural income

**Académie d'Agriculture de France; **INRAe Économie et sciences sociales.* Correspondence*: pboyer845@gmail.com*

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Since 2012, the Observatory for Formation of Food Prices and Margins, set up by the French government to help improve interprofessional dialogue and commercial relationships between the agricultural sector and the sectors further downstream in the agrifood chain (Boyer *et al.*, 2022), has published, along with its microeconomic analyses of the value chains for different food products in France, a macroeconomic overview of the split between value added, imports and taxes for the total sum spent on food by people resident in France, in both shops and restaurants (OFPM, 2022). This calculation is known as the "food euro" (*euro alimentaire* in French), drawing inspiration from the "food dollar" indicator calculated by the Economic Research Service at the US Department of Agriculture (Canning, 2011), which looks at all spending on food and breaks it down into value added, imports for intermediate consumption and taxes, restricting the analysis to spending on food goods and services produced in the USA. The French approach, on the other hand, also incorporates "final imports" (cf. definitions in Box 1). A comparison of these two approaches can be found in Boyer (2021). The "food euro", much like the "food dollar", is calculated by applying calculations to the input-output tables first constructed by W. Leontief (1986), whose pertinence to the analysis of value in agrifood systems has previously been noted by Rastoin & Ghersi (2010). This discussion often focuses on the distribution of value added among the various links in the agrifood chain (European Commission, 2020), applying the institutional, "vertical" definition favoured by interprofessional organisations, and thus limiting itself to agriculture, agrifood processing industry and the agrifood trade. Using input-output tables, however, enables us to consider the distribution of value across all branches, going beyond those listed above. This approach also includes services, which are increasingly prominent in value chains, as well as taxes and imports of finished goods ready for final consumption, as well as those for use in intermediate services (commodities, energy, etc.). The results of these approaches, particularly the relatively small share taken by agriculture, feed into long-running, recurring and recently-resurrected debates in France regarding agricultural policy and competition law, how food products "create" value, and how this value is "shared" between the agricultural sector and other activities. There are two opposing points of view on this matter. For the proponents of the "sharing" standpoint, the agricultural prices formed on the market do not reflect the fair value of the various outputs which combine to make up the food supply, because of the market power created by the concentration of the downstream sections of the industry (supermarkets and the agrifood chain): as such, it would be reasonable to politically manage prices in order to bolster producers' income, with legislative efforts to rebalance the commercial relationships between agriculture and its clients (Mancaleoni & Torino, 2023), or else to boost competition by regulating the oligopsony held by large purchasing centres, helping new actors to enter the market (Allain *et al.*, 2018). For defenders of the value "creation" argument, market prices are the best (or "least worst") available reflection of true value, and producers would do better to focus their efforts on improving their incomes by increasing their productivity.

The breakdown of the "food euro" in France, much like that of the "food dollar" in the USA, and particularly the share taken by agriculture, is determined by various characteristics of the respective national agrifood systems, which have been studied elsewhere: the productivity of the different branches and the transfer of productivity gains from agriculture towards other sectors further downstream (Butault, 2008; Boussemart & Parvulescu, 2021), the market power and the concentration of the supermarket sector (Allain *et al.*, 2022), and also the importance, within both food systems, of imports, taxation and products which are processed to a greater or lesser degree, or which incorporate varying amounts of services (Colonna *et al.*, 2011).

This article represents an update of an earlier study presented at a colloquium (Boyer & Butault, 2013).[1] It also proposes expanding the horizons of the "food euro" beyond France's borders to include other European nations, with a view to identifying the key characteristics of our different national agrifood systems, in terms of the relative contributions of the different branches, imports and taxes to determining the value of agrifood consumption goods (i.e. products emanating from the agriculture and fisheries branches, as well as the food, drink and tobacco manufacturing branches). Among the contributions made by these different branches, agriculture receives special attention in order to allow for international comparisons which might better inform the debate provoked by France's relative weakness in this field.

1. This earlier effort looked at a quite different selection of European countries, and focused on the year 2005, using data in base SEC 2000.

Our data and methodology are described in Sections 1 and 2 of this article respectively. In particular, we make clear that differences in the availability of data from one country to the next meant that we were unable to apply exactly the same concepts used to define the French "food euro" in all cases.

In Section 3, we consider the respective contributions of agrifood consumption and exports to the value added by agriculture in the various European nations we studied, demonstrating that the contribution of agrifood consumption to the value added by the agricultural branch varies significantly from one European country to the next. As a result, the share of consumer spending which finds its way back to farmers has become a major political issue in Europe (European Commission, 2020), and merits more detailed analysis.

In Section 4 of this article, we analyse the breakdown of final consumption expenditure on agrifood products in terms of the value added induced for the different branches, along with imports and taxes. We look at how this distribution varies between countries and, with the help of a principal component analysis, we analyse the differences observed between these countries. We thus demonstrate that the major differences are to be found in two areas: firstly, total value added as a proportion of consumption, relative to taxes and imports, and, secondly, the respective importance of the upstream and downstream segments of the agrifood chain in terms of share of value added. Finally, Section 5 details the differences we observed between the countries with regard to the relative share of value added taken by agriculture. We focus particularly on breaking this share down into a product of two factors: rate of agricultural value added, and agricultural production coefficient in agrifood final consumption.

1. Data

For each country, the most important calculations require the use of symmetrical product-by-product input-output tables for domestic products at basic prices. These tables are described in detail hereunder.

We also need, for each agrifood product:

a) total final consumption (domestically-produced and imported goods) at purchase price;

b) commercial and transport margins of this final consumption;

c) value of taxes on the product, less subsidies on this product.

All of these data were extracted from the Eurostat online database, with the exception of the symmetrical input-output tables for certain countries (see below). Five European Union (EU) member states failed to publish any of these data for the year 2020, and were thus excluded from our analysis (Bulgaria, Denmark, Ireland, Luxembourg and Malta). We have full data for 20 countries: Austria, Belgium, Cyprus, Croatia, Estonia, Finland, Greece, Hungary, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden and the Czech Republic. The data sets are incomplete for Germany and Spain, meaning that we are not able to include these countries in certain analyses. For the additional calculations required to consolidate the results for the various countries, and to analyse imports, we used the inter-country input-output tables from the Eurostat Figaro database, along with the import input-output tables for each country.

Box 1 recalls the definitions of some of the national accounting concepts and aggregates used in our calculations. This study focuses on the year 2020, the most recent year for which data were available when the research was conducted.

For illustrative purposes, the Table contains product-by-product symmetrical input-output tables for France, in a condensed format comprising 6 branches and products. The calculations, however, were made using the original input-output tables, with their 65 branches and products. This table is considered to be symmetrical product-by-product because it uses "pure" branches: each branch is regarded as producing a single product defined in the classification table, and is the only branch to produce this product; the branch thus becomes synonymous with the product, and the value added by a branch is equal to the value contained in its defining product. Moreover, output and uses are measured using the same conceptual price construct: basic price; total use of a domestically-made product is thus equal to the output of its associated branch (Box 2). Pure branches are theoretical constructs obtained by "symmetrising" the standard input-output tables, in which each branch is an "observable branch of activity" (in France, otherwise known as a sector of activity in other countries, cf. INSEE 2024) which, in addition to the primary product for which it is named, also produces secondary products. Symmetrisation consists of excluding secondary products from the branches, instead assigning them to the branch whose principal output they represent. There are various methods for doing

this, each based upon different hypotheses (Arthaut & Braibant, 2011; Dias, 2009; Eurostat, 2008; United Nations, 2018). We applied one of these methods, developed with Portugal in mind (Dias, 2009) to the standard input-output tables taken from the OECD database for the five countries for which symmetrical input-output tables were not available: Belgium, Finland,

Box 1 – **National Accounting Concepts Used in This Study**

Pure branch	All production units and sub-units which exclusively produce the same product. This is a statistical construct, and thus differs from the "observable" branch or "sector" (INSEE, 2024).
Final consumption	Acquisition of goods and services to be definitively used for the direct satisfaction of a human need.
Final consumption at basic prices	Final consumption expressed at the price received by the producer of a product, including subsidies producer receives on this product, less taxes he paid on said product.
Final consumption at purchase prices	Final consumption expressed at the price paid by the purchaser of a product, including commercial margins, transport margins and final consumption taxes (VAT, excise charges on alcohol and tobacco, etc.).
Intermediate consumption	Goods and services transformed or entirely consumed during production processes.
Intermediate consumption at basic prices	Intermediate consumption expressed at the price received by the producer of an intermediate product, including subsidies producer receives on this product, less taxes he paid on said product.
Intermediate consumption at purchase prices	Intermediate consumption expressed at the price paid by the user, including purchase taxes payable on the intermediate product but excluding subsidies (which are paid to the product's producer).
Final demand	All uses of goods and services other than intermediate consumption: encompasses final consumption, exports, gross capital formation (fixed assets, inventory variation).
"Final imports"	Imported product intended to be used "as is" to satisfy a final demand (such as final consumption), as opposed to imports destined for intermediate consumption.
Purchase price	Amount paid by the purchaser per unit of goods or services bought. Includes taxes, with VAT counting only for its non-deductible part, but does not include subsidies on products.
Basic price	Amount the producer receives from the purchaser per unit of goods or services produced, less taxes on the product paid by the producer and plus subsidies on the product he receives.
Output at basic prices	Output at the price received by producers, exclusive of product taxes paid by producers and increased by subsidies on those products.
"Agrifood products"	All of the following products in the classification: agricultural products, fish and aquaculture products, products of the food and drink and tobacco processing industries.
Subsidies on products	Subsidies paid to producers per unit of goods or services produced. Example: agricultural subsidies calculated on the basis of the nature and volume of the products, or the means used in their production (land, livestock), now accounting for a minority of agricultural subsidies as they have been superseded by "Other production subsidies" ("right to basic payment", "green payments", etc.).
Input-output tables (TES)	A table which shows, for each product (rows), its uses (columns): intermediate consumption of that product by different branches or sectors, along with final demand for the product: final consumption, export, gross capital formation. Each column corresponding to a branch or sector contains the value added and output figures for that branch or sector.
Symmetrical product-by-product input-output table for domestic products at basic prices	This table details the uses of domestically-produced goods. Output and intermediate and final uses of each domestically-produced good are measured at basic prices and the branches are "pure": for each product, the resource (output of the branch) is equal to its uses. This symmetry allows us to perform the matrix calculations developed by Leontief, as used in the present article. This table is constructed by "symmetrising" the standard basic price input-output table, where the branches are "not pure" (corresponding to observable branches and sectors).
Tax on products	Tax payable per unit produced; includes: VAT (when it cannot be claimed back). A tax on products applicable to purchases for either intermediate or final consumption. Not to be confused with "Other taxes on production", which are not tied to specific products.
Value added	For the purposes of this article we refer to "gross" value added: production value less the value of intermediate consumption (to calculate "net" value added we must also subtract fixed capital consumption).
Value added at basic prices	Output at basic prices less intermediate consumption at purchase prices Corresponds to the gross income of the "primary" factors of production (capital and labour), before payment of "Other taxes on production" and before receipt of "Other production subsidies".
"Induced value added" (by a particular final demand)	The share of value added which comes from the proportion of output devoted to satisfying a specific final demand. For the purpose of this article, that demand is final consumption of agrifood products.

Box 2 – **Reading the Symmetrical Product-By-Product Input-Output Table for Domestic Products at Basic Prices**

The section of the input-output table comprising rows *[i]* to *[vi]* and columns *[1]* to *[6]* is the *intermediate uses table*. The rows show the quantities of domestic products used for intermediate consumption purposes by the pure branches (or products) shown in the columns. For example, the output of the agrifood processing industry incorporates 15.5 billion Euros' worth of trade and transport services (essentially comprising trade and transport margins on the intermediate consumption products purchased by the industry). These values are given at basic prices, i.e. the price paid to the producers of these products, plus subsidies and less taxes on products.

The section of the input-output table comprising rows *[i]* to *[vi]* and columns *[8]* to *[10]* is the final usage table. The rows show the quantities of domestic products used for final consumption, exports or gross capital formation; these values are also given at basic prices. For example, final consumption of "other services" amounts to 1,094.9 billion Euros, measured in basic prices for these services; these include the financial, administrative and health services consumed by households.

Each column *[1]* through *[6]* constitutes a detailed production account for that branch, including its intermediate consumption of each product, at basic prices (row *[i]* to *[vi]*), intermediate consumption for all products at basic prices (row *[a]*), intermediate consumption of all imported products excluding taxes (row *[b]*) and taxes paid by the branch on all products for intermediate consumption, less subsidies on those products (row [*c*]). As such, the *total [d] = [a]+[b]+[c]* gives us total intermediate consumption paid by the branch, which, when added to value added measured at basic prices (row *[e]*) gives us the total value for output at basic prices (row *[f]*).

The overall equation:

	final demand for all domestic products at basic prices, column *[11]*, row *[a]*:	2,533.1
=	value added for all branches (or products) at basic prices, column *[11]*, row *[e]*:	2,068.8
+	imported intermediate consumption for all branches, column *[11]*, row *[b]*:	397.9
+	taxes less subsidies on intermediate consumption products, column *[11]*, row *[c]*:	66.4

can be broken down for each component of final demand (including final consumption), by branch and by product, using the Leontief matrix calculations. The same goes for final demand for domestically-produced goods and services. For our purposes, then, final consumption of agrifood products can be broken down into value added, imported intermediate consumption and taxes less subsidies on products for intermediate consumption (see Online Appendix S4).

N.B. the full input-output table shows the distribution of value added between wages, gross operating surplus and mixed income (the gross return on the primary factors of production: labour and capital), and other taxes on production less other subsidies on production.

Netherlands, Romania and Sweden. The method is relatively simple to use, is based on acceptable hypotheses and yields plausible results (see Online Appendix S1 – link provided at the end of the article).

2. Method

At this juncture we propose a concise, descriptive summary of the methodology employed; a detailed presentation of the calculations applied to the input-output tables can be found in Online Appendix S2 through S5, as well as in previous publications (Boyer & Butault, 2013, 2014; Boyer, 2021).

2.1. The Contribution of Final Consumption of Agrifood Products and Other Final Demands to the Value Added of Agriculture

The output of a branch meets different final demands, either directly by producing the requested goods, or indirectly by producing goods and services for intermediate consumption by another branch, which then directly or indirectly satisfies demand for its own output. Any output is thus wholly induced (or determined) by some final demands (see Online Appendix S2).

Products from the agricultural branch may, in their original state (i.e. without being processed), be consumed (fruit and vegetables, eggs, flowers, plants, etc.), exported (cereals, livestock, etc.) or else undergo gross capital formation (livestock growth, plantations, harvest storage, etc.). Alternatively, they may indirectly respond to demand in the form of final consumption, export or the storage of processed food products (meat, dairy products, etc.) for which they constitute the raw materials. They may be used for intermediate consumption purposes in processing industries such as energy production, chemicals, textiles, etc., thus indirectly going towards satisfying final demand for non-food goods and services.

Table – **Symmetrical product-by-product input-output table for domestic products at basic price, France, 2020**

in billions of Euros		Agri-culture	Fishing and Aquacul-ture	Agrifood processing industries	Other processing industries	Trade and transport	Other services	Total	Final consumption	Gross capital formation capital	Exports	Total final demand	Total use
		[1]	[2]	[3]	[4]	[5]	[6]	[7] = [1]+…+ [6]	[8]	[9]	[10]	[11] = [8]+…+ [10]	[12] = [7] + [11]
[i]	Agriculture	13.2	0.0	43.2	0.5	0.0	0.9	57.8	10.7	1.3	12.1	24.1	81.9
[ii]	Fishing and aquaculture	0.0	0.0	0.7	0.1	0.0	0.4	1.2	0.5	0.0	0.5	0.9	2.1
[iii]	Agrifood processing industries (*)	6.0	0.0	18.9	2.8	2.1	22.0	51.8	83.2	3.7	33.8	120.7	172.6
[iv]	Other processing industries	9.0	0.3	9.4	266.3	26.3	72.9	384.1	102.5	245.1	281.1	628.8	1,012.9
[v]	Trade and transport	4.6	0.2	15.5	72.4	93.5	56.1	242.3	238.8	24.5	115.4	378.7	621.0
[vi]	Other services	4.1	0.3	18.6	106.2	136.7	521.5	787.5	1,094.9	166.7	118.3	1,379.9	2,167.4
[a] = [i] +…+ [vi]	Total at basic prices	36.9	0.8	106.2	448.2	258.6	673.9	1,524.7	1,530.6	441.4	561.2	2,533.1	4,057.8
[b]	Use of imported products	10.2	0.5	19.1	199.1	55.3	113.7	397.9	142.9	77.6	45.2	265.7	663.6
[c]	Taxes less subsidies on products	1.7	0.1	0.9	9.7	7.3	46.7	66.4	143.3	39.3	0.0	182.6	249.0
[d] = [a] + [b] + [c]	Total at purchase prices	48.7	1.4	126.3	657.1	321.2	834.3	1,989.0	1,816.7	558.3	606.4	2,981.4	4,970.4
[e] = [f] – [d]	Value added at basic prices	33.2	0.8	46.2	355.8	299.7	1,333.1	2,068.8					
[f] =[d] +[e]	Production at basic prices	81.9	2.1	172.6	1,012.9	621.0	2,167.4	4,057.8					

(*) includes manufactured food, drinks and tobacco products.
Note: Cf. Box 2 for a key to reading this table.
Source: Eurostat, INSEE.

Basing our calculations on the input-output tables allows us to measure the contribution made by final demand for each product to the value added for each branch, i.e. the gross return on the primary factors of production (capital and labour) each branch employs. Value added at basic prices by the agriculture branch can thus be broken down as follows (see Equation [7] in Online Appendix S3):

value added at basic prices (i.e. including subsidies and less taxes applied to these products)

= value added at basic prices induced by final consumption of agrifood products

+ value added at basic prices induced by exports of agrifood products

+ value added at basic prices induced by gross capital formation involving agrifood products

+ value added at basic prices induced by other final demands for other products.

In the specific case of the agricultural branch, we shall see in Section 3 that there are two forms of final demand – final consumption and exports of agrifood products – which chiefly determine value added.

2.2. Breaking Down Final Consumption of Agrifood Products Into Value Added, Imports and Taxes

Since value added is induced by final demand, all final demand induces value added for different branches. In particular, the fact that the consumption of agrifood products induces value added for various branches (agriculture, industry, trade and services) can be interpreted

as a distribution of consumer spending among these branches, in the form of gross income of the primary factors of production (capital and labour) utilised by these branches.

However, the output required to satisfy demand (or induced by demand) does not only engender value added: the branches also makes use of various imported intermediate consumptions, which amounts to transferring value overseas, and they also pay the state (in its broadest definition) taxes on intermediate consumption, the cost of which is passed on to their customers.

Since these components are derived from calculations made using a basic price input-output table, the figures for output and induced value added are given at basic prices and refer to final consumption of domestically-produced goods, which is also valued at basic prices, i.e. before trade and transport margins and before final consumption taxes, and including subsidies on products for final consumption (see Box 1). However, we want to break down the shares of actual consumer spending, which is obviously measured in purchase prices, including all margins and taxes but not including any subsidies received by producers. Since margins correspond to the value of final consumption in terms of trade and transport services, they also need to be broken down into value added, imported intermediate consumption and taxes less subsidies on intermediate consumption. We then need to add any taxes on final consumption (VAT, excise duty, etc.) paid by consumers, and also subtract any subsidies on products (included in the measure of consumption at basic prices, but not relevant to value at purchase price). Finally, we add on imports for final consumption, with margins and taxes already covered by the preceding calculations (see Online Appendix S4).

This leaves us with the following breakdown of final consumption of agrifood products:

Final consumption at purchase prices of agrifood products (domestically produced and imported)

= value added at basic prices induced by this final consumption in the "Agriculture" branch

+ value added at basic prices induced by this final consumption in the "Agrifood processing industries" branch

+ value added at basic prices induced by this final consumption in the "Other processing industries" branch

+ value added at basic prices induced by this final consumption in the "Trade and transport" branch

+ value added at basic prices induced by this final consumption in the "Other services" branch

+ imported intermediate consumption induced in the various branches by this final consumption

+ imports of agrifood products for final consumption

+ taxes less subsidies on intermediate consumption induced in the different branches

+ taxes less subsidies on products for final consumption (domestically produced and imported).

This includes a sum not paid directly by consumers: subsidies on products included in the value added at basic prices, but offset by the inclusion of taxes at their net amount.[2]

2.3. Limitations of This Methodology

The main limitations arise from the nature of the data and the assumptions which underpin the calculations in the input-output tables.

First and foremost, the methods used for making input-output tables are specific to each country, which may limit the scope for comparing results obtained from insufficiently homogeneous sources (Braibant, 2018). The input-output table calculations are also based on an assumption of constant coefficients, and thus linear relations, between output and its constituent components: as such, the rate of value added (value added proportional to production) and the intermediate consumption coefficients for each branch are fixed and unchanging, for all or part of the output and regardless of its destination: final consumption, export or gross capital formation; the product classification does not differentiate between different uses. Input-output table calculations, particularly those involving inverted ratio matrices, yield results which are sensitive to the degree to which products are aggregated. Although for the purpose of our calculations we retained the classification system used in the Eurostat input-output tables, with its 65 branches and products (the most detailed classification available), the practice of aggregating multiple goods and services into single items probably has consequences for the results. Moreover, it does not allow us to include food services (which are combined with accommodation services), nor to exclude tobacco products, which have a potentially significant impact on the proportion of taxes in the "food euro".

2. This model differs from the French "food euro" calculated by the OFPM, for which INSEE provides data allowing statisticians to break down expenditure into transfers actually paid for by "pure" consumers (not taxpayers), without taxes to offset subsidies: see Online Appendix S7.

As for the scope of this analysis, due to the constraints imposed by the product classification system, final consumption of agrifood products also includes consumption of tobacco, flowers and plants, along with actual food consumption. Moreover, food consumption in food services cannot be included, as this branch is indissociable from accommodation services in the classification.[3] It should also be noted that final consumption of healthcare and education services, and even trade and transport, may also include a certain amount of food consumption which eludes our analysis because it is counted as part of said services in the classification of products. Examples include hospital and school canteens, and catering on transport services, as well as the range of food products processed by the trade sector and not counted separately from their "pure" commercial activities.[4] Finally, sales of processed products directly from farms, which are on the increase as farmers seek to retain a greater share of the value added by the sector, are not included in the "pure" agricultural branch, which leads to an under-estimation of the share of value added for agriculture in the final consumption of agrifood products.

3. Results and Analysis of the Contribution of Different Final Demands to the Value Added of the Agricultural Branch

Figure I situates each country on the basis of the respective contributions of domestic final consumption and agrifood exports to the total value added of the agricultural branch. As an exception to the method, in this calculation of the value added induced by final consumption of agrifood products we also include value added by the consumption of accommodation and food services, as the value added induced in agriculture by the consumption of these services essentially comes from a form of food consumption.

The sum of these two contributions is below 100% in almost all countries, since other forms of final demand contribute, on a lesser scale, to the total value added of the branch (immobilisation or inventory change in agrifood product stocks, and final demand for non-agrifood products whose production requires the use of agricultural products – biofuels, for example). Nevertheless, the total may exceed 100% in some countries due to the effects of inventory reductions. Point M22 corresponds to the mean contributions across all 22 countries, weighted by the value added of their agricultural branch.

The contribution of final consumption (resp. exports) of agrifood products to the value added of the branch is heavily dependent upon the ratio between final consumption (resp. exports) of domestically-produced agrifood products and final demand for all domestically-produced products at basic prices (see Online Appendix S3, Equation [8]). Hence the unusual position occupied by the Netherlands, where agrifood exports amount to 5.5% of final demand for all products, compared with the all-country average of 2.5%, and account for the majority (76%) of value added for agriculture, of which only 17% is induced by final consumption of agrifood products.[5] At the other end of the scale, Finland's agrifood exports represent less than 1% of final demand for all products, contributing just 16% of the value added for agriculture, which is dominated by agrifood consumption. France sits in a group of countries whose balance of final demands is close to the average: final consumption of agrifood products accounts for 56% of the value added by agriculture, on account of its importance as a proportion of final demand for all products (4% compared with 2% for agrifood exports).

Given the importance of final consumption of agrifood products in determining the level of agricultural revenue, and the considerable concentration of actors generally observed in Europe's food industry and trade sectors, the issue of how consumer spending is shared between agriculture and other activities is at the heart of national and European debates on agricultural policy and competition law, debates which form the backdrop to the studies on which this article is based. However, in terms of value added for agriculture, agrifood exports also represent an important final demand for most countries, and in some of them, the main one. It might thus be useful to study exports using the same method and the same analyses applied to final consumption of agrifood products hereunder.

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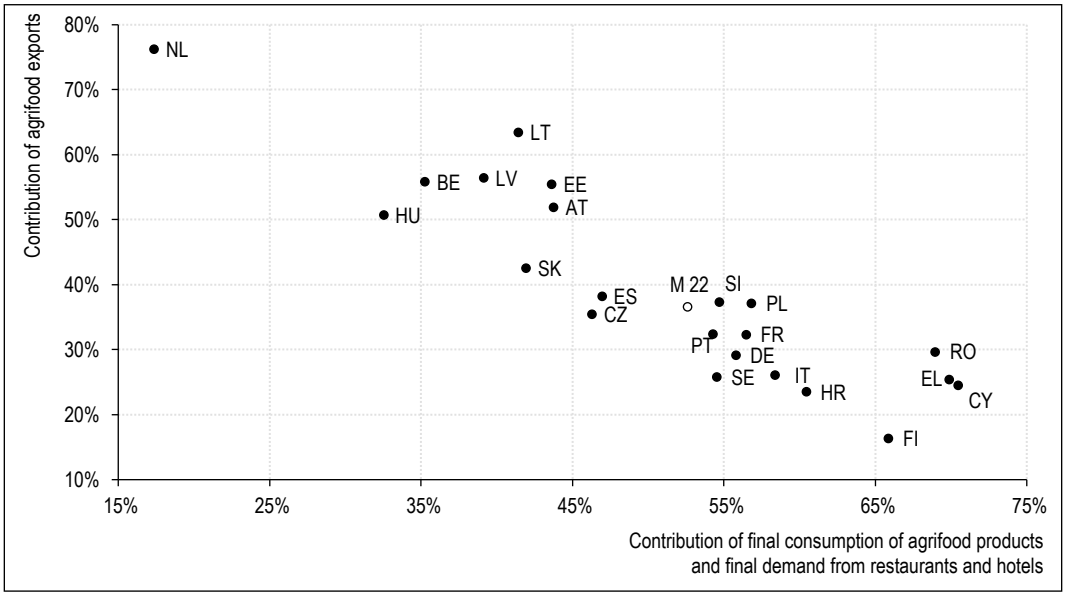
3. This problem does not beset the French "food euro" calculated by the OFPM, as it is based on INSEE data which makes it possible to separate the two. Online Appendix S8 contains a comparison of French results with and without restaurants.

4. In "pure" commercial activity, the products bought and sold in their finished state do not represent intermediate consumption, and thus should not appear as such in the values for this branch found in the product-by-product input-output table.

5. In the making of input-output tables, about the separation of exports between that of domestic products and the re-export of imported products. The latter represents an important category for the Netherlands, accounting for nearly 50% of exports according to the import input-output table (the "Rotterdam effect"), but generating little or no value added for the agricultural branch. Furthermore, the assumption that the technical coefficients are identical for each product, regardless of the nature of final demand (consumption or export), further undermines this result.

Figure I – **Contribution to value added for agriculture of final consumption of agrifood products and exports of agrifood products in 2020**



Note: The contributions of final consumption (x axis) and exports (y axis) are expressed as % of the total value added for agriculture in each country.

AT	Austria	EE	Estonia	HR	Croatia	NL	Netherlands	SI	Slovenia
BE	Belgium	EL	Greece	HU	Hungary	PL	Poland	SK	Slovakia
CY	Cyprus	ES	Spain	IT	Italy	PT	Portugal	M 22	Weighted average
CZ	Czech Republic	FI	Finland	LT	Lithuania	RO	Romania		
DE	Germany	FR	France	LV	Latvia	SE	Sweden		

Source: Authors' calculations based on Eurostat and INSEE.

4. Results and Analysis of the Breakdown of Final Consumption of Agrifood Products Into Value Added, Taxes and Imports

4.1. Components of Final Consumption of Agrifood Products in the 20 Countries

The breakdown of final agrifood consumption in the 20 countries for which the necessary data are available (so excluding Germany and Spain) is shown in Figure II: the countries are ranked from left to right in descending order of proportion of induced value added for all branches. Figure III sums up the situation in France, comparing it with the M20 average whose components are the mean values for all 20 countries (weighted by final consumption of agrifood products) and the U20 entity, a consolidated figure for the 20 countries, in which the value of exchanges between these countries is reallocated to domestic resources and employment in the consolidated input-output table.[6] In this unified 20-country entity, the shares of value added are thus superior to the mean values for the 20 countries (all branches considered: 60.6% instead of 52.2%), while imports are proportionally smaller (21.6% instead of 30.2%).

4.1.1. Induced Value Added for All Branches

The share of total value added, before branch-by-branch distribution, ranges from a low of 32.1% in Slovakia to a high of 63.2% in Italy; the French proportion (55.4%) is above the 20-country average (52.2%) and higher than the figure for 17 of the other 19 countries. The level of taxes and imports determines this share of total value added.

4.1.2. Taxes Less Subsidies on Products

The share of taxes (less subsidies on products, as the breakdown measures value added at basic prices) ranges from 12.1% (Romania) to 29.4% (Finland), with substantial differences between countries. At 16.9%, France is slightly below the average. In addition to VAT, whose rate varies from one country to the next, these taxes also include duties on tobacco and alcohol, which are very high in some countries.

6. We estimated imports by product, by use, by country of origin and by destination, using the inter-country input-output tables from the FIGARO database (Full International and Global Accounts for Research in Input-Output), produced by Eurostat and the European Commission's Joint Research Centre (Remond-Tiedrez & Rueda-Cantuche, 2019).
See Online Appendix S9.

4.1.3. Imports: European Value Chains Integration

The share of imports allows us to distinguish between those countries which are least dependent on foreign sources for their agrifood production and consumption needs (Italy: 22.9%, Finland: 26.8%, France: 27.8%, Romania: 28.1%) and those for whom imports account for almost half of total spending (Cyprus and Slovakia: 48.5% and 47.6%). For these 20 countries as a whole, imports for final consumption and imports for intermediate consumption induced by final consumption of agrifood products come predominantly from elsewhere in the European Union (71%), with 15% coming from Germany, a major European exporter; these averages are almost identical to the import figures for France (Figure IV). Across all of the countries studied here, as in France, products processed by the agrifood processing industries account for the majority of imports for final consumption (Figure V); they also account for a sizeable proportion of imports of intermediate products, albeit less substantial than imports of energy and chemical products, or other manufactured goods.

4.1.4. The Structure of the Food Euro in France

In France, the share of induced value added for all branches by agrifood consumption is noticeably higher than the all-country average, due to below-average taxes and imports. The share of value added for agriculture (7.3%) is above the 20-country average (6.7%), and the difference is even more substantial for the agrifood processing industries (11.1% in France, 8.6% on average). The share of trade and transport depends primarily on the average margin rate of trade and transport on final consumption, which varies considerably from one country to the next (see Figure IX); France is close to the average in this respect. The share taken by other services, however, is higher.

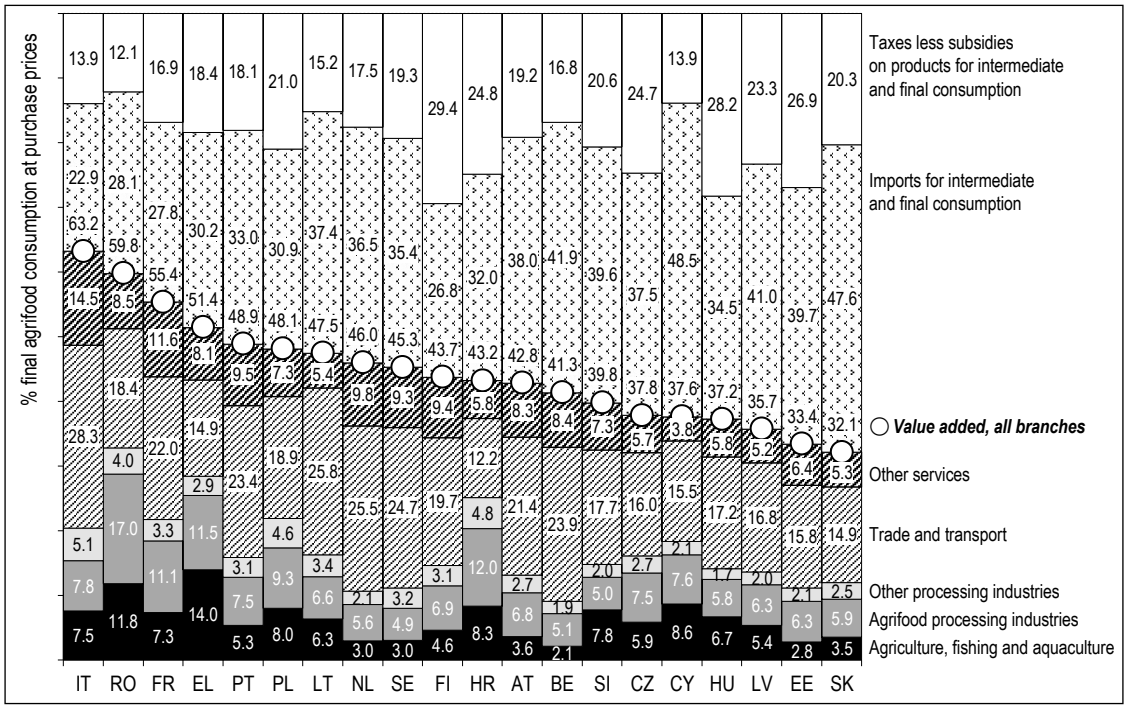
4.2. The Breakdown of the "Food Euro" in Each Country Depends on GDP and the Relative Weight of Imports and Taxes

4.2.1. Variables Analysed

In order to summarise the differences between the countries in terms of the breakdown of their agrifood consumption, we conducted a principal component analysis (PCA), in which the observations corresponded to the 20 EU nations for which all necessary data were available. The variables analysed were the shares (expressed in %) of induced value added across the different branches (agriculture,[7]

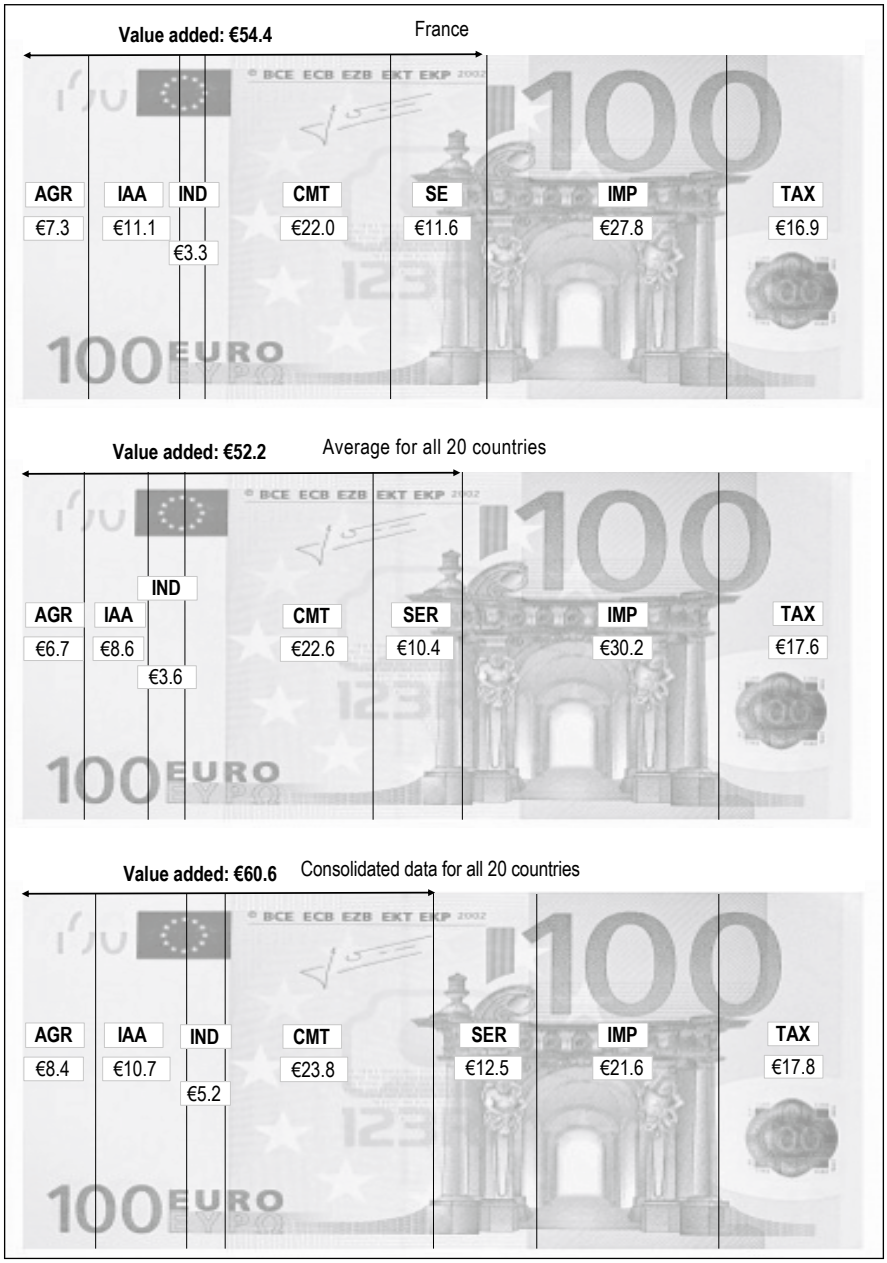
7. The share of value added for the "fishing and aquaculture" branch, which is less than 1% of agrifood consumption in all cases, was not taken into consideration.

Figure II – **Breakdown of final consumption expenditure on agrifood products at purchase prices into value added, imports and taxes in 2020**



Note: See Figure I for the full list of country abbreviations. In France (FR) in 2020, imports for intermediate consumption and final consumption accounted for 27.8% of final consumption of agrifood products.
Source: Authors' calculations based on Eurostat and INSEE figures.

Figure III – **Breakdown of €100 of final consumption expenditure on agrifood products between value added, imports and taxes in 2020**



Note: AGR: agriculture, fishing and aquaculture; IAA: agrifood processing industries; IND: other processing industries; CMT: trade and transport; SER: other services; IMP: imports for intermediate and final consumption; TAX: taxes less subsidies on products for intermediate and final consumption.
Source: Authors' calculations based on Eurostat and INSEE.

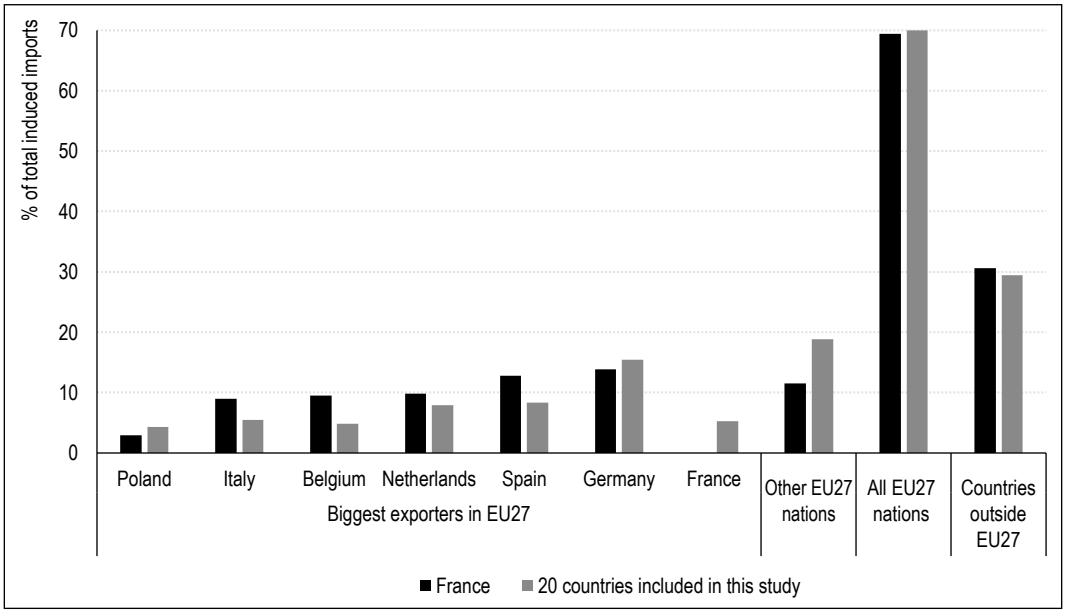
agrifood processing industries, other processing industries, trade, other services), taxes and imports in final agrifood consumption. We also incorporated the following explanatory variables, which do not affect the definition of our principal components, but whose correlations with those components and other variables enable us to more accurately interpret the results:

- GDP per capita in PPP, relative to the EU average;
- consumer prices of agrifood products in PPP, relative to the EU average;
- agriculture as share of total GDP (value added of the branch as a proportion of GDP);
- agrifood consumption as a share of actual individual consumption.

4.2.2. Structural Axes: Taxes and Imports Run Contrary to Value Added, Agrifood Branches Are at Odds With Services

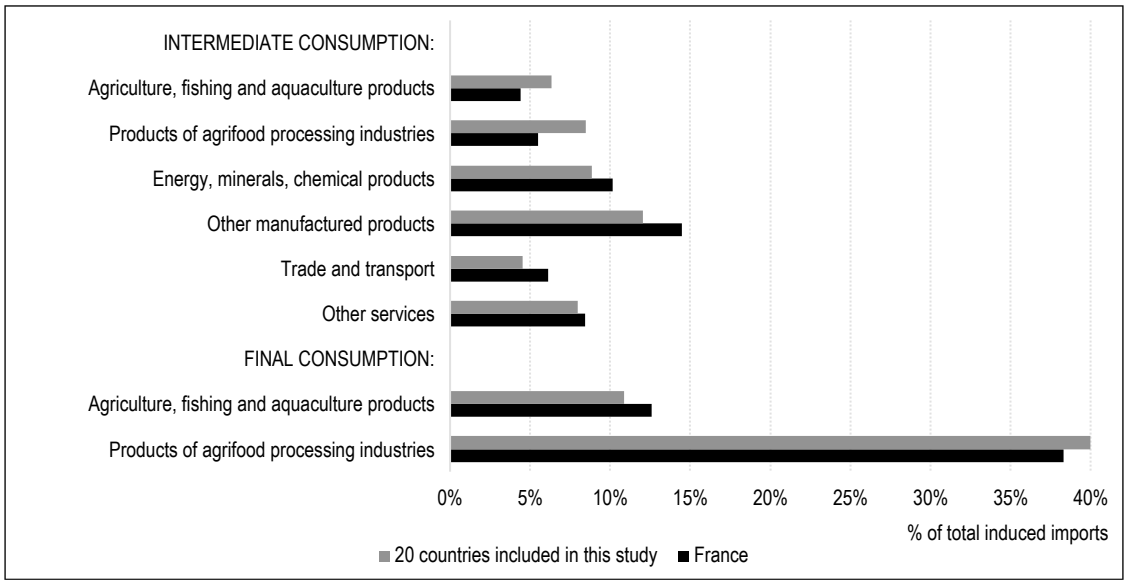
Figure VI shows the correlations between our observations (components for the induced value added for the branches, imports and taxes) and additional explanatory variables, with composite

Figure IV – **Origin of imports induced by final consumption of agrifood products in France, and in all 20 countries, in 2020**



Source: Authors' calculations based on Eurostat, FIGARO and INSEE figures.

Figure V – **Content (products) of intermediate and final imports induced by final consumption of agrifood products in France, and in all countries, in 2020**



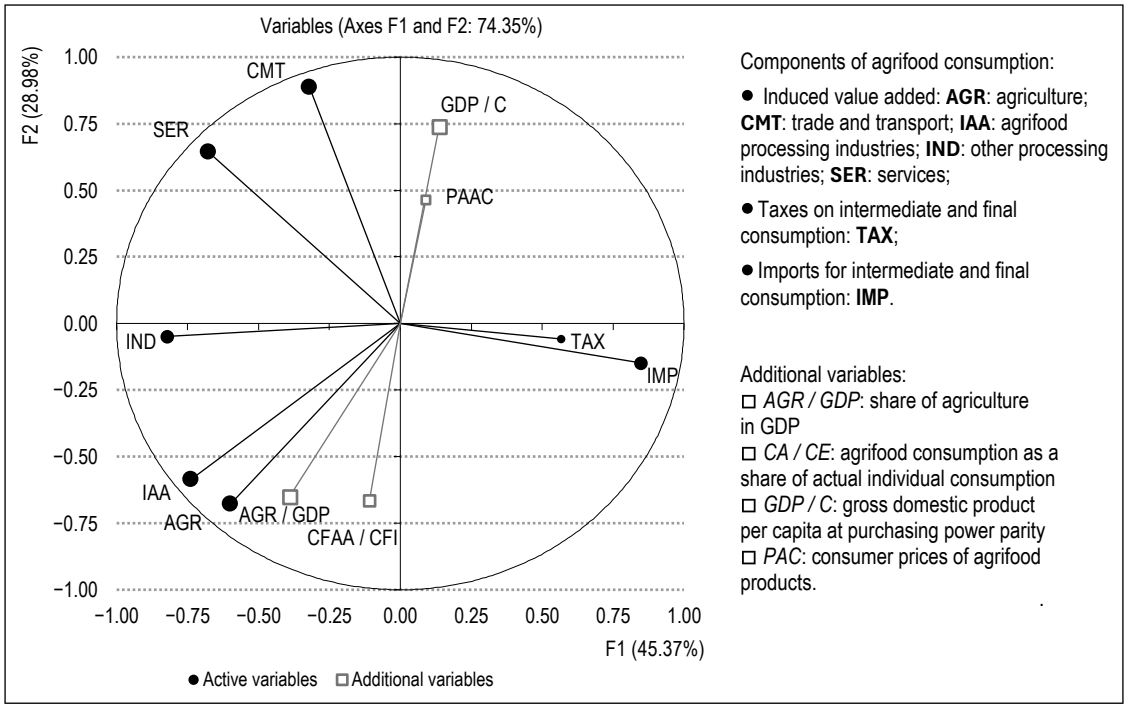
Source: Authors' calculations based on Eurostat, FIGARO and INSEE figures.

axes representing the strongest proportion of total inertia in the data (which amounts to 74.95%, 45.37% for axis F1 and 28.89% for axis F2).

Axis F1 thus pits the level of imports and taxes against the shares of value added for all branches; it is poorly accounted for by the additional variables: the breakdown between taxes and imports, on the one hand, and value added, on the other, is thus not greatly dependent on the relative "wealth" of a country (GDP per capita).

The composite variable which defines Axis F2 is positively correlated with the weight of trade, transport and services as a proportion of agrifood consumption, and negatively correlated with the weight of the agriculture branch and the agrifood processing industries branch. This axis reflects the contrast between, on the one hand, certain indicators of economic development (GDP per capita, agrifood prices) and, on the other hand, the proportional importance of agriculture to the economy and of agrifood consumption to total individual consumption.

Figure VI – **Correlation circle for components of agrifood consumption and additional variables in 2020**



Note: Results of our principal component analysis of 20 EU countries.
Source: Authors' calculations, based on INSEE and Eurostat figures.

Without going into detail about the values of the correlations between our observations and additional variables (see Online Appendix S6), suffice it to say that the relative weight of imports is negatively correlated with the shares of value added received by the agrifood processing industries and other processing industries (confirming our intuition), but also with the share of value added for services (less obviously, since services are, in theory, less likely to be imported). However, we did not observe any significant correlation between imports and the share taken by agriculture: countries which import a lot of goods may still have consumption of domestically-produced foods conducive to a distribution of value added which is beneficial to agriculture, by means of volume effects (consumption of products with little processing), price effects (high relative prices for agricultural produce) or simply because the rate of value added is weak for the industrial processing of agricultural produce (also due to price and/or volume effects).[8] We did not observe any significant correlation between the shares of trade and transport and that taken by imports, which is to be expected as the former branches encompass all products, whether domestically-produced or imported. Due to the substantial intermediate consumption of services (finance, insurance, real estate services, advertising and marketing, etc.) by trade and transport activities, these proportions are positively correlated. On the contrary, the share taken by trade and transport is not significantly correlated with any other branch, not even agriculture. The positive correlation observed between the share of agriculture and the share of the agrifood processing industries, and between the latter and other processing industries, is illustrative of the interdependency of these branches.

A higher share of taxes obviously reduces the *total* share of induced value added, but other determinants influence the share of induced value for each branch, not least their rate of value added. These determinants tend to decorrelate the share of value added from the share of taxes: we observed no significant correlation (not even a negative one) between the share of taxes and the share of induced value added for a given branch. As such, a country whose consumption is heavily taxed may still have relatively high proportions of value added in certain branches, at the expense of other branches or imports.

We noted a negative correlation between income level (measured as GDP per capita in PPP) and the share of agriculture in the breakdown of

8. We do not have price indices for each country in comparison with the others, which would have enabled us to analyse variations between countries for a given year, in terms of volume effects and price effects between countries, in the manner of the analyses available for variation over time within a single country, e.g. France (Boyer, 2021).

agrifood expenditure, while there is a positive correlation with the share taken by trade and transport. The correlation is also positive with other services, but does not appear to exceed the significance threshold of 5%, whereas plotting the French "food Euro" over the long term (Boyer & Butault, 2014; Boyer, 2021) shows that a rise in standard of living tends to increase the share of value taken by services, and reduce the share of agriculture and processing industries (Santeramo *et al.*, 2024).

In countries with a high level of agricultural specialisation, the respective shares of agriculture and the agrifood processing industries in agrifood consumption tend to be greater, as one would expect, hence their positive correlation with agriculture as a proportion of GDP.

The importance of agrifood consumption as a proportion of total individual consumption is positively correlated with the relative shares of agriculture and the agrifood processing industries, and negatively correlated with the shares of trade, transport and services.

We did not observe any significant correlation between the value added components and consumer prices for agrifood products, as the shares of value added induced in the branches by agrifood consumption are more dependent upon, among other things, the relationship between value added prices for the branches and consumer prices, not simply the latter.

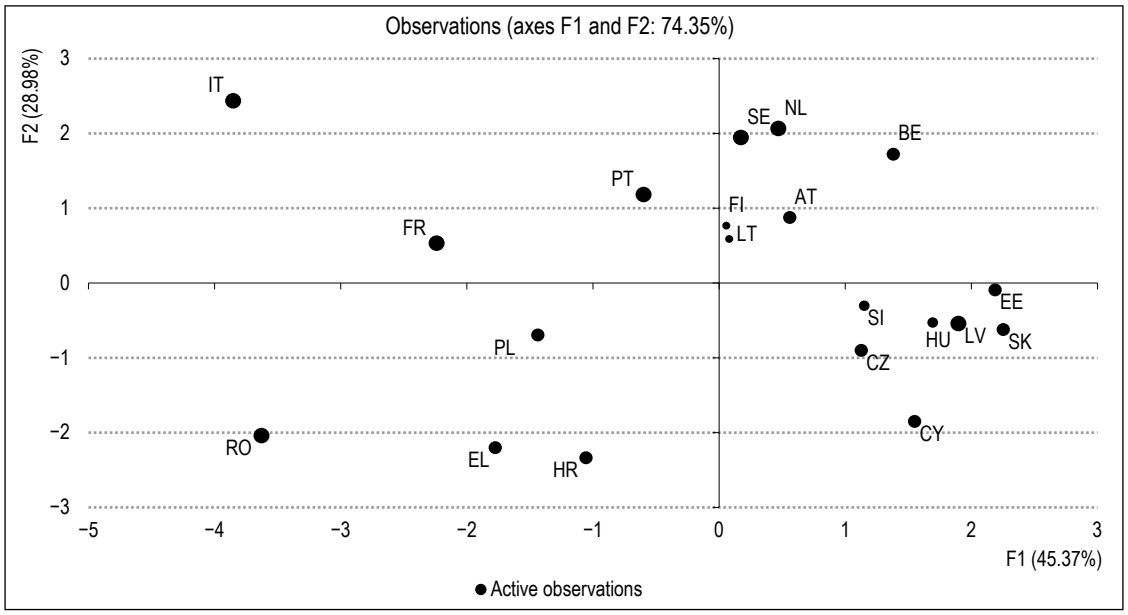
Rising standards of living go hand in hand with a reduction in the relative importance of agriculture to the economy (strong negative correlation with GDP per capita) and consumption of agrifood products represents a smaller share of total consumption (idem). However, it also implies higher prices for these products (positive correlation): in countries with high levels of income, agrifood value chains involve more processing, trade and services, which tends to increase the value of the finished products.

4.2.3. Positioning Countries in Relation to the Composite Axes

Figure VII shows the positioning of each country within this schema (F1, F2). In the top-right quadrant we find countries from Northern Europe, where standards of living and consumer prices are high, and where taxes or imports inhibit value added as a share of overall consumption (the further to the right of the diagram, the more evident this is). In these countries, the distribution of value added is more favourable to the trade and service sectors (the further towards the top of the diagram, the more this applies).

In the bottom-right quadrant we find countries with relatively low incomes (getting lower as we move further down the diagram), where the distribution of value added, which is also constrained by taxes and imports, is more favourable to the upstream branches of the agrifood chain than it is to trade or services. The countries in the

Figure VII – **Coordinates of all countries in the graph formed by composite axes F2 and F1 (in 2020)**



Note: The size of the dots representing the countries is proportional to their degree of representation in the graph: Finland (FI) and Lithuania (LT) are poorly represented in (F1, F2). See Figure I for the full list of country abbreviations.
Source: Authors' calculations, based on INSEE and Eurostat figures.

bottom-left quadrant, meanwhile, have a value added breakdown which is more favourable to the upstream branches (more pronounced the further left we move) at the expense of taxes or imports; these traits are plain to see in Romania. The isolated, and thus highly distinctive, position occupied by Italy in the top-left quadrant is indicative of both a relatively high standard of living and a distribution which prioritises value added over taxes and imports, and a breakdown of that value added which is more favourable to trade and services than it is to agriculture and the agrifood processing industries. Located within the same quadrant as Italy, the French position is less dramatic: the balance between taxes and imports, on the one hand, and value added, on the other, is less favourable to the latter (lower value on the F1 axis, in absolute value); the distribution of this value added, however, is more favourable to agriculture and the agrifood processing industries than it is to trade and services (weaker F2 value).

5. Analysing the Value Added Induced for Agriculture by Agrifood Consumption

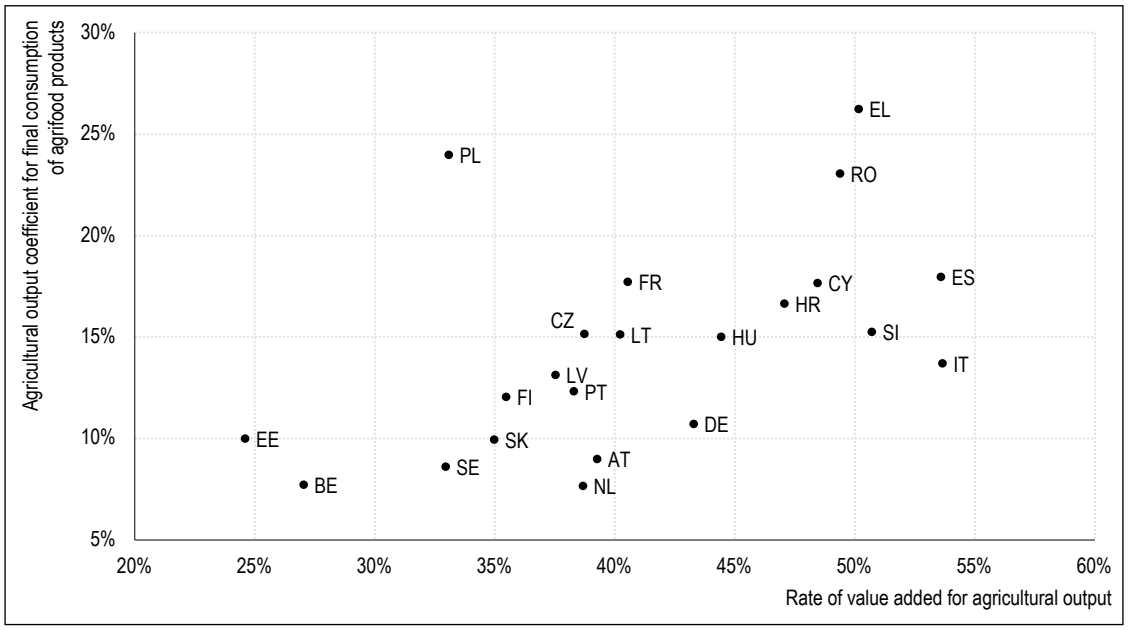
Value added induced for the agricultural branch by final consumption of agrifood products, a proportion hereafter referred to simply as the "share for agriculture", is at the centre of debates over the distribution of value across the agrifood chain. In this section we look in detail at the determinants of this value. The share for agriculture is the product of the rate of value added for the branch multiplied by the *agricultural output coefficient*. We define the latter as the ratio between the value of agricultural output induced by final agrifood consumption (or the output necessary to satisfy this consumption), obtained by means of matrix calculations using the input-output table, and the total value of the latter, at purchase prices including final imports, taxes and margins. The share of agrifood consumption taken by agriculture is thus, for obvious reasons, positively correlated with the aforementioned rate and coefficient, of which it is the product. For this metric, the relative positioning of the countries studied is shown in Figure VIII.

5.1. Rate of Value Added for the Agricultural Branch

The rate of value added for the agricultural branch varies from 25% (Estonia) to 54% (Italy, Spain), with a mean of 41%, which is close to the rate observed in France.[9] The highest rates are observed in southern Europe, with the exception of Portugal, and the lowest rates in the north. These differences in the rate of value added between neighbouring countries depend on the make-up of their agricultural

9. The mean rates mentioned in paragraphs 5.1 and 5.2 are unweighted averages.

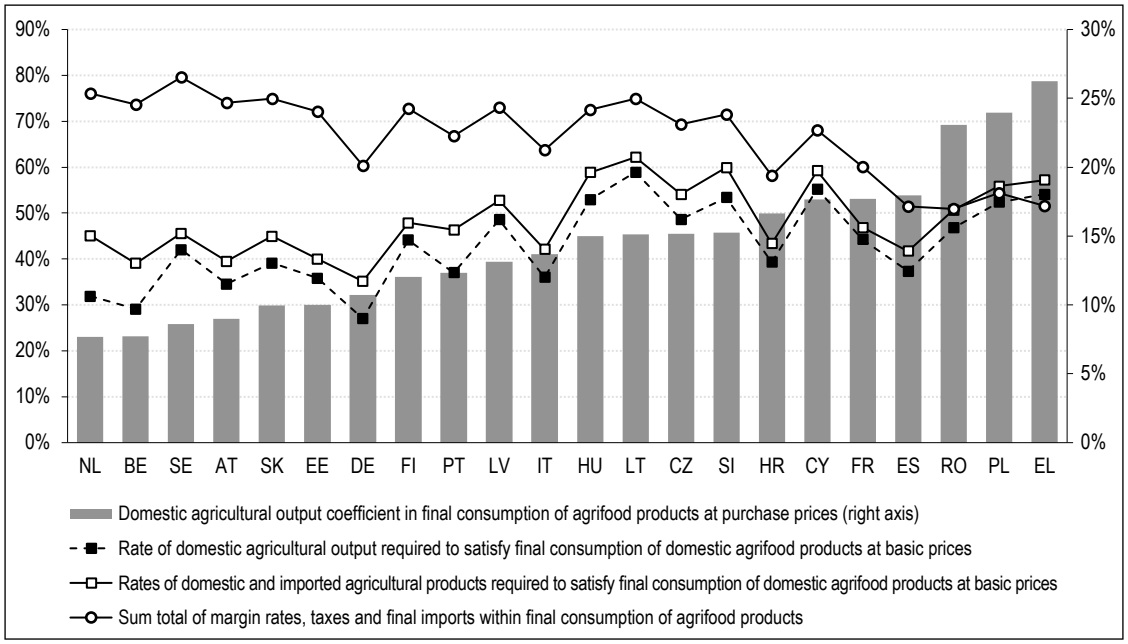
Figure VIII – **Rate of value added for agricultural output and the agricultural output coefficient for final consumption of agrifood products in 2020**



Note: The rate of value added for agricultural output is expressed as a % of final consumption; the agricultural output coefficient is a % of total output from the branch. See Figure I for the full list of 22 country abbreviations.
Source: Authors' calculations based on Eurostat and INSEE figures.

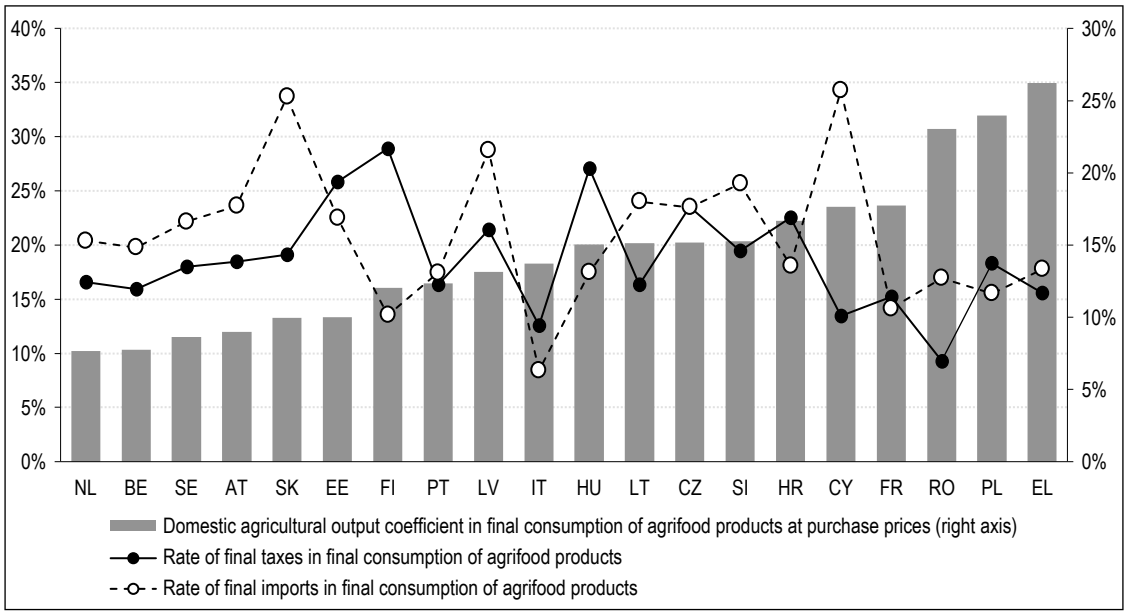
output, and particularly the proportion of that output requiring significant manpower. They also depend on price differences between countries, which would ideally be analysed by constructing, for all agricultural products and their intermediate consumption or value added, price indices allowing us to compare countries with one another, identifying the price effects and volume effects involved in shaping differences in the rate of agricultural value added.

Figure IX – **Agricultural output coefficient, rate of required agricultural output, rate of required agricultural products, sum total of taxes, margins and final imports in 2020**



Note: The output coefficient and sum of margins and taxes are expressed as % of final consumption at purchase prices: the output rate is a % of final consumption of domestic produce at basic prices.
See Figure I for the full list of 22 country abbreviations.
Source: Authors' calculations, based on INSEE and Eurostat figures.

Figure X – **Rates of imports, taxes and the agricultural output coefficient in final consumption of agrifood products in 2020**



Note: There is no significant correlation between the rates of imports and final taxes and the agricultural output coefficient. Imports, final taxes and the output coefficient are expressed as % of final consumption at purchase prices. See Figure I for the full list of 20 country abbreviations.
Source: Authors' calculations, based on INSEE and Eurostat figures.

5.2. The Agricultural Output Coefficient for Agrifood Consumption

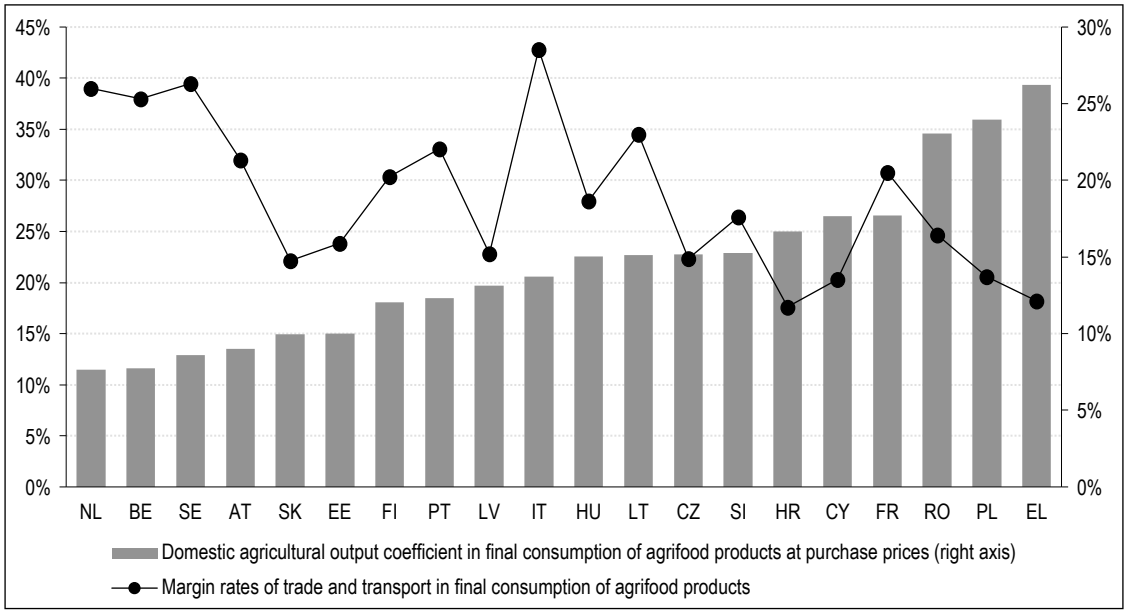
The agricultural output coefficient for agrifood consumption, shown in Figure IX, ranges from 8% (Belgium, Netherlands) and 26% (Greece), with France among the highest-rated countries at 18% (alongside Spain, Greece, Romania and Poland). By definition, it depends on the ratio of agricultural production prices to agrifood prices for final consumption, and the volume ratio between agricultural output and agrifood consumption. As discussed above for the rate of value added, in order to properly analyse differences in the output coefficient (in terms of volume and price effects) we would need to be able to construct pertinent price indices for production prices and for consumer prices of agrifood products. Furthermore, this agricultural output coefficient is dependent on two terms (see Online Appendix S5): it grows in line with the rate of domestic agricultural output required to satisfy domestic consumption of produce (not including final imports) at basic prices (without taxes or margins on final consumption); it decreases in line with the sum of margin rates, taxes and final imports, as total final consumption at purchase prices is the denominator of these rates.

The first term, obtained by means of matrix calculations using the input-output table, represents the importance, for a given price ratio, of the use of domestic agricultural produce by production technologies in the branches working to satisfy final consumption demand for agrifood products, and particularly the proportion of agricultural products undergoing little or no processing, as opposed to more processed foods involving more services. It is equivalent to the difference between the rate of domestically-produced and imported agricultural products and the rate of agricultural imports for intermediate consumption, with final consumption of domestic produce the denominator for these rates.

The second term, which includes the impact of taxes, margins and final imports, aggregates those non-technological factors which, whatever the relative importance of agriculture in the technological make-up of the agrifood value chain, eat into agriculture's share of value added from final consumption.

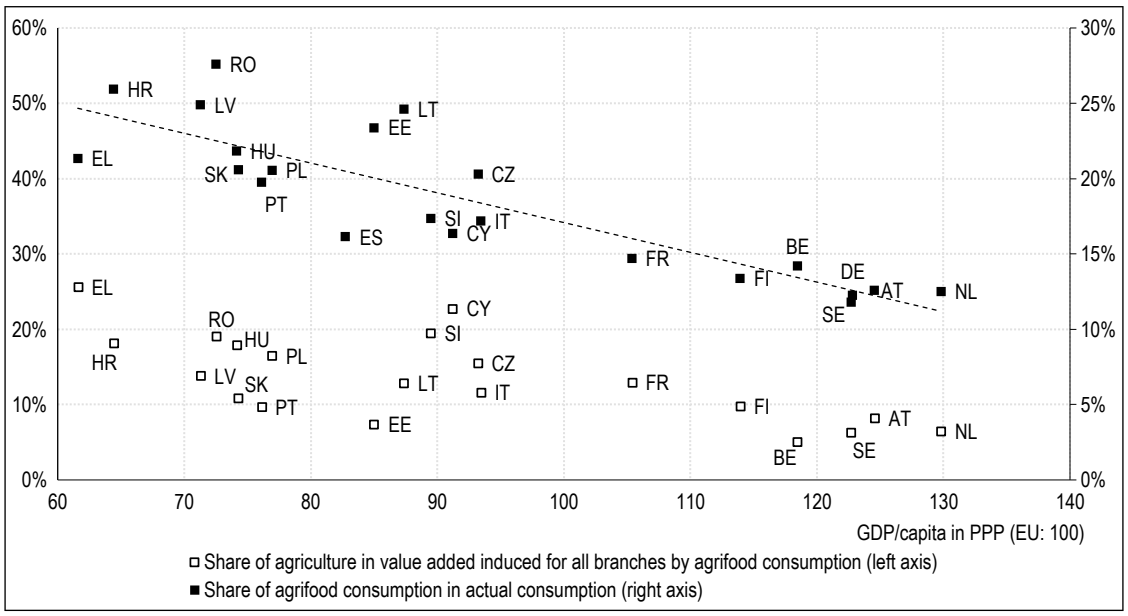
Figure IX shows that the rate of domestic agricultural output and the rate of domestic and imported agricultural products are often very similar, with imports of intermediate agricultural products counting for relatively little in comparison with the use of domestic produce (except in the Netherlands, Belgium, Germany and Portugal). The sum total of margin rates, taxes and final imports is particularly low in Romania, Poland and Greece: these countries also have relatively high rates of agricultural output, and as a result the coefficient of agricultural output in agrifood consumption is high. Individually, the rates of taxes and final

Figure XI – **Final margin rate of trade and transport and the agricultural output coefficient in final consumption of agrifood products in 2020**



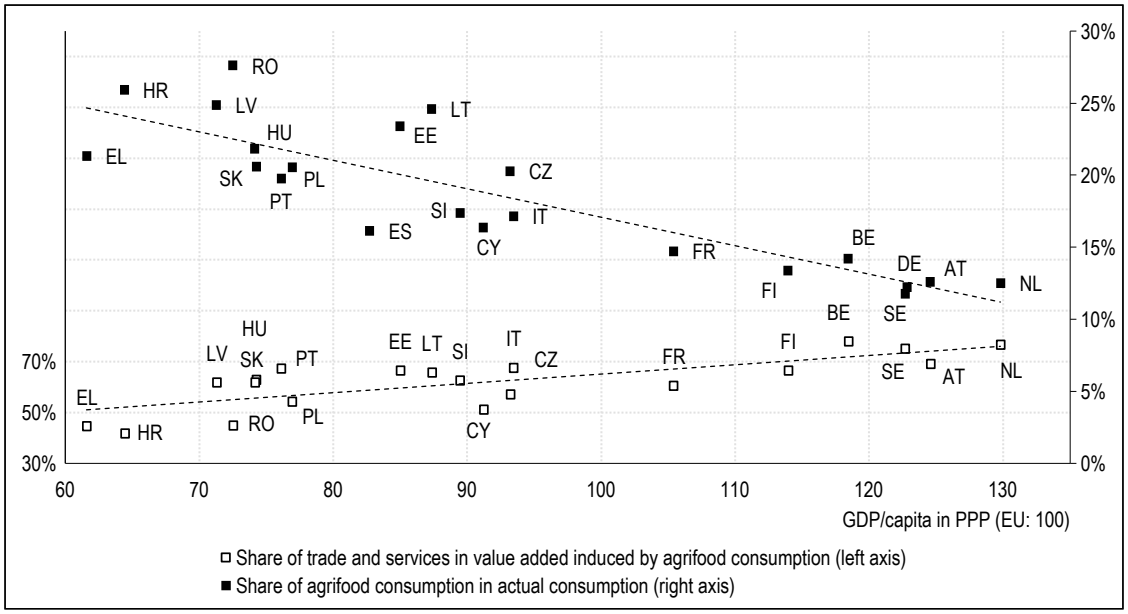
Note: There is a significant linear correlation between the final margin rate and the agricultural output coefficient: r = −0,60.
The margin rate and the output coefficient are expressed as % of final consumption at purchase prices.
See Figure I for the full list of 20 country abbreviations.
Source: Authors' calculations, based on INSEE and Eurostat figures.

Figure XII – **Share of agrifood consumption in actual consumption, and share of agriculture in value added induced by agrifood consumption, in relation to GDP/capita in 2020**



Note: There is a significant linear correlation between GDP/capita and the share of agrifood consumption in total actual consumption (r = −0.86) and between GDP/capita and the share of agriculture in value added induced by agrifood consumption (r = −0.68). See Figure I for the full list of 20/22 country abbreviations.
Source: Authors' calculations, based on INSEE and Eurostat figures.

Figure XIII – **Share of agrifood consumption in actual consumption, and share of trade and services in value added induced by agrifood consumption, in relation to GDP/capita in 2020**



Note: There is a significant, negative linear correlation between GDP/capita and the share of agrifood consumption in total actual consumption (r = −0.86) and a significant, positive linear correlation between GDP/capita and the share of trade and services in value added induced by agrifood consumption (r = 0.75). See Figure I for the full list of 20/22 country abbreviations.
Source: authors' calculations, based on INSEE and Eurostat figures.

imports are not strongly correlated with the agricultural output coefficient (consumption in some countries may involve high imports and low taxes, or vice versa), unlike margin rates (Figures X and XI).

The rate of final imports is high in "small countries" where agrifood output is relatively low, or displays a lack of diversity in relation to the size of the population.

The share of final taxes is difficult to analyse: not only do tax rates, particularly the rate of VAT, vary from country to country, but the structure of the tax base (particularly the levels of tobacco and alcohol consumption) is also beyond the

grasp of the data used here; nonetheless, as Figure IX shows, there does appear to be a North-South divide with regard to tax levels.

With its diversified agricultural sector and highly-developed agrifood processing industry, France has a rate of final imports in agrifood consumption of 14%, which is below the average for the countries included in this study (21%). France's tax rate on final consumption (15%) is also below the all-country average (18%). This gives us a relatively strong agricultural output coefficient (18%, greater than the 16% average), in spite of a rate of domestic agricultural output which is below average (44% compared with 48%) and a slightly higher trade and transport margin rate: 31% compared with 28% (Figure XI).

5.3. The Share of Agriculture in the Breakdown of Consumption Expenditure on Agrifood Tends to Decrease as National Wealth Increases

This result is already evident in our PCA. Figure XII illustrates "Engel's law": the share of food consumption (measured here as the consumption of agrifood products) in actual individual consumption of all products tends to decrease as the average wealth of consumers increases, measured as gross domestic product (GDP) per capita at purchasing power parity (PPP), allowing for comparisons between countries. The same graph shows that the proportional importance of agriculture in the value added induced by final agrifood consumption decreases as GDP per capita rises.

Meanwhile, the share of trade and services in total value added induced by final agrifood consumption increases as GDP per capita rises (Figure XIII). As such, in relatively "rich" countries, agrifood consumption accounts for a smaller share of total expenditure than it does in other countries: it also involves a greater concentration of services and less value added for agriculture.

As our PCA revealed, the shares of imports and taxes in agrifood consumption are not strongly correlated with GDP per capita, and thus with the share of value added induced for agriculture (cf. Figure VIII and Online Appendix S6). GDP per capita mainly influences the distribution of value added induced for the primary and secondary branches, on the one hand, and for trade and services, on the other.

* *
*

In 2020, the breakdown of final consumption of agrifood products in France appeared to be more favourable to value added, at the expense of taxes and imports, than in most other EU countries. This position can be attributed to a combination of slightly below-average taxes and a noticeably low proportion of imports, particularly imports for final consumption, on account of the magnitude of French agriculture and the diversity of its output. But in France, as in other European nations with the highest levels of GDP per capita, the breakdown of the value added induced by agrifood consumption is, relatively speaking, less generous towards agriculture and the agrifood processing industries than it is towards trade and services. Nevertheless, this imbalance is less pronounced in France, where the share of value added induced for agriculture and the agrifood processing industries is above the European average. Compared with other European nations with high levels of GDP per capita, the share allotted to agriculture in France is boosted by a rate of value added for the branch and an agricultural output coefficient in final agrifood consumption which are both clearly above average.

Although it yields results which are slightly more difficult to interpret (with value added counted at basic prices, see Online Appendix S7), and aggregates trade and transport, the calculation method used in this study enables us to work exclusively with the input-output tables published by Eurostat, without the need to dig into more detailed national data (which include subsidies on products), which are not always available (for example, data distinguishing between the margins taken by trade and transport).

This approach to breaking down the "consumer agrifood Euro" could be improved, subject to the availability of data, in the following ways:

- creating a multi-year data series, in order to compare national developments in the breakdown of agrifood spending;
- including food services and calibrating the results for food spending (particularly by excluding the consumption of tobacco products), as is already the case with the food Euro analysis developed in France by the OFPM;
- more detailed analysis of the European and global integration of value chains for final agrifood consumption in EU countries, using data from the Eurostat FIGARO database, which was touched upon in this study. □

Links to the Online Appendix:
www.insee.fr/en/statistiques/fichier/8642191/ES546_Boyer-Butault_Online-Appendix.pdf

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