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

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Online Appendix

S1. IOT Symmetrization

There are two opposite methods for transform a domestic standard IOT, crossing products and industries, into a symmetrical IOT, crossing products with each other (Arthaut & Braibant, 2011; United Nations, 2018; Braibant, 2018):

One, based on the assumption that every product is manufactured with its own technology, regardless of the sector that manufactures it ("product-technology" hypothesis), is based on a calculation of the technology of each product from the standard IOT and the table of national accounts recording the different products of the different sectors;

The other method postulates that all products in the same industry are manufactured with the same technology ("technology-industry" hypothesis): the technology of each product is calculated by weighting those of each of the industries in which it is manufactured.

The "technology-industry" hypothesis is only suitable for secondary products which are fatal ouputs of the main production of the industry, and therefore manufactured with the same production equation as the latter (e.g. coke from petroleum refinery). The "product-technology" hypothesis is suitable for secondary products that are complementary or ancillary products to the main activity, and are therefore produced with their own production function (e.g. commercial activity of purchase and sale supplementing the products range of an industry). This method is more general in scope, but can lead to negative and therefore unrealistic intermediate consumption, and therefore needs to be supplemented by correction methods.

Between these two methods, there are several, more or less complex. For our study, we chose to calculate the symmetrical IOT of the 5 countries in which it was lacking[1] with the method applied in particular by Portugal (Dias, 2009), because of its simplicity and the plausible aspect of the results obtained (no intermediate consumption of an aberrant nature with regard to the productions using them). It is based on the assumption that the technology of any secondary product can be properly approximated by that of the industry in which it is the main ouput. The hypothesis is quite similar to the "product-technology" hypothesis, but avoids negative results. Its defect is that it doesn't suit to the existence of fatal productions. We describe it below.

Let be the matrix $[Z_{NS}]$ n columns $n+3$ rows, extracted from the standard IOT, non-symmetrical (Table S1-1), made up of the following positions in each of the n industries (indexes k):

- intermediate consumptions $CI_{i,k}$ of the n domestic products (indexes i);
- the taxes less subsidies to products of intermediate consumption: $T\_S_{CI\ k}$;
- the uses of imported products: $CI_{X\ k}$;
- the values added: VA_k.

[1] *Belgium, Finland, Netherlands, Romania, Sweden.*

Table S1-1 – **Structure of standard IOT « product × industry » of domestic products at basic prices**

STANDARD IOT	n industries $k \in (1,n)$	Total	Final consumption	Other final demands (*)	Total use at basic price
n products $i \in (1,n)$	$CI_{i,k}$	CI_i	CF_i	AF_i	UT_i
Total at basic prices					
Uses of imported products	$CI_{X\ k}$	CI_X	CF_X	AF_X	UT_X
Taxes less subsidies to products	$T\_S^{\$}_{CI\ k}$	T_S_{CI}	T_S_{CF}	T_S_{AF}	T_S_{UT}
Total at purchaser's price					
Value added	VA_k	VA			
Output	Y_k	Y			

(*) AF : other final demandes : exportation, gross capital formation

Matrix $[Z_{NS}]$.

Let be $[\![Y]\!]$ the square diagonal matrix of output of industries; let be $[\mathfrak{z}_{NS}]$:

$[\mathfrak{z}_{NS}] = [Z_{NS}][\![Y]\!]^{-1}$, the matrix n columns $n+3$ rows, containing the following coefficients:

- the $n \times n$ coefficients $a_{i,k}$ of each of the n domestic products by each of the n industry, in relation to their output, such as: $a_{i,k} = CI_{i,k} \,/\, Y_k$;

- the n coefficients t_s_k of the taxes less subsidies to products of the intermediate consumption of each of n industries, related to their output production, such as: $t\_s_k = T\_S_{CI\ k} \,/\, Y_k$;

- the n coefficients $c_{X\ k}$ of use of imported products by each of the n industry, related to their output production, such as: $c_{X\ k} = CI_{X\ k} \,/\, Y_k$;

- the n rates of value added va_k of n industries k , related to their output production, such as:

$$va_k = VA_k \,/\, Y_k \,.$$

Under the above-mentioned technological hypothesis, we have: [1]

$$[\mathfrak{z}_{NS}] = [\mathfrak{z}_S]$$

$[\mathfrak{z}_S]$ designating the matrix n columns $n+3$ rows of coefficients of IOT symmetrical to be calculated, which relates to the production P_j of each pure branch (or product) its intermediate consumptions of each domestic product, its taxes less subsidies to products of intermediate consumption, its uses of importations and its value added.

So:

$$[\mathfrak{z}_S] = [Z_S][\![P]\!]^{-1} \text{ and } [\mathfrak{z}_{NS}] = [Z_{NS}][\![Y]\!]^{-1} \qquad [2]$$

with: $[\![P]\!]$ the diagonal square matrix of production by pure branches, $[\![P]\!]^{-1}$ its inverse and $[Z_S]$ the matrix n columns $n+3$ rows of the symmetrical IOT to be calculated, containing, for each pure branch (subscript j):

- the intermediate consumptions $CI_{i,j}$ of each of the domestic products (subscript i);

- the taxes less subsidies to products on intermediate consumption products: $T\_S_{CI\ k}$;

- the uses of imported intermediate consumptions: $CI_{X\ k}$;

- the values added VA_k.

Therefore we have to calculate $[Z_S]$, knowing $[Z_{NS}]$, $⟦P⟧$ and $⟦Y⟧$. From [1] and [2], we have:

$$[Z_S]⟦P⟧^{-1} = [Z_{NS}]⟦Y⟧^{-1} \quad [3]$$

or:

$$[Z_S] = [Z_{NS}]⟦Y⟧^{-1}⟦P⟧ \quad [4]$$

$[Z_S]$ is represented on Table S1-2.

Table S1-2 – **Structure of symmetrical « product × product » IOT of domestic products at basic prices**

SYMMETRICAL IOT	Pure branches or products	Total	Final consumption	Other final demands	Total use at basic price
Products	$CI_{i,j}$	$\boldsymbol{CI_i}$	$\boldsymbol{CF_i}$	$\boldsymbol{AF_i}$	$\boldsymbol{UT_i}$
Total at basic prices					
Use of imported products	$CI_{X\ j}$	$\boldsymbol{CI_X}$	$\boldsymbol{CF_X}$	$\boldsymbol{AF_X}$	$\boldsymbol{UT_X}$
Taxes less subsides to products	$T\_S_{CI\ j}$	$\boldsymbol{T\_S_{CI}}$	$\boldsymbol{T\_S_{CF}}$	$\boldsymbol{T\_S_{AF}}$	$\boldsymbol{T\_S_{UT}}$
Total at purchaser's prices					
Value added	VA_j	$\boldsymbol{VA}$	for : $i = j$: $P_j = UT_i$		
Output	P_j	$\boldsymbol{P = Y}$			

: Matrix $[Z_S]$

NB: the amounts in bold are the same as those of the standard IOT; values left blank are calculated by the sum of their components.

S2. Calculation of the production required for the final consumption of domestic products at basic prices

Let $\left[P^{CF}\right]$ the square matrix $n \times n$ of ouput at basic price of pure branches or products [2] (in rows) required for (or induced by) the final consumption of domestic products at basic price (in columns):

$$\left[P^{CF}\right] = [I - A]^{-1}[\![CF]\!] \qquad [5]$$

with:

$[A]$: square matrix of the technical coefficients of intermediate consumption of domestic products at basic prices (in rows) by the ouputs of the branches (in columns), calculated from the symmetrical IOT of domestic products at basic price;

$[I - A]^{-1}$: the inverse of the square matrix $[I - A]$, difference between $[\![I]\!]$ the unit square diagonal matrix (value 1 on the main diagonal and zero on both sides) and the $[A]$ matrix The coefficients of $[I - A]^{-1}$ are the values of the productions (in rows) required for 1 euro of final demand at the basic price of the domestic products (in columns), whatever the nature (final consumption, exports, gross capital formation) and the level of that final demand, and this, under the assumption (strong but inherent to the calculations on IOT) of the constancy of the technical coefficients;

$[\![CF]\!]$: the diagonal square matrix of final consumption of domestic products at basic prices (values of final consumption on the main diagonal, zero on either side).

Demonstration of [5]

Note $[\![DF]\!]$ *the diagonal square matrix of final demands of domestic products.*

To serve this demand, the branches must produce $[\![DF]\!]$*, but also* $[A][\![DF]\!]$ *the intermediate consumptions necessary for these productions, as well as* $[A]^2[\![DF]\!]$*, the intermediate consumption necessary to produce the previous intermediate consumption, etc.*

So, $[P^{DF}]$ *the matrix of ouputs (in rows) requested to serve the final demands of the products (in columns) is given by :* $[P^{DF}] = [\![DF]\!] + [A][\![DF]\!] + [A]^2[\![DF]\!] + [A]^3[\![DF]\!] + \cdots + [A]^p[\![DF]\!]$

The superscript p being high and the coefficients of $[A]$ *less than 1:* $[P^{DF}] = [I - A]^{-1}[\![DF]\!]$

As $[\![DF]\!] = [\![CF]\!] + [\![FB]\!] + [\![XP]\!]$ *and under the linearity assumption, we then have:*

$[P^{DF}] = [I - A]^{-1}\{[\![CF]\!] + [\![FB]\!] + [\![XP]\!]\}$*, so, in particular:* $[P^{CF}] = [I - A]^{-1}[\![CF]\!]$

[2] *In all of the following unless otherwise stated: "branch" shall mean "pure branch" or product (defining the branch).*

S3. Contributions of final demands to the value added of agriculture

S3.1. Contributions of final demands at basic prices

Production at the basic price of the agricultural branch (denoted P) is the sum of the outputs at the basic price P^{DF_i} induced in this branch by the various final demands DF_i of domestic products i to which it responds directly and indirectly (induced demands for intermediate consumption). These are final demands for *domestic* products. The demand for imported products directly induces only domestic production of trade and transport services, which in turn induces very little agricultural ouput. In addition, the taxes do not require any ouput, so the final demands inducing output of the branch are final demands *at basic prices*:

$$P = \sum_{i} P^{DF_i} \qquad [6]$$

In all that follows, the products are domestic and the values are at the basic prices.

Noting $va,$ the rate of value added of the agricultural branch, VA, its value added and VA^{DF_i} the value added driven by final demand of product i , we have:

$$VA = va\,P = va \sum_{i} P^{DF_i} = \sum_{i} va\,P^{DF_i} = \sum_{i} VA^{DF_i} \qquad [7]$$

The value added of the branch is the sum of the added value induced in that branch by the various final demands for products to which it responds, directly and indirectly.

S3.2. Analysis of the contribution of a given final demand

The contribution of a given final demand, for example, agri-food final consumption, to the added value of the agricultural branch, in relation to its added value, can be broken down as follows:

$$\frac{VA^{CF_{aal}}}{VA} = \frac{P^{CF_{aal}}}{P} \times \frac{va}{va} = \frac{P^{CF_{aal}}}{P} = \frac{b^{CF_{aal}} CF_{aal}}{P} = \frac{b^{CF_{aal}}}{b^{DF}} \times \frac{CF_{aal}}{DF} \qquad [8]$$

with (in addition to the notations already explained):

$VA^{CF_{aal}}$: value added induced in the agricultural branch by the final consumption of agri-food products;

$P^{CF_{aal}}$: production induced in the agricultural branch by the final consumption of agri-food products;

$b^{CF_{aal}}$: coefficient of agricultural inputs necessary for one euro of final consumption of agri-food products; it is the sum of the agricultural production coefficients required per unit of final demand for each of the agri-food products, given by the matrix $[I - A]^{-1}$, weighted by the amounts of final consumption of these products.

CF_{aal} : final consumption of the product i.

b^{DF} : coefficient of agricultural input necessary for one euro of final demand for all products; It is the sum of the agricultural production coefficients required per unit of final demand for each of all products, weighted by the amounts of their final demands.

DF : final demand all products.

The calculation applies to any other final demand, such as the export of agri-food products XP_{aal} : just replace CF_{aal} by XP_{aal} in equation [8].

S4. Breakdown of final consumption into value added, imports and taxes

S4.1. Breakdown of final consumption at basic prices

The symmetrical IOT of domestic products has the following overall balance:

$$\sum_{i} DF_{i} = \sum_{j} VA_{INT\,j} = \sum_{j} P_{j} - \sum_{j} CI_{j} = \sum_{j} VA_{j} + \sum_{j} CI_{X\,j} + \sum_{j} T\_S_{CI\,j} \quad [9]$$

$VA_{INT\,j}$: « internal » value added of the branch j, i.e. its *value added only to the intermediate consumption of domestic products, which are expressed at their basic prices*: $VA_{INT\,j} = (P_j - CI_j)$. From the IOT, we also have: $VA_{INT\,j} = VA_{j} + CI_{X\,j} + T\_S_{CI\,j}$; the « internal » value added is equal to the value added VA_j plus intermediate imports $CI_{X\,j}$ and taxes less subsidies to products of intermediate consumption $T\_S_{CI\,j}$.

The equation [9] is broken down by branch and by product, for each part of final demand, including the final consumption that interests us here; by calculation of the square matrices:

$[VA^{CF}]$: Values added at basic prices induced in the branches in rows by final consumption at the basic price of the products in columns, the general term: $VA_{j}^{CF_i}$;

$[CI_X^{CF}]$: intermediate consumptions of imported products induced in the branches in rows by final consumption at the basic price of the products in columns, the general term: $CI_{X\,j}^{CF_i}$;

$[T\_S_{CI}^{CF}]$: taxes less subsidies to products of intermediate consumption induced in the branches in rows by final consumption at the basic price of the products in columns, the general term: $T\_S_{CI\,j}^{CF_i}$;

with for each product i :

$$CF_{i} = \sum_{j} VA_{j}^{CF_i} + \sum_{j} CI_{X\,j}^{CF_i} + \sum_{j} T\_S_{CI\,j}^{CF_i} \quad [10]$$

And, the IOT provided for each branch j :

va_j: its value added rate, $va_j = VA_j/P_j$;

$x_{CI\,j}$: its rate of imported intermediate consumption, $x_{CI\,j} = CI_{Xj}/P_j$;

$t\_s_{CI\,j}$: its rate of taxes less subsidies to products of intermediate consumption, $t\_s_{CI\,j} = T\_S_{CI\,j}/P_j$

These rates are assumed to be constant in each branch regardless of the level of production; thus, by forming the diagonal square matrices $[\![va]\!]$, $[\![x_{CI}]\!]$, $[\![t\_s_{CI}]\!]$ of the above-mentioned rates, we have the following equalities:

$$[VA^{CF}] = [\![va]\!][P^{CF}] \quad [11]$$

$$[CI_X^{CF}] = [\![x_{CI}]\!][P^{CF}] \quad [12]$$

$$[T\_S_{CI}^{CF}] = [\![t\_s_{CI}]\!][P^{CF}] \quad [13]$$

$[P^{CF}]$ given by the equality [5]. Thus, the following matrices give the components of final consumption at the basic price of each product in columns, induced in the branches in rows: values added at the basic price, intermediate imports and taxes minus subsidies to products of intermediate consumption:

$$[VA^{CF}] = [\![va]\!][I-A]^{-1}[\![CF]\!] \quad [14]$$

$$[CI_X^{CF}] = [\![x_{CI}]\!][I-A]^{-1}[\![CF]\!] \quad [15]$$

$$[T\_S_{CI}^{CF}] = [\![t\_s_{CI}]\!][I-A]^{-1}[\![CF]\!] \quad [16]$$

S4.2. Decomposition of final consumption at purchaser's price

Final consumption at the purchaser's price of the product i of all origins is written *at first*:

$$\mathcal{CF}_i = \sum_j VA_j^{CF_i} + \sum_j CI_{X\,j}^{CF_i} + \sum_j T\_S_{CI\,j}^{CF_i} + \boldsymbol{M_{\mathcal{CF}_i}} + CF_{X\,i} + T\_S_{\mathcal{CF}_i} \quad [17]$$

with (in addition to the above notations): $\boldsymbol{M_{\mathcal{CF}_i}}$: Trade and transport margins of final consumption of product i, *domestic and imported;* $CF_{X\,i}$: Import of product i for final consumption measured at basic price; $T\_S_{\mathcal{CF}_i}$: taxes less subsidies to products of final consumption of the product i. The margins of final consumption are final consumption of trade and transport services, and like all final consumption, they induce added values, imported intermediate consumptions and taxes less subsidies to products of intermediate consumption, in *a priori* all branches (mainly in trade and services). It is therefore necessary to break down $M_{\mathcal{CF}_i}$ as we have broken down CF_i.

To do this, the equalities [11], [12] and [13] provide the components of the final consumption of each good or service, including trade and transport.

For example, [11] provides $VA_j^{CF_{cmt}}$, value added in each branch j induced by the final consumption of trade and transport services (index cmt). The same goes for the other components. However, trade and transport margins are a fraction $M_{\mathcal{CF}_i}/CF_{cmt}$ of the final consumption of these services and, under the assumption of linearity, the values added induced in the branches j by the final consumption margins of the product i are then given by: $(M_{\mathcal{CF}_i}/CF_{cmt})\,VA_j^{CF_{cmt}}$. The same goes for the other components (intermediate imports and taxes minus subsidies on the intermediate consumption). The components of final consumption at the basic price and those of the final consumption of margins are then added member by member, and the decomposition of final consumption at the purchaser's price is obtained:

$$\mathcal{CF}_i = \sum_j VA_j^{\mathcal{CF}_i} + \sum_j CI_{IMP\,j}^{\mathcal{CF}_i} + \sum_j T\_S_{CI\,j}^{\mathcal{CF}_i} + CF_{X\,i} + T\_S_{\mathcal{CF}_i} \quad [18]$$

with: $$VA_j^{\mathcal{CF}_i} = VA_j^{CF_i} + VA_j^{M_{\mathcal{CF}_i}} \quad [19]$$

$VA_j^{M_{\mathcal{CF}_i}}$: value added induite dans la branche j par les marges de consommation finale de i; The same goes for the other components.

S5. Analysis of agriculture's value added share in final consumption of agri-food products

The share of value-added induced in agriculture in the final consumption of domestic and imported agri-food goods at the purchaser's price, denoted $\mathcal{CF}_{aal}$ is the product of the value-added rate of the branch

(va) by the coefficient of agricultural output necessary for the final consumption of domestic and imported agri-food goods, at the purchaser's price ($q^{\mathcal{CF}_{aal}}$):

$$\frac{VA^{\mathcal{CF}_{aal}}}{\mathcal{CF}_{aal}} = \frac{VA}{P} \times \frac{P^{\mathcal{CF}_{aal}}}{\mathcal{CF}_{aal}} = va \times q^{\mathcal{CF}_{aal}} \qquad [20]$$

Margins induce very little ouput in the agricultural branch, therefore:

$$q^{\mathcal{CF}_{aal}} = \frac{P^{\mathcal{CF}_{aal}}}{\mathcal{CF}_{aal}} \approx \frac{P^{CF_{aal}}}{\mathcal{CF}_{aal}} \qquad [21]$$

or, according to [8] :

$$q^{\mathcal{CF}_{aal}} \approx \frac{b^{CF_{aal}}\, CF_{aal}}{\mathcal{CF}_{aal}} \qquad [22]$$

Final consumption *at basic price* of *domestic* agri-food goods: CF_{aal}, can be written according to the amount of final consumption *at purchaser's price* of *domestic and imported* agri-food goods: $(\mathcal{CF}_{aal})$, and according to the following rates in final consumption *at purchaser's price* of *domestic and imported* agri-food goods: margins rate of final consumption: $(m_{\mathcal{CF}})$, importation rate for final consumption: $(x_{\mathcal{CF}})$ and to the rate of taxes less subsisdies to products $(t\_s_{\mathcal{CF}})$:

$$CF_{aal} = \mathcal{CF}_{aal}(1 - m_{\mathcal{CF}} - t\_s_{\mathcal{CF}} - x_{\mathcal{CF}}) \qquad [23]$$

Then: $$q^{\mathcal{CF}_{aal}} \approx b^{CF_{aal}}(1 - m_{\mathcal{CF}} - t\_s_{\mathcal{CF}} - x_{\mathcal{CF}}) \qquad [24]$$

Furthermore: $b^{CF_{aal}} = B^{CF_{aal}} - x_{CI}$

with $B^{CF_{aal}}$: coefficient, in the final consumption at basic price of domestic agri-food products, of *domestic and imported* agricultural products necessary for this final consumption, and x_{CI}, coefficient, in this final consumption, of *imported* agricultural products necessary for this final consumption, thus:

$$q^{\mathcal{CF}_{aal}} \approx (B^{CF_{aal}} - x_{CI})(1 - m_{\mathcal{CF}} - t\_s_{\mathcal{CF}} - x_{\mathcal{CF}}) \qquad [25]$$

$B^{CF_{aal}}$ depends on technology; x_{CI} constitutes the share of imports in this technology; $(B^{CF_{aal}} - x_{CI})$ determines the share of value added of agriculture in the final consumption of domestic agri-food products at basic prices, so before margins, taxes and imports of final consumption at the rates $m_{\mathcal{CF}}$, $t_{s_{\mathcal{CF}}}$ et $x_{\mathcal{CF}}$.

S6. Correlations between observations and PCA variables

Table S6-1 – **Linear correlation coefficients between components of final consumption of agri-food products and additional variables**

Country: 20 EU countries in 2020. Year: 2020

	Manufacture of agri-food products (*)	Other manufactures	Trade and transport	Other services	Importations (intermediate and final)	Taxes les subsidies to products of intermediate consumption and final consumption	GDP per capita in PPP	Share of agricultural branch in GDP	Share of agri-food final consumption in total individual final consumption	Consumer agri-food prices
Agriculture	0.75						−0.61	0.83	0.45	
Manufacture of agri-food products (*)		0.59			−0.52		−0.46	0.61	0.49	
Other manufactures					−0.70					
Trade and transport				0.70			0.62		−0.50	
Other services					−0.73				−0.47	
Importations (intermediate and final)										
Taxes les subsidies to products of intermediate consumption and final consumption										
GDP per capita in PPP								−0.74	−0.87	0.56
Share of agricultural branch in GDP									0.72	−0.58
Share of agri-food final consumption in total individual final consumption										−0.69

(*) processed food goods, beverages and tobacco products.
Note: only significant correlations at the 5% threshold are mentioned (excluding diagonal).
Source: authors calculations based on INSEE, Eurostat.

S7. Interpretation of the result calculated on IOT at the basic price

In the French "food euro", the breakdown of final consumption is calculated on an IOT in which subsidies to products have been *previously subtracted from the values at basic prices*. This option was justified by the importance of agricultural subsidies to products until 2006, and by the "pedagogical" concern to give a distribution of consumer expenditure in which the share of taxes is that of "consumer's receipts", while it is reduced by subsidies to products in the decomposition resulting from the IOT maintained at basic prices.

Let us consider the simplified expression of the decomposition of final consumption at the purchase price, resulting from the calculation on IOT at the basic price:

$$\mathcal{CF} = VA^{\mathcal{CF}} + CI_X^{\mathcal{CF}} + T\_S_{CI}^{\mathcal{CF}} + CF_X + T\_S_{\mathcal{CF}} \qquad [26]$$

and that of final consumption at the purchase price resulting from the calculation on IOT at the basic price *without subsidies to products*:

$$\mathcal{CF} = \overline{VA}^{\mathcal{CF}} + CI_X^{\mathcal{CF}} + T_{CI}^{\mathcal{CF}} + CF_X + T_{\mathcal{CF}} \qquad [27]$$

$\overline{VA}^{\mathcal{CF}}$ denotes values added at basic prices without subsidies to product, induced by final consumption at the purchaser's price.

$\overline{VA}^{\mathcal{CF}}$ differs from $VA^{\mathcal{CF}}$ by subsidies to products of production induced by final consumption at the purchaser's price, thus, with $P^{\mathcal{CF}}$ the outputs at basic price induced by final consumption at the purchaser's price and s_P the subsidy-to-products rate for that production:

$$\overline{VA}^{\mathcal{CF}} = VA^{\mathcal{CF}} - s_P P^{\mathcal{CF}}.$$

The calculation option does not affect intermediate imports $CI_X^{\mathcal{CF}}$, as these are without subsidies to products. The same goes for final imports.

In the decomposition calculated on IOT *at the basic price without subsidies*, subsidies to products for intermediate consumptions do not have to be deducted from taxes to these products in order to obtain the value of the latter at the purchaser's price, as these subsidies are previously subtracted, in this IOT, from the values of the intermediate uses of the various products by the different branches. Thus:

$T_{CI}^{\mathcal{CF}} = T\_S_{CI}^{\mathcal{CF}} + s_{CI} P^{\mathcal{CF}}$, with s_{CI} the rate of subsidy of intermediate consumption products in production at basic prices induced by final consumption at purchaser's price.

The principle is the same for taxes to products of final consumption goods:

$T_{\mathcal{CF}} = T\_S_{\mathcal{CF}} + s\mathcal{CF}$, with s the subsidy-to-product rate for final consumption goods.

Thus, the expression [26] of the decomposition resulting from the calculations at the basic price can be written:

$$\mathcal{CF} = \overline{VA}^{\mathcal{CF}} + s_P P^{\mathcal{CF}} + CI_X^{\mathcal{CF}} + T_{CI}^{\mathcal{CF}} - s_{CI} P^{\mathcal{CF}} + CF_X + T_{\mathcal{CF}} - s\mathcal{CF} \qquad [28]$$

We therefore have the following balance of subsidies:

$$s_P P^{\mathcal{CF}} = s\mathcal{CF} + s_{CI} P^{\mathcal{CF}} \qquad [29]$$

This, because the production necessary for final consumption includes the production of the goods of this final consumption and all the productions of intermediate consumptions needed.

Equality [28] can be interpreted as follows:

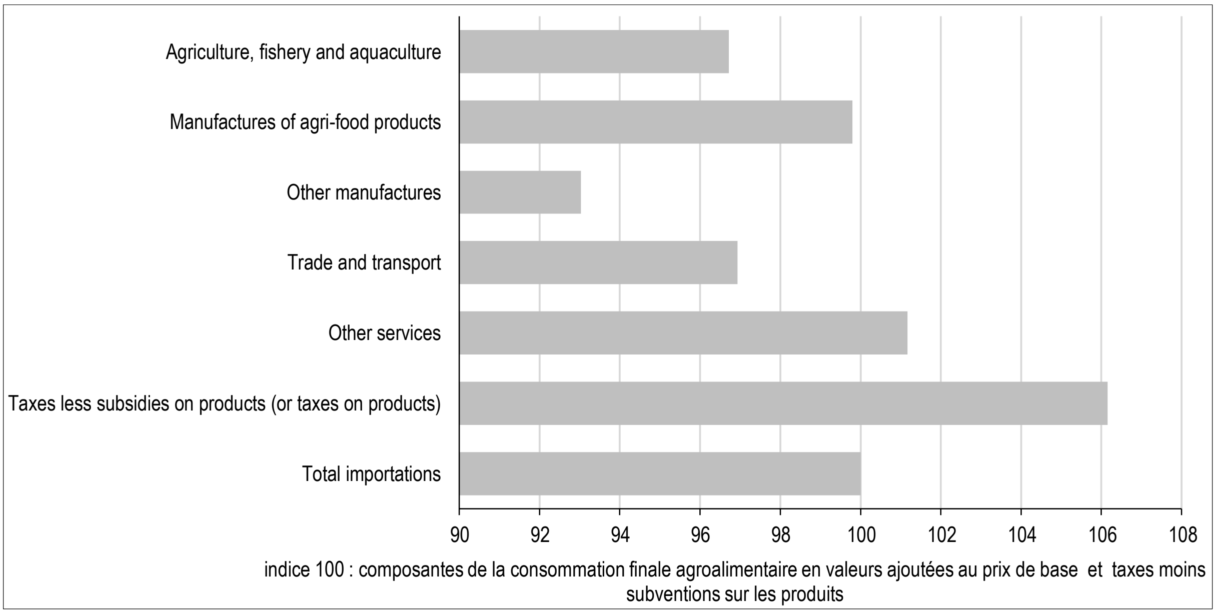
In the calculation at the *basic prices without subsidies to products*, consumer expenditure is divided between transfers to the industries, transfers abroad and transfers to the State (*largo sensu*);

In the calculation at the basic price, consumer demand determines in the branches some transfers *which indirectly include subsidies to products paid by the State* : the industries receive these subsidies because they produce to meet consumer demand; thus, in this approach, the taxes actually paid by consumers are considered to be distributed, via the State (*largo sensu*) between the State itself (taxes net of subsidies) and the industries (in the form of subsidies to products from the State).

In France, because of the sharp reduction in subsidies to agricultural products and the low presence of such subsidies in the other industries, the results are now little affected by the option chosen for the calculations:

Figure S7.I – **Decomposition of final consumption of agri-food products into value-added without subsidies on products and taxes compared to the decomposition into value-added at basic price and taxes less subsidies**

France, 2020

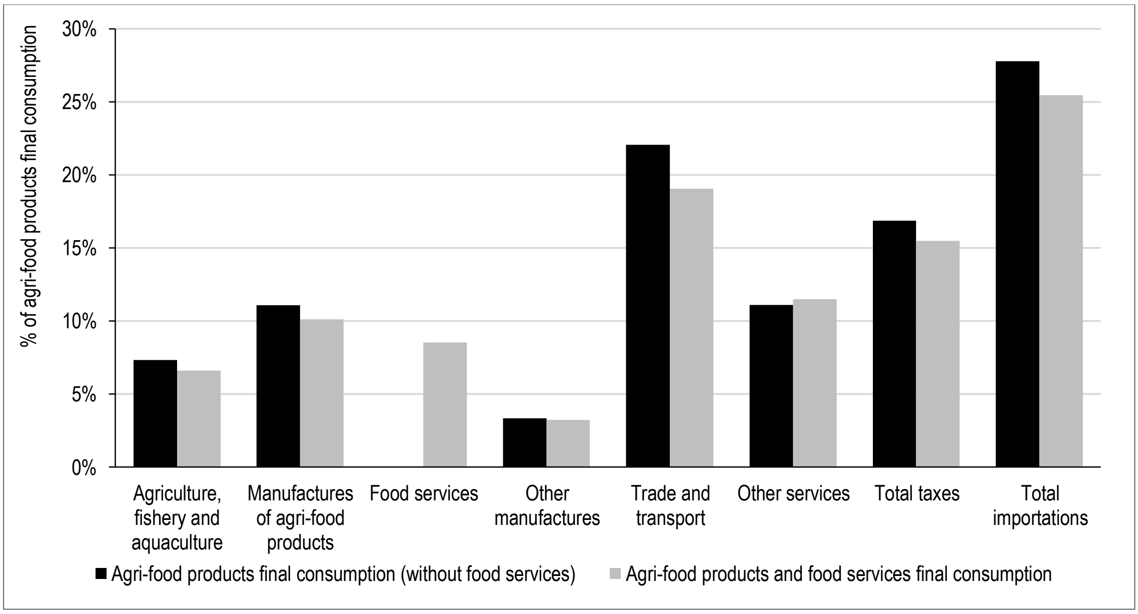


Source: Eurostat, INSEE, authors calculations.

S8. Comparison of the distribution of final consumption in the agri-food sector with and without food services in France

Figure S8.I – **Breakdown of agri-food final consumption into value-added, imports and taxes**

France, 2020



Source: Eurostat, INSEE, authors calculations.

Taking into account the food services, a high value-added activity, increases the share of total value-added in final consumption and reduces the shares of the other components except "other services", which are heavily used by food services industry. The share of imports decreased, as the amount of final imports is unchanged whereas the total consumption is increased by consumption of food services. The share of taxes is lower, as the tax rate for food services is on average lower than that for agri-food purchases in the retail trade. In 2020, due to the measures taken in response to Covid-19, food services fell sharply: the share of this branch, appreciated this year, is therefore lower than in a normal year.

S9. Consolidated total countries calculations

The consolidated symmetrical IOT (SIOT) for all 20 countries, from which the same calculations are made as described above for each country, is obtained at the end of the following operations, summarized below in tables S9-1, S9-2 and S9-3.

1) Making of of a "domestic – sum SIOT " by adding the 20 domestic national SIOT;

2) extraction of inter-countries SIOTs from Eurostat's Figaro database. Each inter-country SIOT gives the imports by product of a country of destination from a country of origin, and the domestic uses (i.e. excluding re-exports) of these imports: intermediate consumption by pure branches, final consumption, gross capital formation. The Figaro database divides the world into 42 geographical entities: the 27 countries of the EU, plus 14 other individual countries and a "rest of the world". We therefore extracted 41 inter-country TES for each of the 20 countries studied (i.e. 820 tables);

3) calculation, from Figaro, for each of the 20 countries surveyed and by product, of the rate of its imports from the other 19 study countries, or "internal imports", to its total imports (from the 41 geographical entities of the world);

4) we apply these rates to the SIOTs of imports by product of the 20 countries (source: Eurostat, SIOT imports product-by-product) to estimate amount of internal imports in all 20 countries for each product, for intermediate use by branch, final consumption and gross capital formation. We could not use directly the amounts of internal imports by product given by inter-countries SIOTs because they are not evaluated in the same way as in the national SIOT [3];

5) we realize of the "consolidated domestic SIOT" by correcting the items of the "domestic sum - SIOT" as follows:

- the intermediate consumption of each domestic product by each branch is increased by the intermediate internal imports by the 20 countries of this product and this branch;

- final consumption and gross capital formation of each domestic product are increased by the final internal imports for these uses by the 20 countries;

- the amount of exports of each product, excluding internal exports to the 20 countries, is given by the difference between its total uses (domestic – sum SIOT) and the sum of its intermediate uses, final consumption and gross capital formation;

- the total imports all products for intermediate and final uses are reduced by internal imports in the 20 countries.

The production, the *total* intermediate consumption (domestic and imported inputs) and the value added of each branch, and the *total use* of each domestic product, are obviously identical in the "domestic – sum SIOT" and in the "consolidated domestic SIOT".

On the other hand, final consumptions and intermediate consumptions of domestic products are higher in the "consolidated domestic SIOT", as they include "internal imports". As a result, in this consolidated domestic SIOT compared with the domestic – sum SIOT, more ouput from the different branches is used for the final consumption of domestic products (and less for export), first, because of higher domestic final consumption itself, and second, because of higher production coefficients per unit of final demand, as intermediate consumption coefficients for ouputs are increased by internal intermediate imports.

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[3] *National SIOT : the amounts of imports by products include trade and transport margins paid by exporters (estimate at basic price of importing country)*
Inter-countries SIOT : the amounts of imports by products don't include trade and transport margins paid by exporters (estimate at basic price of exporting country), which amount is recognized in the amount of imports in trade and transport services.

Table S9-1 – **Structure of the product-by-product domestic – sum SIOT**

	Pure branches or products j	Total	Final consumption	Gross capital formation	Export	Total use
Products i	$CI_{i,j}^{\square}$	$CI_{i}^{\square}$	$CF_{i}^{\square}$	$FB_{i}^{\square}$	$XP_{i}^{\square}$	$UT_{i}^{\square}$
Total at basic price	$CI_{j}^{\square}$	$CI_{\square}^{\square}$	$CF_{\square}^{\square}$	$FB_{\square}^{\square}$	$XP_{\square}^{\square}$	$UT_{\square}^{\square}$
Taxes less subsidies to products	$CI_{Xj}^{\square}$	$CI_{X}^{\square}$	$CF_{X}^{\square}$	$FB_{X}^{\square}$	$XP_{X}^{\square}$	$UT_{X}^{\square}$
Use of imported products	$T\_S_{CI\ j}^{\square}$	$T\_S_{CI}^{\square}$	$T\_S_{CF}^{\square}$	$T\_S_{FB}^{\square}$	$T\_S_{XP}^{\square}$	$T\_S^{\square}$
Total at purchaser's price	$\mathcal{CJ}_{j}^{\square}$	$\mathcal{CJ}_{\square}^{\square}$	$\mathcal{CF}$	$\mathcal{FB}$	$\mathcal{XP}$	$\mathcal{UT}$
Value added at basic price	$VA_{j}^{\square}$	$VA_{\square}^{\square}$				
Output at basic price	$P_{j}^{\square}$	$P_{\square}^{\square}$				

$CI_{i}^{\square}$: total of intermediate consumption of domestic product i in all the branches of the 20 countries.

$CI_{j}^{\square}$: total of intermediate consumption of all domestic products by the branch j of the 20 countries.

$CI_{Xj}^{\square}$: total of intermediate consumption of all imported products (all origins) by the branch j of the 20 countries.

$CI_{X}^{\square}$: total of intermediate consumption of all imported products (all origins) by all the branches of the 20 countries.

$T\_S_{CI\ j}^{\square}$: total of taxes les subsidies to products of intermediate consumption in branch j of the 20 countries.

$T\_S_{CI}^{\square}$: total of taxes les subsidies to products of intermediate consumption by all the branches of the 20 countries.

$\mathcal{CJ}_{j}^{\square}$: total of intermediate consumption at purchaser's prices in branch j of the 20 countries.

$\mathcal{CJ}_{\square}^{\square}$: total of intermediate consumption at purchaser's prices in all the branches of the 20 countries.

The same notation principle applies to final consumption, gross capital formation, export and total use.

Table S9-2 – **Structure of domestic product-by-product inter-countries SIOTs**

	Pures branches or products	Total	Final consumption	Gross capital formation	Export	Total use
Products i	$CI_{X20;\,i,j}$	$CI_{X20;i}$	$CF_{X20;i}$	$FB_{X20;i}$		
Total at basic price	$CI_{X20;j}$	CI_{X20}	CF_{X20}	FB_{X20}		

$CI_{X20;\,i,j}$: total of « internal imports » of the 20 countries for intermediate consumption of the branch j in product i.

$CI_{X20;\,i}$: total of « internal imports » of the 20 countries for intermediate consumption by all branches in product i.

$CF_{X20;i}$: total of « internal imports » of the 20 countries for final consumption of product i.

$FB_{X20;i}$: total of « internal imports » of the 20 countries for gross capital formation of product i.

$CI_{X20;\,j}$: total of « internal imports » of the 20 countries for intermediate consumption of the branch j in all products.

CI_{X20}: total of « internal imports » of the 20 countries for intermediate consumption of all branches in all products i.

CF_{X20}: total of « internal imports » of the 20 countries for final consumption of all products.

FB_{X20}: total of « internal imports » of the 20 countries for gross capital formation of all products.

Table S9-3 – **Calculation of the consolidated product by product domestique IOT of the union of 20 countries**

	Pures branches or products	Total	Final consumption	Gross capital formation	Export	Total use
Products	$CI^*_{i,j} = CI_{i,j} + CI_{X20;\, i,j}$	$CI^*_i = CI_i + CI_{X20;i}$	$CF^*_i = CF_i + CF_{X20;i}$	$FB^*_i = FB_i + FB_{X20;i}$	$XP^*_i = UT_i - CI^*_i - CF^*_i - FB^*_i$	
Total at basic price	$CI^*_j = CI_j + CI_{X20;j}$	$CI^* = CI + CI_{X20}$	$CF^* = CF + CF_{X20}$	$FB^* = FB + FB_{X20}$	$XP^* = UT - CI^* - CF^* - FB^*$	
Use of imported products	$CI^*_{Xj} = CI_{Xj} - CI_{X20;j}$	$CI^*_X = CI_X - CI_{X20}$	$CF^*_X = CF_X - CF_{X20}$			
Taxes less subsidies to products						
Total at purchaser's price						
Value added at basic price						
Output at basic price						

Superscript « * »: value in the consolidated SIOT.

[white box] Same value as in the domestic – sum SIOT.

[grey box] Value not calculated (not needed for calculation of final consumption decomposition).

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

Philippe Boyer and Jean-Pierre Butault

Online Appendix

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