

Contents

Introduction

1. Framework
2. Database and methods
3. Results
4. Discussion



2

XXVII Convegno Nazionale AIVI

Le sinergie tra grande distribuzione organizzata, industria,
piccole produzioni locali e controllo ufficiale: tutela del
consumatore, difficoltà e prospettive
Perugia, 13 Settembre 2017

**EU Agro-food chain and vertical integration
potentiality: a strategy for diversification?**

Ting Fa Margherita Chang,
Maurizio Drolì
University of Udine



1

Introduction: the rationale

- The vertical integration of the firm is an important consideration in corporate strategy because it can have a significant impact on a business unit's position in its industry with respect to cost, differentiation, and other strategic issues (e.g. food quality standard adoption within the 'extended food value-chain' and other transaction costs reduction)



4

Introduction: the rationale

- As we know, the connection of a firm with its upstream suppliers and downstream buyers is referred to as vertical integration.



3

An example

- Pre-production activities might include university-based research and development, and post-consumption activities could include waste disposal and recycling, while government regulations would likely be engaged throughout the chain." (Stevenson and Pirog 2009).



6

An example

- "For example, a food supply chain featuring pork products might include feed suppliers, veterinarians, farmer producers, meat packing and fabrication plants, food distributors & marketers, supermarkets, farmer market / food hub management units, and consumers.



5

Study purposes

- Our attention is focused on EU countries strategic perspectives of diversification by vertical integration, regarding in particular the potentiality of the main Agrifood Chain branches: Agriculture, hunting and related services and Food and beverages.



8

Study purposes

- Establishing the strategy pursued by some branches of EU countries for diversifying production, so enriching the range of their secondary (non-core) products.



7

Key-concepts

- Our attention is focused on EU countries strategic perspectives of diversification by **vertical integration**, regarding in particular the potentiality of the main Agrifood Chain branches: Agriculture, hunting and related services and Food and beverages.



10

Key-concepts

- Referring to this investigation area, literature generally distinguishes diversification by vertical integration and concentric or conglomerate diversification (related or unrelated).



9

Key-concepts

- In this context of diversification strategies, we deal with the backward and forward linkages that are the expression of Agriculture and Food vertical integration potentialities.



12

Key-concepts

- The intent of the integrative growth is to improve firms' economic efficiency by facilitating and controlling (non managing) strategic importance activities.



11

Key-concepts

- Specifically, we formulate a new Entry barriers index in order to take into account the so called “insulation” effects of these barriers (Porter 1979).
- Other appropriate indicators or measures (e.g. Invasion index) will be applied to determine the actual strategic perspectives of the two branches to integrate themselves, through their secondary production (Chang and Iseppi 2011) in the main field of competence (core business) of the other.



14

Key-concepts

- diversification strategies that, as we know, are articulated into:
 - a) intensive, that operate in the core business;
 - b) integrative, whose main object is the industrial chain in which the firm is positioned, comprised its backward, forward or side extensions; and
 - c) related/unrelated, when a firm takes advantage through exploiting complementary outside the usual scope of its activities (Lambin 2004; Kotler and Keller 2007).



13

Originality

The originality of this approach consists of:

- i) abandonment of conventional optics, which considers separately backward and forward linkages of the branches, taken two by two, to establish the potentiality of diversification by vertical integration (Fan and Lang 2000). In this research, the same linkages will be juxtaposed for each branch in order to emphasize the opportunities of diversification according to a logic of vertical supply chain;
- ii) the design of two new indices.



16

Proxies

- The Entry Barriers index reveals the presence of more or less strong barriers to entry for new firms and
- the Invasion index allows to determine whether the core business of a branch has been invaded or not and to measure the degree of invasion.



15

1. Framework - 1. Diversification strategies and expected performance

- In terms of the relationship between performance and degree of specialization, empirical tests suggest that they are **positively correlated**.
- Specialized firms have generally outperformed diversified ones (Fan and Lang 2000).



18

1. Framework - 1. Diversification strategies and expected performance

- Growth strategies through integrative, related or unrelated diversification are motivated by the **difficulty of some businesses to improve profitability in the context of their core business**.
- Businesses then decide to expand production into other manufacturing sectors, related upstream, downstream and laterally to their main activity.



17

1. Framework - 1. Diversification strategies and expected performance

- Other sources claim that diversification can allow firms to realize benefits associated with the use of complementary resources, which are not negotiable, through the joint acquisition of human and physical inputs as well as of shared marketing and distribution activities (Penrose 1959; Teece 1980).



20

1. Framework - 1. Diversification strategies and expected performance

- The literature has shown how firms can use vertical integration to mitigate the costs of market transactions (Coase 1937; Williamson 1979; Klein et al. 1978).



19

2. Database and methods: tools

- We get 26x2 matrices containing vertical and horizontal coefficients of the economy (59x59 products/industries) and 2 aggregated matrices (58x26 products/countries); one country did not supply data.
- The last two matrices are pertaining to “Agriculture, hunting and related service” and to “Food and beverages”.
- The complete database will include 58 matrices.
- For some new-entries or non-Euro countries, we had to convert data from national currency into Euro.



22

2. Database and methods: database

- This work utilizes both single country and EU aggregated five-year symmetric input-output tables (SIOTs - 2005) in order to create an input-output coefficient database, derived from the application of Leontief's vertical and horizontal models.
- Input-Output tables are constantly updated and made available “free of charges” by the EU Commission, Eurostat.
- Several authors consider input-output method very appropriate to the scope (Vannoni 1996; Fan and Lang 2000).



21

Tools: 2.1 The new Entry barrier and Invasion Indices

- In literature, we found among others a very interesting entry barrier index “... which expressed entry as a function of various incentives to enter and barriers to entry” (Orr 1974, p. 39). Another author established also a classification scheme of entry barriers but it depends only upon his subjective judgment (Mann 1966).



24

2. Database and methods: approach

- The originality of this approach consists in giving up the conventional optics presented afterwards (Rondi and Vannoni 2005). The branches examined were taken in pairs instead of considering the backward and forward linkages separately (Fan and Lang 2000).



23

Tools: The Chang New Invasion Index is

$$I_i = \frac{(n+1)(S_i - A_i)}{\left(\sum_{j=1}^n |S_j - A_j| \right) + n|S_i + A_i|}$$



26

Tools: Chang new indices here presented consist essentially of ...

- I. each industry / country is compared with the average behavior of economic or geographical reference system;
- II. the symmetry is fundamental: we have also considered both the insulation ability of each branch in building up entry barriers and the invasion ability of other branches to enter the core business of the reference branch; and
- III. we also highlight the **balance** between the performance of entry barriers and the invasion ability.



25

Table 3 - Food and beverage products: other branches secondary production

Code	Branches that produce food and beverage products as secondary production	Million €	%	Country frequency
01	Products of agriculture, hunting and related services	13,086,108	35.49	21
51	Wholesale trade and commission trade services, except of motor vehicles and motorcycles	11,189,313	30.34	17
52	Retail trade services, except of motor vehicles and motorcycles; repair services of personal and household goods	5,847,883	15.86	17
24	Chemicals, chemical products and man-made fibres	2,697,273	7.31	21
55	Hotel and restaurant services	1,071,035	2.90	12
05	Fish and other fishing products; services incidental of fishing	965,819	2.62	9
	Subtotal: first 6 branches	34,857,431	94.53	
	Other branches	2,016,327	5.47	
Total		36,873,758	100.00	



Source: our elaboration on EUROSTAT (2011), Supply I-O Tables

28

Table 1 - Agriculture, hunting and related services (branch): production at basic prices (26 UE countries, 2005)

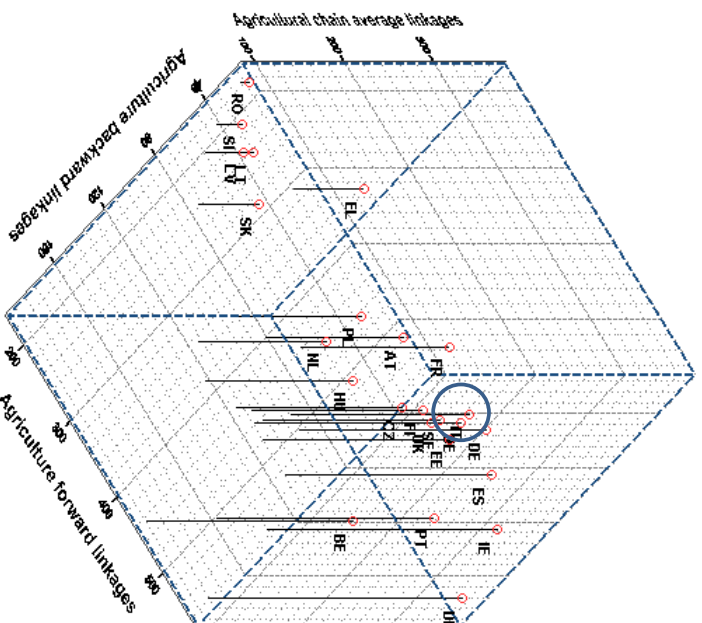
Code	Description	Million €	%	
	Total Production at basic prices	356,188,714	100.00	
	Main Production	333,824,057	93.72	
01	Products of agriculture, hunting and related services	333,824,057	93.72	
	Secondary Production	22,364,656	6.28	
	Fields of Agriculture secondary production	Million €	% Secondary Production	Country frequency
15	Food products and beverages	13,086,108	58.51	21
55	Hotel and restaurant services	1,773,920	7.93	17
45	Construction work	1,531,285	6.85	16
92	Recreational, cultural and sporting services	1,393,608	6.23	11
51	Wholesale trade and commission trade services, except of motor vehicles and motorcycles	973,381	4.35	12
71	Renting services of machinery and equipment without operator and of personal and household goods	584,416	2.61	14
70	Real estate services	555,867	2.49	12
60	Land transport; transport via pipeline services	472,220	2.11	11
	Subtotal: first 8 branches	20,370,805	91.08	
	Other branches	1,993,851	8.92	
Total		22,364,656	100.00	



Table 1 - Agriculture, hunting and related services (branch): production at basic prices (26 UE countries, 2005)
Source: our elaboration on EUROSTAT (2011) Supply I-O Tables

27

Fig. 1 Agricultural Chain: Vertical Integration Potentiality toward Food and Beverages



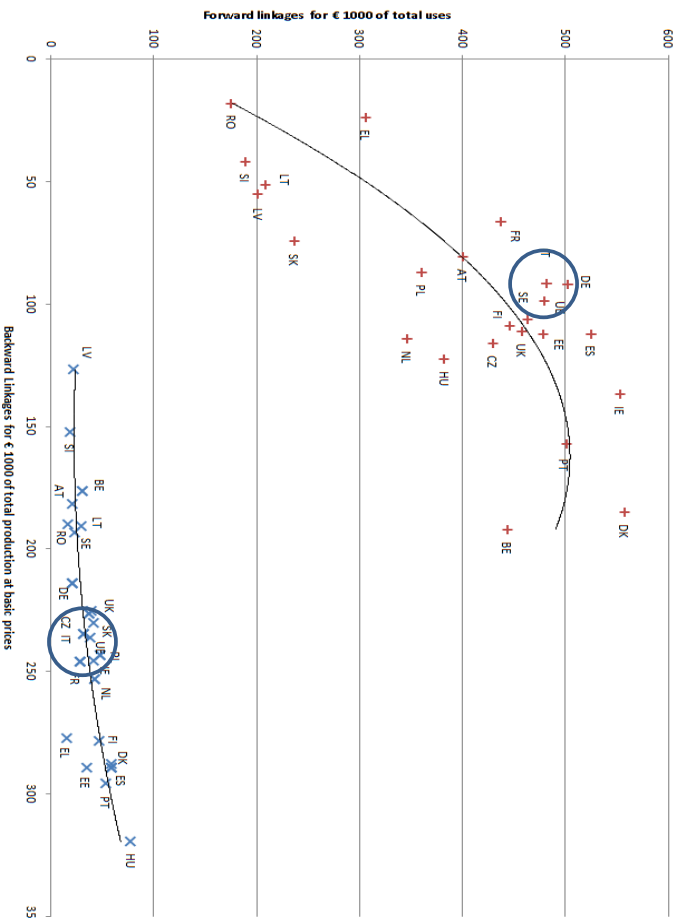
Source: our elaboration on EUROSTAT (2011), Symmetric I-O Tables

Table 4 – Linkages of Agriculture and Food and beverage Chains

Country Code	Agricultural Chain		Food and beverage Chain	
	Backward linkages ¹ Purchases	Forward linkages ² Sales	Backward linkages ¹ Purchases	Forward linkages ² Sales
EU	99	480	236	39
BE	192	444	176	30
CZ	116	430	226	39
DK	185	558	288	59
EE	112	479	289	35
DE	92	502	214	21
IE	137	553	246	41
EL	24	306	277	16
ES	112	525	289	59
FR	66	438	246	28
IT	92	482	235	32
LV	55	201	127	22
LT	52	209	191	30
HU	123	382	320	78
NL	114	346	253	43
AT	81	400	182	20
PL	87	360	243	48
PT	157	502	296	53
RO	18	175	190	17
SI	42	189	152	19
SK	74	236	230	41
FI	109	446	279	47
SE	106	463	193	24
UK	111	458	227	37



Fig. 2 Agriculture and Food and Beverage Chains: Vertical Integration potentiality



32

5. EU countries strategic perspectives of diversification by vertical integration

- In Fig. 1, we have determined the existence vertical integration potentialities and thus and the entity of diversification. In Fig. 2, we represent on a single graphic, for Agriculture and Food, those potentiality related both to forward and to backward linkages, using the same scale.



31

Fig. 2 Agriculture and Food and Beverage Chains: Vertical Integration

potentiality

- ... With regards to countries whose agriculture produces more than 50% of non-animal products on the total (EL, IT, RO, ES, HU, FR, PT, NL, LV), the significance of R^2 is much smaller than the previous (0.54) and move down to 0.51 including those agricultures in which that % is above (but less than 50%) of the EU average, (SK, LT, CZ, SI, AT, DE). In that case, the interest to manage directly feed industry is smaller than the previous case.



34

Fig. 2 Agriculture and Food and Beverage Chains: Vertical Integration

potentiality

- Fig 2 shows as great integration potentiality in EU countries whose Agriculture is more livestock oriented to diversify their production by integrate both upward and downward toward Food as input provider (feed for livestock) and as a processor of agricultural raw materials respectively from animal slaughtering to milk and meat processing, as well as of other agricultural raw materials transformation. (continues)



33

6. Agrifood chain: entry barriers and invasion performance

- Entry can be blockaded into one of an industry's strategic groups and easy into another” (Porter 1979, p. 216). Thus entry barriers facing new entrants are endogenous and specific for each strategic group or economic branch; a common firm strategy in spite of their efforts may not be able to blockade new firm entrance.



36

6. Agrifood chain: entry barriers and invasion performance

- According to Stigler, “a barrier to entry may be defined as a cost of producing (at some or every rate of output) that must be borne by a firm which seeks to enter the industry but is not borne by firms already in the industry.” In this contest, incumbents have a competitive advantage with respect to new entrants.



35

Table 6 – Agriculture and Food and beverages: Entry Barriers and Invasion Indexes

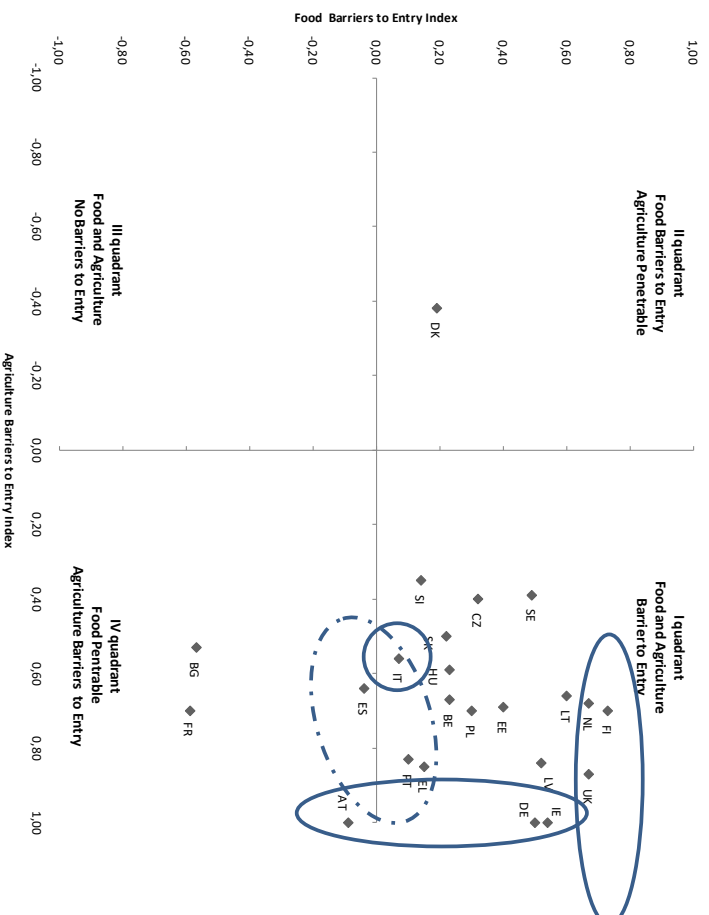
Country Acronym	Agriculture Entry Barrier Index	Agriculture Invasion Index (I)	Country Acronym	Food and Beverages Entry Barrier Index	Food and Beverages Invasion Index (I)
DE	1.00	0.31	FI	0.73	0.47
IE	1.00	0.23	NL	0.67	0.44
AT	1.00	0.71	UK	0.67	0.51
UK	0.87	0.39	LT	0.60	0.71
EL	0.85	0.73	IE	0.54	0.89
LV	0.84	0.30	LV	0.52	0.70
PT	0.83	0.60	DE	0.50	0.61
FR	0.70	0.85	SE	0.49	0.35
PL	0.70	0.18	EE	0.40	0.09
FI	0.70	0.35	CZ	0.32	0.40
EE	0.69	0.65	PL	0.30	-0.51
NL	0.68	0.35	BE	0.23	-0.48
BE	0.67	-0.03	HU	0.23	-0.41
LT	0.66	0.57	SK	0.22	0.05
ES	0.64	0.55	DK	0.19	0.57
HU	0.59	0.78	EL	0.15	0.40
IT	0.56	0.03	SI	0.14	-0.46
BG	0.53	0.93	PT	0.10	-0.57
SK	0.50	0.29	IT	0.07	-0.62
CZ	0.40	0.75	ES	-0.04	-0.45
SE	0.39	0.12	AT	-0.09	-0.49
SI	0.35	0.49	BG	-0.57	-0.93
DK	-0.38	-0.65	FR	-0.59	-0.85
RO	n.d.	n.d.	RO	n.d.	n.d.

Source: our elaboration on EUROSTAT (2011), Supply I-O Tables

6. Agrifood chain: entry barriers and invasion performance

- In this context, suffice it to say that we may assume as Entry barriers index (shown in Figure 3) the opposite of Invasion Index in the sense that the higher the penetration the lower the entry barriers. This seems to be a reasonable proxy. Hence the originality of this operation lies in the ability of the new index to explain a phenomenon on the basis of the negative correlation with another index.

6. Agrifood chain: entry barriers and invasion performance

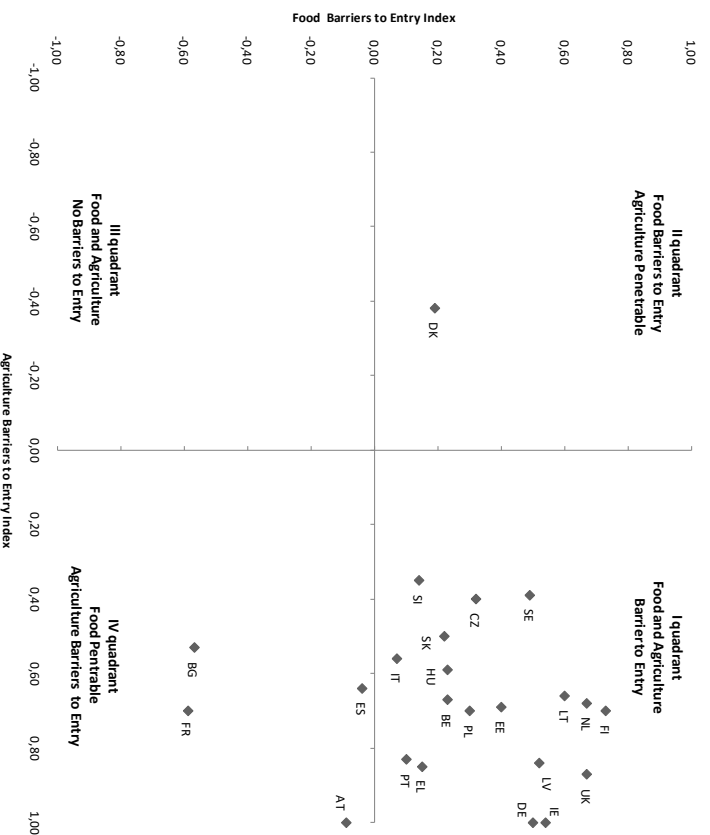


Source: our elaboration on EUROSTAT (2011), Supply I-O Tables



40

6. Agrifood chain: entry barriers and invasion performance



Source: our elaboration on EUROSTAT (2011), Supply I-O Tables



39

In summary, we observe some basic elements

- B) the different shape that the curve of diversification by vertical integration potentiality takes for Agriculture with respect of Food and beverages and vice versa, perhaps dependent on a respective heritage diversification/specialization (e.g. share of livestock on agricultural production);



42

In summary, we observe some basic elements

- A) the long-term continuity of the vertically integrated and complementary activities that have traditionally characterized Agriculture (vineyard - wine, olive - olive oil etc.);



41

In summary, we observe some basic elements

- Entry barriers may be consider both endogenous and exogenous according the pressure power that one recognizes to the lobbies (farmers, industrialists, bankers etc.)
- They should represent research units of fundamental importance at both micro and macro (regional, national) level



44

In summary, we observe some basic elements

- C) the existence of different entry barriers in EU countries, which explain the asymmetry between the behavior of branches more or less interrelated. In addition to economic, also regulatory (e.g. Common Agricultural Policy - CAP) and non-market barriers are involved inducing further differences in the behavior of various countries.



43

Introduction: an example

- Typical links in the supply chain are that among the following operators: inputs producers, farms, food processors, distributors, wholesalers, retailers and consumers.



Thank you for your patience



Framework - 1. Diversification strategies and expected performance

- As we know, the connection of a firm with its upstream suppliers and downstream buyers is referred to as vertical integration.
- Firm's vertical integration is an important consideration in corporate strategy because it can have a significant impact on a business unit's position in its industry with respect to cost, differentiation, and other strategic issues (such as E.g. food security).



48

Introduction: key-concepts

- Historically, the literature has shown how firms **can** use vertical integration e.g. to mitigate market transactions costs (Coase 1937; Williamson 1979; Klein et al. 1978)

- ...
- ...
- ...



47

2. Database and methods

- By calculating the above mentioned indexes, we were able to evaluate two following different types of integration:
- A) horizontal integration by comparing the intra-industry trade between its internal groups of products, that is, by considering the weight on the production of so-called redeployment emerging from Use or SIOT's (symmetric) tables. This measure will not be taken into account here;
- B) vertical integration, using synthetic, forward and downward indicators, as previously described in formal terms (Rondi and Vannoni 2005).



50

2. Database and methods

If the two branches are for example Agriculture (i) and Food (j), the formulas that arise are the following:

$a_{ji} = X_{ji}/X_i$ net i coefficient of input (backward integration $i \rightarrow j$)

$b_{ji} = X_{ji}/X_i$ net i coefficient of output (forward integration $i \rightarrow j$)

$AB_i = (a_{ji} + b_{ji})/2$ = synthetic indicator of branch i (in our example Agriculture) supply chain potentiality of integration.

$a_{ij} = X_{ij}/X_j$ net j coefficient of input (backward integration $j \rightarrow i$)

$b_{ji} = X_{ji}/X_j$ net j coefficient of output (forward integration $j \rightarrow i$)

$AB_j = (a_{ji} + b_{ji})/2$ = synthetic indicator of branch j (in our example Food) supply chain potentiality of integration. In this case X_{ji} and X_{ij} are the generic elements of Transition matrices derived by EU Symmetric input-output tables.



49

RESULTS: 3. EU Agriculture and Food secondary production

- Agricultural branch secondary production covers 6.3% of its total production and is perfectly in line with EU average. This share amounts to over € 22 billion and consists primarily (58.5%) of Food and beverage products obtained by the farms as secondary activities. Other relevant agricultural branch secondary activities are those of Hotel and restaurant services (7,9%), Construction work (6,85%), Recreational, cultural and sporting services (6,23%), Wholesale trade and commission trade services, except of motor vehicles and motorcycles (4,35%), Renting services of machinery and equipment without operator and of personal and household goods (2,6%), Real estate services (2,5%) and Land transport; transport via pipeline services (2,1%). The secondary activities listed account for 91.1% of all secondary activities of the agricultural branch.



52

RESULTS: 3. EU Agriculture and Food secondary production

- In the EU economy, the phenomenon of productive branches differentiation is not negligible. In fact, secondary productions amounts to € 1,271 billion and accounts for 6.3% of the total output at basic prices (2005) that reaches € 20,222 billion (Supply Tables 2005, Eurostat 2009). EU total production at basic prices of the agricultural branch amounted to € 356 billion and as much as 93.7% is attributed to Agriculture, hunting and related service group of products which pertain to its main activity (Tab. 1).



51

Table 5 - Products of Agriculture, hunting and related services: other branches

secondary production

Code	Branches that produce agricultural products as secondary production	Million €	%	Country frequency
51	Wholesale trade and commission trade services, except of motor vehicles and motorcycles	1,090.059	28.71	12
15	Food products and beverages	939.542	24.74	12
52	Retail trade services, except of motor vehicles and motorcycles; repair services of personal and household goods	472.379	12.44	12
36	Furniture; other manufactured goods n.e.c	305.400	8.04	7
02	Products of forestry, logging and related services	186.778	4.92	12
50	Trade, maintenance and repair services of motor vehicles and motorcycles; retail sale of automotive fuel	179.489	4.73	5
75	Public administration and defence services; compulsory social security services	132.479	3.49	10
74	Other business services	100.482	2.65	8
	Subtotal: first 8 branches	3,406.608	89.72	
	Other branches	390.342	10.28	
	Total	3,796.950	100.00	

Results

For a given branch, say branch i , we denote by P_i the proper production (namely production by the branch in its main field of competence), by S_i the secondary production of the branch in all the remaining branches, by A_i the secondary production of all the other branches in the core business of

We take then normalized indexes, namely p_i is P_i normalized by

(1)

$a_i = A_i$ normalized by

(2) $\sum_{j=1}^n A_j$

$s_i = S_i$ normalized by

(3) $\sum_{j=1}^n S_j = \sum_{j=1}^n A_j$

A first index is Chang Entry Barrier Index

(4) $\Phi_i = \frac{-\lg \frac{a_i}{p_i}}{1 + \left| \lg \frac{a_i}{p_i} \right|}$

Remark that it is normalized so that it ranges from -1 to +1.



In synthesis

- the countries where Food industry would gain applying a strategy of diversification by backward integration with Agriculture (purchase coefficient higher than EU average), are (in decreasing order of convenience) the following: HU, PT, EE, ES, DK, FI, EL, NL, FR, IE, PL. In all these countries Agriculture has high entry barriers (Fig. 3), except Denmark, and we suppose that it is very difficult for Food to penetrate into Agriculture core business by upward integration.