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Nicolas Lacombe, François Casabianca. By-products from raising small ruminants: an analysis based on the “baskets of goods” theory – A comparative study of Corsica, Sardinia and Morocco. 13. European IFSA Symposium. Farming systems: facing uncertainties and enhancing opportunities, International Farming Systems Association (IFSA). AUT., Jul 2018, Chania, Greece. 10 p. <hal-02734414>

**HAL Id: hal-02734414**

**<https://hal.inrae.fr/hal-02734414v1>**

Submitted on 2 Jun 2020

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# By-products from raising small ruminants: an analysis based on the “baskets of goods” theory – A comparative study of Corsica, Sardinia and Morocco

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**Abstract:** *Since the 1980s, agricultural economy has experienced a profound renewal through the process of territorial differentiation of production. In this perspective, Corsica got a Protected Designation of origin for the Brocciu cheese, as Sardinia for the Pecorino cheese, while Argan oil got a Protected Geographical Indication in Morocco. But are these 'product-leaders' actually hiding other forms of production behind them? The “basket of goods” theory helps to emphasize complementarities between several activities within a territory. Through this framework, we conducted research on by-products, also called joint products. Suckling lamb is a product derived from the main activity, dairy ewes and goats in the cases of Corsica and Sardinia, and argan oil in the case of Morocco. However, the relationships between these joint products present more competitive situations with the main product than real complementarity. This work is based on a PhD thesis in geography realized between 2011 and 2015 in these three regions. We aim to show, based on bio-technical dimensions associated with farming activities, how these relationships are taken into account and how they may be conflicting in a context of agricultural specialization. We approach the features of product certification as a potential vector of specialization where by-products could be excluded. We will develop these case studies further on and over wool as it offers a new perspective for craft products. Finally, our endeavour is to underline governance issues in the implementation of cross-sectoral coordination in contexts of strong social differentiation of the activities.*

**Keywords:** *By-products, production systems, multifunctionality, territorial approach*

## Introduction

What does the argan tree spontaneously evoke to you? The answer, with varying degrees of appreciation, will undoubtedly reveal what is for each of us associable with this endemic tree of south-western Morocco; argan oil. This reflects the weight of the consumer society in the collective imagination of our territories. But this statement is partially true, as well as it is partially false, since we, also have partially, or not at all in mind the idea of a "goat tree". It is the relationship between these two activities, that is undoubtedly less noticeable (Simenel et al., 2009), and it is in this sense that research on "by-products" appears essential.

"By-producing" refers to the set of manufacturing techniques for developing a finished product that results in the generation of joint resources that can enter into a different valorisation cycle. In this way we adopt a posture of new research in the field of productions related to the origin (Lacroix et al., 2000) since the central object of the study here is not a "flag-product", but a secondary product. Milk-meat is a by-product of milking sheep and goat production. The concept meets a strict definition however other cases just fail to that comply with this definition. The production of argan oil in Morocco is closely linked to goat farming; each activity benefits from a common resource; the argan tree. In this case, we can speak of a joint or related production, as it is the case for wool, which we will study additionally.

We wish to position this study carried out as part of a PhD work (Lacombe, 2015) with regard to the theory of the basket of goods (Mollard and Pecqueur, 2007,) as empirical and conceptual proximities define almost naturally a certain number of analogies between both approaches. Indeed, we are dealing with "related products", which maintain relations with each other on a territorial scale, and which can be jointly valued. The Baronnies and the Aubrac have been study cases around which these perspectives have emerged, where a set of products with shared characteristics benefit each other. But is not this proximity synonymous with conflicts? Are there not rival uses in the use of joint resources? Does not allocating a function to a resource prevent others from existing? If a model of multifunctionality can be thought from the basket of goods theory (Mollard, 2003), the conditions for its operationalization deserve to be measured. From the study of by-product qualification modalities, to giving continuity to works based on the economy of qualities (Callon et al., 2000), we got interested in the links of dependence and hierarchy that were established between related products. It seemed to us essential not to position these related productions in a situation of equivalence, but in a « center-periphery» type of relationship dear to geography (Reynaud, 1981), where the place of the by-product can be studied as a territorial "margin" (Prost, 2004).

This work is based on surveys carried out in the three regions studied (Corsica, Sardinia, south-western Morocco) with different livestock representatives. The sampling concerned breeders, slaughterhouses, dairies, artisans, representatives of the profession (interprofessional body, defense and management organization) and public actors (the Corsican tourism agency, the Essaouira Provincial Directorate). The 72 interviews carried out gave an essential place to biotechnical dimensions associated with livestock farming (seasonality, grazing, mowing, etc.) as well as market dimensions (valorization method, marketing system, books of procedures). From these different interviews it was possible to reconstruct the trajectory of the different basins while giving an essential place to history in order to design the functioning of productive systems from back then until today.

This proposal aims to shed new light on the proposed analysis model by choosing a distinct research position. The basket of good theory is based on an economic analysis centered on consumers' market preferences. The link that unites different products of the same territory is based on common representations they share and that consumers recognize. In this proposal, we will focus mainly on the material relations that link these products to each other, without turning away from their forms of valorization, although giving an essential place to the breeding technique. As such we will propose to consider three types of scales that will lead to separate analyzes:

- i. *The space*, considered here as a place where several closely related activities coexist around agricultural practices (Morocco);
- ii. *The agricultural holding*, as a management space for interactions between products linked by a breeder in the management of its production cycles (Corsica);
- iii. *The animal*, as a potential supplier of heterogeneous materials potentially allocable to several production food and non-food sectors, (Corsica, Sardinia).

First, we will present the model of analysis proposed by the basket of goods theory in order to state the conceptual contributions to which it refers to and to emphasize the interest of a crossed approach with that of by-products (i). In a second phase, we will position the studied cases to analyze the levels of convergence and limits vis-à-vis of the theory of the basket of goods (ii). Finally, we will propose more specifically an institutional reading aiming at placing each of the case studies in specific configurations, of articulation between related products (iii).

## **1.The “basket of good” theory, an analytical model for thinking by-products**

We propose to focus initially on a clarification of the “basket of good” theory to account for the proximities and differences with the approach we propose. Subsequently it was considered important to situate this research in a broader questioning spectrum on trajectories of specialization correlated to an alternative political choice towards multifunctionality.

### **1.1 Conceptual and empirical proximities**

During the 1990s, an innovative research introduced a concept that caught the attention of many researchers. The theory of the “basket of goods” shows a research trajectory originated in the Baronnies (South of the Drôme, France) (Lacroix et al. 1997), that induced later works in other regions and further beyond French borders (Requier - Desjardins, 2015). For several reasons, it arches over the research contributions engaged in Corsica, Sardinia and the Moroccan argan forest, from a thesis work on by-products issued from livestock breeding. This expression means these products derivate from a same activity thus oriented by another product considered as the main outcome. In this sense, we considered as an analogy the Nions olive oil and its derivatives (olives, soaps, Tapenades, etc.). The leading product, oil, encourages the development of its related products that reinforce each other because of the close geographical and symbolic links among them. The aggregation of a joint product offer can, under certain conditions, participate in the emergence of a rent of territorial quality (Lacroix et al. 1998).

It seemed important to us to return to these analytical foundations to show how the research carried out differs from them and makes a new contribution to the theory of the basket of goods (Hirczak et al., 2008). Milking lamb, a by-product of dairy sheep production, the young kid from the argan tree, is tightly linked to argan oil production, places in evidence the relationships between related products that far from being complementary also reveal tensions.

We are confronted with a kind of pitfall between patrimonialization (heritage building) and exclusion, a process already analysed with regard to geographical indications where the introduced quality requirements may induce the marginalization of certain social groups or systems of production (Linck, 2012). If in this approach the analysis is conducted at the scale of the same sector of activity, the choice made applies to activities that are heterogeneous but located in interdependent relationships. Although the underpinning of the analysis and the research objects mobilized are found to be related to the theory of the basket of goods, the disciplinary anchorage and the conceptual equipment proved to be different. The basket of goods theory is inspired by the territorial economy, based in the encounter between the contributions resulting from the territorial differentiation of supply (Mollard et al., 2005) and the approach of product quality centred on consumers' preferences (Lancaster, 1998). In cases like Corsica, Sardinia or Morocco, the promotion of alternative tourism based on the valorisation of rural heritage and in particular agricultural products is very present (Furt and Michel, 2011). It also converges to a second approach since quality products, especially those under quality signs, find an echo towards a touristic promotion through a logic of promotion of the *terroir* (Senil et al., 2014). If the fields of study thus gathering a set of conditions making possible to think of the emergence of a basket of goods-type model, the empirical analysis carried out shows a very different process directed towards the decoupling of activities. In order to explain this trajectory, we will rely on a reading of technical cultural terms, in order to shed light on the interdependencies between related products, in the support of an institutional reading in order to integrate social dimensions, in particular sectorization processes being implemented.

### **1.2 The functional specialization of animals and trees**

Livestock systems are submitted to a growing functional specialization. They are classified in several broad categories that have been built on the basis of genetic selection. If the sheep is the common strain, the classification distinguishes dairy, suckling and wool producing farms while the enterprise replaces the farm, and the modern farmer replaces the peasant.

Some produce cheeses, others meat while finally others value the wool. If you take the French case, these separations lead to a specialization of sheep breeds according to performance criteria allocated to each of them: Ile de France or Berrichon du Cher (Conformation), Lacaune/Manech redface, Corsican (protein milk content) - Merino Arles (fiber diameter). If we are still talking of genetic diversity this is essentially for testifying the preservation of local endangered breeds in the heritage of French breeding (Lauvie and Couix, 2012). This diversity is much less concerned by the animal within a racial category and homogeneous traits associated to a specific function.

The issue does not aim to rehabilitate old relics but to situate them in a new context given to the livestock by-products. By by-product, we understand "a material, intentional and unavoidable, created during the same manufacturing process and at the same time as the main product" (ADEME, 2000). Two trajectories are opposed in terms of prospective related to breeding, one promoting a hyper specialization while the other preferring the way for multifunctionality. « Chicken without feathers» is the most extreme example of the first option where the assumed function (meat production) is to limit the work of de-feathering at the slaughterhouses. The alternative way may also lead to conversely induce animal functions, as in the case of methanization, where the cow becomes almost essentially associated to energy production (1000 cows caged for methane production). Couldn't we consider it from the opposite perspective in which plural functions cohabitating would result in more heterogeneous productions obtained from the same animal?

A similar reflection can be transferred to the forest. The development of forestry and fruit orchards gradually erased the relationship between the breeding animal and forest resources. More or less yielding, the forest also knows a strong specialization as its uses have gradually been redefined. Forest management is in line with references intended for fire wood or lumber. In terms of orchard culture as well, if one takes for example the forests of chestnut trees and ancient olive orchards, they were closely associated with pig (Michon, 2011) for the first one, and to sheep breeding for the second one respectively. These interactions, even if today they attempt a reconnection to sylvo-pastoralism (Normandin, 1996) as an innovative option, these have been largely deconstructed and makes us wonder if in the case of the moroccan argan forest such a process is not underway. Goat breeding is indeed closely articulated to the pasture of the argan forest, which is also associated with the collection of fruits for oil production. From here we will observe that these interactions are gradually erased.

## **2 Case studies: lambs, goats, wool**

Here, we propose to analyze the interactions between by-products by showing processes of decoupling that operate on the field, focusing on three empirical case studies (Corsica, Sardinia, Morocco).

### **2.1. Lamb of milk: meat from a dairy farming system**

In Corsica and Sardinia, dairy sheep farming represents an emblematic activity for these two islands of the Mediterranean. It owes its origins to a long pastoral tradition that has shaped the landscape for thousands of years, nourished the cultural imaginary through the figure of the shepherd, and provides now famous, quality cheeses, some of which (Brocciu, Fiore Sardo) have a PDO system official recognition. Less known, suckling lamb is also a product obtained from these farms, and is traditionally consumed on Christmas and on Easter. Milk production necessarily involves the birth of lambs that participate in the production of milk in ewes. One part of births is thus allocated to the renewal of the herd and the other for meat production, the category we are interested to study. Suckling lamb obeys to few typicity criteria, its weight is between 4.5 and 7 kg, for an age ranging between 30 and 45 days, prescriptions that are included in the specifications of the PGI project "Agnellu di Corsica ". An organic link thus links the milk production to that of meat through breastfeeding from mother, a characteristic which makes possible, in particular, to differentiate them from heavy lambs resulting from specialized meat breeds and associated with fattening sectors (Quercy,

Sisteron). Here we are in a productive configuration that makes possible the emergence of a basket of goods insofar as the farms have a composite product supply and located, to the extent that these two products are intrinsically linked by history and shared farm operation conditions. Are these by-products subject to be jointly valorised? Is tourism a mode of valorisation that ensures its aggregation? If we take as reference touristic market access, there are tensions that reveal in terms of seasonality. Tourism in Corsica and Sardinia is mainly structured during the two summer months according to the model "Sea, Sun and Sand" (3 S). However, birth periods have changed profoundly due to the seasonal alteration of herds coupled to the Roquefort industries from the 19th century, aiming to produce milk on off-season, thus leading to earlier fall and autumn. The orientation of production systems is thus determined according to a "flag-product", cheese, which defines the set of technical dimensions thus preventing any form of valorisation of fresh lamb, by then unavailable on summer. In the absence of a local market at this time, live suckling lamb is shipped to Sardinia and situated in a "commodity-chain" market, which does not value its qualities thus weakens its territorial anchorage. In recent years, however, marketing operators have developed a deep-freezing system whose function is to postpone consumption in summer for restaurants where the product is then addressed to tourists, committed to discovering the local food heritage.

## **2.2. The Arganeraie: pastoral or oil forest?**

The Arganeraie is a Moroccan forest located between Essaouira and Agadir extended to the foothills of the Moroccan Atlas. It is a multi-use forest where rural communities live whose activities are focused on agriculture and livestock farming. Argan oil is one of the emblematic productions that experienced an economic boom in the 1990s, supported by public-private investments that favored the development of women's cooperatives. Part of this family farming, goat farming is an essential component of this productive system and gives rise to the production of the young Argan kid, marketed in the rural souks. These two products, revealing the specificity of local agriculture, have recently been engaged in labelling processes, considering Morocco processed a specific law on geographical indications. The differentiation of qualities is established in one case on the basis of cosmetic properties (Argan oil) and in the other as its nutritional attributes (young Argan kid). These two activities are closely linked as the argan tree is a food resource for goats grazing fruit and leaves, and also for manual harvesting of fruits for the production of argan oil. The Arganeraie is a territory of experience for the public authorities with a view to setting up a "basket of goods" approach, which is also enshrined in the second pillar of the Green Morocco Plan. These two productions have a natural vocation to be part of the attractiveness of the region that polarizes a significant share of tourism around including the promotion of rural heritage and Berber culture. The analysis of the local situation offers yet another representation to the extent that the nut growing and the breeding know today deep antagonisms (Simenel and al.2009). This conflictuality was largely induced by a reappropriation of the uses of the forest by the actors of the argan oil PGI (AMIGHA) and this to the detriment of livestock. The specifications of the argan oil show an exclusion of breeding. In fact, the ban on the collection of fruit from animal regurgitation for oil production reflects an alteration of goat grazing conditions, whereas this practice was previously widespread. The same is true of professional communication strategies where breeders are often stigmatized by questioning the practice of aerial grazing goats, which would contribute to weakening the argan ecosystem. Finally, the members of AMIGHA strongly opposed to the project of certification of the young lamb after consultation by the public authorities by denouncing the risks related to overgrazing (Lacombe and Casabianca, 2005). Considering the emergence of a basket of goods, in these circumstances, it fails in the absence of shared representations of the territory as to the use of resources, and this transition also marks the weakening of the traditional agro-sylvo-pastoral system. For a long time, the rural communities of the region have arranged these two activities by a very specific land organization and rules to organize this cohabitation as the Agdal, which allows the defense of land during the harvest of nuts.

### **2.3. Wool: a non-food product from breeding**

Sardinia is the main production area for dairy ewes in Italy. The dairy productive fabric is organized mainly by industries as well as cooperatives. Its cheese production is mainly represented by Pecorino Romano, which is widely shipped to the USA and considered as a generic cheese. However, Pecorino Sardo and Fiore Sardo are two productions that result from a reappropriation of local cheese culture and associated PDO. The ewe has also given rise to the development of a textile culture around the use that is made of local wool. It is the subject of a patrimonialization that is embodied both in the making of traditional clothes and the manufacture of carpets whose motifs are inspired by Sardinian culture that we think of the symbols relating to fertility or funeral rituals. The possibility of articulating the valorization of artisanal products from livestock farming to that of agro-food production can be a model of convergence with the theory of the basket of goods. If it is not in itself endowed with specific qualities for its clothing use (so-called scarlet breeds), as may be the merino, it is mainly around the weaving know-how that the fabrications take all their sense. The wool trades are closely associated with tourism and the craftsmen regularly make discovery visits during the season. This link to tourism also materializes in museums devoted to the textile arts as in Aggius and Samugheo where the wool culture is staged (uses, natural dyes, looms, manufacturing techniques). In this case, we are faced with a composite offer of goods and services, largely mobilized in the construction of the tourist identity of the region. However, two conditions may weaken the emergence of a quality rent as the qualification of wool evolves. Alongside artisans who make use of local wool, part of the production is mainly made of cotton which can alter the link at the origin and its articulation with livestock, but also because of the use of industrial techniques fully mechanized weaving where know-how loses all their meaning. In addition, wool is today the object of a rediscovery of its technological aptitudes and its uses evolve. It is used both as insulating material, fertilizer material or for the production of rods allowing the retention of hydrocarbons at sea because of its absorption properties. Here we leave the sphere of the craft and by this way, even if it is important to underline the interest of these forms of recycling, the articulation with tourism is in this case altered in favor of other forms of valorization. These new uses are thus detached from an old culture related to the textile trades and the territorial anchoring is here much more tenuous in favor of more functional and technological uses.

These different case studies highlight the fact that, despite the coexistence of productions linked by interdependencies, the relations between by-products can result in tensions, forms of antagonism preventing their joint valorization: (i) We can thus identify technical routes defined by a "product-leader" that exclude the possible valuation of by-products (seasonality). (ii) There may also be antagonisms, conflicts over how to use common resources (grazing / collection). (iii) Finally, this decoupling can also be the result of two linked products, but of use, the design modes of one of them conveys asymmetrical representations vis-à-vis its by-product (tradition /innovation). These processes reflect a movement of specialization and differentiation of activities linked to the sectorization of activity, and reinforced by the advent of "leading products" that establish relationships of hierarchical dependence vis-à-vis their by-products;

## **3 – Coordination and territorial governance**

In the theory of the "basket of goods", the authors emphasize the issue of governance and coordination, and insist on the issue of overcome the sectoral approach in order to promote the joint valuation of related product, according to a territorial logic. We propose here an organizational analysis model to account for relational patterns found in our different cases.

### **3.1 – Integration: the path of meat qualification by dairy operators**

Since the beginning of the 2000s, actors of the Corsican dairy sector have internalized a skill in terms of valuing milking lamb meat. The regional association of ovine producers (AREO) and the breeders' group providing milk to the Roquefort dairies collaborate in the collection and commercialization of lamb of their members. They also participate in the administration

committee of the Inter-professional body (ILOCC) as representatives of the college of milk producers. The interprofessional body gathering actors from milk production and cheese making currently manages the Technical Committee for application of the PGI milk lamb of Corsica and is working on the development of the specification in relation to the French body in charge of GI instruction (INAO). In this case, the actors of the dairy sector are entering a new area of competence in terms of promotion and valorisation of the meat. This relational proximity, with the same groups of actors in the dairy sector, seems favourable for coordination based on collective action historically built throughout cheese production. Nevertheless, it can also contribute to bring up existing tensions within the profession, after negative learning on the previous PDO Brocciu (tensions between on-farm processors and dairy industries) (Linck et al., 2009).

### **3.2 – Differentiation: toward a functional division of the argan forest**

In the case of the Moroccan argan forest, there is however a pathway that leads to a social differentiation of the activities. This is a transition marked by the passage of a family regime of activities, toward the allocation of use to a specific sector (argan oil production). This path is also one of the consequences of the implementation of geographical indications where the main product becomes a figure of reference for collective action more than the activities. Thus, from horizontal (family) coordination, the emergent model is moving towards a differentiation of activities built according to occupational regimes (sector), where the interactions between activities, but also their modes of management are erased (Lacombe et Casabianca, 2015). In this case, within a regime of new ownership of resources, rivalries are born between different sectors and each group of actor sees in its relationship with the other groups, possible conditions of conflict of use.

### **3.3 – Singularity building: wool specification according to common regimes**

The case of wool is very different and there is no level of collective action between the dairy sheep profession and actors in the wool industry, as Sardinia case is showing us. Such situations show probably very different development trajectories between agri-food products and handicrafts. In Corsica, the collective wool has its own structured device around Lana Corsa, largely invested in national networks more than local ones. One of the challenges of institutional type is that crafts had so far no recognition on the GI regime which makes difficult to make possible analogy with cheese qualification. Today, however, French government has recently adopted a specific regime for manufactured goods on a similar basis than food geographical Indications. In these conditions the same universe of reference can encourage more meaningful interactions between by-products and professions associated with each of them. This sharing of devices can be identified as a condition for realization of a “basket of good” combining produced food and crafts, through the link to a same origin.

## **4 - Discussion and Perspectives**

We could see that the complementarities between related products were not granted by offering another perspective of the theory of “basket of goods” from the case studies proposed.

### **4.1 Two main issues**

There it appears important to emphasize two key points.

- i) **Specification and exclusion:** Firstly, territorial specification of a product can result in marginalization, and even in the exclusion of its by-products. So the social construction of a quality product, associated with the implementation of a geographical indication, by the technical requirements identified, may result in a fragmentation of the production systems as in the case of the argan forest. As such, the emergence of a leading product can be an opportunity to reshape the agricultural practices and thus altering the conditions of production of its by-

products. Such analysis thus reverses the classical outlook around relationships between place-based products and territory made from the prospective of the economy of the qualities.

**ii) Rivalries of uses and conflicts:**

Moreover, it seems quite important to articulate the theory of the basket of goods, anchored to the territorial economy, with a geographical and biotechnical reading. First of all, because the space can be a place where rivalries emerge and grow in a parallel form to the use of resources (argan) (Ostrom 1990). Furthermore, the relationships between related products are closely associated with technical dimensions (seasonality), assuming they contribute to strengthen the place given by the agriculture and livestock farming systems (Dedieu et al. 2008).

#### 4.2 Organizational and institutional dimensions

On aspects concerning the organizational and institutional dimensions related to construction of a “basket of goods”, it is important to note two types of configurations:

- i) Decoupling** ; decoupling represents a configuration in which two areas of activities are profoundly differentiated by the modes of organization and by the nature of professional networks that are associated (Grossetti and Bes, 2003). In this type of configuration every sector sets a proper trajectory, without maintaining connection with its by-product and its own sustainability does not integrate the taking into account of the by-products. A hierarchical relationship is established here, where the place of the secondary product is determined by the flag product that sets self-referenced standards (Luhmann, 1995).
- ii) Recoupling**; recoupling can be considered as a situation where, despite a strong differentiation of activities, actors of both activities design common areas of reference (Nahrath et al. 2008), of the type or inter-sector which is able to create new links between activities. We may underline that these "spaces" do not necessarily have a material existence and can for example refer to the seasonality, or to be materialized in institutions (technical committee of milk lamb). They can also refer to the investment in similar devices as GIs, defining a shared universe between related products.

### Conclusion

Relationships between related products within the same territory do not necessarily materialize complementary activities but can also reveal situations of conflict. These processes of decoupling of activities result from a sectorization of livestock linked to a strong social differentiation between activities at the heart of the industrial societies. These processes can be strengthened by the consecration of an economy of qualities where emblematic products registered in geographical indication regimes discard the visibility and the taking into account of by-products. From this perspective, multifunctionality can be considered as a configuration in which inter-sectoral modes of governance make possible to regulate interdependencies and the joint valorisation of related products. The by-product approach gives a new perspective to the basket of goods theory by refocusing on cases where the activities in question are in a relationship of technical interdependence and thus presuppose new arrangements between differentiated social groups.

At the end of this analysis, we can propose a different reading of territorial anchorage (Letablier, 2000; Frayssignes 2005) than the usually admitted. Anchoring means also appropriating, reappropriating resources already invested in current uses. Today the question of anchoring is often considered in a sectorial approach where a reference product conveying an attachment to a historical culture, materializes a link to the territory and promotes its singularity. But in these same processes of activation of resources, promoted notably by GIs, it is possible to see the emerging terms of a territorial anchorage if several interconnected activities are considered. It should be of great importance for a society which

is strongly differentiated into subsystems of activities, to highlight the role of the modes of governance, in order to reintroduce a relationship between related products, their associated groups of actors belonging to their different social worlds respectively.

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