

The territorial biorefinery in France

Innovation in governance forms

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Outline

Introduction: the Knowledge Based Bio-Economy

1) What is a territorial biorefinery ?

2) The territorial biorefinery in France

3) The territorial biorefinery as innovation in governance forms

Conclusion: challenges for the bioeconomy

Introduction: a new paradigm

- *The sustainable production of renewable biological resources and their conversion into food, feed, bio-based products and bioenergy (Bridge 2020, European Commission, 2012)*
- **The KBBE links:**
 - sustainability, renewable resources, economic competitiveness, research priorities and technological innovation
- **The KBBE is:**
 - the sustainable production and conversion of biomass into various food, health, fiber and industrial products and energy'
 - such conversion is also sustainable, being efficient, producing little or no waste, and often using biological processing

- **1. What is a territorial biorefinery ?**
- **Phase I biorefineries**
 - Use one only feedstock, have fixed processing capabilities (single process) and have a single major product
 - They are already in operation and are proven to be economically viable under certain conditions (policies)
- **Phase II biorefineries**
 - Can only process one feedstock
 - Producing various end products (energy, chemicals and materials)
 - Respond to market demand, prices, contract obligation and the plant's operating limits
- **Phase III biorefineries**
 - Correspond to the most developed/advanced type of biorefinery
 - Produce a wide variety of energy and chemical products
 - Use various types of renewable resources and processing technologies to produce the multiplicity of industrial products our society requires

- **Two different business models of biorefineries**
- **Port biorefineries**
 - Based on raw material
 - Driven mainly by logistics optimization and cost domination
 - Specialized
- **Territorial biorefineries**
 - Based on strong relationships with local and regional suppliers
 - With large range of inputs as well as outputs

The concept of territorial biorefinery: a few characteristics

- “multi input/multi output” model
 - Use novel technologies and diverse biomass feedstock— requiring significant investments in research, development, and deployment to reduce costs and achieve competitiveness with fossil fuels
 - Strategic location of biorefinery projects in different areas promotes local and regional economic development
 - Integrated into a relevant industrial clusters
 - Next to agricultural areas with existing residues collection infrastructure
 - Close to clients and biotech knowledge (e.g. industries active in the bio based area, research centers, universities)
 - **Horizontal and vertical integration is being promoted through coordination mechanisms**

2. Territorial biorefineries in France

2.1 The “established” territorial biorefinery

- Historically the site of production in Bazancourt-Pomacle (near Reims) gathered members of the “Industries and Agro Resources” cluster
- A real network of actors based on synergies has been developed:
 - *two farming cooperatives*
 - *two industrial units specialized in cosmetics*
 - *a research and development center*
 - *an industrial demonstration unit in white biotechnology*
 - *a cogeneration unit*
 - *a university laboratory specialized in white biotechnology*
 - ***But this is still a biorefinery “by chance”, and not “by conception”***

The territorial biorefinery



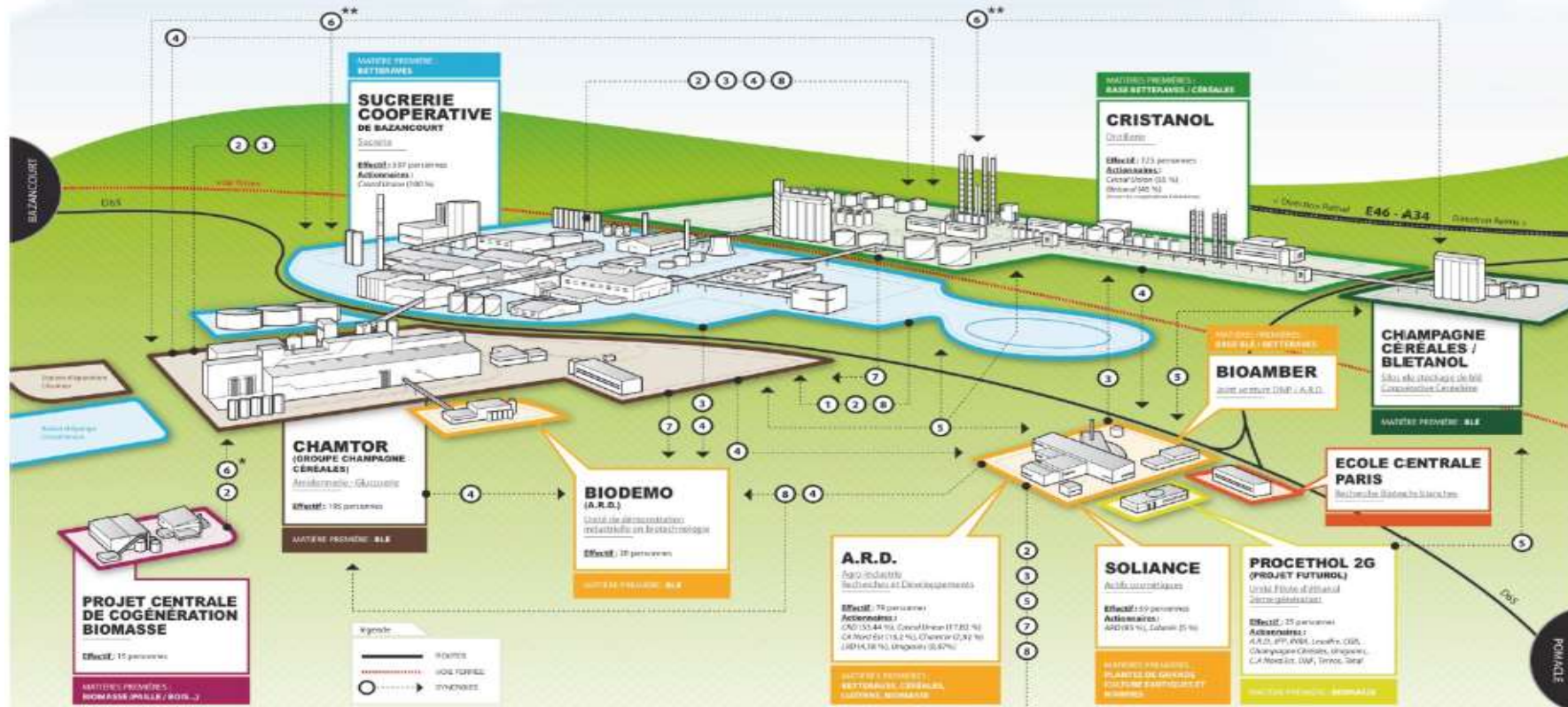
Zone d'activité "Les Sohettes"

Site de Bazancourt - Pomacle

POSITIONNEMENTS ET SYNERGIES

- 1 **synergie EAU** : Récupération de Condensat
20 000 m3 de condensat industriels utilisés par Chamtor pendant la campagne
Avantage : réduit sa consommation dans la phase printemps et réduction d'énergie
- 2 **synergie VAPEUR**
Un assureur vapeur biologique
Avantage : production des sèves industrielles
- 3 **synergie EFFLUENTS**
ÉPURATION - STOCKAGE - SPANDAGE
Avantage : Matières et supports agricole
- 4 **synergie PRODUITS**
Les produits du répertoire de l'un sont les matières premières de l'autre.

- 5 **synergie R&D**
Des propositions de recherche élaborent en coopération par les agriculteurs locaux et les A.R.D.
- 6 **synergie ENERGIE**
Production de biogaz et à partir de coproduits betteraves / sac.
* Synergie Energie : utilisation de la vapeur produite par cogénération
** Synergie Energie : production de biogaz
- 7 **synergie ORGANISATIONNELLE**
Dans le cadre du pôle de compétitivité I.A.R.E. en sont mises en place des synergies organisationnelles
Assistance à la construction et à l'exploitation des installations et programmes de formation.
- 8 **synergie FORAGE**
Production d'eau brute.



2.2 The conceived biorefinery: The PIVERT project

- **The design of a fully *integrated* biorefinery** for which factories (belonging to one or several companies) share:
 - *Starting point with one basic principle: valuation of the whole plant (with the choice of oil crops)*
 - *Innovation in biobased chemistry*
 - *Local/regional supply of raw materials*
 - *Industrial symbiosis (industrial ecology): the by-products become a raw material with a high value development on a neighbor site*
 - *This 'synergy' principle is extended in several directions: flow of new materials, energy, water, information, knowledge...*

The PIVERT consortium

- **Launched in 2012**
- **Selected by the French State in the program “Investments for Future” with total budget 136 millions euros, financed at the level of 37 millions euros**
- **Ten-year program, until 2024**
- **The organization is set up around**
 - **The PIVERT academic consortium: universities, research organizations, engineering schools**
 - **The PIVERT industrial club: agricultural cooperatives, chemical and seed industries**
 - **The shareholders: research organizations and private companies**
 - **With institutional support (region and State levels)**
 - **Various R&D projects launched annually (80 projects, 10 patents, 38 PhDs, 4 databases.....)**

The PIVERT Academic Consortium



The PIVERT Industrial Club



The Shareholders



With the support of the French Government and the Local Authorities



3- The territorial biorefinery as innovation governance forms

Innovation in governance forms: alignment as an overarching principle

“Calculative agents operating in a competitive environment will adopt the mode of organization that fits comparatively better with the attributes of the transactions at stake” (*Ménard, 2005, Handbook of New Institutional Economics*)

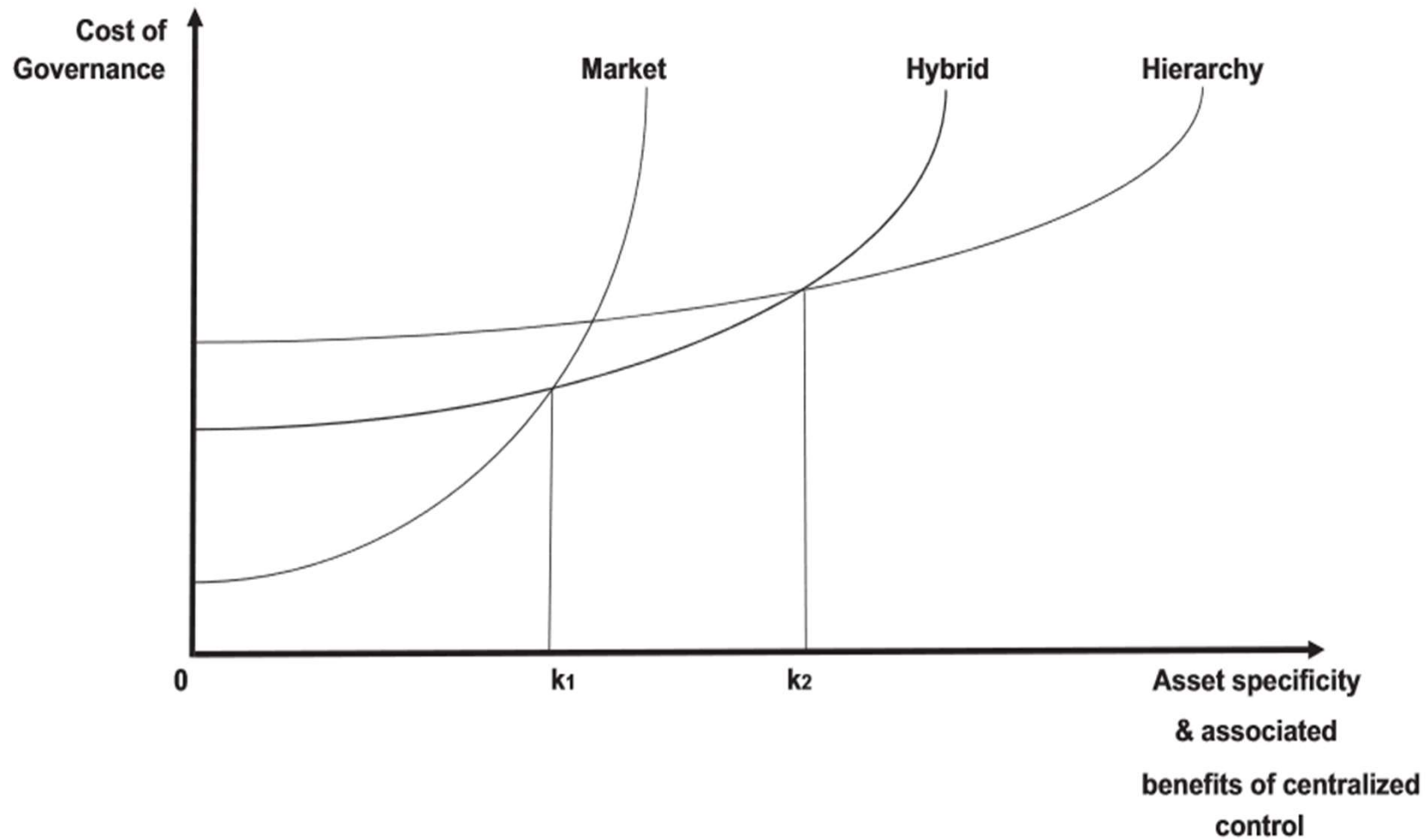
How is it possible to identify this alignment component ?

The PIVERT consortium provides an interesting example of innovation in governance forms:

- Transactions ⇒ Relationships**
- Time horizon: short term ⇒ long term**

⇒ *Identifying new forms of coordination; and relate these forms to the territorial biorefinery*

A TCE representation of the tradeoff among alternative organizations'



Value chain coordination

- **Definition: a governance form that brings together players part of a same value chain**



Spatial coordination: the proximity concept

- **Definition: a governance form that brings together players with high level of proximity**
- **The role of proximities in the building of the territorial biorefinery:**
 - **Geographical proximity: the territory is recognized as one of the building block of the business model**
 - **Farmers and their organizations are part of the PIVERT consortium**
 - **Cultural proximity**

Temporal coordination: the circularity-design concept

- **Definition: a governance form that brings together separated processes in time**
- **There are two levels in industrial ecology approach**
 - **The first level: existing products and flows**
 - **The second level: a strategic thinking leads to the creation of R&D activities in order to overcome technological uncertainties**
- **The role of technological research in the building of the territorial biorefinery which can be seen as an “innovation ecosystem”**
 - **Academic consortium**
 - **Research organizations in the shareholders**

Institutional coordination

- **Definition: a governance form which puts together public and private partners**
 - **The idea of radical uncertainty**
 - **of research programs**
 - **of diversity of partners with competitive positions**
 - **of public involvement at local/regional/state levels**
- ⇒ The partnerships in the governance bring funding on the long run (10 years) as well as an “official” guarantee**

What theoretical backgrounds in the governance forms for these different coordination issues ?

⇒ **Hybrid governance**

⇒ **Plural governance**

⇒ **Polycentric governance**

The need for hybrid plural governance forms (Claude Ménard)

-the stakeholder value chain: spot market and contracts

-the stakeholder innovation system (innovation cluster) : hybrid forms with a diversity of players (business, academic, institution)

-the circular chain: mid- and long-term coordination devices

A TCE representation of the tradeoff among alternative organizations'

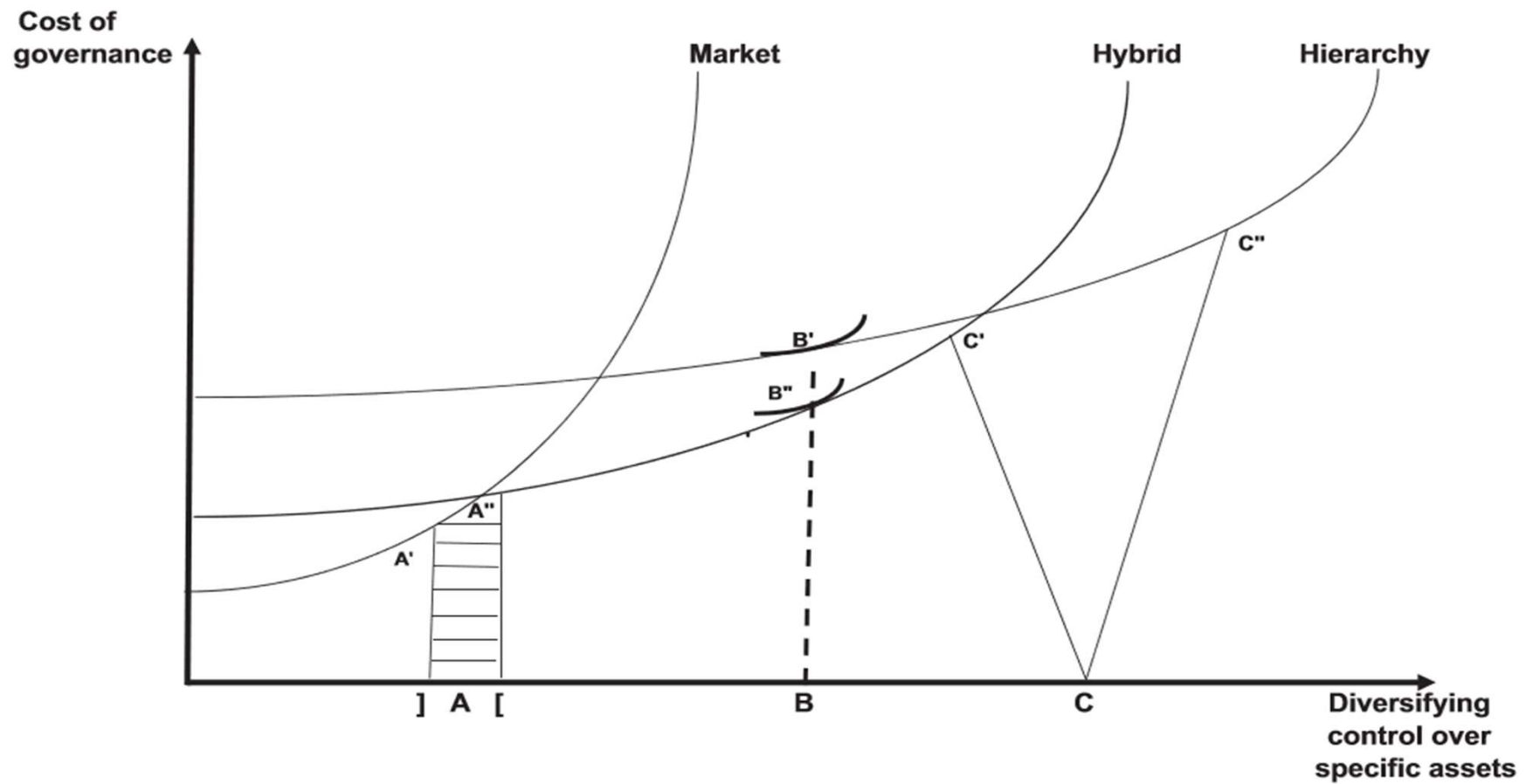


FIGURE 5 Potential plural forms

TABLE 1 Alternative organizational solutions

		Asset Specificity					
		Low	$K_1 \leq \text{Intermediate} \leq K_2$		High		
Market U.	Low	Markets	Hybrids P_{2a} : "Between" H & I		Integration		
	High					M & H	
Technological U.	Low	Markets	Hybrids P_{2b} : "Between" H & I		Integration		
	High					M & H	
Performance U.	Low	Markets	Hybrids P_{2c} : "Between" P_{2d} : "Within" P_{2e} : "Between"		Integration		
	High						
M & T	Low	Markets	Hybrids		Integration		
M & P	High					P_{2e} : "Combo"	
T & P							

Note. M denotes market arrangements, H denotes hybrid arrangements, and I denotes integrated (hierarchical) arrangements.

The need for polycentric governance forms (Elinor Ostrom)

-the stakeholder value chain: farmer implication

-the stakeholder innovation system (innovation cluster) : triple helix

-the circular chain: uncertainties in the interdependency between processes

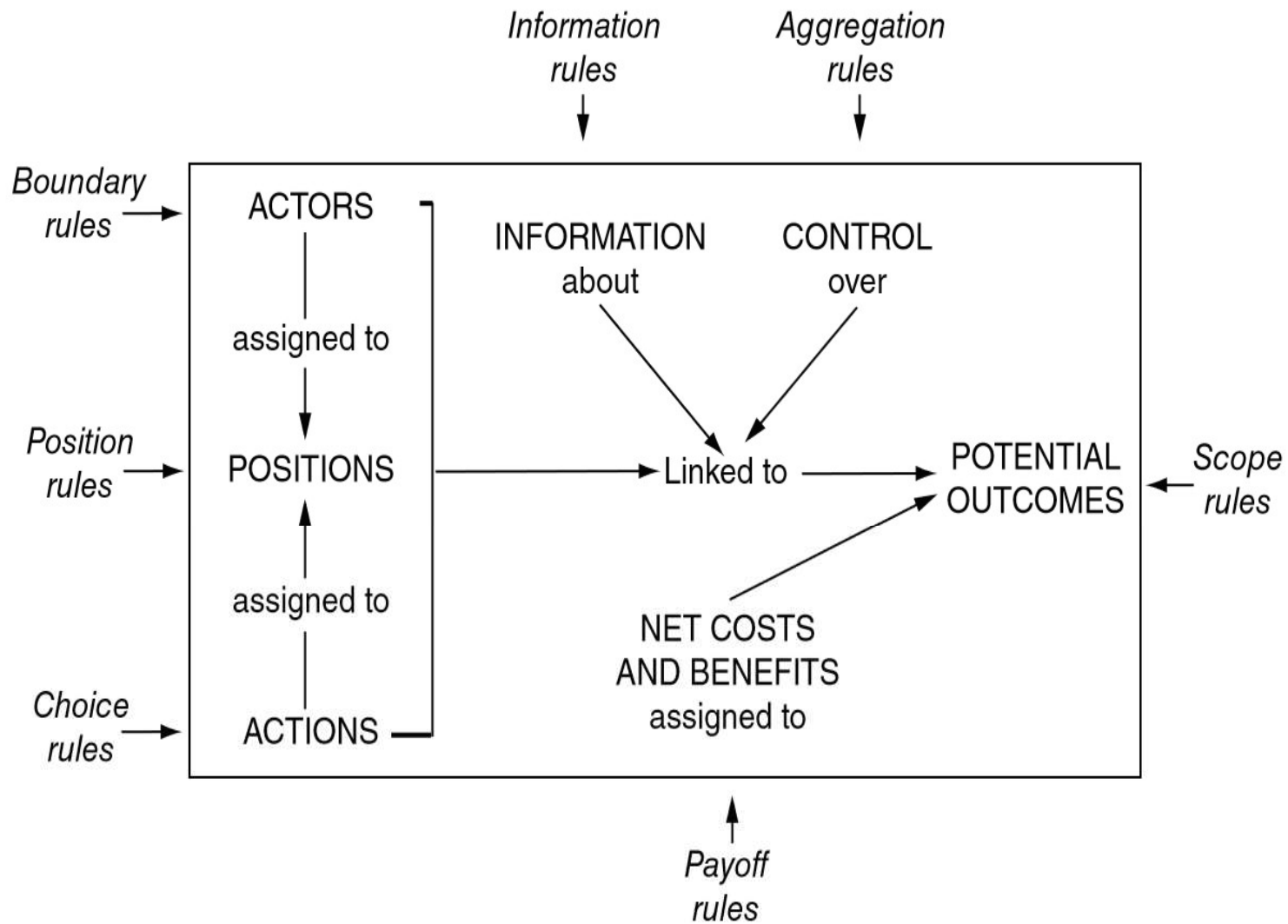


FIGURE 4. RULES AS EXOGENOUS VARIABLES DIRECTLY AFFECTING THE ELEMENTS OF AN ACTION SITUATION

Some remaining questions concerning the governance of site (territory) specificity: the farmer issue

⇒ Territorial anchorage: roles of farmers, of farmers' groups, of rural communities

-value creation and distribution within the chain

-industrial symbiosis: roles for farmers (application of the life cycle analysis at farm level)

-farmers' representation at cooperative top management level

Conclusion(1/2): challenges for the bioeconomy

The territorial biorefinery could be one building block of the bioeconomy, one of its business model:

⇒ blurring the distinction between sectors, players and time episodes

⇒ reconsidering the role of agriculture and of relationships between stakeholders in multiple contexts

Conclusion (2/2): challenges for the bioeconomy

Challenges ahead

⇒ *The farmer issue*

⇒ *Towards a “quadruple helix”: the citizen as part of the deal (a political scientist issue)*

⇒ *From governance design to systemic sustainable transition*

-applied comparative research on common pool problems

-organizational learning research

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Thank you for your attention

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