THE DIVERGENT TRANSITIONS TOWARDS SUSTAINABLE BIOFUEL NETWORKS/CHAINS

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ABSTRACT

In this exploratory paper we investigate how Capabilities, Transaction Costs and Vertical Scope co-evolve, by testing the Jacobides & Winter (2005) model on the Biofuels Industry in the area of the EU. The theoretical framework is based on the Industrial Architecture theory but also on Transaction Costs Economics, Resource Based View and on the concept of the Dynamic Capabilities. Qualitative data on the institutional environment of the Biofuels Industry in the EU-15 was collected. Via interviews, qualitative data (case studies) was collected through interviews on the elements of productive capabilities, the vertical division of labour, knowledge and technology and attributes of the transactions. These conclusions include the verification of mechanisms 1 & 2 of the Jacobides & Winter (2005) model, in particular that the resources and capabilities determine the degree of vertical specialisation, with transactions costs as moderating factor. The conclusions of this project bring the need for further investigation on measuring the concepts of Capabilities and Transaction Costs together but also, on how to prescribe and measure the process of Capabilities development and the capabilities redistribution.

KEYWORDS: biofuels, corporate strategy, supply chain.

1 INTRODUCTION

In principle, the emerging biofuels industry results from the convergence or linking up of the Agricultural Industry and the Petrochemical Industry, which before had hardly any linkages whatsoever. Already for that reason, the technological and economic dominance in biofuels research should be complemented with the perspective of management to solve the non-technical barriers to create an industry. Research in the biofuels chains shows that there is a "collaborative interaction" (Dautzenberg & Hanf 2007), between the upstream (agricultural industry) and the downstream (petrochemical industry) which means, first, that despite of the technical or production costs that probably occur, organizational costs and transaction costs are made, and, second, incumbents and new firms may fight for the market.

The present research is exploratory with the objective to verify if the Jacobides & Winter (2005) model is applicable to the growing EU-Biofuels Industry. These authors 'provide a theoretical framework that explains how capabilities co-evolve with transaction costs to set the menu of available choices that firms face in an industry' (Jacobides & Winter, 2005: p.396). A firm's choice must depend on the characteristics of the transactional conditions but also on its capabilities, attributes, its strategic objectives and its governance (Madhok 2002). As a corrolary the derived research question states; How do transaction costs and resource and capabilities-based factors influence the vertical scope of the Biofuels Industry in the area of Western Europe? By using the term biofuels (industry), in this paper we refer to the two, most wide spread biofuels which are biodiesel, and bioethanol, and the involved companies Geographically the paper is restricted to the Western European coutries, the socalled EU-15,

with the assumption that these countries are sufficiently similar to lend general conclusions. Application of these concepts in a systematic manner should increase our knowledge of the evolving European biofuels industry.

The paper is structured in line with its theory-testing orientation. Following this introduction, is the literature study detailing the relevant concepts from resources- and capabilities-based theory, the transaction costs theory, and industrial organization theory. This results in the theoretical framework and four hypotheses, as detailed in the next section. The empirical section starts with a part on the biofuels indutry in the EU. The second part of empirical section concentrates on testing four derived hypotheses. Finally, our conclusions on the verification of the J&W (2005), but also conclusions on the specific features of the EU-biofuels industry.

2 LITERATURE STUDY

As stated in the introduction, taking a business perspective, we use recent concepts and insights from the literature in strategic management (e.g. dynamic capabilities), transactions costs theory, and industrial organization (esp. industrial architectures) to test whether or not the concept of industrial architecture is applicable to the developing biofuels industry.

2.1 Resources and dynamic capabilities theory

Resources and capabilities-based factors influence the degree of integration or specialisation of a industry. 'A firm's resources at a given time could be defined as those (tangible and intangible) assets which are tied semi-permanently to the firm' (Wernerfelt, 1984: p.172). Some examples of resources are assets, organizational processes, firm attributes, human resources, information, knowledge, etc. The bundles of productive resources controlled by firms can vary significantly by firm – that firms, in this sense can be fundamentally heterogeneous even if they are in the same industry. The heterogeneity of the firms' resources is expected to explain differences in efficiency and profitability of firms that brings some firms competitive advantage over other firms in the same industry. The basic assumptions of this theory of the firm are resource heterogeneity and the resource immobility (Barney, 1991; Peteraf, 1993; Barney et al, 2001; Priem & Butler, 2001; Barney 2007). Ingerestingly, the most outstanding of imperfect mobile resources is when the property rights cannot be defined. Barney (1991) next defined sustainable competitive advantage (SCA) as a competitive advantage the benefits of which cannot be duplicated by current and potential competitors.

The Dynamic Capabilities-concept (DC) was created and explored separately as the Resource Based View (RBV) could not explain why specific firms endure Competitive Advantages while rapid and unpredictable change existed (Eisenhardt and Martin, 2000). There are diverse kinds of Dynamic Capabilities, of which Product development, Strategic Decision making and Strategic alliances are the most important (Eisenhardt and Martin, 2000). While the RBV of the firm may explain how we can achieve SCA in the short term, the DC explains how we can achieve competitive advantage over the long term. There can be either moderately dynamic markets where DC are detailed, complicated, and extensive on existing knowledge versus high-velocity markets. Eisenhardt and Martin (2000) define high-

velocity markets as the markets in which market boundaries are blurred, successful business models are unclear, and market players are ambiguous and shifting. The overall industry structure is unclear. DC in high velocity markets are simple, rely less on existing knowledge and more on rapidly creating situation-specific new knowledge. Given this definition, the biofuels industry that we are focused on is a high-velocity market.

By identifying how resources and knowledge are distributed inside the industry, the DC concept influences the level of vertical specialization in an industry. Furthermore, capabilities influence the Transactions costs level inside the industry, by influencing the attributes of the transactions. In this project, we focus on productive capabilities. With special attention to knowledge as scarce resource in order to see how much the scarcity of knowledge influences the capabilities' distribution inside the Biofuels Industry.

2.2 Transactions costs theory

Transaction Costs may be defined as 'the costs associated with negotiating, reaching, and enforcing agreements' (Church & Ware, 1999) The TC relate the expenses of trading with others above and beyond price, comprising primarily. a) costs of gathering information, b) negotiating costs, c) monitoring costs, and d) enforcing contracts costs. The ex ante choice of governance should attenuate ex post hazards of opportunism. There are three characteristics of transactions that a play significant role on the choice of the governance structure, namely: Asset specificity, uncertainty and frequency of the transaction (Williamson, 1998; 1999; 2002; 2008). Assets specificity typically refers to those assets that cannot be allocated to alternative value creating activities other than activities related to a particular partner, physical locations, or specific fields of knowledge. Uncertainty refers to events that are judged at high costs, that cannot be judged or that are too difficult to be judged. The 'more uncertainty that there is in the relationship.. the more room there is for opportunism' (Afuah, 2001: p.1212). Finally, the aspect of frequency, is about how often the transactions take place. If frequency is low, the TC will be extremely high whereas if the frequency is high, the TC will be low.

Instead of being considered as a production function, as in neo-classical economics, TCE considers the firm as a governance structure. By that means, the efficiency boundaries of the firm are settled through aligning different transactions with governance structures. When TC are high then the industry will be highly integrated and firms will prefer to make themselves, rather than to buy. In a similar vein, the cooperative perspective of adaptation suggests that adaptation will be achieved through changes that occur inside the organization through the rearrangement of internal processes. However, when TC are low, the industry will be highly specialized or disintegrated and the firms (inside the industry) will prefer to buy rather than make. The related autonomous adaptation perspective suggests that adaptation problems arise because of market changes, as signalled by changes in relative prices. Firms observe these changes and respond on them.

This paper investigates two attributes of the transaction. Uncertainty, and Asset specificity. We investigate uncertainty from the perspective of environmental uncertainty and behavioral uncertainty. The institutional environment of the biofuels industry has a significant influence on the decisions made by the firms on each of the levels of the biofuels industry. Further,

Perry & Rosillio-Calle (2008), on the UK farmers, uncertain on cultivating energy farms, explains why behavioral uncertainty should be investigated. Next, we will investigate the following three asset specificities; Human asset specificity; physical asset specificity; and, site asset specificity. Altman & Johnson (2008) argue that physical and human asset specificity are very important for the biofuels industry. Site asset specificity is investigated through the importance of the role of transportation costs.

2.3 Industrial Organization

This paper uses the concept of Industrial Architecture, which stands for a description of the economic agents within an business network (in terms of economic behavior and the supportive capabilities) and the relationships among those agents in terms of a minimal set of rules governing their arrangement, interconnections, and interdependence (the rules governing exchange among economic agents) (Jacobides et al, 2006). We focus on investigating how much integrated or specialized this new industry is. Thus, we define Vertical Scope (VS) as the degree of vertical integration that is related with the organizational and productive structures of a firm/industry which are directly influenced by the capabilities and transaction costs that occur in this firm/industry. According to the Industry Life Cycle theory, when an industry is in its early stages of its life, VS is considered high (Vertical Integration occurs). In the mature stage of the industry's life cycle VS is low (Vertical Disintegration occurs). Finally when the industry is in the decline stage of its life, VS is high again (Vertical Integration occurs).

However, there might be a point in time where the companies in the industry will be selectively integrated on specific levels of the industry's value chain. One reason may be that the Life Cycle-theory assumes that industries start from scratch early on, with few firms present, requiring the firms in the industry to produce almost everything themselves. However, firms may micgrate or copy practices from elsewhere, quickly creating specialized firms and activities. Bask & Juca (2001) refer to supply chains, where. 'selectivity has been promoted instead of all-embracing integration, asking what type and level of integration applies to each link of the supply chain' (Bask & Juca, 2001: p. 137). They define as semi-integrated supply chains those supply-chains which are partially or selectively integrated (Bask & Juca, 2001: p. 139).

The J&W (2005) model, through the capabilities part, describes the characteristics of the economic agents in an industry, and through the transaction costs part, prescribes the relationship between those economic agents. We now present four general characteristics of the industrial architecture theory. First, Jacobides & Winter (2005) described the 'façade of the market', the market clearing principle, as the usage of another firm's capabilities (which other firms want to transact) inside the industry. A second characteristic is that an industry might have many different vertical segments each with a regime of its own. For instance, one company might source internally (integrated firm) and another might source externally (specialized firm) in order to realize the same activity. These are two different shapes inside the same industry and together the aggregate scope determine the predominant industry's regime. A third important characteristic holds that the architecture of the industry is determined by firms that hold superior (in terms of technical efficiency) capabilities inside the industry. Finally, a fourth characteristic considered by Jacobides et al (2006) comprises

of the two templates for Industry Architectures. First, a template defining value creation and the division of labor. Second, a template defining value appropriation and the division of surplus or revenue. Now that we have detailed the different theories and prime concepts we can detail he integrating framework and hypotheses.

3 THEORETICAL FRAMEWORK

We consider the biofuels industry (hereafter BI) as a new industry. A dominant element of our perspective is that we consider BI as a converged industry that rises from the linking up of the Agricultural Industry (AI, upstream) and the Petrochemical Industry (PI, downstream). We assume that firms in the BI are (pre-)selected from their previous industries, due to superior capabilities (and more specific their knowledge on production and distribution). Next, we find there are two independent variables (Capabilities heterogeneity and Transaction Costs) and one dependent variable (Vertical Scope) (see figure 1).

Figure 1: Theoretical model (Jacobides & Winter, 2005)

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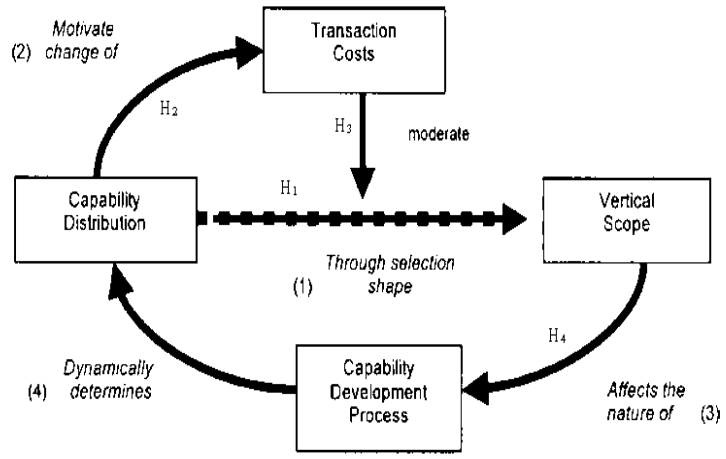

On the basis of figure 1, 4 Hypotheses were tested:

-H1: Capabilities heterogeneity is negatively related with Vertical Scope (VS).

-H2:Capabilities heterogeneity is negatively related /impacting with Transaction Costs.

-H3: Transaction Costs positively influence Vertical Scope, as moderator.

-H4: Capabilities Development Process is 'enabled' if changes on VS occur and CDP is 'disabled' if changes on VS do not occur.

The 1st part of the model (hypotheses 1 – 3) describes the current industry, while the 2nd part (hypothesis 4) makes a forecast of the changes on the distribution of the Capabilities of the industry. Deriving from the literature, one may expect that, at the early stages of the Industry's Life Cycle, scarce resources form the most influential factor on shaping the Vertical Scope of the biofuels industry. TC are influenced by resources at the early stages of the industry's life cycle and they are influenced by DC at more mature stages of the industry's life cycle. DC play a dominant role on shaping scope at more mature stages of the industry's life cycle because knowledge is explicit at these stages. Knowledge is the element that can enable the Capabilit Development Process.

3.1 Methodology

The research strategy of this project is a combination of two strategies, desk research and case studies. Survey was not considered an appropriate strategy for this project because the information needed is more specific than possible in a survey. The research experienced at least the following three problems: 1) lack of specific data (operationalization problem, especially for the TC and DC concepts), 2) inability to identify the value chain (because the industry is still in its nascent stages), and, 3) methodological issues, such as time limitations, geographical delineation, and confidentiality issues. Many respondents were negative as the feared knowledge spillover effects to competitors. We finally used 53 scientific articles to detail the theoretical research, over 20 scientific articles to detail the European biofuels industry at large, and 19 interviews were executed for the field research. We used scientific papers but also companies' presentation schemes in order to identify both the value chain of the BI, and the influence of the institutional environment on this value chain. As the industry is young and in progress, and not in a stable setting, it will be necessary to respond and follow upon unexpected information from diverse directions. The required specific data, which relate to the Capabilities and the Transaction Costs of the industry was collected through interviews. Data on companies' capabilities, knowledge, asset specificity, and uncertainty of transactions was included there.

Our field research lasted for almost two months, in particular it ran during January and February 2009. We identified 127 companies that are involved in the biofuels industry in the EU-15. We received 32 replies, 25.2% of the gross number. From the 13 companies which have asked further information, not one further participated in the research, leaving 19 participating companies (15 percent response rate), with one from a research institute. Our interviewees are sector (biofuels) managers, general directors, R&D managers, marketing managers, COO, sales directors, CFO, European level coordinators, business development technology managers, biofuels department managers, and financial managers. The sample covers nine countries of the EU-15: Germany, Italy, Spain, Portugal, Belgium, Greece, Sweden, Finland, and the Netherlands. The absence of participation from France and UK impoverishes the representativeness and validity of the sample, because of the high involvement of companies from these countries in the BI.

Due to the fact that most (except two) companies were operating in more than one level of the BI these 19 companies led into having 2 companies active at the producers level, 9 companies active at the pre-processors level, 15 companies at the processors level, 10 companies as blenders level, and 8 companies with distribution activities. Our sample is based mostly on the large scale companies of the industry. We think that large scale companies are more influential on the biofuels industry since this industry is considered to be a commodity industry, where large numbers are important. Considering the number of companies on each of the levels of the value chain of the BI, and also the represented countries on diverse levels, we argue that the sample is convenient enough in order to avoid personal bias of the interviewee, and also, in order to obtain data of sufficient quality for the project.

4 THE EUROPEAN BIOFUELS INDUSTRY

The European Union was late in promoting biofuels for transport, as indicated by the publication of the related biofuels-Directive as its primary policy tool which was published just a few years ago, in 2003 (Directive/2003/30/EC) The forces pushing the turnaround of policies were the Kyoto-treaty (Kyoto, 1998), and (expected) energy price rises. The steady price increase of oil allows to diversify the energy-mix and promote renewable resources, with lower emissions. According to the Kyoto treaty in 2012 the emission of CO2 must be 8% below the level in 1990. The directive sets reference values for an increasing share of biofuels in total fuel supply rising from 2% in 2005 up till 5.75% on energy basis in 2010. The enormous agricultural productivity and production of the EU may help substantially to reach these targets (OECD, FAO 2007). However, expectations to reach the 2010-policy targets are low. Developments in the institutional environment, e.g. regarding blending rates, tax exemptions, and sustainability criteria, strongly impact prices, substitution, sourcing, infrastructures, and industry growth rates. (see figure 2)

Figure 2: national regulations within the EU

Austria 1. No mineral oil tax for biodiesel and bioethanol. 2. Small scale production of biodiesel is tax free 3. Tax concessions are granted for fuels with a biofuels share of 4.4% 4. 5.75% of the total energy fuel companies create must replaced from biofuels. 5. Promotion of 2nd generation biofuels.
Belgium 1. Support the agro-industry. 2. Quota system. 3. Tax reduction for blended fuels. 4. Full tax exemption for pure plant oils 5. Promotion of 2nd generation biofuels.
Finland 1. Obligation law for blended fuels with a 3% in 2010 of the total energy produced by fuel companies. 2. Tax reduction on bioethanol and petrol blends. 3. Tax benefits for methane-fuel vehicles. 4. Investment subsidies. 5. Promotion of 2nd generation biofuels.
Germany 1. Use of biodiesel and plant oil is full tax exempted. 2. Introduction of biofuel quotas. 3. Regulation of sanctions in case of non-compliance. 4. Producers are obliged to meet quantity targets (fictitious quota). 5. Promotion of 2nd generation biofuels.
Netherlands 1. Tax exemption for pure biofuels. 2. Obligation of blended diesel and petrol. 3. Obliged companies are the companies that bring fuels in the free-market of

the Netherlands. 4. Tax relief for investments. 5. Subsidies for the production of 2nd generation biofuels.
Spain 1. De-taxation for biofuel pilot plants. 2. Tax benefit for investments on biofuels production. 3. Subsidy to biofuel R&D projects. 4. Support for farmers. 5. Funding R&D projects for 2nd generation biofuels.
UK 1. Biofuels obligation on fuels suppliers (with a buy out fee of £0.15/liter. 2. Planning to introduce a system of enhanced capital allowances which will enable investors to write off their capital invested in the first year. 3. Encourage and reward 2nd generation biofuels investments.

Based upon Biofuels implementation agendas (2007)

Despite the intransparant EU-biofuels market, the building of additional factories is underway and plans are developed for new large investments. International companies are interested in realizing ethanol facilities in the same way oil companies have big facilities for refinery of crude oil and the production of chemical products. The production of bioethanol in the EU is expected to reach 5.9 million m3 in 2009 (F.O.Licht, 2008). This implies an average growth of approximately 20 percent a year. Research has shown that about 75 percent of all bulk chemicals produced in Rotterdam can be produced using plant materials instead of oil derivates (Sanders et al. 2007). Also oil companies like Shell commit themselves to investments in biomass processing. This situation can form the starting point for the use of biomass as raw materials substituting for production of traditional chemicals using oil.

When we look at the biofuels markets we observe a growing but immature markets, with the high concentration rates. More in particular the EU bioethanol industry is growing but is regarded as an immature industry, unable to compete with Brazil or the United States. Countries as Brazil and the USA know lower production cost of bioethanol due to decades of experience gained already in these countries and the low price of feedstock. The early movers in the EU are Spain and the UK, but both were surpassed by France and Germany. France is the market leader of Europe which produces 1.5 million m3 bioethanol per year. The protected position this industry has been given in France clearly pays off. The EU-industry is highly concentrated; For the four largest firms the concentration ratio is 70 percent. For the eight largest firms, the concentration is even 90 percent, leaving little room for other competitors. The eight largest firms utilize large scale plants considering the amount of plants utilized is still only 55 percent. The largest EU firm, Südzucker, is represented by several firms in which it has majority stakes (Cropenergies AG, Agrana, Hungrana). Through these companies it is active in Germany, Austria, Belgium, France and Hungary. The second and third largest firms are both active in the Brazilian market. Number two, Abengoa Bioenergy, is on a global scale the largest EU firm. When its activities in the

USA and Brazil are included its total capacity amounts to 1,65 mln m3, and is expected to grow by another 30% by 2011 (Borgman, 2009)

5 EMPIRICAL RESEARCH

Many scholars describe individual parts of the BI's Value Chain, together adding up to 3 main levels, or 5 steps. Dautzenberg & Hanf (2007) separate between raw material producers and processors. Hamelinck et al (2005) indicate two more levels upstream in the BIVC between the producers and the processors, in particular warehousing and transportation. Venendaal et al (1997) introduce a pre-processing level. Kondili & Kaldellis (2007) present a very broad schema of the Biofuels Supply Chain, which in general terms it consists of four steps: Resources, Biofuels Production, Biofuels Distribution and Biofuels Consumption. To conclude, we identify the following five different levels of activities, excluding final consumers; Production, Pre-processing, Processing, Blending and Distribution These five levels add value to the final product of the consumer. Also, in-between th transformational levels, we identified that transportation as an activity has a significant role from the cost perspective. Of the 5 levels producers, processors and distributers are the domain levels, with pre-processing and blenders as supplementary levels.

When it comes to technologies we found that due to high asset specificity that is necessary for 1st generation biofuels (Altman & Johnson, 2008) there seems to be a competition between 1st and 2nd generation biofuels. Furthermore, upstream firms with a history in upstream acticities, seem to focus on 1st generation biofuels, while originally downstream firms focus their research on 2nd generation biofuels. Evidently, this comes with consequences.

The biofuels Industry's value chain

The results of the quantitative analysis learns us that producers are held responsible for the 42% of the final economic value added, pre-processors for the 14%, processors for the 28%, blenders for the 8% and finally distributors also for another 7%. The added value of others was negligible. This result was rather robust. However, the processors interviewed have no shared view of the producers segment in terms of their economic value added. On the one hand, when the interviewee was a processor of 1st generation biofuels, the economic vale added of the producers is considered very high (70-80%), but, on the other hand, when a processor of 2nd generation biofuels is asked the same question, he evaluates the added value of the production level in the final value as quite low (10-20%)

Interviewed firms stated that the institutional environment is (highly) influential on the segment that they operate in, resulting in an average score of 6.58, on a 7-point Lickert-scale. For example, interviewees from the petroleum industry state that oil companies do not want to blend the fuels (because of higher costs), but they are forced to.

superior capabilities

Some interviewees argue that the Biofuels Industry in the EU-15 is in a 'transformation stage', for which the data analysis lends substantial support. Although only 2 companies from the sample were almost fully integrated, strong arguments were provided in favor of the 'integrated industry' –stance: 1) the economic value added of one level of the industry is not

enough for survival if the company wants to stay competitive. 2) large firms that enter the market do so in an integrated mode. 3) Knowledege of all levels influence price changes. 4) And, finally, for 2nd generation firms, the upstream materials are still too important to just buy them. The arguments in favor of the specialised industry-stance run as follows: 1) early cirtical players are specialised. 2) the optimal scales of the 3 domain levels are very different. 3) blending levels are too low to demand high involvement of oil companies to integrate. 4) focus reduces risks 5) unclear regulation hinders backward integration. 6) And, firms at different levels do act very differently. Almost all the companies operating in the industry are integrated to the secondary levels of the value chain (pre-processors, blenders) but only a few cases are found being integrated between the domain levels of the industry (producers, processors, distributors). . In sum, the vertical integration-stance is somewhat stronger, leaving us to conclude that derive the conclusion that the biofuels industry in the EU is a semi-integrated industry, where upstream integration occurs at a higher scale than downstream integration.

Also the distribution of capabilities and innovation investments favors the semi-integrated structure of the industry, with firms in two subgroups.

Transactions costs

….From the analysis of the answers of the interviewees the political conditions seem to influence more the environment of the industry, than the economic crisis. Many consider their political climate as quite or very certain, but others posit it as very uncertain. Also the opinions on behavioral uncertainty differ; some have it that lawyers deal with it, or that (quality) regulation is dominant Others emphasize negotiation powers and potential of knowledge spillover. Transportation costs are considered important on the levels of producers, pre-processors, processors and blenders. First, because the raw material contains relatively little energy compared to mineral oil. Second, biofuels is a commodity business, thus, transportation is a relatively important cost-factor.

6. CONCLUSIONS

The research brings the verification of mechanisms 1 & 2 of the Jacobides & Winter (2005) model, the semi-integrated Scope of the Biofuels Industry in the EU-15, the differentiation of the way industries emerge according to the background of the companies and the influence of the Institutions on the growth of the Biofuels Industry in the EU.

On the basis of the interviews, we derived two general conclusions. First, the biofuels industry in the EU-15 is a semi-integrated industry. Second, the biofuels industry in the EU-15 started as a specialized industry, and, paradoxically, changes into an integrated industry!

Information on the vertical division of labour, and the degree of Vertical integration, we concluded that the biofuels industry in the EU-15 is semi-integrated. But the interviewees became split in two equal groups. Half of them support an integrated shape, while the other half support a specialized shape of the Biofuels Industry. Even the companies of the interviewees which stated that the biofuels industry is a specialized industry, they are selectively integrated

Productive capabilities are achieved on different strenghts by companies (some companies are better in Economies of Scale, than other in the Biofuels Industry). This leads to the

conclusion that productive capabilities in the Biofuels Industry are partially heterogeneous. The heterogeneity of the companies (from the production costs perspective) will lead to their expanding on other levels of the chain because companies of one level will try to differentiate in terms of profitability through gaining economical value added from operating on other levels of the BIVC. However, these companies will not integrate in all the five levels of the BIVC (due to lack of knowledge). Since the capabilities heterogeneity and the shape of the Scope of the Biofuels Industry in the EU-15 line up, we are justified to derive that mechanism 1 of the J&W (2005) model is verified for the Biofuels Industry in the EU.

…. Jacobides & Winter (2005) argue that the capabilities distribution (or capabilities heterogeneity) will influence the TC in the industry because this distribution will lead in 'latent gains' which 'motivate reduction of TC' (Jacobides & Winter, 2005). We identified that capabilities such as annual production capacity and technology in use are important. Also, we identified that capabilities such as risk management, logistics, market inside are important, just as physical asset specificity and site asset specificity (which are attributes of transactions). When a capability is identified in the industry (e.g. logistics decrease TC) then firms which own this capability will be preferable than others. This selection creates the capabilities distribution in the industry and this will influences TC. The conclusion is that mechanism 2 of the J&W (2005) model is verified for the Biofuels Industry.

Jacobides & Winter (2005) argue that TC are involved as a moderator in the selection process. We identified that indeed TC have a moderating character in the Biofuels Industry because although firms are selected by the market due to their capabilities (and the industry's capabilities distribution), considerations such as physical, human, and site asset specificity but also environmental uncertainty influence the capabilities distribution, and consequently the selection process.

We argue that the capabilities inside the biofuels industry will develop according to the capabilities of companies, which are selectively integrated at present, and the "direction of capabilities development" will lead into a higher degree of Vertical Integration (since specialized firms will try to be semi-integrated also). Since this development of capabilities will take place, then mechanism 3 (= hypothesis 4) of the J&W (2005) model will be verified (see figure 3).

Figure 3. hypotheses confirmation.

H1: "Capabilities heterogeneity is negatively related with Ver ical Scope." (mechanism 1)	Confirmed
H2: "Capabilities heterogeneity is negatively related with Transaction Costs." (mechanism 2)	Confirmed
H3: "Transaction Costs positively influence Vertical Scope as moderator"	Confirmed
H4: "Capabilities Development Process is 'enabled' if changes on VS occur and CDP is 'disabled' if changes on VS do not occur" (mechanism 3)	Not Verified

7. CONCLUSIONS

The research showed that the Biofuels Industry is a semi-integrated industry. Further, companies who invested in the Biofuels Industry consider their background (i.e. converging chains differ). The upstream of the BI is focused on 1st generation biofuels, while downstream invests on 2nd generation biofuels. This evidently influences current and future competitive advantages. It is doubtful whether the dynamic capabilities of the upstream firms will suffice to remain competitive in the long run.

Institutional Environment is very important for the Biofuels Industry, and it significantly explains the move from a specialized into integrated shape of the industry. This is an element where the original J&W (2005)-model may have to be extended. Further investigation on an industry level on issues such as reduction of TC and capabilities enforcement would lead in more efficient and accurate intervention of the Institutional Environment in order to help the growth of the industry.

….We do have to state again that the reliability of the research can be improved strongly. Funding for a more detailed research is sought for!

ACKNOWLEDGEMENTS

The authors would like to thank J.Bijman, dr Eli de Vries, and students of the Wageningen University for their constructive comments, which helped to realise the research from which this paper is derived. An earlier version was presented as poster at the 17th European Biomass Conference and Exhibition (EBCE) ,29 June – 3 July 2009, CCH, Hamburg

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