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Market power and
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a novel approach

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Market Power and Sustainability: A Novel Approach

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Summary

Increasing market concentration has caused the rise of market power issues. Particularly in the agri-food sector, increased concentration and thus market power can be observed. Due to the hourglass shape of the value chain within the agri-food system, markets tend to be concentrated on retail as well as on farm-input (seeds, fertilizers, etc.) level. At these levels market power concerns arise, whereat negative effects might play out most on farm level, as it is the level flanked by market concentration.

Without a doubt, sustainability is a main challenge of the 21st century. Sustainability entails the notion to maintain the ability to meet people's needs in the present and in the future. This ability is put at risk as human resource extraction, use and waste production overshoot planetary boundaries. Many initiatives try to support sustainability and a sustainability transition. Among those incentives are endeavors that try to find the cause and the solution to sustainability problems in the market sphere. Market failures, most prominently externalities and missing markets, have been identified to be a cause and potential cure for sustainability problems. Given the rising relevance of market power issues, the question arises whether market power can be identified as cause and cure for the lack of sustainability too. This thesis aims at answering this question. This study investigates in-depth the characteristics of the potential relationship between market power and sustainability. To investigate the characteristics of this relationship, the following questions have been posed: Do both phenomena influence each other mutually (Chapter 1 and 2)? Is the relationship positive or negative for sustainability (Chapter 2, 3 and 7)? What does the characteristic of the relationship imply (Chapter 4 and 7)? Seven chapters are dedicated to answering these questions.

That a relationship between market power and sustainability does indeed exist is briefly outlined in Chapter 1. A more thorough analysis of whether market power and sustainability are related is presented in Chapter 2 with a literature review to gain insights of whether the connection between market power and sustainability has already been studied. Supplementary to the literature review a network analysis is conducted providing an overview over the existing literature and outlining common themes within this body of literature. Results from Chapter 1 and 2 show that market power and sustainability are connected. However, understanding the connection to its full extent requires market power to be understood in all its complexity. Accordingly, both phenomena, market power and sustainability, need to be analyzed separately to provide a better understanding.

Chapter 3 dissects the market power phenomenon, which then allows to unravel the aspects as well as the dynamics of power. The dissection of market power follows the work of Foucault, whereas other literature on power is integrated into the cornerstones developed by Foucault. Moreover, the classification of power developed by Foucault is amended to include the notion of a paradigm. This idea is lent from systems thinking and allows to add a superstructure to the structural considerations of power. Further, by using a systems thinking approach the dynamics of the power struggle can be depicted allowing to understand phenomena such as Green Washing. While Chapter 3 focuses on market power, Chapter 4 takes a closer look at sustainability. Specifically, the notion of decoupling within the context of the Green Revolution is studied. This chapter provides a crucial contribution to identify sustainability narratives that are assimilated by the current predominant paradigm; economic growth. Hence, it explains why weak sustainability will never create sustainability as it is in itself based on a system which is unsustainable. Thus, it explains why the notion of weak sustainability is an oxymoron. Chapters 3 and 4 deliver answers to the sub-questions regarding the understanding of the characteristics of the relationship between market power and sustainability. While Chapter 2 illustrates that the relationship is positive, Chapter 3 and 4 highlight that whether a positive or a negative relationship is identified depends on the normative stance one takes.

Chapter 5 and 6 provide case studies that exemplify how the gained insights about market power and sustainability can be used for the analysis of market power issues in the agri-food sector. Systems thinking is employed in Chapter 5 to analyze market power within the Belgian sugar beet sector. A causal loop diagram is developed to unravel the dynamics that cause market power issues within this specific case. Chapter 6 comprises of a comparative case study. The Belgian sugar beet value chain is confronted with the German rapeseed value chain. The aim of this chapter is to study potential strategies of farmers to increase or maintain farm income. In both case studies power imbalances are an issue.

Finally, Chapter 7 concludes the thesis by providing an overview on how the research questions are answered and expands on the value of developed schemes and approaches. Chapter 7 recapitulates that Chapter 1 and 2 illustrate that a relationship between market power and sustainability does exist. Chapter 2 does further expand on how the two phenomena are connected, by identifying aspects of market power related to sustainability issues. Moreover, Chapter 2 does also show that the relationship between market power and sustainability is mutual, by discussing examples of the reviewed literature. The elaborations on power in Chapter 3 are needed to answer whether the relationship between market power and sustainability is positive or negative. Power as such is neither positive nor negative, but it depends on what it is used for. The same applies to the relationship between market power and sustainability. Market power can be used to support sustainability, but it does not have to. Another valuable result from

Chapter 3, which relates to the implications of the characteristics of the relationship between the two phenomena, is that whether market power has a positive or negative effect depends on the overarching goal of our socio-economic system. This also applies to the effect of sustainability on market power. Chapter 4 illustrates how the understanding of sustainability itself is adapted to fit within the goals of our socio-economic system, striving for growth. It could be understood that sustainability is positive for market power, as it provides a potent business model that provides above average profits. Nevertheless, the question remains whether this is positive or not. Is market power something to be aspired or not? While this may seem to be a strange question, one may also keep in mind that market power can support a sustainability transition. However, these are normative questions that call for further discussion. It needs to be decided whether market power is an acceptable tool to support sustainability. It needs to be discussed what kind of sustainability should be supported. Chapter 4 makes clear that in order to achieve a sustainable state, weak sustainability has to be abandoned. The implications for market power are then discussed in Chapter 7.

In short, this thesis shows that market power and sustainability are connected. Due to the complexity of both phenomena as well as due to the complexity of our socio-economic system there are, however, no straightforward answers to the posed research questions. A main point to be highlighted is to understand market power in all its complexity and not limiting it to the market sphere. This allows to understand the connection between market power and sustainability as a struggle of paradigms; namely the growth and the sustainability paradigm. Further research particularly in relation with transition theory is suggested. Other future research avenues could focus specifically on the social dimension of sustainability and market power, as well as on the relationship among market power, sustainability and resilience.

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List of Abbreviations

ALTER-EU	Alliance for Lobbying Transparency and Ethics Regulation
CAP	Common Agricultural Policy
CBB	Confederatie Van De Belgische Bietenplanters – Confederation of Belgian Sugar Beet Growers
CFC	Chlorofluorocarbons
CSR	Corporate Social Responsibility
EEC	European Economic Community
EEG	Erneuerbare-Energien-Gesetz – Renewable Energy Law
EIA	Environmental Impact Assessment
EU	European Union
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GGND	Global Green New Deal
GMO	Genetically Modified Organism
HERA	Hessische Erzeugerorganisation Für Raps W. V – Hessian Producer Organization for Rape Seed
IN	Innovation
INN	Innovation Network
IO	Industrial Organization
IUCN	International Union for Conservation of Nature
MP	Market Power
MR	Machinery Ring
MSC	Marine Stewardship Council

NAWARO	Nachwachsende Rohstoffe – Renewable Materials Organization
NEIO	New Empirical Industrial Organization
OPEC	Organization of The Petroleum Exporting Countries
PO	Producer Organization
PPP	Public-Private-Partnership
RM	Resource Management
RMN	Resource Management Network
SCP	Structure Conduct Paradigm
SDGs	Sustainable Development Goals
UN	United Nation
UNEP	United Nation Environment Program
WTO	World Trade Organization
WWF	World Wildlife Fund

Chapter 1.

Introduction

1. Introduction

This thesis is dedicated to two highly ethical and complex topics; market power and sustainability. A comprehensive analysis, connecting those two topics is currently missing in the literature (see Chapter 2). This is despite their importance and relevance for our society. Sustainability is a main theme of the 21st century and has been neglected in the past (Zaccai 2012, Arora and Mishra 2019, European Court of Auditors 2019). The increasing damage caused by climate change (IPCC 2014, Rosenzweig, Elliott et al. 2014), environmental pollution and degradation (Dirzo, Young et al. 2014, Ivar do Sul and Costa 2014) made it impossible to further neglect sustainability issues (Rockstrom, Steffen et al. 2009, Steffen, Broadgate et al. 2015, Waters, Zalasiewicz et al. 2016). While sustainability problems are pressing, not enough has been done to tackle them. In this context, relevant questions are: (i) What needs to happen to finally tackle them? (ii) Who is able to tackle them? (iii) Does the responsibility lie with governments, with the civil society, with businesses, or do they have a shared responsibility? A transformation is needed to bring about the change necessary to tackle the sustainability problems that our society is facing. Currently initiatives are not reaching far enough (Zaccai 2012, Spindler 2013).

This thesis does not intend to focus on the transition towards sustainability but on the relationship between market power and sustainability. The focus on the market sphere and on market power stems from the observation that other stakeholder groups have not yet achieved the necessary transition. Nation states seem to have lost their power (Loorbach and Wijsman 2013), while citizens connect globally to fight for the needed transformation (Ogden, Heynen et al. 2013). Despite enormous efforts, they were not able to force governments implement the needed changes. Some argue that governments actions are too cautious to not jeopardize their economic position (Rosen and Guenther 2015, Kormann 2019). Is it then that the power to change lies within the economic sphere (Schaltegger and Wagner 2011, Schleifer 2016)? Is it that those who have market power are the ones who could turn the tide? The question of who participates in making the transformation happen, is related to the empowerment of stakeholders and as such it is itself a question of sustainability (Attfeld 2013).

The impetus to investigate the relationship between market power and sustainability stems not only from the question about who has the power to bring about the urgently needed transformation towards sustainability. It is also owed to the observation that market power makes up a market failure. Other market failures, most notably externalities and missing markets, have been identified as

cause for environmental degradation (Beckerman 1994). Initiatives such as the Economics of Ecosystems and Biodiversity or the Economics of Land Degradation are an expression of aiming to find market-based solutions to problems caused by these market failures. Another well-known example are CO₂ trading mechanisms. Generally, market-based solutions as well as command and control instruments are covered in Environmental as well as Ecological Economics literature (Common and Stagl 2005, Wiesmeth 2012).

If there are two market failures that are acknowledged to cause environmental problems, why should not other markets failures do the same? Originally market power was ascribed a positive effect on the environment (Solow 1974, Devarajan and Fisher 1981, Gopinath and Wu 1999). In contrast, one can as well refer to Serafy (1996) who defends weak sustainability and with this the market mechanism that do have the ability to support sustainability. However, he admits that this is only so if markets failures are absent. He specifically refers to "market power, exploitation, political pressure, military intervention, and skewed income distribution", which are all related to some sort of power imbalance. Clearly more research is needed to investigate the role of market power and its relationship with sustainability. This is particularly the case given the fact that market power seems to be of increasing relevance (IMF 2019).

2. Sustainability

The discussion of sustainability is handed over from one generation to the next (Van Passel 2007). Understanding that one generation after the other is discussing the same themes over and over again, one may wonder if another discussion of sustainability is not in vain. Only future will give an answer to this question. However, the discussion about the meaning of sustainability has not lost relevance, rather the opposite is the case (Attfield 2013).

The question on how to define sustainability is often neglected, making it a fuzzy term (Beckerman 1994, Redclift 2005, Attfield 2013), a buzzword, that needs to be used, but that has not much meaning (Renn 2005). Hugé, Waas et al. (2013) discuss, that sustainability does not need to be specified as this would have the consequence of including only one particular narrow perspective. Defining sustainability is, however, important even if it needs to be done for each particular context. Sustainability has a teleological quality, thus without defining the goal one would never know the disparity between the present and the aspired state. One would not only recognize the present disparity, but any attempt to close the gap could not be evaluated; neither qualitatively, nor quantitatively.

Attempts to clarify the meaning of sustainability have started off discussions (Beckerman 1994, Beckerman 1995, Daly 1995, Jacobs 1995, Common 1996, Serafy 1996), which are still ongoing. This can be seen in the weak versus strong sustainability divide (Ang and Van Passel 2012). In Chapter 4 a clear stance is taken towards strong sustainability, by declaring weak sustainability as being illogical. The concept of weak sustainability has been dismissed by others on different grounds as well (Beckerman 1994, Attfield 2013, Hector, Christensen et al. 2014).

Sustainable development has been coined by the definition that can be found in the Brundtland report. Sustainable development is described as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED 1987). However, it has to be mentioned that sustainability is a normative term. Thus stakeholders are called to decide what is aimed to be sustained for how long and for who (Pearce 1988, Costanza and Patten 1995). That sustainability is complex can be deduced from the Sustainable Development Goals (SDGs) which already comprise of 17 topics, which have all together 169 sustainability targets (UN 2015).

2.1. History

The notion of sustainability is often only understood to encompass environmental problems. This is not unfounded. Not least, human existence is based on the environmental sphere and the need to manage the resources we depend on is a precondition for human survival (Chew 2001, Du Pisani 2006, Spindler 2013). Modern man often lives detached from the environment and has lost the understanding that ultimately man is one with nature. What the sustainability concept comprises of has undergone changes since the emergence of the term. Some argue that the term was first used in forestry, referring to the maintenance of the resource stock (Weber-Blaschke, Mosandl et al. 2005, Du Pisani 2006). In this context sustainability was accessed from a Resource Economics perspective. It was also already in these early examples of the usage of the term that a temporal component was brought into play by highlighting the need to maintain the resource stock for future generations (Spindler 2013). Spindler (2013) points out that already these early accounts of the usage of the sustainability term contained the main dimensions of present sustainability definitions (environmental, economic and social dimension). Nevertheless, it was not until the formulations of the SDGs that the multidimensionality of sustainability became mainstream.

As already stated, managing natural resources has for a long time been in the interest of humankind. Though, through the Industrial Revolution starting in the end of the 17th century human impact on the environment reached an unprecedented scale. The Industrial Revolution (and later Green Revolution)

permitted human population to grow and with this the pressure on the environment increased as well. Not only human population was increasing but living standards and consumption as well. A trend that has continued until now (Rockstrom, Steffen et al. 2009, Dauvergne 2010, Ewing, Moore et al. 2010, Horton 2017, European Environment Agency and Swiss Federal Office for the Environment 2020), a trend which has given rise to the sustainability debate (Du Pisani 2006, Hector, Christensen et al. 2014).

Due to the Great Depression starting in 1929 and the two World Wars sustainability relegated in relevance. In the second half of the 20th century the discussion gained traction once more (Devarajan and Fisher 1981, Hector, Christensen et al. 2014). Contributions by Rachel Carson's *Silent Spring* in 1962, (Lear 1993), of Ernst Friedrich Schumacher's *Small is beautiful* in 1972, or Paul Ehrlich' *Population Bomb* in 1968, gave the topic new popularity and brought it back to people's attention (Du Pisani 2006, Spindler 2013). This led to the introduction of the sustainability debate on national as well as on the international level. In the USA the National Environmental Policy Act was enacted in 1969, which demanded Environmental Impact Assessment (EIA) for large scale projects. From then on EIAs were required in other countries as well (Spindler 2013). On international level it led to the foundation of the Club of Rome and their influential publication on the *Limits to Growth* in 1972. In the same year the first UN conference on the Human Environment took place, where the United Nations Environmental Program (UNEP) was found. Another hallmark was the Brundtland Report published in 1987, which coined the sustainability term thereafter (Caldwell 1996, Du Pisani 2006). From there on international conferences that discussed human impact on the environment became a regularity¹.

The UN conference on the Human Environment was not only relevant as it paved the way for future international endeavours regarding sustainability. It also marks the point where the notion of development was combined with the one of sustainability. Hence, this is the point when sustainability and sustainable development became synonyms and sustainable development was discussed at future conferences, rather than sustainability as such (Beckerman 1994, Caldwell 1996, Spindler 2013, Hector, Christensen et al. 2014). The enmeshment of

¹ For a detailed overview see: Caldwell, L. K. (1996). International Environmental Policy: From the Twentieth to the Twenty-First Century. Durham, London, Duke University Press. For a shorter description see: Spindler, E. (2013). *The History of Sustainability The Origins and Effects of a Popular Concept*. Sustainability in Tourism. J. Ian and S. Roland. Wiesbaden, Springer.

sustainability and development was finally completed by the installment of the SDGs in 2015.

Despite sustainability and sustainable development being used as synonyms, they are not (Attfield 2013, Hector, Christensen et al. 2014). Both are grown historically, contain certain dimensions (usually environment, social and economic) and are still contested. Sustainable development is born out of the idea that human civilizations following a certain development path (procedural character) (Du Pisani 2006), whereas sustainability has a teleological character, being a goal that one aspires towards. While sustainable development was first rather meant to be a concept for Developing Countries it became an universal goal for all nations (Spindler 2013, Hector, Christensen et al. 2014).

With the enmeshment of sustainability and development the market-oriented and economics focused views gained in importance. This is as at that time and up until now development is usually understood to be achieved by economic growth. Thus, limiting growth as some have proposed could no longer be an option. As Attfield (2013) points out, limiting growth was in opposition to development thinking, as economic growth was understood to be the panacea to *underdevelopment*. Over the years the role of markets to solve the problems of *underdevelopment* and sustainability increased. This is not only expressed by market based solutions to environmental problems, but also by the emergence of Public-Private-Partnership (PPP) at the Earth Summit in 1992 in Rio de Janeiro (Spindler 2013). This notion increased the role (as well as responsibility) of private businesses in achieving sustainability goals and is in line with neo-liberal policies that reduce the interference of governments to allow the regulatory forces of the market economy to unfold.

To put the historical development of the sustainability term in a nutshell it can be stated that the original meaning of the term stems from forestry describing a harvest practice that allows maintaining at least a constant stock of trees (Weber-Blaschke, Mosandl et al. 2005). This is a purely economic consideration which is reflected in the subdiscipline *Resource Economics* looking at resource depletion and the optimal usage of resources. Nevertheless, sustainability was in the 1970s and 80s rather approached from an environmental perspective due to increasing pollution and environmental destruction (Weber-Blaschke, Mosandl et al. 2005, Du Pisani 2006, Spindler 2013). Later economic, environmental and social aspects were integrated into the sustainable development debate. These three pillars of sustainability are in business often called the triple bottom line (Foran, Lenzen et al. 2005, Hacking and Guthrie 2008).

2.2. *Dimensions of sustainability*

It was already indicated that already early accounts of the usage of the sustainability term contained three dimensions; the environment, society and the economy. It can be stated that in most sustainability definitions these three dimensions are represented. However, some contain more dimensions, such as an institutional, political, or governmental (Seghezze 2009, Spindler 2013, FAO 2014) and it is still up to debate what the subjects of sustainability precisely are (Attfield 2013). There are suggestions to term the dimensions differently altogether (Weber-Blaschke, Mosandl et al. 2005), or to adapt them as needed or to add more or less complexity to them (Spindler 2013). Along with these different ideas pertaining what is part of sustainability one can also find different depictions of sustainability. These depictions include ideas of pillars, buildings or circles (Spindler 2013). Pillars represent the seclusion of each dimension, buildings add the notion of dimensions equally carrying the overarching sustainability concept, and circles often indicate an overlap, interdependence or even hierarchy of sustainability dimensions (Lozano 2008, Spindler 2013, Purvis, Mao et al. 2019).

Despite most sustainability definitions containing the typical three dimensions (Purvis, Mao et al. 2019) some would argue that this leads to a dilution of the sustainability concept. Spindler (2013) argues that sustainability should focus on environmental goals and the integration of these goals into the social and economic sphere (Kuhlman and Farrington 2010). However, the idea of sustainability containing three dimensions seems not to be a new one (Purvis, Mao et al. 2019). In his criticism Spindler (2013) does not neglect the three dimensionalities of sustainability, but rather questions the entrance point to an analysis. In any case, it can be stated that sustainability attempts to balance the environmental, social and economic sphere.

From the etymological development of the sustainability term it is clear why the environment is one dimension of sustainability. Since humans do depend on the environmental sphere, the long-term maintenance of this environmental sphere is of pivotal relevance to human existence. Publications showed the harmful effects of human actions that gave rise to sustainability concerns on a global level. Silent Spring as well as Limits to Growth have already been mentioned. Since then much research has been undertaken to illustrate the effects of human actions on the environment (Rockstrom, Steffen et al. 2009). By proclaiming a new geologic era, the Anthropocene, the unprecedented negative impact of human actions on planet earth was even more highlighted (Steffen, Crutzen et al. 2007, Erlandson and Braje 2013, Steffen, Broadgate et al. 2015, Waters, Zalasiewicz et al. 2016). That humans are changing the climate by their unsustainable actions is only one, but for sure the most prominent and no longer contested example of the scale that has been reached (IPCC 2014). It comes as no surprise that much research focusses on the environmental dimension of sustainability (consult for

example the journals: Current Research in Environmental Sustainability , Environmental Sustainability , Nature Sustainability).

The historic account laid out above does also indicate why the economic sphere has been a part of sustainability from the onset. To put it in a very simplistic way, economic considerations have been and are a way to understand resource management (Tietenberg and Lewis 2009, Lipsey and Chrystal 2015). The special focus on environmental issues within economics can be seen by the subdisciplines Environmental Economics, Natural Resource Economics or Ecological Economics. Natural Resource Economics can be traced back to Hotelling's paper "The Economics of Exhaustible Resource" from 1931 and thus it even predates the renewed interest in environmental issues which emerged only after the Second World War (Devarajan and Fisher 1981). The emergence of Environmental Economics can be traced back to the 1950s (Pearce 2002) and the formation of Ecological Economics to the 1980s (van den Bergh 2001).

While economics can be understood as a way to manage resource consumption optimally, economics had its own contribution to the degradation and mismanagement of the environment. Although economic growth allowed living standards to increase, the paradigm got more and more criticized for its negative impact on the environment as well as on its inability to solve the development problem (Purvis, Mao et al. 2019). Voices that propagate the limits to growth (Daly 1996), that call for a steady state economy (Daly 1974, Daly 1974, Pirgmaier 2017) or even for degrowth have become louder since then (Alier 2009, Kerschner 2010, Buch-Hansen 2014).

While one could argue that the social sphere was only added through the creation of the sustainable development idea, it has to be noted that certain social aspects were already part of the early sustainability understandings. Resource management in forestry had an intergenerational aspect and thus it included a social dimension. Proper forest management meant to maintain the forest stock for future generations. An intragenerational dimension was added through the debate of social equity and the distribution of wealth. Today, sustainability usually contains the notion of both inclusive (intergenerational) and distributive (intragenerational) justice (Spindler 2013). What sustainability is about in terms of the social sphere is already a debate on principles. Without even touching upon aspects of the social sphere (e.g. culture, health, security, gender, income), one can ask whether it is about justice, equity or distribution. Each of these terms have completely different effects on what sustainability implies and what is needed to be in accordance with it.

Beckerman (1994) deems the notion of (weak) sustainability as redundant as he suggests that welfare economics² does already take care of it (Hediger 2000). Intragenerational distribution is tackled by the attempt to maximize welfare and intergenerational distribution is taken care of by choosing the right discount rate. There is opposition to this suggestion (Goodland and Ledec 1987, Daly 1995, Ackerman and Heinzerling 2002), nevertheless a substantial body of literature (Howarth 1996, Lumley 1997, Pearce, Groom et al. 2003, Asafu-Adjaye 2005, Moxnes 2014) is dedicated to Beckerman's observation (without of course declaring sustainability a redundant concept). There are many different understandings of sustainability and sustainable development, but if one returns to the Brundtland Report it has to be recognized that equity is part of it (WCED 1987). While the question remains open what equity really means, it is clear that it is not merely about maximizing wealth. Pertaining equity there is another interesting account in respect to this thesis, the account to power. The Brundtland Report several times mentions a connection of power imbalances and sustainable development (WCED 1987). The connection between market power and sustainability is discussed at the end of this Chapter (Section 4).

2.3. *Weak versus strong sustainability*

A discussion of all different versions of sustainability dimensions and their depiction is beyond the scope of this Chapter. Nevertheless, a short excursion to introduce the two main understandings and depictions of sustainability is undertaken in the following. Figure 1 shows how weak and strong sustainability are usually depicted. Both contain three dimensions, however, the individual importance of each of these dimensions in their contribution to sustainability is viewed differently.

A main reason for the divide in the interpretations of sustainability seems to stem from the different world views applied to the sustainability concept. Is it understood from a mere utilitarian perspective or from an ecological perspective? With which ethical principles are these perspectives connected? Usually this divide is expressed by weak and strong sustainability. However, it has to be noted that some would argue that weak and strong sustainability are not that much different, as both take an anthropocentric, utilitarian, value or capital based approach

² For an alternative view on welfare economics and sustainability see: Gowdy, J. (2005). "Toward a new welfare economics for sustainability." *Ecological Economics* 53(2): 211-222. For a critique for welfare economics disregarding questions of equity and just distribution see Tinbergen, J. (1957). "Welfare Economics and Income Distribution." *The American Economic Review* 47(2): 490-503. Or Stiglitz, J. E. (1991). "The Invisible Hand and Modern Welfare Economics." *NBER Working Paper* 12867.

(Jacobs 1995, Common 1996, Holland 1997, Hediger 2000, Hector, Christensen et al. 2014).

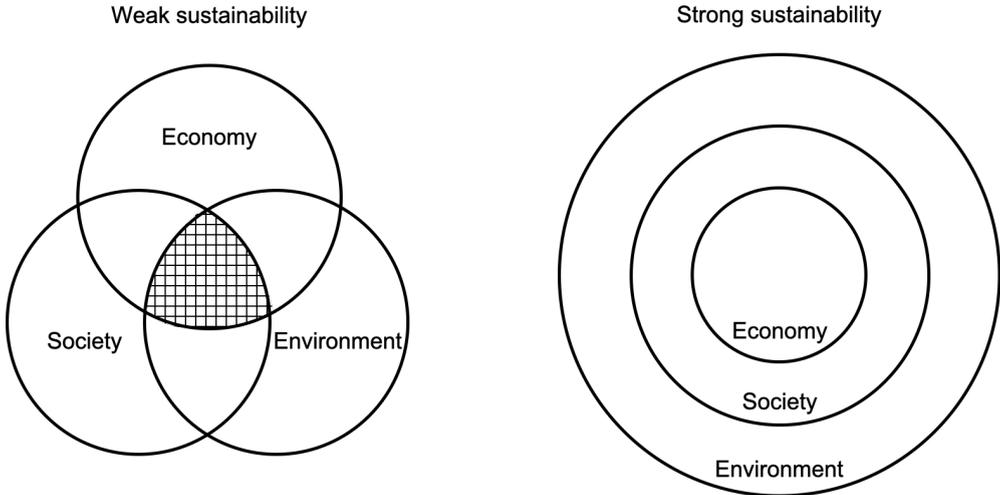


Figure 1 Conceptual illustration of weak and strong sustainability.

This dichotomous understanding of sustainability is widely accepted. Nevertheless, there are more nuances to these two concepts, such as very weak sustainability or absurdly strong sustainability. A distinction between very weak and weak sustainability is drawn on the base of economic considerations presented by Solow and Hartwick (Hediger 2000). Absurdly strong sustainability can be understood as the return to non-utilitarian roots of sustainability, sometimes referred to as deep ecology (Daly 1995, Holland 1997). The notion of absurdly strong sustainability could also be compared to the environmental-preservationist approach. Following this approach the environment should be preserved because of moral (rather than utilitarian or instrumental) grounds (Hector, Christensen et al. 2014).

Weak versus strong sustainability bring some important questions to the table. Those of intrinsic and extrinsic values, those of incommensurability of values and of substitution of capital. Hector, Christensen et al. (2014) state that both mostly deal with capital, which presses the whole world in the sphere of economics. As Attfield (2013) highlights, economizing the environment is an expression of the anthropogenic world view. From the economization follows that something is only preserved if it has some value to humans. Attfield (2013) points out that no

anthropogenic approach will ever be able to fully capture sustainability. This point is explained by Hector, Christensen et al. (2014) who state that "if we accept that nature has intrinsic value, frameworks that acknowledge only instrumental valuation can never fully evaluate the sustainability question, because they do not provide means of making axiological or moral judgements."

Generally, one can observe not only an economization but an obsession with the quantification of sustainability goals. Qualitative discussions of sustainability goals often seem to be neglected. Though some goals, particularly those in the social realm may be difficult to be translated into quantitative terms, which is why they are often dropped altogether (Hediger 2000, Sharma and Ruud 2003, Choi and Ng 2011, Rafiaani, Dikopoulou et al. 2020). That is despite the fact that proponents of strong sustainability would ask for an interdisciplinary, multimethod approach to solve sustainability issues (Jerneck, Olsson et al. 2011). Jacobs (1995) calls to remember that „sustainable development and sustainability were not originally intended as 'economic' terms. They were, and remain, essentially ethico-political objectives, more like 'social justice' and 'democracy' than 'economic growth'. And as such their purpose or 'use' is mainly to express key ideas about how society - including the economy - should be governed."

Weak sustainability does not adhere to the idea of intrinsic value or incommensurability of values. Instead all capital – man-made or natural – is understood as substitutable. In order to operate sustainably, overall capital needs to be sustained. In contrast, strong sustainability does acknowledge the intrinsic value of nature and the incommensurability of values. Accordingly, not all capital is understood to be substitutable and at least critical capital should be preserved (Daly 1995, Jacobs 1995, Serafy 1996, Hediger 2000, Ang and Van Passel 2012). To decide upon critical capital the precautionary principle should be followed and insights from all relevant experts should be taken into account (Jerneck, Olsson et al. 2011).

As stated, one difference between weak and strong sustainability is the question of substitutability of capital. Although strong sustainability accepts only limited substitutability there is much room for interpretation. How does one really discern between weak and strong sustainability? How much capital should be protected? Which capital cannot be substituted? Daly (1995) indicates that the answer depends on the situation. It depends on what critical capital is. In a *cowboy economy* (Boulding 1966), man-made capital is the limiting factor. Though in the *spaceship economy*, in which we live now, natural capital is the limiting factor. Jacobs (1995) similarly states that "sustainability is the injunction to maintain the capacities of the natural environment: its ability to provide humankind with the services of resource provision, waste assimilation, amenity and life support. This allows for change in the composition of the environment, even (above certain sustainability thresholds) in its 'level'. Of course, there will be disputes about

exactly which changes maintain capacity and where the thresholds should lie: this is inevitable in practical policy making.” As it will be impossible to always know how much nature needs to be preserved to maintain it functioning, humans may have to make decisions that are based on moral and ethical grounds.

The notion of substitutability contains one important aspect, the aspect of human ingenuity and the ability to alter human’s dependence on natural capital by the application of human ingenuity. The idea that our ability to fulfill human’s needs in the present as well as in the future within the carrying capacity of the environment is determined by technological advancements, is already stated in the Brundtland Report (WCED 1987). Du Pisani (2006) correctly summarizes “that the damage caused to the environment and the gulf between rich and poor were admitted, but the remedy was seen in further scientific and technological development”. One reason why one may focus on technology and the weak sustainability approach may be to make the concept of sustainability operational (Serafy 1996, Van Passel 2007). Ang and Van Passel (2012) accurately summarize that the debate between weak and strong sustainability in the end may only boil down to the belief or disbelief in technological advancements. Chapter 4 provides a discussion on why focusing on technological advancements alone fails to deliver sustainability. The role of technology is mentioned here since it does also relate to market power issues, which will be shown in Chapter 2.

2.4. The use of sustainability in different ways

Within this thesis, sustainability is used in different ways. As illustrated above, sustainability can have different meanings. It can refer to one dimension, such as the environment (Goodland and El Serafy 1993, Goodland 1995, Goodland 1997); it can refer to behavior or actions, such as of companies (Maloni and Brown 2006, Hashmi, Damanhoury et al. 2015); it can be related to strategies and plans, such as those developed by governments (Fenton and Gustafsson 2017, Bertoldi, Kona et al. 2018); it can relate to the whole system, such as our socio economic system (Haberl 2006, Hoeks, Azadi et al. 2014).

Chapter 2 may create the impression that a focus on the environmental dimension of sustainability has been put. This is however not the case. For the literature review in Chapter 2 sustainability was used as one of the terms in the search query. Thus, no bias towards a certain interpretation of the sustainability term was planned. Nevertheless, most literature exclusively dealt with the environmental dimension of sustainability. It has been pointed out above, that the social sphere is often neglected in research. An example is the paper of Hashmi, Damanhoury et al. (2015). They use the term sustainability in the title, but then only discuss environmental aspects of sustainability. Walmart delivers another example. While they greened their supply chain, they did little to improve the social dimension of sustainability (Meeks and Chen 2011). In Chapter 2,

sustainability was understood in the broadest sense possible. No pre-selection was undertaken, such as to only look at one dimension or expression (e.g. weak or strong) of sustainability.

In Chapter 3 and 4, the sustainability debate is lifted on a system level. While this is the case, there is still the connection to the individual (in this case company) level. If one assumes that the current socio-economic system has the potential to reach a sustainable state, it can be assumed that individual actors can contribute to reaching this state by their actions. This is related to the main research question; are market power and sustainability related; if so how. Thus, if there is a relationship, can market power for example support sustainability? Another aspect would be to question whether market power as a phenomenon is in itself sustainable. This is more related to the social dimension of sustainability and the question of equity. If this is to be answered with no, then this is an indication that the current socio-economic system cannot be sustainable. A stance that is discussed in Chapter 4. Following the two assumptions, that the current socio-economic system either can or cannot be sustainable, lead to two distinct discussions. One is about how to improve the sustainability of the current system, assuming that a sustainable state can be reached. The other is how to initiate and complete a sustainability transition towards a sustainable system, assuming that the current system cannot be sustainable. Chapter 3 discusses both but does indicate that rather the latter assumption is correct. Both assumptions are revisited in the concluding Chapter 7. Thus, sustainability is applied at system level, as well as to the concept of market power itself. Furthermore, sustainability can be the guide for a transitory process towards a sustainable system or a more sustainable state. This is also outlined in Chapter 3.

2.5. The importance of sustainability in the agricultural sector

In a recent report of the European Environment Agency (2020), it was pointed out that Europe is not operating within its planetary boundaries. The report identified the agri-food sector as the main stressors on the environment, thus causing the overshoot of planetary boundaries. Accordingly, it is advised to pay thorough attention to this sector in order to tackle sustainability problems. Loorbach and Wijsman (2013) project that sectors that are resource intense will increasingly be challenged by sustainability issues. Among these sectors is the agri-food industry. Agriculture will not only suffer from sustainability problems, but it does create them as well.

The Neolithic Revolution marks one of the most important evolutionary steps of human history. It describes the revolutionary process of humans turning from hunters and gatherers to farmers (Hillel 1991). Although humans had already earlier manipulated the environment to increase nutritional uptake, it was agricultural practices that led to the manipulation of land to an unprecedented

degree. For sure it was not only agriculture that allowed humans to develop civilizations, though, agriculture played a key role in it. To the same degree to which agriculture allowed the development of civilizations, agriculture has also its part in their cessation. While the term sustainability is a relatively new one (Weber-Blaschke, Mosandl et al. 2005), the problems that are created by unsustainable behavior, management practices or systems are as old as human history (Erlandson and Braje 2013). Working the land led to its degradation and if not halted, flourishing human civilizations were condemned to vanish (Hillel 1991). The central role of agriculture for human history is brought to the point by Hector, Christensen et al. (2014): "Agricultural reform and industrialization led to the rise of immensely powerful capitalist economic systems with diverse and ubiquitous consumption-led markets, characterized in part by massive flows of materials and energy."

Obviously, while some civilizations ceased, others were able to continue and manage their resources good enough. Nevertheless, resource management is still a main concern, not least in the agri-food system (Rockström, Edenhofer et al. 2020). Our ability to further increase nutritional uptake does permit population growth. Malthus famously warned in 1798 that population growth would outpace food production and pledged to reduce population growth to prevent human misery (Du Pisani 2006). This increase has always been related to technologies and innovation. Apart from permitting to feed more people, technologies also allowed to free up human work force, which could then be employed in other fields, permitting the further development of human civilizations (Hillel 1991, Chew 2001, Erlandson and Braje 2013). Technologies and innovations that mark the Green Revolution are another hallmark in human history. Chapter 4 will expand on the downside of these technologies. While it may have made the impression that the Green Revolution allowed humans to evade Malthus' dire prognosis, humankind is still struggling with the exact same problem (Du Pisani 2006).

Modern, industrial agriculture has its virtues, but it also has its evils. In a recent article Rockström, Edenhofer et al. (2020) find that the present global food system is unsustainable and unless major changes are undertaken they will fail to deliver international sustainability goals and agreements. Sustainability problems caused by the agri-food system are not limited to the environmental dimension, but do encompass the social and thus the economic dimensions as well. In that regard they do not only highlight the role of governments, but also the role of businesses to solve sustainability problems in the agri-food sector (Rockström, Edenhofer et al. 2020).

3. Market power

Market power is one of several phenomena (others are: externalities and missing markets, public or common goods, asymmetric information) that cause markets to fail. They are understood as failure since they inhibit efficient allocation. In the case of market power, this means that the agent with market power can charge higher or demand lower prices (depending on whether the power is exerted up or down stream the supply chain) which causes a deadweight loss (Lipsey and Chrystal 2015). One definition of market power is “[...] the ability to set prices above cost, specifically above incremental or marginal costs, that is, the cost of producing an extra unit” (Cabral 2000). Thus, market power leads to a shift of the output level, which means that a certain amount of value is lost to society (deadweight loss) (see Figure 2).

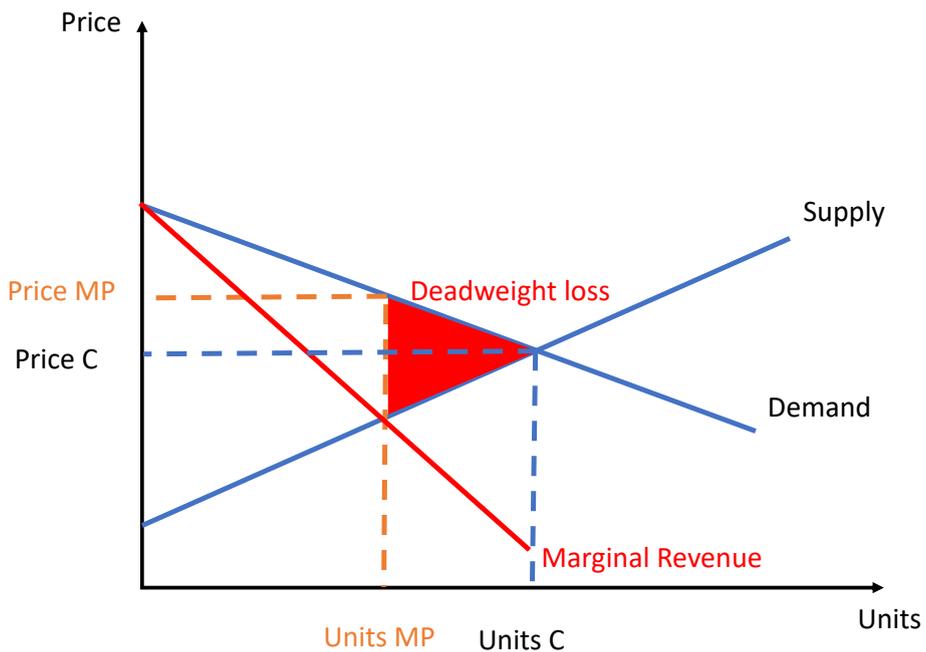


Figure 2: Deadweight loss: The blue lines describe the market under perfect competition. By shifting the output level to equal marginal revenue of the monopolist, output is lost, which is illustrated by the red triangle. This means that less is bought at the higher market power price. Hence, fewer consumers have the possibility to increase their utility by purchasing the offered commodity.

In most instances, market power is understood to be harmful for a market economy. Due to the characteristics of some goods, markets are faced with natural monopolies. In such instances (often related to infrastructure), governments control these commodities to inhibit distortions, which would be detrimental for society (Lipsey and Chrystal 2015). Wherever the characteristics of the commodity allow, markets should take over efficient allocation. However, due to cartelization or firm size, market power issues may arise. Within economics specialized fields, such as New Empirical Industrial Organization³ (NEIO), have emerged that deal with the analysis of firm behavior and the market structure to track market power (Einav and Levin 2010, Bhuyan 2014). However, in most instances such analysis remains at a theoretic level, due to the lack of data (Bhuyan 2014), or because of the imperfection of the market (Murphy 2006). In Chapter 5 a case study is presented that deals with both shortcomings. The application of systems thinking allowed a market power analysis despite the respective restrictions. Although econometric models are used to analyze the effect of mergers ex-ante (Einav and Levin 2010), successful investigations of hidden market power are often based on whistle blowers (Luz and Spagnolo 2017, European Commission 2019). The detection of market power is not only difficult due to the lack of data, but also due to its complexity, going beyond the price distortions.

Basic economics textbooks limit the discussion about market power to price and output distortions. Though, market power is not limited to the ability to influence prices and outputs. Murphy (2006) argues that market power is also the ability to reduce competition. Means to undermine competition can be the installation of entry barriers, starting off price wars, setting standards, or lobbying. Some of these means can be connected. For example, the installation of standards can pose entry barriers. The implementation of industry wide standards can be pushed through lobbying activities. The effects of price wars can be seen at the prominent example of oil prices. OPEC is repeatedly (first in 2015, now in 2020) showing its position by reducing prices that other sellers may not be able to support on the long run (Krämer, Jung et al. 2016, Makortoff 2020). A prominent example of a big company lobbying for industry wide standards is DuPont's support to phase out Chlorofluorocarbons (CFCs) (Maxwell and Briscoe 1997). Though, not only

³ NEIO is an approach to estimate market power. This approach is based on micro-economic theory and makes use of data intensive industry-wide econometric models to estimate market power. Bhuyan, S. (2014). "Visiting an old battleground in empirical industrial organization: SCP versus NEIO." Applied Economics Letters 21(11): 751-754. Bresnahan, T. F. (1989). Chapter 17 Empirical studies of industries with market power. Handbook of Industrial Organization, Elsevier. Volume 2: 1011-1057.

national standards can support a company's market position, private standards can too (Dauvergne and Lister 2012).

Common market power estimations are based on firm size, or similar variables. However, firm size does not need to be an indicator for market power. First of all, we are of course already dealing with the question of defining the market to which we compare the respective firm size (Podszun 2016). But apart from this, Murphy (2006) show that multinational companies may not be specialized in one or two areas, but exhibit a portfolio of diversification. This complexity alone, make market power estimations difficult as it gets harder to specify a particular market. It is argued that companies such as Cargill represent a one-stop shop for farmers, where they are getting everything they need from one company (Xue and Tisdell 2000). A similar picture is drawn by Ryan (2020) where farmers are forced to buy several products from one company to get access to a service. A trading practice that can be termed as unfair, which is a topic taken up by the European Commission (European Commission 2018). To counteract this instance, the European Parliament enacted a new law to protect trading partners from unilaterally imposed unfair trading practices. It has to be pointed out that this legislation is valid for the agricultural sector only (European Parliament 2019).

While the analysis of market power and sustainability would for sure be interesting for most industries, it is of particular relevance for the agri-food sector.

The importance of controlling market power in the agricultural sector.

Unfair trading practices or generally market power issues can be a problem in any industry, however, the agri-food sector has been particularly prone to it. This explains this unique law against unfair trading practices in the agri-food industry. "Within the agricultural and food supply chain, significant imbalances in bargaining power between suppliers and buyers of agricultural and food products are a common occurrence. Those imbalances in bargaining power are likely to lead to unfair trading practices when larger and more powerful trading partners seek to impose certain practices or contractual arrangements which are to their advantage in relation to a sales transaction" (European Parliament 2019). Imbalances cannot only be explained by different company sizes, but also by the commodity exchanged. The legislative text points out that farmers bare larger risks due to their dependence on environmental conditions (like weather conditions). Furthermore, their produce is often seasonal and perishable.

As described above, unfair circumstances may also arise due to created dependencies. Murphy (2006) indicates the dependency of farmers from agribusinesses. He states, that a certain degree of dependence is inherent in industrial farming. As soon as farmers engage in industrial farming, they get

dependent, as they need the inputs from them. Often, farmers cannot even change to another seller. This fact is also pointed out by Ryan (2020) analyzing power and big data in agriculture.

Market power issues are, furthermore, particularly common in the agri-food sector as the value chain can be described as an hourglass⁴ (Carolan 2012, EEA 2017). This means that some degree of concentration is common within the agri-food value chain, that makes the chain susceptible to vertical market power issues (Schleifer 2016). Besides concentration in the input sector (seeds, chemicals) (Murphy 2008, Ryan 2020), a common theme in the agri-food industry is the concentration on retail level (Bertazzoli, Fiorini et al. 2011).

Above the relevance of sustainability of the agri-food sector has been indicated. In the quest to achieve a sustainable agri-food system the role of businesses has been questioned (Schleifer 2016, Rockström, Edenhofer et al. 2020). Thus, analyzing market power and sustainability is of particular relevance in the agri-food sector. In this respect this thesis contributes to this call by taking a closer look at market power and sustainability in the agri-food sector.

4. Are sustainability and market power related?

When evaluating this connection one can first take a look at the many environmental problems that humanity is facing. Many of these problems are caused by our throw-away society. A behavior which is supported by the current economic system striving for continuous growth. These problems are food waste (Melikoglu, Lin et al. 2013), e-waste (Widmer, Oswald-Krapf et al. 2005), and plastic waste (Rochman, Browne et al. 2013), amongst others. Other examples are fertilizers that poisoned water supplies (Vitousek, Naylor et al. 2009), and acid rain that destroyed forests (Likens, Driscoll et al. 1996). This leads to the conclusion that there is indeed a tight connection between our economic system and sustainability. The problems listed illustrate that a sustainability transition is overdue (Daly 1996, Rockstrom, Steffen et al. 2009, Meadows 2010, Jackson 2017, Ripple, Wolf et al. 2017). While the examples above indicate that economic activities and economic agents are mostly contributing to the degradation of our environment, there are as well opposing examples. Pollution caused by chlorofluorocarbons (CFCs) thinned the ozone layer (Ball, Alsing et al. 2018). Even if the depletion of the ozone layer was caused by economic activity, economic agents also contributed to solving this problem (Maxwell and Briscoe 1997).

⁴ The hourglass shape serves to illustrate concentration in the middle of the value chain. Thus, there are more actors at both ends of the value chain and relatively less in the center.

The connection between environmental problems and the economic system is studied by disciplines such as Natural Resource Economics, Environmental Economics and Ecological Economics. They all have different foci as well as viewpoints on the sustainability challenge. However, it is acknowledged that market failures are part of the causal relationship. Most prominently, missing markets are seen as a core root cause for the sustainability challenge caused by economic interactions. The use and destruction of natural resources is not valued at all or undervalued, leading to a distorted consumption function, usually an overconsumption. It is suggested by attaching a (correct) price to these resources, consumption would be corrected, hence reduced. This reduced consumption should then in turn solve sustainability issues related to the overuse of resources. Hence it is supposed that the economic system caused a problem. Furthermore, it is understood that the same system can also be used to solve these problems. Missing markets are not the only market failure. If a connection between one market failure and sustainability can be found, maybe the connection is relevant for other market failures as well. Market power is an increasing problem due to the large internationally operating companies (Murphy 2006, IMF 2019, Ryan 2020). It can be asked if market power does also affect sustainability. If so how? Is it negative or positive for sustainability? Thus, can market power be the cause but also the cure? Another question is, whether sustainability affects market power as well, and if so, how?

When we want to draw a relationship between sustainability and market power we can distinguish between a narrow understanding and a comprehensive understanding of market power. The first instance would be asking whether price and output distortions caused by market power are related to sustainability. The second instance would be asking whether other abilities born out of market power (the ability to reduce competition, the ability to set industry wide standards, the ability to effectively lobby, the ability to introduce entry barriers, the ability to start a price war), are related to sustainability.

There are many reported cases of market power affecting sustainability (Clapp and Fuchs 2009). Maxwell and Briscoe (1997) illustrated DuPont's key role in phasing out chlorofluorocarbons (CFC) (for a more recent example regarding DuPont see: Bjørnåvold and Van Passel 2017). Another positive example from the refrigerator industry is listed by Puller (2006). While these are positive examples, industry lobbies also have blocked the implementation of stricter regulations (Myllyvirta 2015, HRC 2017). Puller (2006) delivers some examples from the car industry that illustrate companies' strategic behavior in this regard. Economic agents may impact sustainability through lobbying, and also through altering their own business operations, such as the "greening" of Walmart (Meeks and Chen 2011). When the number one Fortune 500 company (Time Inc. 2017) changes its business practices, we can assume the impact will be larger than when a small company takes the same action (Dauvergne and Lister 2012). In a recent study,

Pulker, Trapp et al. (2017) investigated the link between supermarket power and human health, which is related to sustainability (Tilman and Clark 2014). Pulker, Trapp et al. (2017) characterize supermarkets as gatekeepers that exercise instrumental, structural and discursive power through which they influence consumer's nutrition (Hawkes 2008). Parker and Scrinis (2014) emphasize that supermarkets do not only hold economic power, but political power as well. Thus, they do not only determine terms of trade, which is a manifestation of their market power. They moreover have regulatory power⁵, which allows them to set industry wide standards and influence consumers' taste or willingness to pay.

The notion that market power and sustainability are connected is in fact not new. Solow (1974) highlighted that in 1931 Hotelling was referring to the tendency that a monopolist would slow down the exhaustion of a mine (Devarajan and Fisher 1981). Obviously entertained by this revelation, he stated: "The amusing thing is that if a conservationist is someone who would like to see resources conserved beyond the pace that competition would adopt, then the monopolist is the conservationist's friend" (Solow 1974). This tendency to preserve natural resources can be seen as an unintended, if even positive, side effect. The main reason for the monopolist to reduce the extraction is to maximize profits. Market power as a market failure and its relationship with sustainability has not received the same attention as externalities or missing markets. That is despite the fact that Hotellings' observation predates the renewed interest in sustainability issues in the 1960s and was brought up again by Solow (1974) in a time when the sustainability discussion resurfaced.

There is indeed literature investigating the effect of market power on resource depletion (Datta and Mirman 1999, Gopinath and Wu 1999, Cinner, Marnane et al. 2005, Damania and Bulte 2007, Halsema and Withagen 2008, Kotchen and Salant 2009, Fischer and Laxminarayan 2010, Fischer 2011, van der Ploeg and Withagen 2012, Cabo, Martín-Herrán et al. 2014). However, the relationship between market power and sustainability has not generated a wider scientific interest. This is once more surprising as the role of businesses and of power imbalances is mentioned several times in the Brundtland Report⁶ (WCED 1987)

⁵ In Chapter 3 power is discussed in more detail.

⁶ Here are examples:

"It could be argued that the distribution of power and influence within society lies at the heart of most environment and development challenges."

"But many problems of resource depletion and environmental stress arise from disparities in economic and political power."

which coined the sustainable development definition. The Sustainable Development Goals (SDGs) interestingly do no longer mention the relevance of power imbalances in relation with the market sphere (United Nations 2020).

A more recent book looking at sustainability being a successful strategy to increase competitive advantage by Laszlo and Zhexembayeva (2011) indirectly discusses the connection with market power. The idea of increasing the competitive advantage by using a specific strategy can be connected to ideas already developed by Porter (1985). The downside of using sustainability merely as a business strategy is highlighted in Chapter 3. Laszlo and Zhexembayeva (2011) argue that the sustainability challenge should not lead to a “bolt on” strategy, which increases costs, but to an embedded sustainability strategy that improves the company’s competitiveness (see also: Dauvergne and Lister 2012, Loorbach and Wijsman 2013). They come up with seven factors⁷, each of which does not only permit the supply of sustainable products at competitive prices, but also have the potential to create market power. Laszlo and Zhexembayeva (2011) propose that in order to embed sustainability within the company profile and transform the cost of sustainability into a comparative advantage of sustainability radical innovation is needed. Thus, a comparative advantage may allow a company to become a market leader and obtain market power.

This introductory Chapter indicates that there is a relationship between market power and sustainability. Thus, further investigations to unravel more details about the character of this relationship are due. The remainder of this thesis will dig deeper into the relationship between market power and sustainability to answer the following research questions:

“If economic power and the benefits of trade were more equally distributed, common interests would be generally recognized.”

“But mutual suspicions still exist, usually because of an asymmetry in bargaining power between large corporations and small, poor, developing countries. Negotiations are often made one sided by a developing country's lack of information, technical unpreparedness, and political and institutional weaknesses.”

Another example is Box 3-3 within Point III Enabling Sustainable Development. The Box is about the role of transnational corporations and lists the involvement of large international companies in different sectors (foreign direct investment in developing countries in the sectors: manufacturing, mining and other extractive industries, agriculture and trade).

⁷ The factors are: 1) risk reduction, 2) improved efficiency, 3) differentiation, 4) niche markets, 5) brand enhancement, 6) lobbying for standards, and 7) radical innovation

Are market power and sustainability related in agri-food systems?

If a relationship can be found further sub-questions are:

- a. How are market power and sustainability related?**
- b. Is the relationship between market power and sustainability unidirectional or a bidirectional relation?**
- c. Is the relationship between market power and sustainability positive or negative for sustainability?**
- d. What does the character of the relationship between market power and sustainability imply?**

To answer the research questions, this thesis is structured as follows (see Figure 3 for an outline of this thesis). In this introductory chapter the two main subjects, sustainability and market power, are outlined. Both subjects were only discussed briefly, while certain aspects that are important for the matter at hand are discussed in more detail in later chapters. It is clear that complex subjects such as market power and sustainability cannot be discussed in all their detail. Hence, only those aspects relevant to answer the research questions are discussed with more depth. After this concise outline of the main subjects, a first attempt to answer whether market power and sustainability can be related or not was undertaken. Given the fact that both subjects are of high importance for our society, it is assumed that research connecting both concepts does already exist. To identify existing research about this connection a literature review was performed, which is presented in Chapter 2. While this literature review allowed to identify aspects of market power that are potentially related to sustainability, none of the screened literature made the direct link. The found aspects of market power made it obvious that the subject is broader than it appears from basic economic textbooks. A study of the concept of power itself was missing.

In Chapter 3 the power term is dissected and discussed taking a broader perspective, whereas the before identified aspects of market power reappear. Apart from dissecting aspects of power, the mechanism of power is identified and discussed. This allowed to add another aspect (teleological aspect / paradigm) and a systems thinking perspective. A model is introduced that not only illustrates the mechanisms of power, but also allows the analysis of situations that involve power. Since power aims at achieving something, adding the teleological aspect of it, is key to understand power mechanisms. Understanding sustainability as one possible goal (teleological aspect) we can analyze market power as a force that strives towards the fulfillment of this goal. Clearly, which goal is set is a political and ethical question, whereat setting or exchanging goals involves the same power mechanisms that are explained in Chapter 3.

Chapter 4 expands on the question of sustainability. This is, as the term itself allows at least two distinct interpretations, weak and strong sustainability. First sustainability needs to be defined, otherwise it is not clear what we want to achieve. While we can differentiate between two main interpretations of sustainability, it is argued in Chapter 4 that only one of them is legitimate. The other interpretation of sustainability is a *contradictio in adiecto* and is hence impossible to be fulfilled. Furthermore Chapter 4 uses the example of the Green Revolution to explain the importance of innovation narratives to achieve sustainability.

Chapter 5 and Chapter 6 introduce case studies. In Chapter 5 market power within the Belgian sugar beet value chain is analyzed. Systems thinking is introduced to investigate which aspects lead to the development of market power in this specific case. Chapter 6 makes up a comparative study of the value chain of sugar beet in Belgium and rape seed in the German region Wetterau. The value chain is analyzed and farmers' strategies to deal with power imbalances are investigated. These two case studies exemplify how the complex phenomena of market power can be analyzed. Thus, they illustrate how to make use of the insights established throughout this thesis.

Finally, Chapter 7 concludes this thesis, by reviewing how the research questions were answered. Furthermore, the methods used and schemes developed within this thesis are connected and discussed. The limitations of undertaken research are outlined and ideas for future research resulting from these limitations are presented.

In summary, more detail to the answer on the relationship between market power and sustainability is added in Chapter 2 and this chapter investigates how the two phenomena are connected. An answer to the question about the directionality of the relationship between market power and sustainability is given in Chapter 2. More detail to that question is added in Chapter 3, where the dynamics between the two phenomena, which are there identified as paradigms, are unraveled. Chapter 3 illustrates the relevance of defining sustainability. In the concluding Chapter, it is explained how this example answers the question whether the connection between market power and sustainability is positive or negative. Chapter 5 and 6 represent case studies that illustrate the facets of market power aspects. Chapter 7 concludes the thesis answering the research questions, summarizing the main findings, the methods used, and schemes developed.

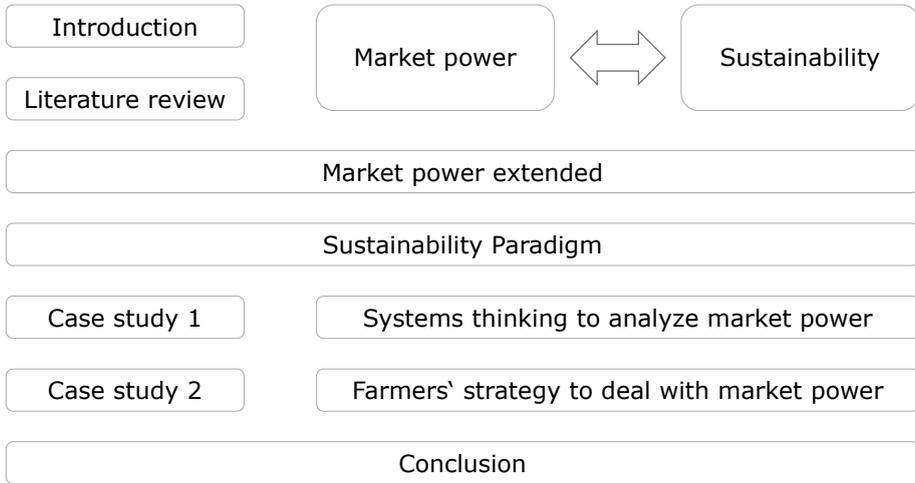


Figure 3: Thesis outline

Chapter 2.

Market power and sustainability: a literature review

1. Introduction

The previous chapter illustrated that connecting sustainability and market power is not trivial, but a necessary step. Market power is a market failure of increasing importance, particularly in the agri-food sector. Market power is in itself an issue that calls for governmental regulation to assure proper functioning of the markets. It could be shown that other market failures such as externalities or missing markets do affect the natural resource management, extraction, consumption and exhaustion. Given the fact that sustainability is one of the major challenges of the 21st century, all phenomena that present the sustainability transition need to be identified and studied. There are indications of a connection between market power and sustainability. This bares the question whether literature connecting both concepts does already exist. To this end a literature review was performed. The literature review shows that a direct connection between market power and sustainability is hardly found in the screened literature. Further the main topics within this body of literature are innovation and resource management. While a connection between these topics does not exist in the screened literature, particularly innovation has shown to be of greater importance also for the market power discussion. Five aspects (innovation, differentiation, lobbying, standards and labels, policies) have been identified that are not only relevant for market power but also for sustainability. This chapter provides a broadened understanding of market power, which then also provides several contact points between the two phenomena.

The remainder of this chapter will first expand on the methods used for the identification and analysis of literature. Then the results are presented. First the results from the network analysis are discussed, which provide a concise overview of the reviewed literature. This is followed by the presentation and discussion of the aspects identified within the literature. Finally, the findings are discussed in the concluding section.

2. Methodology

In order to screen literature that potentially connects sustainability with market power an integrative literature review was performed (Cooper 1982, Whitemore and Knafel 2005, Luederitz, Meyer et al. 2016) following the steps of 1) problem formulation, 2) data collection, 3) analysis of the data and 4) presentation of the results. An integrative literature review was chosen over a systematic literature review as the research question aims at combining knowledge from two separate

fields (sustainability science and economics), thus creating new knowledge (Torraco 2005, Kohtala 2015). As not only qualitative research material was analyzed but research applying different kind of approaches, the integrative literature review was appropriate, in contrast to a meta-synthesis (Thorne, Jensen et al. 2004) or a meta-analysis (Whittemore and Knafl 2005).

For the integrative literature review, peer reviewed articles provided by scientific databases were used. These data bases were ProQuest, ScienceDirect and Web of Science. The search engines were fed with the terms market power, market concentration, vertical integration, monopoly, oligopoly, collusion, mergers and imperfect competition. Each of these terms were combined with the term sustainability⁸. The search terms were identified during the research on market power and its characteristics. The literature review, including publications within the years of 1997 to 2016, was conducted as an iterative process, hence, terms used in already screened literature were taken to refine the literature search. This was done to reduce the chance of overlooking relevant literature. Moreover, the literature search was combined with the “ancestry approach” (Cooper 1982:295), tracking the citations of screened articles. This was again done to reduce omitting relevant articles (Whittemore and Knafl 2005). Apart from peer reviewed articles, economics textbooks were consulted to learn more about the general definition and implications of market power (Cabral 2000, Lipsey and Chrystal 2015). One of the research areas is sustainability, which is extensive (Hugé, Waas et al. 2013), even forming a discipline on its own (Jerneck, Olsson et al. 2011). As it is impossible to screen all articles on sustainability the “theoretical saturation” approach was adopted (Strauss and Corbin 1998:212, Hacking and Guthrie 2008, Finfgeld-Connett 2014). The aim of this literature review is to investigate whether research about the connection between market power and sustainability does already exist and what is stated about this connection within this body of literature.

From the key word search 272 papers were included in the first analysis. From these 57 papers remained that were relevant for the research question and were used for the consequent thorough analysis. The percentage of papers (21%) used for analysis is explained by the broad employment of the term sustainability. The results section expands on this matter. First, all papers resulting from the search on ProQuest and ScienceDirect were screened. The literature query was extended to Web of Science, only using the search term market power. Despite monopoly providing most results, the search was not repeated due to “theoretical saturation”. Generally, all articles were screened by their titles and abstracts to decide upon their relevance for this research. If screening of titles and abstracts

⁸ In ScienceDirect the key word search was limited to “title, abstract, keyword”, in ProQuest to “anywhere except full text” and within Web of Science to “topic”.

did not provide clarity pertaining the in- or exclusion of an article, the whole article was read to take a decision in this regard.

3. Results

Despite connecting market power terms with the term sustainability in the query, it has to be pointed out that in many cases no causal relationship between sustainability and market power was discussed in the respective articles. Earlier (see Chapter 1) it was pointed out that the sustainability term is blurry and has many different meanings depending on who is using it for what reason. This problem of a lacking consistent definition became obvious during the literature review. Some articles were part of the search result, but did not contribute to the analysis at all, as the sustainability term was used in order to convey the general meaning of viability or continuation, instead of the more specific meaning of sustainability coined by the Brundtland report. For example⁹ Song (2009) used the term "sustainable competition" with which Song meant competition that allows the viability of the industry. While some researchers argue that the meaning of the sustainability term changes with the context (see for example: Costanza and Patten 1995, Hugé, Waas et al. 2013) Shearman (1990) disagrees, stating that the term is usually connoted with continuation¹⁰. Using the term sustainability gives rise to related normative and value laden questions. To avoid this, other terms could be used. For example, Song (2009) could have used the

⁹ Other examples are Sharkey, W. W. (1981). "Existence of Sustainable Prices for Natural Monopoly Outputs." *Bell Journal of Economics* **12**(1): 144., Bauzon, S. (2015). "Classical distributive justice and the European healthcare system: rethinking the foundations of European health care in an age of crises." *The Journal of medicine and philosophy* **40**(2): 190-200., or Li, G. (2009). "Can the PRC'S new anti-monopoly law stop monopolistic activities: Let the PRC'S telecommunications industry tell you the answer." *Telecommunications Policy* **33**(7): 360-370.. Also the textbook by Pindyck, R., S. and D. Rubinfeld, L. (2015). *Microeconomics*. Edinburgh, Pearson. refers to "significant and sustainable market power." We assume what Pindyck and Rubinfeld mean is sustained instead of sustainable market power.

¹⁰ For an overview of the sustainability term's meaning see Glavič, P. and R. Lukman (2007). "Review of sustainability terms and their definitions." *Journal of Cleaner Production* **15**(18): 1875-1885.

differentiation between perfect and imperfect competition, by employing the term optimal competition instead.

Apart from this, sustainability was mostly related to technologies, similar to the sustainability strategy suggested by Laszlo and Zhexembayeva (2011). We could not identify literature that discussed the connection between sustainability and market power in general. Instead we found specific, individual cases related to market power issues that are also connected to sustainability. Nevertheless, it is aimed to draw general conclusions from the analyzed body of literature.

The literature was analyzed in two separate steps. First, the main themes of the articles were collected as keywords. These key words are not the ones that got assigned by the respective authors of the articles but by the following procedure. First a short summary of each article was prepared. This allowed to gain an overview over the body of literature and to already identify certain themes. In a second run, key words were assigned that further summarize the main points within the summary. To keep the list of key words short it was aimed to find terms that cover different but similar topics. For example, the key word "resource management" was assigned to articles about fisheries, exploring issues of overfishing or optimal fish stock. But also, literature dealing with hunting or the extraction of fossil fuel was assigned with this key word. Assigning key words aimed at understanding what the main topics are and how they might be connected. Second, the articles were analyzed to find aspects that are relevant for the connection between market power and sustainability. All used articles are found in the APPENDIX. A concise summary of each article is provided alongside key words that were attributed to the articles.

3.1. Network analysis

For the first step, two to four key words were assigned to each article. It became apparent that certain themes were recurring. Hence, literature that relates market power with sustainability (usually indirectly) deals with specific topics. 45 key words were assigned, with "Innovation" (IN) and "Resource Management" (RM) being the most prevalent, after "Market Power" (MP) (see Figure 4). MP contains different types and degrees of market power, such as Monopoly, Duopoly, or Oligopoly. To simplify the analysis these terms have been accumulated. However, it is noteworthy to point out that within the literature all types of market power have been used, with monopoly being the most prevalent one. Other terms related to market power among the top ten key words are "Concentration" and "Competition". The other top ten key words are "Policies", "Infrastructure", "Biotechnology", "Food" and "Fisheries".

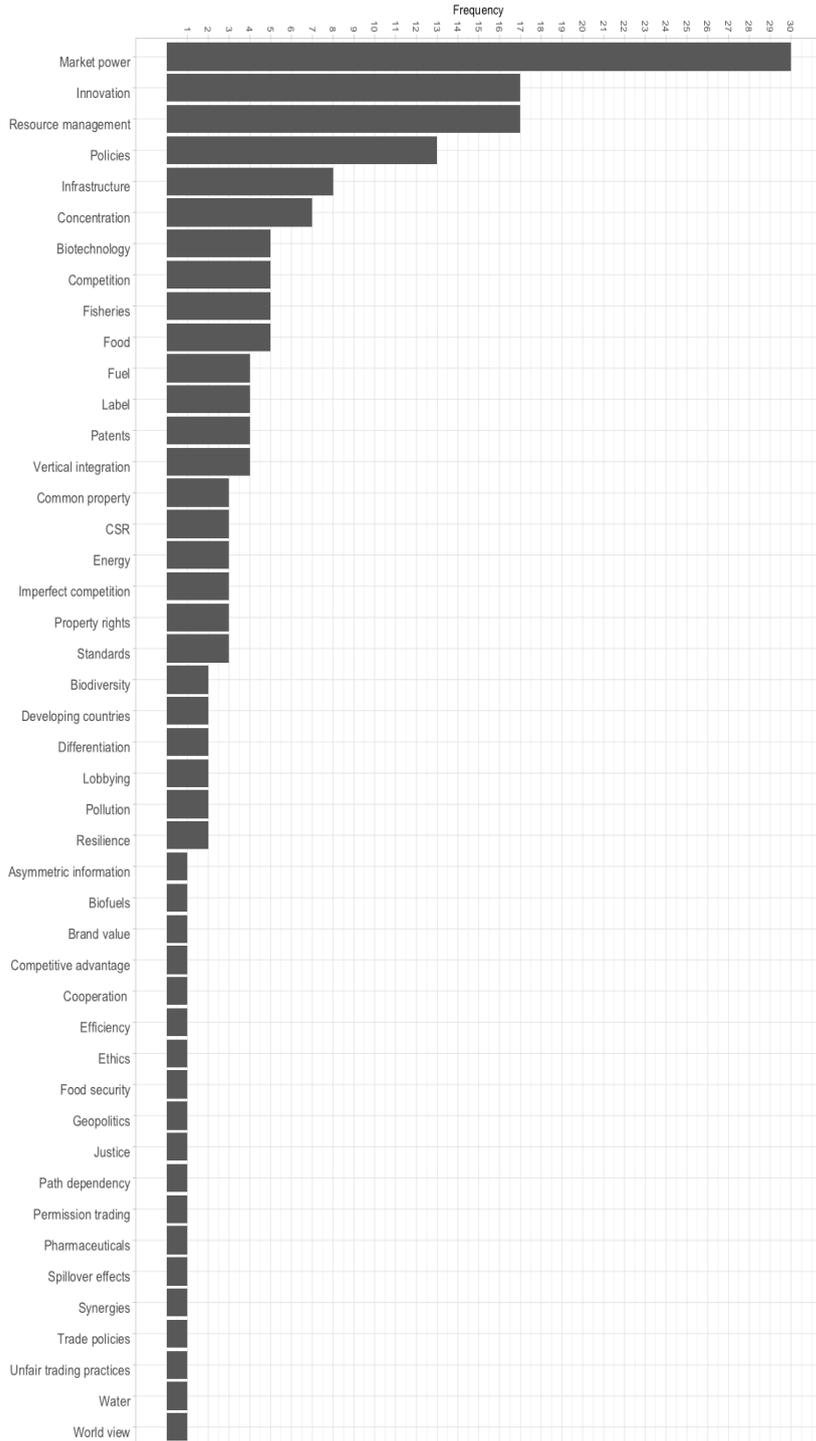


Figure 4: Frequency of assigned key words

In order to better understand how key words are related with each other, a network analysis was performed. Figure 5 illustrates the result of this analysis. The network was computed using the Igraph package of the R software. The size of each node is determined by its degree, which is the number of its adjacent edges (Csardi 2020). The width of the edges (connections between nodes) reflects the edge weight. Thus, the thicker the line, the more often the two nodes are connected. Similarly, as Figure 4, the network highlights the frequency of assigned keywords. Additionally, the connections between them can be analyzed. In order to further simplify the network, two networks have been computed, which only display direct connections from IN and RM. These can be seen in Figure 6.



Figure 5: Network of all assigned keywords

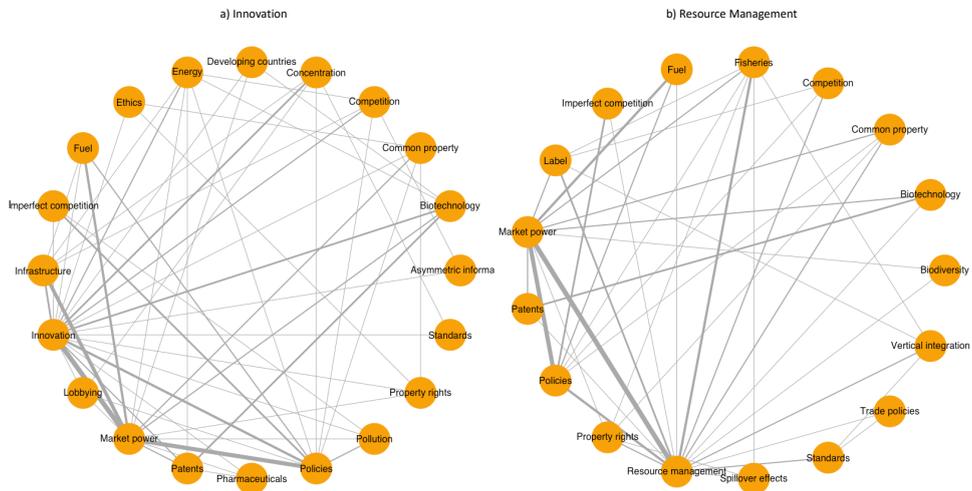


Figure 6: Networks "Resources Management" and "Innovation"

Although IN and RM are the most important keywords (apart from "Market Power"), they have no direct connection. Both networks show the strongest connection with MP (8) and "Policies" (7). This illustrates the importance of the political sphere for market power questions within the literature. The two aforementioned connections could be found in both networks, with the same weight. The IN-Network (INN) has 14 connections more than the RM-Network (RMN). Thus, while IN and RM have been assigned equally often to the references, IN is more connected to other key words. This is also seen by the sum of connections between IN and other key words, compared to RM and other key words. IN has 38 direct connections, RM has 36. Both networks have unique connections. Within the RMN those are with the keywords "Biodiversity," "Fisheries," "Labels," "Spillover Effects," "Trade Policies" and "Vertical Integration." Within the INN the key words are "Asymmetric Information," "Concentration," "Developing Countries," "Energy," "Ethics," "Infrastructure," "Lobbying," "Pollution" and "Pharmaceuticals."

Pertaining market power issues, it is interesting that RM is connected with "Vertical Integration" while IN is related to "Asymmetric Information". Indeed, this is only a snapshot of the literature analyzed and does not allow to make general assumptions about this connection. Nevertheless, the networks allow to reflect about main elements of the analyzed literature. The RM references often looked at issues within the fisheries sector and how the management of one area affects another one (spillover effect). Vertical integration was discussed in the relation to labeling efforts which call for an integrated value chain management. Within this body of literature, the connection to sustainability is clear. All of these

references do not only deal with sustainability, but also with market power issues, building clear cases on the connection between the two. The IN references thematized infrastructure topics and questions of natural monopoly. In that regard infrastructure was mostly related to energy provision and the question on how to innovate the provision but also the source of energy. The need to innovate is not least due to pollution, along the provisioning infrastructure but also at extraction sites. It was related to questions of ethics, and also with another main strand within the IN literature, biotechnology. Biotechnology does not have a unique connection to innovation, as one article referred to biotechnology as exhaustible resource that needs to be managed properly. Nevertheless, biotechnology along with patents was mostly discussed within the IN literature. Within these references, market power was connected to patents as well as to asymmetric information. Biotechnology and sustainability are connected as well, however, sustainability was only a side note in these references. Thus, the connection between market power and sustainability was implicit, and was not discussed explicitly in the selection of papers.

3.2. *Aspects relating market power and sustainability*

The aspects are derived from keywords assigned to the literature and aim at summarizing aspects most important for market power and which also connect to sustainability. Of course, as shown by the network analysis, aspects are connected to each other. For example, innovation and differentiation can be related. Both can also be related with another aspect of market power; entry barriers (Lipsey and Chrystal 2015). Entry barriers are however connected with for example standards and labels as well. Patents are connected to innovations, as such potentially also to differentiation, as well as to policies. Vertical integration is another key word, that is relevant for a series of aspects, such as innovation, differentiation or standards and labels (Cabral 2000). While all aspects seem to be connected, they are however, presented separately.

Five different aspects could be identified in the literature that are connected to the emergence of market power issues and that are relevant for sustainability as well. These five were summarized in three categories (see Table 1).

Capacity		Communication		Structure
Innovation	Differentiation	Lobbying	Standards and labels	Policies

Table 1: Market power aspects

3.2.1. Capacity

Innovation

Innovation is not the same as an invention, neither are they conditioned by each other. The innovation is a groundbreaking change or novelty; however, an invention does not need to be groundbreaking (Brozen 1951). Innovation does not only pertain to technology but can be related to all aspects of life. For example business models (Schaltegger, Florian et al. 2012), social systems (Olsson, Moore et al. 2017), or supply chains (Kusi-Sarpong, Gupta et al. 2019) can be innovative. Thus, an innovation can be about how things are organized, whereat this innovation exhibits a fundamental improvement of the previous situation.

Indeed, innovations do not need to support sustainability. Leach, Rockström et al. (2012) argue that innovations need to be directed in order to tackle sustainability issues. In contrast Schaltegger and Wagner (2011) argue that sustainability innovation needs entrepreneurs who strive to positively contribute to sustainability. They also argue that sustainability innovations call for radical innovations, which create completely new markets and present a disruption for producers and consumers alike. According to their research such radical innovation is more likely for start-ups and small businesses.

Similar results were found in the performed literature review. Hart (2004) modelled technological change, showing that environmental damage promotes abatement, but also the quantity and orientation of research. He further discusses that companies investing in new technologies usually exert market power, which causes underinvestment in research. This effect can be counteracted through governmental intervention. Thus, the sustainability challenge triggers more research, which leads to market power. Depending on the market structure and circumstances, market power, on the other hand, can lower investments in new technology and therefore lowers the impact on the sustainability transition. Hence, policy intervention is needed to counterbalance the effect of market power and to stimulate continuous innovation. On the other hand, depending on the market structure policy intervention may not be needed to initiate innovation (Puller 2006). Cambini (2009) report that lower market concentration is related to higher investment. Dereli and Altun (2013) indicate that innovation is often seen as a strategy to survive, while on the other hand it can also be a successful strategy "being an (early) imitator." Moreover, they state that the profits gained from innovation depend on the timespan between successful commercialization and imitation. Lipsey and Chrystal (2015) refer to Schumpeter's theory, stating that monopolists need to keep investing in order to maintain their position. Through creative destruction entry barriers may be precluded and a monopoly may fall. These two contrasting views about market power and innovation are expressed in two different theories. Joseph Schumpeter argued that market power

leads to more innovation, while Kenneth Arrow stated the opposite. Up to now the consensus is that the issue of market power and innovation is complex, hence there is no clear cut relationship (Gilbert 2006, Carrier 2008). Several factors influence the effect of market power on innovation such as a) product or process innovation, b) drastic or non-dramatic innovation (Calantone 2000), c) the respective industry (Gilbert 2006, Carrier 2008). Clearly, whether an innovation supports sustainability depends on the innovation. Path-dependencies can lead to a lock-in that counteracts the development and application of sustainability supporting innovations (Oberling, Obermaier et al. 2012). The relationship between innovation and market power is not clear and depends on the specific circumstances. However, innovations are a key to support sustainability. Accordingly, the dynamics between innovation, market power and sustainability need more attention.

Differentiation

Product differentiation is a strategy to make a product stand out on a respective market based on its product characteristics and aims at triggering consumers' specific taste. The more a product differentiates itself from alternatives, the more market power may the respective company obtain (Cabral 2000). A well-known case are the tech companies Windows and Apple who offer the same product (personal computers), but with a distinct operating system. One aspect through which products can be differentiated is sustainability. There is of course not only one sustainability characteristic but many, which are usually communicated through labels. To profit from this differentiation, the performance pertaining a specific label matters less, than simply using a label (Dekhili and Akli Achabou 2014).

The label itself is not only a means of differentiation but also a way to generate market power. Having or not having a specific label can influence a company's revenue. The endeavors to create one's own label is explained by their intention to circumvent difficult eligibility processes and differentiate on a respective market (Hadjimichael and Hegland 2016). Differentiation can also be a means to explore alternative markets as a reaction to changed circumstances. Oberling, Obermaier et al. (2012) investigate the differentiation endeavors of oil mayors as a reaction to the call for alternative fuels. Their research also highlights that those already in power will determine the path ahead. Regulations can cause product differentiation which can then also lead to price distortions (Chakravorty 2008). This is a clear case where the quest to more sustainability causes market power. The case study presented by Purnomo, Guizol et al. (2009) is an instance of a private label, which is a means of differentiation, creating an entry barrier and thus, giving rise to market power considerations. Differentiation is one clear example of how the demand for more sustainable products can generate market power issues.

3.2.2. *Communication*

Standards and labels

Standardization allows the harmonization according to specific criteria. A standard can apply to processes as well as to behavior (such as a code of conduct, or supply chain governance). Thus, standards are not only limited to technology, but can help regulating social aspects of life as well. Labels are a means of communication, transmitting information about quality, composition, or danger of something by visibly marking it. Labels potentially allow consumers to have easier access to relevant information. Pertaining sustainability there are already many labels on the market, such as energy-efficiency, organic farming, palm-oil free, fair-trade, CO₂-neutrality or toxicity labels. Labels and standards do not have to be initiated by governmental regulations, but can also be businesses' or industries' invention to harmonize production processes (Henson and Reardon 2005) or satisfy consumer demand (Riganelli and Marchini 2017). Standards and labels are not only a means of communication but also a means to secure market share. Henson and Reardon (2005) argue that in the agri-food sector competition shifted from a mere price to a quality competition. They further point out that standards are not only a means of communication but also a means of differentiation.

Standards and labels can be entry barriers, thus contributing to market power issues. Greenberg (2013) analyzed the South African wine value chain indicating the importance of sustainability standards for the sector. Any company that is not able to comply with the minimum standards cannot participate in the market. Additionally, particularly in fragmented markets transaction costs for labeling are too high and, thus, also foreclose small players (Ebeling 2009). In this respect the sustainability challenge which leads to the demand for sustainable products and the introduction of sustainability standards represent entry barriers. Vos (2014) analyzes the effect of private standards in the water industry, consolidating market power. Some of these standards are not due to the sustainability challenge but rather reasoned by tractability¹¹. Still, companies use standards and certifications to satisfy the demand for more sustainable products. While smaller companies may be at a disadvantage pertaining labeling and standardization costs, compliance becomes even more important for large companies. Gulbrandsen (2006) elaborates the reason for eco-labeling, finding that it is not demand but NGOs' power to name and shame that makes companies and retailers applying private standards. Moreover, NGOs target big companies as leverage, rather than small ones (Leat 2011, Schleifer 2016). Market power related to labels

¹¹ In the highly complex commodity chains of the global market standards can be used to simplify the complexity Gereffi, G., J. Humphrey and T. Sturgeon (2005). "The governance of global value chains." Review of International Political Economy **12**(1): 78-104..

is interesting as it illustrates vertical power structures. Foley (2016) analyzes the Marine Stewardship Council (MSC) eco-label, originating from the Unilever company and initiated by WWF, that lost part of its market power due to the decision of Walmart, the biggest retail chain globally, to support also other labels. A similar case was reported by FAO (2015) in the banana sector. Thus, market power on one level can be mediated by market power on another level.

Lobbying

Lobbying is the provision of information from interest groups and experts to policy makers. This information can of course influence the decision of policy makers. Policy makers depend on this information source to a certain degree, since it is a fast way to gain understanding on matters they have to take decisions on. De Bruycker (2016) differentiates between two types of lobbying; 1) technical, legal and economic expertise and 2) political information. Those who provide information usually have a stake in the decision to be taken and thus have an interest to shape the decision in the preferred direction (Sharif and Swank 2019). The act of lobbying has rather a negative connotation, it is however, argued that lobbying is necessary to provide balanced information to policy makers (Bauer 2015). However, the ability to deliver unbiased information can be questioned (Cotton and Déllis 2016). Within the European Union, the Alliance for Lobbying Transparency and Ethics Regulation (ALTER-EU) investigates and reports about lobbying as well as the problematic position of big business in advisory groups for policy makers (ALTER-EU 2013, ALTER-EU 2018).

The introduction of standards and labels can be influenced by lobbying. The literature review revealed an example of lobbying in the business highlights section of the Journal "Biofuels, Bioproducts and Biorefining." It is reported that complaints by the industry about an UN report led to the review of their interim report. (Cozier 2008) and Puller (2006) deliver a couple of examples about companies influencing decisions pertaining standards. These examples illustrate not only that companies lobby for the reduction or delay of standards, but they also illustrate the opposite. Increasing standards can provide a competitive advantage for companies who have the technology ready (Hammoudi, Hoffmann et al. 2009). Such strategic disruption aims at increasing competitor's transaction costs (Averyt and Ramagopal 1999, Bruce 2015). Hence a sustainability strategy can increase or consolidate a company's market share.

Another form of lobbying can be added, Corporate Social Responsibility (CSR), or how Lock and Seele (2018) call it "politicized CSR." It has been pointed out above, that the companies take over tasks of governments. Their benevolent actions can be ascribed to their CSR activities, which can be marketed to support the company's reputation. Roberto Scharf, Fernandes et al. (2012) report from a bank that invests in CSR to increase their brand value. Hicks (2010) indicates a

connection between firm size and the likelihood to engage in CSR activities. He points out that larger companies are more likely to take up CSR activities, as they do have the financial means to do so. The relationship between national governance and CSR is highlighted by Schleifer (2016). He finds that internationally operating companies diverge their CSR efforts depending on the respective country. It is argued that consumer's preferences influence a company's incentive to invest in CSR. Thus, in developing countries consumer's preferences lead to reduced CSR efforts. This finding opposes the notion that companies would take over governmental responsibilities and rather indicates that companies intend to respond to consumers' demands. Hence, CSR may mostly be a means to improve a company's reputation and thus its market share.

3.2.3. Structure

Policies

As mentioned above, sometimes governmental intervention may be needed in order to support the sustainability transition. The literature review provided cases that indicate that policies can lead to market distortions, promoting market power. Policies aiming at improving sustainability may have the opposite effect as intended since higher prices can lead to lower adoption of (more) sustainable practices and purchase of (more) sustainable commodities (Chakravorty 2008, Hughes 2011). Such examples show that policy makers need to be careful in the formulation of environmental policies as they may create unintended effects, that countervail environmental protection. Hareau (2006) describes lower adoption of biotechnology due to price mark ups caused by market power of multinational corporations in the seed industry. The sustainability of genetically modified plants is another discussion (Nowicki 2000). However, assuming a general case of the development of more sustainable agricultural technologies, low adoption due to price distortions would indeed affect sustainability negatively. Governmental intervention may not always be the most efficient way to achieve a certain goal. The socio-economic system is complex and the ways in which it works is often disguised. Therefore, thorough analysis of policies to support sustainability is needed. Another interesting example of governmental intervention, which went wrong, was reported by Erik S. Reinert (2006). He examines how the Finish government wrecked the traditional Finish reindeer industry, although a monopoly on reindeer herding was in place.

This subsection starts with pledging that in some cases governmental support may be needed to support sustainability. In fact, the absence of governmental regulation can be a hindrance to the quest towards sustainability. While EU and national anti-trust regulations of EU countries aim to make sure that market power is disabled, they can pose a hindrance to the sustainability initiative. This has been showcased by two initiatives in the Netherlands. Energie Akkoord as well

as Chicken of Tomorrow are initiatives that support sustainability industry-wide. The former in the energy sector, the latter in the food sector. However, both initiatives intended to integrate several players within the sector making them cases for anti-trust legislation. Finally, neither initiative was allowed to continue, due to market power issues (Toma 2016). Competition law can present a hindrance to sustainability initiatives and is put on the agenda of EU institutions since (CoR/EESC 2019, FTA 2019). From this it can be concluded that if an industry intends to change practices industry wide, standards need to be enacted by governments in order to not infringe anti-trust legislation. The two above mentioned cases thus also represent instances in which legislation is slower than industry in making considerable changes towards sustainability. This is in contrast to individual actors implementing standards within the industry. It has to be noted that particularly from large actors, it is often expected to regulate quality through the installation of standards (Freidberg 2020).

4. Discussion

The literature review revealed that market power and sustainability are often implicitly linked, but not discussed explicitly. Within the reviewed literature two main areas could be identified, innovation and resource management. Both are pivotal to tackle the sustainability challenge (Pasqual and Souto 2003, Rammel, Stagl et al. 2007, Leach, Rockström et al. 2012, Seebode, Jeanrenaud et al. 2012). The review also indicates the relevance of policies, not only in the sector of resource management (Ascher 2001), but also in the sector of innovation (Fagerberg 2018). Policies being of such importance within the literature review, indicates that market power is not limited to the market sphere. This is also reflected by the aspects, one of which was labeled policies. Since policies structure the socio-economic system it was attached to the category structure. Depending on the economic school of thought, more or less intervention by the state is demanded. However, some degree of governmental intervention might always be needed. Therefore, a strict separation between economics and politics is impossible. This lends the conclusion that market power is not limited to the market but transcends it. A common argument against governmental intervention is that this leads to market distortions. In fact, the literature review did include such examples (Hughes 2011, Arfaoui, Brouillat et al. 2014). While the interventions intended to support sustainability, they influenced the market in a way that reduced or annihilated the intended positive effect. However, markets fail also without the influence of policies. Natural monopolies are one example, externalities are another one. These market failures call for political intervention to reduce the harmful effects (Fletcher and Büscher 2017).

The category communication contains the aspects of lobbying and standards and labels. Both are examples of the blur between the economic and the political sphere. The analysis showed that companies do influence policy makers through lobbying. Sometimes such lobbying activities are directly related to the implementation of standards and labels (Puller 2006). Hence not only does the political realm affect the market, but the economic realm does also influence politics. This influence is not merely a coincidence but is targeted and intended. The review showed that lobbying as well as standards and labels are connected to market power issues. CSR activities have been included here as well. These activities are not necessarily lobbying as such, though they are used to communicate measures taken up by a company. These measures are often related to governmental responsibilities and are thus another example of the transcendence of the economic sphere into the realm of governance.

The reviewed literature and the examples that were discussed therein have another common feature, the fact that our socio-economic system is complex (Rammel, Stagl et al. 2007). Sustainability science is characterized by high complexity (Clark and Dickson 2003, Martens 2006, Miller 2013). The result of this complexity is that the effects of actions or events are difficult to predict and estimate. Some of the literature assigned with the keyword "Policies" illustrate unintended side effects of policies that aim at protecting the environment (Hughes 2011, Arfaoui, Brouillat et al. 2014). These articles exemplify the difficulty to foreshadow all possible side effects of certain actions. Hence, complexity does not permit having a simplistic view on sustainability problems. Likewise, complexity does not allow simplistic answers or solutions to sustainability. This is, as well, the case when one wants to clarify the relationship between market power and sustainability. Market power and sustainability are connected. The reviewed literature does indirectly deal with this connection. However, based on the analyzed literature it is impossible to specifically characterize the connection between the two. The results from the reviewed studies are non-conclusive. The most prominent example is the divide between Arrow and Schumpeter.

Regarding innovation, market power and sustainability Einav and Levin (2010) pinpoint the ambiguous relationship: "higher market concentration can reduce static welfare due to less competition and higher prices, but the prospect of gaining market power can provide strong incentives for innovation with consequent welfare benefits." Innovation is needed to solve sustainability issues. Innovation may be spurred by the prospect of gaining market power and thus earning higher profits. Though, established market power can reduce welfare, which can be interpreted as social aspect of sustainability. In short, innovation may have positive and negative effects on sustainability at the same time. One effect is direct, the other indirect and can only be unraveled when one undertakes a comprehensive analysis on system level. Another example is in the sector of resource management. Some

references indicate a positive relationship between market power and resource management, others a negative one (Cinner, Marnane et al. 2005, Chen and Skonhoft 2013, Cabo, Martín-Herrán et al. 2014).

The very unsatisfying answer to the question on whether market power supports sustainability might be, it depends. It depends on the circumstances and on the exact matter at hand. The inability to give a clear-cut answer is not only based on the complexity of the socio-economic system we live in, but also on the complexity of sustainability itself. A label might for example be positive for environmental sustainability, but it can be negative for social or economic sustainability. A label may help the promotion of an environmentally friendly product, but the labeling process may act as entry barrier, or might simply be too costly to be implemented by all economic actors (Ebeling and Yasué 2009, Hadjimichael and Hegland 2016). One effect may be a reduced supply of environmentally friendly products by a greater number of companies. Another may be that companies may be pushed out of business. Literature related to labels provided an interesting insight into the dynamics between sustainability and market power. As pointed out, labels can represent an entry barrier, thus, potentially increasing market power. While market power can reduce welfare, it can also be instrumentalized by other actors to increase sustainability. Non-Governmental Organizations (NGOs) may make use of the greater leverage of large companies to promote the sustainability transition. They may use for example the strategy to name and shame large companies not applying sustainability measures in order to force them into change (Leat 2011, Schleifer 2016). This in turn may then force a whole industry to change in order to compete with these larger companies. Such instances are an example of a virtuous circle. Though, one still needs to consider negative side effects of higher prices due to market power. Nevertheless, such instances would support the theory, that the sustainability challenge leads to, consolidates and makes use of market power.

While aspects that are related to market power and to sustainability have been singled out in the analysis, it needs to be highlighted, that all of these aspects are interconnected. Clearly, policies affect all of these sectors. Labels and standards can act as entry barriers, they might be supported or hold back by lobbying activities and they might be related to innovations. It was shown in our analysis that all of these areas are not only prone to market power issues but are relevant for sustainability too. Though, since no clear-cut relationship could be deduced, proper analysis is needed for each instance.

The network analysis showed that innovation and resource management were not related. However, it needs to be emphasized that innovations need to tackle resource management in order to support sustainability. Not only should innovations serve resource management, resource management can be innovative as well. Thus, these two areas are indeed, related as well. Furthermore,

innovation and resources management being the most prominent topics it can be concluded that at least research is focusing on those two areas. However, it does not necessarily mean that the relevance of the market power – sustainability nexus is limited to these areas, nor does it say whether these are actually the most relevant ones. More research focusing on other areas may exist. As stated above, the blurriness of the sustainability term may lead to the exclusion of relevant literature. Thus, further research is needed to investigate areas for which the market power – sustainability nexus is most relevant. Further research needs to expand on the structural aspects of the market power – sustainability nexus. The network analysis showed that innovation is linked to asymmetric information and resources management to vertical integration. Since this review does only discuss a selection of papers no general statements can be made about the actual prevalence of these structures. However, if such patterns exist policies could be better targeted.

To analyze the relationship between market power and sustainability, the understanding of market power needs to be broadened. The literature review revealed that market power is not limited to the market. Lobbying delivers the most obvious example in this respect. Hence, a broader understanding of market power is necessary.

Chapter 3.

Market Power Extended: from Foucault to Meadows

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1. Introduction

On first sight, market power is easily explained, yet a second look indicates that it clearly is a much more complex issue. The European Parliament (2016) explored this complexity in a report on unfair trading practices in the food supply chain. The report noted that too narrow a definition of market power as the basis for antitrust legislation can result in the inability to prosecute certain practices with a negative effect on trading partners. Therefore, the European Parliament suggested the enactment of legislation to cover unfair trading practices stemming from power imbalances. The report provided a list of practices that transcend pricing and payment issues, suggesting that market power is more than the ability to charge a markup. Blaug (2001) indicated that the problem lies much deeper, in the understanding of competition. Orthodox economists assume that some sort of equilibrium can be reached: a state of optimum, a state of perfect competition, a state in which all competing forces are abrogated. However, Blaug (2001) challenged the existence of such an optimum, a final stage, and suggested instead that competition is an ongoing dynamic force. From this position, he concluded that quantitative assessments do not suffice, and qualitative assessments are needed.

Undoubtedly, a sustainability transition is needed (Daly 1996, Rockstrom, Steffen et al. 2009, Meadows 2010, Jackson 2017, Ripple, Wolf et al. 2017). The economy is inextricably connected with the environment. Past examples include the pollution caused by chlorofluorocarbons (CFCs), which thinned the ozone layer (Ball, Alsing et al. 2018), fertilizers that poisoned water supplies (Vitousek, Naylor et al. 2009), and acid rain that destroyed forests (Likens, Driscoll et al. 1996). In all cases, economic agents were part of the problem, although they can be part of the solution, too. It could be assumed that humans learn from past experiences. However, it can be observed that previous environmental problems have not served to eliminate the harmful effects of economic activities. An economic system built on growth necessitates a throwaway society, reflected in persistent food waste (Melikoglu, Lin et al. 2013), e-waste (Widmer, Oswald-Krapf et al. 2005), and plastic waste (Rochman, Browne et al. 2013) that can poison the environment and the food chain.

The connection between market power and aspects of the environmental dimension of sustainability has already been highlighted by Hotelling in 1931 (Devarajan and Fisher 1981). Studies that followed this observation focused on resource depletion rather than on sustainability as a whole (Datta and Mirman 1999, Gopinath and Wu 1999, Cinner, Marnane et al. 2005, Damania and Bulte

2007, Halsema and Withagen 2008, Kotchen and Salant 2009, Fischer and Laxminarayan 2010, Fischer 2011, van der Ploeg and Withagen 2012, Cabo, Martín-Herrán et al. 2014). However, the effect of market power on sustainability, in not limited to this one aspect. There are examples of market power positively as well as negatively affecting sustainability (Clapp and Fuchs 2009). DuPont makes up an interesting example as their role pertaining sustainability changed over the years. While they did lobby for the phasing out of chlorofluorocarbons (CFC) (Maxwell and Briscoe 1997), they later lobbied to keep their cooling agent in the market, despite the availability of more environmental friendly alternatives (Bjørnåvold and Van Passel 2017).

Despite the relationship between market power and sustainability (see Chapter 1), the literature on neoliberal economics does not provide a comprehensive definition of market power that includes its relationship to sustainability (Clapp and Fuchs 2009). Other economic theories may provide a broader understanding of market power (Peterson 1988, Néron 2015, Phillips 2017). However, we focused on neoliberal economics. Note that we are aware that the term neoliberalism has differing meanings and connotations (Boas and Gans-Morse 2009, Flew 2014, Birch 2015). Anyhow, we do not intend to embark on the distinctions between the variations of neoliberalism. Rather, we want to keep it concise by stating that we focus on the predominant neoliberal economic theory that puts market forces within a free market at the center, as this is the dominant economic theory (Jessop 2009, Senker 2015, Appel and Orenstein 2016). However, as Biebricher (2014) points out, most neoliberal thinkers have turned a deaf ear to a clear definition of market power. Therefore, he states: "all varieties of neoliberal thought harbor a blind spot regarding specific forms of power. This means that certain forms or effects of power are either overlooked or systematically brushed aside by definitional fiat. This failure to acknowledge power effects of various kinds in neoliberal thought should be properly registered and scrutinized in any critical account of neoliberalism" (Biebricher 2014).

In this chapter, we seek to close this gap as we present an amended understanding of market power based mostly on Foucault's (1982) work regarding the structure and complexity of power. Foucault identified the complex dimensions of power, which go beyond the categorizations provided by other social scientists, and at the same time, he examined power in a very structured way. Foucault (1982) discussed three dimensions of power: (a) its basic nature, (b) its origin, and (c) its manifestation. Thus, Foucault's structured and complex understanding of power serves to integrate other research on power from different disciplines, such as political science or economics, allowing us to take an interdisciplinary approach to answering the research questions: What is power? What is market power? How can (market) power be defined? How can market power be analyzed? How does market power relate to sustainability?

In their book about power in the agri-food system, Clapp and Fuchs (2009) illustrated the relationship between power and sustainability; specifically how market power shapes an understanding of sustainability. We also aim to understand how market power and sustainability are related, but we seek a broader view between these two concepts — exploring the possibility of sustainability’s potential effect on power as well. Moreover, power not only shapes the interpretation of sustainability, but also sustainability issues themselves. For example, Pulker, Trapp et al. (2017) investigated the effect of supermarket power on human health, employing the categories of sources of power outlined by Clapp and Fuchs (2009). Such a categorization of power supports the analytic analysis of power’s complexity, but nevertheless, these authors did not use these categories to develop a theory. We close this gap.

We base our analysis on Foucault’s (1982) article, “The Subject and Power,” a clearly structured text, perhaps due to Foucault’s own late-career lucidity about power. Foucault’s perspectives changed throughout his lifetime (Behrent 2010, Read 2010), which is why scholars may have come to different conclusions when applying a Foucauldian lens. Therefore, some readers may miss a focus on Foucauldian “core” topics such as knowledge or governmentality (Biebricher 2014). Indeed, we could expand on these topics, but we have omitted lengthy excursus here in the interest of providing as comprehensive yet as concise a discussion as possible. Moreover, we emphasize that we seek to use Foucault’s work as a tool (Binkley 2010) to understand power, rather than to reproduce his work. Methodologically this chapter is based on non-empirical theory building (Lynham 2002) and philosophical conceptualization (Meredith 1993). The prime intention of this Chapter is to understand power. The journey to this endeavor starts with the taxonomy provided by Foucault. Taxonomies suggested by other researchers are integrated into Foucault’s work. Furthermore, at certain points the taxonomy was completed with new elements.

In this chapter, we aim to understand the potential relationships between market power and sustainability; however, this goal first requires a comprehensive understanding of power, specifically market power. Although we believe that the definition of power that we develop in this paper can be useful to many researchers, we recognize that our analysis was influenced by our ultimate research goal (Ahlborg 2017) and by historical circumstances (Foucault 1982). The current reality differs from the reality from 10, 20, or 50 years ago. Sustainability has become a ubiquitous term, and the emergence of some multinational companies has underscored the influence of market power (Economist 2016).

The importance of analyzing the relationship between economics and sustainability can be found in Foucault’s work. He outlined the concept of “subjectification” channeled by neoliberalism, the predominant current economic

system, leading to the increasing importance of self-government and the decreasing legislative discipline (Read 2010). In the neoliberal system, subjects are entitled to govern themselves rather than be directed by governments. In a world in which governments are the main force directing human conduct, any analysis of market power and sustainability would need to focus on governmental power. But if we accept Foucault's suggestion that governments have less impact on humans' conduct in the neoliberal system, we must focus on the nexus between the market system and sustainability. The analysis of sustainability in economics is usually limited to corporate social responsibility (CSR), the triple bottom line (Callens and Tyteca 1999), or green washing (Lankoski 2016). Companies, which are increasingly required to include sustainability within their business strategies, tend to view sustainability as a competitive advantage (Laszlo and Zhexembayeva 2011). However, the connection between market power and sustainability has been missing, and with increasing market concentration, we must understand how market power influences sustainability, and vice versa. Therefore, not only the structured nature of Foucault's work, but also his interest in the subject, constitute the reason that his work provides a suitable framework for our analysis of market power and sustainability.

This chapter offers:

- A categorization of power that can be used to analyze power and its relationship to other concepts.
- A categorization of power that recognizes the interactive, dynamic character of power as an active force for change, even as it is subject to change.

First the orthodox definition of market power that is found in economics textbooks is discussed, then an extended understanding of power is outlined, including a definition that was developed based on the literature studied. Next, a focus on the problems of market power, the limits of governmental intervention, and the importance of underlying values that guide the direction of power is set. The chapter concludes with a short excursus on how this theory could be used for future analyses.

2. Limitations of the orthodox Market Power definition

In orthodox economics, market power is defined as "[...] the ability to set prices above cost, specifically above incremental or marginal costs, that is, the cost of producing an extra unit" (Cabral 2000, compare with: Pindyck and Rubinfeld 2015). Students, being presented the basic ideas of neoliberal economic theory,

learn that market power is negative; a market failure that leads to a deviation from optimality which is indicated by a deadweight loss (see for example: Pindyck and Rubinfeld 2015: chapter 10).

Several researchers have noted the necessity of an extended understanding and definition of market power. For example, Bardhan (1991) stated, "Economics is, of course, not confined to the exercise of economic power and is often concerned with the consequences of other forms of power, particularly political and ideological." White (1993) also pointed out the complex manifestation of power within the market system, which is not merely related to a measurable markup or market share: "[Power] is a protean phenomenon and power resources in the markets are many and various" (White 1993). Expanding on corporate power in the agri-food sector, Clapp and Fuchs (2009) noted that market power is usually equated to the market share, and that corporate power transcends the pure economic dimension. They stated that market power and political power are related; however, the complex nature of this relationship calls for comprehensive analysis. "Accordingly, it is important to unpack corporate power and to look at its different political facets as well as to consider important additional sources besides market power such as access to information and the policy process, or the perceived political legitimacy of corporate actors" (Clapp and Fuchs 2009). Moreover, in a recent report, the European Parliament emphasized that the narrowness of the orthodox definition of market power can reduce the number of antitrust cases, and therefore, introduced a broader concept of unfair trading practices (European Parliament 2016).

Therefore, market power discussed within economics often suffers from a truncated delineation (White 1993). The observation that market power is a highly political matter is indeed not new. Quite the contrary is the case. The limited conceptualization of market power within orthodox economic theory is even more astonishing if we consider that Adam Smith, the founding father of this very economic theory, assigned a much greater importance to power (Elliott 2000). Elliott (2000) stated, "[...] Smith's argumentation incorporates, indeed features, causes and consequences of the pursuit and exercise of social power by individuals, organizations, classes, and governments. Thus, the scope of Smith's social or political economy is broader than twentieth century orthodoxy in economics and expressively includes within this corpus the 'visible hand' of power and politics as well as the 'invisible hand' of market exchange relationships." Elliott (2000) even went so far to state that Smith's writings can illuminate an "internal flaw" in the neoliberal economy, which is the interconnection of "market exchange and power." Bowles and Gintis (1993) argue that the marginal role of power issues within neoliberal economics is based on the oversimplification of Smith's political economy, and call for a return to a new political economy that offers more comprehensive means to understand exchange.

Transaction cost theory reduces the importance of market power to a question of efficiency. Williamson (1995) understood market power as a vague concept that is used to explain instances ex post for which other explanations are lacking. Efficiency, rather than power is the main driver for organizational change (Williamson 1985, Brown 2002, Slade 2004). Therefore, economics offers two different points of view on market power: a negative view in which market power reduces welfare, and a positive view in which it increases efficiency. Although these views may appear to be a fundamental disagreement, they are rather the symptom of the cognitive amalgamation of (market) power and its legitimate use. On the one hand, orthodox economic theory evaluates market power as deviating from optimality, and therefore having a negative impact on welfare. On the other hand, transaction cost theory evaluates market power (or rather market concentration) as having a positive effect on cost reduction. In the latter case, the superordinate goal (transaction cost reduction) legitimizes market concentration, if and only if that goal is achieved (Williamson 1995).

Perfect competition has not always been the prevalent way of organizing economic activity (Blaug 2001), as the economic system existing in a point in time is a result of the respective circumstances (Vanberg 2004). Neoliberal economic theory resulted as well from a counterreaction to a system that was understood to be repressive (Biebricher 2014, Senker 2015, Cross 2017). In reviewing the history of cartelization and decartelization between 1780 and 1995, Schröter (1996) noted that cartelization was commonly supported until the end of the Second World War. According to his analysis, the main reason for the postwar change of perspectives was the acknowledgment of the potential adverse effects of economic power, coupled with political power, which supported Nazi Germany. The defeat of the Nazis allowed the "American Way," which supported competition (compare with: Read 2010, Biebricher 2014)). Rieter and Schmolz (1993) review the contribution of Ordoliberalism to the transformation of the war economy after the Second World War. They point out that the Ordoliberalists (Rieter and Schmolz 1993, Boas and Gans-Morse 2009, Bonefeld 2013, Biebricher 2014) called for governmental intervention to break up existing monopolies. This was a necessary step to ensuring that the post-war economy would not suffer from monopoly power. Even before the war, Pigou (1932) had identified the problematic interrelationship between economics and politics: "These things lie outside the economic sphere, but the risk of them may easily be affected by economic policy. It is true, no doubt, that between economic strength and capacity for war there is a certain rough agreement" (Pigou 1932). Clearly, the main problem is the illegitimate use of (market) power, rather than (market) power per se. Moreover, the principal reason for demonizing market power is a political one. Consequently, market power should not be reduced to the market sphere, and a much broader definition is needed.

Following the analysis of Bonefeld (2013) the apolitical view on neoliberal economics represents “an exception to neoliberal dogma” (Bonefeld 2013) that has been reevaluated with the economic crisis of 2008. After all, the political character of neoliberalism becomes clear by its proliferation through governmental force and elites (Harvey 2007). While neoliberal theory reduces the importance of politics, the political economy and its variants (Bowles and Gintis 1990, Bowles and Gintis 1993, Chandhoke 1994, Busch and Juska 1997, Milios 2000, Cox and Schechter 2002, Springer 2012), explicitly connect the economic sphere with the political sphere.

This brief outline of market power within neoliberal economic theory illustrates the ambiguity and the complexity of (market) power. The exertion of power seems to be legitimate when based on an overarching normative goal (Lukes 1974), and therefore, (market) power per se is not negative, but rather it achieves the purpose for which it is employed. Accordingly, the exertion of (market) power to support the sustainability transition could be understood as a legitimate exercise of power that should be supported rather than prosecuted. Indeed, this view is rather truncated, and the downside of such a perception is discussed below.

3. Market Power Extended

Following the definition of market power cited above, market power is understood within orthodox economic theory according to Hobbes’ approach to power, as a quantifiable matter; that is, having more of a certain characteristic (possession, capacity, or attribute) entitles an entity with power (Hindess 1996). This view is in analogy with market power measurements, based on the market share or the ability to charge a markup. Thus, the market share is the reason for the ability (power) to charge a higher price, which in turn consolidates the possessed power.

Williamson (1985) stated that, “there are those who possess economic power and those who do not. The organization of economic activity is under the control of those who possess power. The reason why one mode is chosen over another is that it permits those who are in control to extend and perfect their power.” This statement aligns with the notion of power as being quantifiable and indicates that there are strategies within the economic system to consolidate power. However, Williamson’s statement does not reveal the source of power, whether there are strategies and/or possibilities to change power relationships, or if the exercise of power is positive or negative for sustainability.

In the following, we outline a more comprehensive understanding of power for analyzing and understanding market power. Indeed, ours is not the first attempt to extend the understanding of power within economics (Bardhan 1991, White

1993, Rezaabakhsh, Bornemann et al. 2006). Although our literature review offered some interesting elements for the analysis of power, none of the works were comprehensive enough. On the other hand, we found that Foucault's understanding of power provided a comprehensiveness that allowed for the integration of other conceptions of power, and it was a suitable starting point for our analysis. Our goal was to understand power and its relationship to sustainability, and the understanding of power that we developed was influenced by this goal (Ahlborg 2017). Nevertheless, we believe that the understanding that we have established will be helpful for the general analysis of power. In the following we will delve into these dimensions and their relationship to the economic system (see Table 2).

Nature of Power			
Freedom	Dependency	Potential	
Origin of Power			
Capacity	Communication	Structure	Paradigm
Manifestation of Power			

Table 2: Dimensions of power

3.1. *Nature of Power*

We extended Foucault's nature of power to add two more elements: dependency, because it builds the antagonistic element to freedom (Biebricher 2014), which has a measurable equivalent within economics, demand and supply elasticity; and potential, because it illustrates that power is not always visible.

The nature of power is comprised of fundamental elements without which it could not develop. Nevertheless, all three elements of nature of power—freedom, dependency, and potential—are interrelated and influence each other. Hence, the analysis of power suffers from the chicken-and-egg problem.

3.1.1. *Freedom*

The most important element for the exertion of power is freedom (Foucault 1982) of actors, which also lies at the heart of neoliberalism (Read 2010). "At the very heart of the power relationship, and constantly provoking it, are the recalcitrance of the will and the intransigence of freedom" (Foucault 1982). The free market economy organizes the exchange of commodities among sovereign market

agents. Foucault (Foucault 1982) stated that the very nature of power is to influence someone's action within a set of options. Therefore, a deviation from the free market constitutes a situation in which market agents (who have freedom of choice) are influenced to act in a certain way. If there is monopoly (or monopsony) and insurmountable entrance barriers, the consequence is the market agents' infringement of sovereignty and freedom. According to Foucault, such a situation exhibits an extreme on the range of power manifestations, which is repression (Hindess 1996).

3.1.2. Dependency

Another crucial element of power relations is dependency. Emerson (1962) pointed out that the root of power is control over something that another party wants. "[...] Power resides implicitly in the other's dependency" and defines "[t]he dependence of actor A upon B [as] (1) directly proportional to A's *motivational investment* in goals mediated by B, and (2) inversely proportional to the *availability* of those goals to A outside of the A-B relation" (Emerson 1962). Within the market system, supply and demand elasticities indicated such dependencies, and Pigou (1932) determined supply and demand elasticities to be a main precondition for the prevalence of market power. If both freedom and dependency are part of any power relationship, then dependency must never become so large as to eliminate freedom, a conclusion that Rezabakhsh, Bornemann et al. (2006) confirmed, pointing out that monopoly annihilates the consumers' power to exit the market and not buy anymore. Therefore, dependency has to be the area between perfect demand/supply elasticity and inelasticity (see Figure 7).

3.1.3. Potential

For Foucault (1982), "power exists only when it is put into action [...]." Still, one needs to distinguish between potential power and factual power (Emerson 1962, Foucault 1982, Rezabakhsh, Bornemann et al. 2006). In perfect competition, the power game may be played, but no party effectively exerts power over another, and mutual dependencies exactly weigh each other off. Even so, power struggles may still exist (Emerson 1962), either in relative balance to each other, or with one party powerful enough to suppresses any struggle (Lukes 1974). Kaplow (2015) similarly expanded on this notion of potential and factual market power, writing about market power and the actual (ab)use of that power. Market power is a function of both factors, whereas companies' market power does not necessarily result in the (ab)use of this power. Contrarily, a relatively low amount of market power can result in high (ab)use of power—a possible reason for the mismatch in measuring market power and the actual existence of market power. A mismatch which may be due to the respective market definition taken (Podszun 2016), a non-trivial decision that has led to questionable anti-trust verdicts (Massey 2000). The distinction between actual and potential power is important,

because not being able to measure or identify market power does not mean there is none.

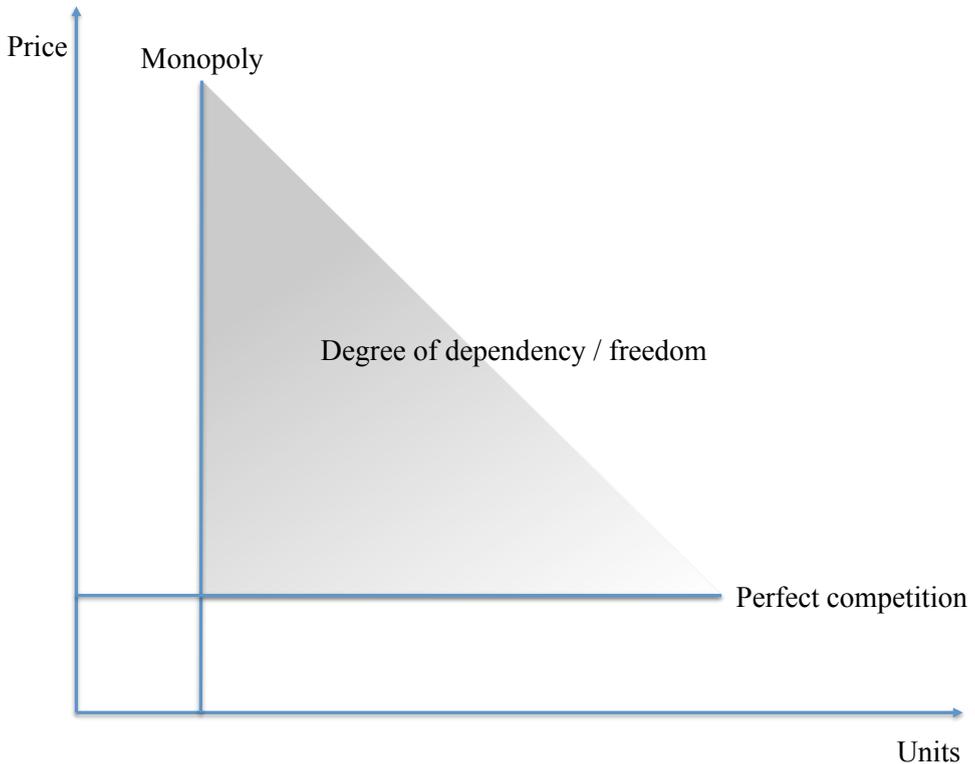


Figure 7: Illustrating the relationship between demand/supply elasticity and dependency/freedom.

Williamson (1995) may have fallen into this trap: “The confusion to be avoided is to assume that nonstandard practices at the contracting stage invariably magnify power disparities in the initial stage. That needs to be shown rather than assumed.” Again, just because one cannot show market power, does not mean that it is not there. Foucault (1982) claimed the exertion of power is a process, which is part of every social interaction. Accordingly, we should start with the general assumption that some power struggle is in place, rather than assuming that it is not.

3.2. *Origin of Power*

Foucault’s categorization of power is used because his identification of the sources of power goes beyond the quantitative elements (Foucault 1982, Hindess 1996).

Foucault referred to three sources of power: capacity, communication, and relations. Levy and Egan (2003) developed a neo-Gramscian approach using three pillars of power (economic, discursive, and organizational strategies), which can be integrated into the origin of power. The critical point of their approach is understanding these pillars as strategies, which harness most power when coordinated into a super-strategy. White (1993) differentiated between four different dimensions of power within the market system (state, association, market structure, and socio-cultural status), which can similarly be integrated within this dimension. The same is true for the sources of power (reward power, coercive power, legitimate power, referent power, and expert power) offered by French and Raven (1959). Finally, Lukes (1974) differentiated between five different means to exert power: coercion, influence, force, manipulation, authority. Apart from these theoretical conceptualizations, Pulker, Trapp et al. (2017) illustrated how such categories may be used in their analysis of supermarket power and human health. The categories they selected were drawn from Clapp and Fuchs (2009), who distinguished between instrumental, structural, and discursive power. While this categorization has similarities to the one that we suggest, there are some differences in the specific integration of phenomena under a respective element (see Table 3). Pulker, Trapp et al. (2017) extended the framework in Clapp and Fuchs (2009) with "political legitimization." While the need to add an element of legitimization is understandable, legitimization does not need to be reduced to the political realm. Instead, this dimension was amended with the element paradigm, taken from systems thinking. An illustration of the dimensions of power with the various elements is shown in Table 3.

3.2.1. Capacity

Hindess (1996) reported that power is usually understood as some quantitative substance, like abilities, capacities to do something, or the possession of something (compare with: Bardhan 1991). From a purely economic point of view, market share can be listed as a key element, and is particularly important within the New Empirical Industrial Organization (NEIO) approach. Capacity is related to the size of an individual company or a group of companies within a market, which equips the organization with the ability to influence the market in certain ways (Cabral 2000, Lopez, Azzam et al. 2002).

Three out of the five sources of power identified by French and Raven (1959) fit this element: reward power, coercive power, and expert power. The first two are related to the ability to exercise positive and negative reinforcement, and the third corresponds to the possession of an asset (here knowledge) that may equip someone with power. Lukes' (1974) categories for the exertion of power (coercion, influence, force, manipulation, authority) similarly constitute different types of capacities, and indicate that an evident struggle does not always need to

be present. For example, manipulation is a very subtle way to induce another party to act in a certain way. Foucault (1982) acknowledged this element of the origin of power but added two more elements: communication and structure.

3.2.2. *Communication*

According to Foucault (1982), communication—not limited to language—is a means to transmit meaning. Communication is related to capacities as well as structures. Still, it should be understood as a separate source of power. As we have shown, expert knowledge is a capacity, but one that may become effective only through passing on or suppressing information. Or, as Foucault noted, changing the structure of the information flow also affects power balances. This aspect aligns with the neo-Gramscian approach of Levy and Egan (2003), pointing to the ability to shape discourse in order to increase power. Also, manipulation, which Lukes (1974) identified as a source of power, is indeed related to communication. Indoctrination or persuasion require some means of communication. Advertisement is one example of how companies use various means of communication to influence consumers' behavior to their favor (O'Barr 2008, Hebden, King et al. 2011, Senker 2015).

Economics also acknowledges the crucial importance of communication, where asymmetric information represents another market failure. Williamson (1995) stated that the significance of market power is higher in labor and final product markets, because of the inherent problem of asymmetric information. Similarly, labels are a type of signaling that reduce information asymmetries. The more labels are institutionalized, the more they are connected to the structural element of power.

White (1993) identified lobbying as one dimension of power (state) that constitutes a special type of communication that is aimed at influencing other entities in favor of the lobbyist. Moreover, lobbying is a clear example of where power transcends the economic realm, penetrating the political sphere (Clapp and Fuchs 2009).

3.2.3. *Structure*

Foucault (1982) described power as embedded within a certain structural web of relationships. Economic theory also acknowledges the importance of structure, particularly Industrial Organization (IO), which focuses on the impact of structure on market power (Cabral 2000, Martin 2012). Other researchers have also recognized the relational character of power (Levy and Egan 2003). For example, Emerson (1962) pointed out that power is not an attribute, but a relationship building upon mutual dependencies: "[...] these ties of mutual dependence imply that each party is in a position, to some degree, to grant or deny, facilitate or

hinder, the other’s gratification” (ibid). Both, Bardhan (1991) and White (1993) undertook investigations in the realm of power within economics, and both pointed to the structural (relational) character of power.

Nature of Power ¹			
Freedom ¹	Dependency ²	Potential	
Origin of Power ¹			
Capacity ^{1,5,7}	Communication ₁	Structure ^{1,5,8}	Paradigm ⁶
Authority ⁷	State ^{4,8}	Association ⁴	Legitimate power ³
Expert power, Information ^{3,7}			
Coercive power ^{3,7} force ⁷			
Reward power ³ , manipulation ⁷			
Manifestation of Power ¹			

Table 3: Integration of literature within the dimensions of the power framework. ¹ Foucault; ² Emerson; ³ French and Raven; ⁴ White; ⁵ Levy and Egan; ⁶ Meadows; ⁷ Lukes; ⁸ Clapp and Fuchs.

Three of the four power dimensions described in White (1993) can be categorized under the structural element of the origin of power: “association,” “market structure,” and “socio-cultural status.” Association may be related to unionization, but also to the development of common rules through private standards. According to White (1993), “usurpation represents a counter-attack by threatened or subordinated actors, such as workers or consumers, to improve their power within the market.” The existence of unions is confirmation of power struggles within the system. Moreover, association may include legal/official groups and illegal ones, such as cartels. Describing the market structure dimension, White (ibid.) referred to market interactions as a political process, and therefore, no transaction within the market system can be seen apart from power concerns. “Markets can thus be analyzed as political games in which outcomes are structured in terms of choices taken in the context of variable but structured asymmetries in the capacities of participants, which vary across specific markets and which may in certain contexts result in systematic exploitation through unequal exchange” (White 1993, compare with European Parliament 2016). Similarly, Clapp and Fuchs (2009) emphasized the role of structure in the fight for power. They discussed corporate social responsibility (CSR), the role of labels

and standards as a means by which corporations set the rules of the game, and thereby construct the market structure. Finally, socio-cultural status means that markets are embedded in a wider socio-cultural context with their own values and institutions, which necessitates the analysis of markets and market power within this wider context (Levy and Egan 2003).

3.2.4. *Paradigm*

As we have discussed, power arises within a relational interaction that has a certain structure, which allows the flow of power to be dynamic (Levy and Egan 2003, Ahlborg 2017). Therefore, power is found within a certain system. But as Foucault (1982) stated, “[...] there are also ‘blocks’ in which the adjustment of abilities, the resources of communication, and power relations constitute regulated and concerted systems.” Thus, from systems thinking, we can gain another insight related to the origin of power. The question is, what makes entities influence other entities towards a certain direction? We suggest that entities (sub)consciously follow a particular paradigm. If that paradigm is to grow, entities will do everything in their power to influence others, in order to achieve growth. Meadows (1999) proposed a list of 12 leverage points that are used to influence or transform a system. Among these, we can identify quantitative leverage points, which are those easiest to use, such as capacity. Thus, changing the market share may potentially influence the power balance. Other leverage points include communication, which is also an element of the origin of power, and those that are related to the structure of the system, or that are related to the relationship between the parties. Finally, leverage points relating to values or paradigms, which have the most influence on the whole system, are also the most difficult to use (see Table 4). For example, a system having growth as its paradigm (Schmelzer 2015, Harangozo, Csutora et al. 2018) will resist competing forces that aim to change this focus (e.g., growth versus de-growth).

The correlation between these leverage points and the elements of power gave us the insight that the paradigm was another element of the origin of power. We followed Meadows’ idea, that the paradigm is the ultimate initiator of action (Meadows 1999). The paradigm is also a normative force, and not only a source of power in terms of giving incentives for action. The neoliberal system, with its dictum of growth, not only provides the incentive to set actions that will increase the actor’s power, but also legitimizes these actions. The two remaining sources of power identified by French and Raven (1959)—“legitimate power” and “referent power”—can be placed here. Both correspond to reasons for why entities accept or even aspire to being ruled by some other entity.

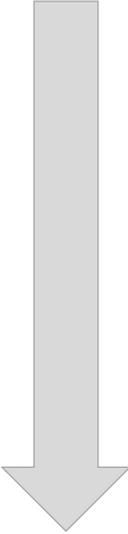
Element of Origin of Power	Leverage Point	Potential of Leverage Points
Capacity	Constants, parameters, numbers	
Capacity	The size of buffers and/or stabilizing stocks, relative to flows	
Structure	The structure of material stocks and flows	
Communication	The length of delays, relative to the rate of the system change	
Capacity	The strength of negative feedback loops, relative to the impacts that they are trying to correct against	
Capacity	The gain by driving positive feedback loops	
Structure/Communication	The structure of information flows	
Structure	The rules of the system	
Capacity	The power to add, change, evolve, or self-organize system structure	
Paradigm	The goals of the system	
Paradigm	The mindset or paradigm out of which the system arises	
Paradigm	The power to transcend paradigms	

Table 4: Connection between leverage points and the elements of the dimension 'origin of power'.

Legitimacy gives permission not only to the exercise of power, but also to the means of this exertion (French and Raven 1959). The higher the degree of legitimacy, the more likely that coercion will be accepted. This effect is examined in criminology, where people’s acceptance to obey police or military forces in order to maintain social order are analyzed (Jackson, Bradford et al. 2012, Tankebe 2013). On the other hand, people do not accept civilians, hurting others to make them obey. Expert power is categorized as capacity, since people must have certain knowledge, as well as the ability to pass it on. It has to be pointed out that communication is linked with ability and structure, but it is also related to legitimacy. Not everyone is automatically understood as an expert, as certain criteria must be fulfilled to legitimize that status. The legitimacy, and thus the acceptance of expertise is what French and Raven (1959) referred to as “expert power,” a first-order influence in communication. The second-order influence in

communication is the impact of repressed or disseminated information, which Clapp and Fuchs (2009) identified as “discursive power.” Legitimacy also warrants structural changes. Not only do capacities serve the paradigm, but structures are also built to do so (Porter and Kramer 2011). As the transaction cost theory case illustrates, market power may be accepted for the sake of increased efficiency; therefore, a change in the structure of the market will be accepted in order to increase certain capacities.

Including the concept of paradigm in the analysis of power also reveals the different levels of power, a superstructure (macro level) and a substructure (micro level). Paradigm is located on the superstructure, but unfolds on lower levels. Therefore, power is not an end in itself, but an instrument to achieve a higher goal. For example, in the capitalistic system, power is used to accumulate more capital. If capital were completely purposeless, no one would use power to gain capital. The scheme depicted in Figure 8 indicates how power works on different levels, and how these are interrelated, which helps to understand the directionality of the power dynamic. For example, Clapp and Fuchs (2009) included the element of “instrumental power,” which relates to lobbying. In our framework, lobbying is part of communication, but indeed it has influence at other levels. However, the critical insight is that all elements of power below the macro level (paradigm) are instrumental (see Figure 8).

We must point out that there is not one paradigm, but a predominant one among several that are struggling for domination (Colby 1991, Levy and Egan 2003, Barry 2016). From systems theory, we know that drawing the limits of a system is a matter of defining analytical limits, rather than identifying actual boundaries. Hence, the economic system is not separate from the environmental, cultural, or political systems. Therefore, the predominant paradigm may be challenged by emerging paradigms that are outside of the economic system (see Figure 9). The sustainability challenge may serve as illustration. As Colby (1991) described, the biophysical reality may lead to the formulation of a new paradigm to challenge the current economic system’s predominant paradigm. For example, organic food, originally an initiative of farmers, was a counteraction to industrial agriculture, and could be seen as following the paradigm of sustainability. Over time, however, organic agriculture became conventionalized (De Wit and Verhoog 2007, Best 2008), and thus was made to fit within the neoliberal economic system (Scott, Vandergeest et al. 2009). Padel, Röcklinsberg et al. (2009) illustrated the process of how values of one paradigm (organic agriculture) may be brought into alignment with the current paradigm. In the example of organic agriculture, an initiative of individual farmers was overtaken by big players who used the organic label to consolidate their position. Finally, governments may try to counterbalance such power struggles by creating a legal framework (Scott, Vandergeest et al. 2009). Springer (2012) takes a cultural political economics perspective and frames neoliberalism as a discourse. A frame that resembles the dynamics

between competing paradigms as outlined in Figure 9. He outlines the mutability of neoliberalism that has been born in its manifold implementations, due to the differing regional conditions and historic transformations that changing conditions made necessary (Boas and Gans-Morse 2009, Ferguson 2010).

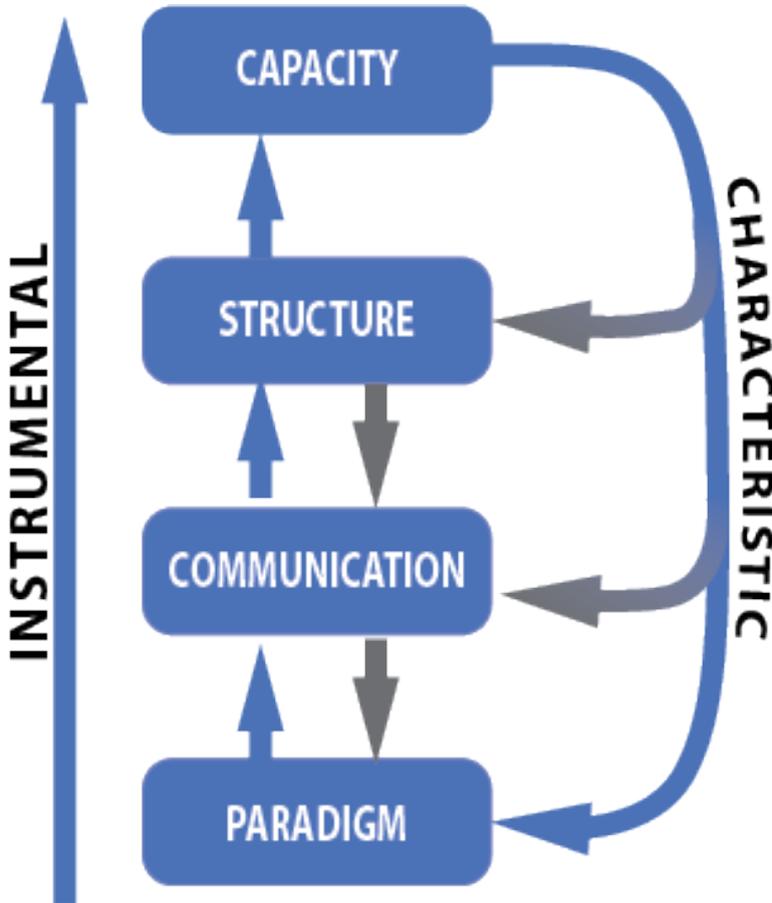


Figure 8: Relationship between the different levels of the origin of power.

The predominant paradigm's defense of its position bares the danger that a system may become a self-operating entity (Foucault 1982, Read 2010, Biebricher 2014, Ahlborg 2017). Barry (2016) described this danger: "[...] power is, on one hand, the power and struggle of ideas and, related to that, how those ideas that win or are dominant create the economy they prescribe. In other words, dominant framings or conceptualizations of the economy, such as neo-classical/capitalist economics, do not simply 'objectively' or 'neutrally' describe an economy that 'just is', but rather, actively prescribes and bring into being an economic system that

is aligned with normative and ideological assumptions” (compare with Milios 2000, Harvey 2007). Hence, paradigm not only exploits the other levels (instrumental), but each level that is below the macro level (paradigm) supports the maintenance of the system (Figures 8 and 9). The ability of the system to recreate itself, is based on its paradigm—increasing growth, calling for increased profits of companies. As market power can be a means to increase profits, market power is a logical result (Ims 2006). Korten (1998) discussed this dilemma: “The problem is not business or the market per se, but rather a corrupted global economic system that is gyrating far beyond human control. The dynamics of this system have become so powerful and perverse that it is becoming increasingly difficult for corporate managers to manage in the public interest, no matter how strong their moral values and commitment.”

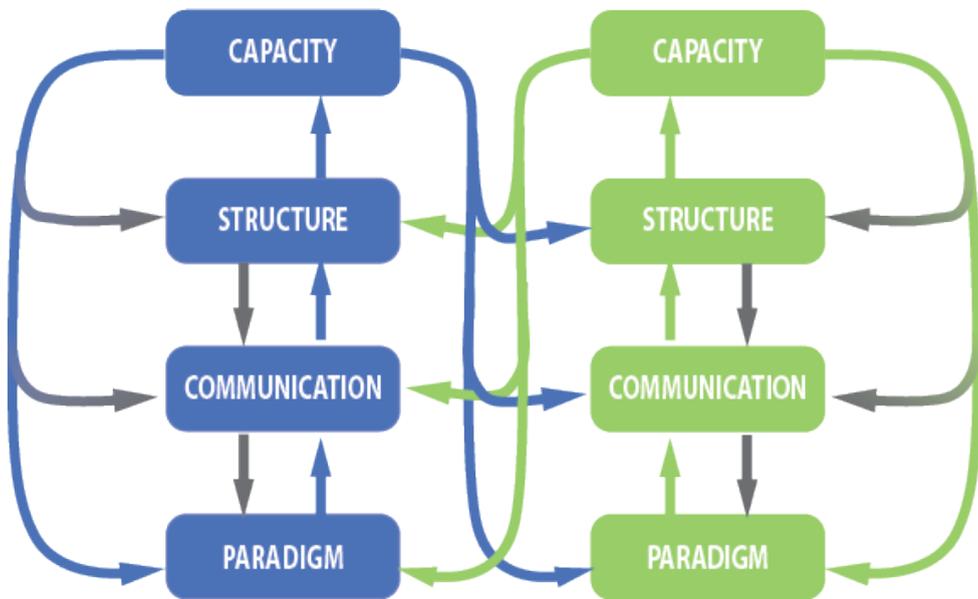


Figure 9: Power struggle between paradigms.

A paradigm does need not originate from the economic sphere, but that is the case at present (Read 2010), and this reality necessitates once more a broadened understanding and definition of market power. Even more so, if, as some argue (Milios 2000, Harvey 2007), capitalism and market liberalization have been pushed by the interests of the capitalist class.

In contrast to other categorizations of power, we suggest that the elements of power are hierarchically ordered. Moreover, we argue that legitimacy has a source

as well: the paradigm. According to systems thinking and Meadows's (Meadows 1999) leverage points, power has an ultimate source, or stated differently, there is a specific reason why all entities aim at becoming powerful and why they act in a certain way. Therefore, paradigm exploits communication, structure, and capacities to sustain itself. In that sense, power is an instrument, but it also is a characteristic that describes an entity's ability to reinforce the paradigm. Figure 9 depicts this self-operating mechanism. Capacities that are exploited as instruments to sustain the paradigm work not only within their own system, to improve communication and structure in support of the paradigm, but capacities also work within other systems to fight and to suppress other paradigms.

3.3. *Manifestation of Power*

Instead of discussing visible or measurable manifestation, this section rather focusses on the latent or invisible manifestation of power. This Chapter aimed at showing that market power is more than the measurement of market share, firm size and markups. Indeed, firm size and market share are indicators to look at for the evaluation of the potentiality of the application of market power in a given situation. Market power can manifest in price distortions, but this is for sure not the only possibility. Unfair trading practices described by the European Parliament are one example (European Parliament 2016). Due to power imbalances one party is pushed in a less favorable position; a position they would not have taken if power was equally distributed. A party in power can make use of tools such as lobbying, though the manifestation of power is then the result of this endeavor. Power may manifest through the combined use of elements of the origin of power. A company may innovate, but only through lobbying, marketing and entry barriers they might be able to manifest their market power and charge a higher price for their product.

The original intention of exerted power is not necessarily visible in the final outcome, as involved or affected actors can react in different ways (Ahlborg 2017). Foucault (1982) understood power as a force that is expressed through action, which "[...] does not act directly and immediately on others." Not only can the outcome of the exertion of power be elusive, the exertion itself may be disguised. Lukes (1974) pointed out that actions of power may be unconscious or unintended, because the actors may be unknowingly trapped within a system, making them the media that consolidate this very system. Accordingly, power can be difficult to identify, let alone measure.

The manifestation of power is not simply its quantitative measurable effect, such as a markup. Rather, market power also may have other subtler effects (such as manipulation via advertisement, or lobbying). Therefore, econometric models may not suffice in the task of identifying and measuring market power. To determine the capacity element of the origin of power, as well as the dependency

of the nature of power (understood as demand/supply elasticity), quantitative methods may indeed deliver useful proxies; however, as explained, within each dimension of power, market power has several elements that must be considered to fully capture its occurrence.

One main difficulty in capturing market power solely in quantitative terms may be the tendency of market power to remain latent, which is a general characteristic of power, according to Lukes (1974). Power is expressed not only by evident struggle, but also by the absence of struggle. This latency may stem from the potential hazardous consequences of power struggles that serve to silence the opposition, even in its onset, or from the ability of those in power to shape people's interests, and thus prevent opposing ideas or desires from emerging (Clapp and Fuchs 2009). The way in which an actor accumulates power may as well be characterized by silence. Pulker, Trapp et al. (2017) described this element in their analysis of supermarket power, in which supermarkets have achieved their power through consumers' and governments' inaction. Foucault (1982) stated that the goal of power is the manifestation of power itself. Nevertheless, one manifestation of power may be the ability to use disguises. Blunt manifestations of power run the risk of opposition, and in turn, more struggles for power and potential loss of power. The less than obvious market power has the chance to persist, not the least because anti-trust legislation needs evidence to be enforced.

4. Definition

In economics textbooks, market power is described as an agent's power to influence market prices (Cabral 2000, Black, Hashimzade et al. 2009, Lipsey and Chrystal 2015), but this is not the only effect that market power may have (Xhoxhi, Pedersen et al. 2014). Pointing out the many blind spots and problems in market power research, Kaplow (2015) stated that the actual channels of market power are understudied.

Indeed, a clear definition of power that assists in easy identification and quantification of market power would be convenient. However, any such definition would most probably fall short in capturing power's subtler elements. Therefore, we support a description of power that follows Foucault, who emphasized the structural (qualitative) elements of power. In this respect, "[...] power is seen as a matter of instruments, techniques, and procedures employed in the attempt to influence the actions of those who have a choice about how they might behave"(Hindess 1996).

Based on existing definitions and perceptions of power, we suggest the following definition:

Power is a characteristic that exists only in the relational interaction of free entities that are mutually dependent. The relational character of power gives it a dynamic quality, as it is continuously subject to change. Each interaction potentially allows changes in the extent of freedom, the extent and direction of dependency, and in the ability of parties to employ capacities and communication. Consequently, these changes may alter the whole structure, the whole power relationship itself, or even the paradigm that governs the direction of power. In the presence of actors' conflicting interests, but depending on the actors' consciousness of these conflicting interest, power is a characteristic that is evident or in disguise. Power serves the diffusion or the maintenance of a paradigm, and consequently, manifests as the characteristics of agents who are (1) in a struggle to influence another party in favor of their own preferred paradigm, (2) in a struggle to escape another party's influence, or (3) without a struggle because the predominant paradigm has blinded them to their innate interests.

In accordance, we define market power:

Market power is a characteristic that unfolds through the relationships of mutually dependent and free entities. Market power is constantly changing due to the dynamic character of relationships. Each interaction allows a recalibration of market power. The origin of market power lies in a predominant paradigm, by which it aims to support by exploiting communication, structures, and capacities. Neither entities' actions nor their effects are limited to the economic system. At the same time, power struggles within the economic system are affected by (superior) systems. The predominant paradigm of the (economic) system governs entities' actions, and these activities strive to increase and/or stabilize entities' own market power.

5. The Power of Paradigms

Now that we have provided a discussion and definition, we expand to some problematic elements of (market) power. First, we discuss an implication from transaction cost theory. We pointed out that market power might be viewed as being positive, based on its contribution to a certain superordinate goal. However, there is a rub to this positive view. Next, we broach the issue of legitimacy of power, elaborating on governmental intervention, and finally we elaborate on the importance of paradigm to the effect of power on sustainability.

5.1. A Problematic Side of Market Power

Considering the transaction cost theory's contribution to an analysis of market power, we agree that market power may be seen as positive if the goal is to

increase efficiency of transactions, and market power fulfills that goal¹². However, we want to briefly share some thoughts about where such a simplistic way of thinking may lead.

Bardhan (1991) stated that the direction in which the dominator pushes the dominated actor does not need to be harmful. He used the example of parents who make children act in a certain way. Indeed, usually parents only want the best for their children. We could argue that a company with market power may be like a well-intentioned parent, but that comparison does not allow for the sovereignty of consumers. Elucidating the origins of capitalist theory in the era of mercantilism, Bassiry and Jones (1993) wrote: "The political economy Smith was advocating, was thus based on maximizing consumer/citizen choice in both economic and political spheres. Smith's paradigm shifted the institutional emphasis from centralized to decentralized structures, from authoritarianism to representative democracy, from monopoly to competitive markets, from autarky to international interdependence through a spatially expanding division of labor, and from producer appropriation of societal surplus to consumer sovereignty." Therefore, the argument for market power as a solution to the sustainability challenge is a return to mercantilism. Interestingly, according to Bassiry and Jones (1993), Smith's greatest fear concerning the adverse effects (dysfunctionality) of his theory was the formation of monopolies. Apart from the inefficiencies that they would cause, Smith foreshadowed the political impact that such economic players could gain. Accordingly, Smith realized the inevitability of market failure, making governmental intervention necessary.

Stopping the discussion with the statement that market power can be beneficial for sustainability simply because an econometric model may support this (Gopinath and Wu 1999), would be quite shortsighted (Thampapillai 2010). Ethics must be considered, particularly when we elaborate on sustainability, which is a normative concept, and therefore, calls for addressing ethical questions. Smith's considerations were based on deep ethical concerns. Bassiry and Jones (1993) pointed out that Smith's fears coming true, makes the ethical foundation of the

¹² Within transaction cost theory the main concern is to increase efficiency to reduce transaction costs. Market concentration is thus seen as positive if it increases efficiency. See: Williamson, O. E. (2009). Prize Lecture: Transaction Cost Economics: The Natural Progression. Williamson, O. E. (1995). "Hierarchies, Markets and Power in the Economy : An Economic Perspective." *Industrial and Corporate Change* 4(1): 21-49. Erdem, S. A. (1994). "AN INVESTIGATION OF THE CONCEPT OF POWER AND POWER TAXONOMY IN CHANNELS AND DISTRIBUTION: A TRANSACTION COST ANALYSIS PERSPECTIVE." *Journal of Marketing Theory & Practice* 2(1): 62.

contemporary economic system questionable. To go a step further, we realize that the fact that some social scientists prefer not to deal with ethics, and would rather try to fix one problem with another problem, which legitimizes the problem, is the manifestation of a lack of an ethical foundation among those researchers whose research could impact every human's life.

5.2. *Governmental Intervention*

The ostensible shift of power from governments to corporations induces people to call for the restructuring of power relationships. "To reclaim the power that a rogue global economy has usurped from people and communities, we must press for sweeping political campaign reforms to get big money out of politics. We must re-establish that a corporate charter is a privilege—not a right. It is issued by governments to serve a public purpose, and it is the inalienable right of the sovereign people to withdraw it any time they decide a corporation is not serving that purpose. We must also break up the largest corporations to restore the conditions essential for the efficient function of competitive markets. And we must return to nations and communities the right to set their own economic priorities and to regulate commerce within their jurisdictions" (Korten 1998). This power struggle is not only one that is related to market power, but also one that is related to the power of markets. Although fully elaborating on power at this level is beyond the scope of this paper, we point out that Foucault's work offers interesting and relevant insights. Foucault argued that competition as the ruling idea of neoliberalism needs governmental protection from the tendency of markets to concentrate (Read 2010, compare with Bonefeld 2013). As we have pointed out, a main task of governments is to establish the freedom of market agents; however, governments' superiority in steering society is not assured.

Buchanan (1954) for example, pointed out that the marketplace may be the best form of direct democracy. Elliott (2000) reviewed and analyzed Adam Smith's understanding of power. His research illustrated that inequalities make the installation of a political system necessary. If this is true, then governmental intervention will never succeed in eliminating market power. And finally, Pigou (1932) pointed out that governments are also prone to unethical behavior: "The case, however, cannot become more than a *prima facie* one, until we have considered the qualifications, which governmental agencies may be expected to possess for intervening advantageously. It is not sufficient to contrast the imperfect adjustments of unfettered private enterprise with the best adjustment that economists in their studies can imagine. For we cannot expect that any public authority will attain, or will even whole-heartedly seek, that ideal. Such authorities are liable alike to ignorance, to sectional pressure and to personal corruption by private interest." Pigou (1932) continued to point out that governments are not perfect, and that corrupt politicians can be open to lobbying. The extent that corruptive tendencies can be overcome depends on the design of the political

system (see for example: Glennon 2005), which brings us back to the importance of structure for power relationships. In this regard, Ims (2006) indicated that a voting system in which the majority automatically has all the power may not be ideal to achieve sustainability.

The ability of governments to regulate social life may be corrupted not only by the weaknesses of the human beings who form governments, but by the economic sphere. "Neoliberalism constitutes a new mode of 'governmentality,' a manner, or a mentality, in which people are governed and govern themselves. The operative terms of this governmentality are no longer rights and laws but interests, investment and competition" (Read 2010). Read (2010) also pointed out the tragedy of being trapped in a dominant system without an external reference point for correction (see also Harvey 2007). "Thus, while it is possible to argue that neoliberalism is a more flexible, an open form of power as opposed to the closed spaces of disciplines, a form of power that operates on freedoms, on a constitutive multiplicity, it is in some sense all the more closed in that as a form of governmentality, as a political rationality, it is without an outside. It does not encounter any tension with a competing logic of worker or citizen, with a different articulation of subjectivity. States, corporations, individuals are all governed by the same logic, that of interests and competition" (Read 2010). Indeed, this statement relates to the problem of a self-operating system, as outlined above.

There may be two reasons for why governments are not potent enough to counterbalance market power. First, market agents may be strong enough to influence governments to their favor (Harvey 2007). Second, the economic system absorbs all spheres of human life, which then subordinates the government to work as an agent of the economic system.

5.3. *Get the Paradigm Right*

Whether actions in the market are favorable to the general society depends on the values of the actors. For example, Rothbard (1970) said, "When people are free to act, they will always act in a way that they believe will maximize their utility, i.e., will raise them to the highest possible position on their value scale." The question is: What are their values? The same is true for companies. If market power is used solely to increase their wealth to the detriment of society, then market power is indeed negative. But if market power has no harmful effects, it need not be demonized. Transaction cost theory allows such an approach: While focusing on the efficiency of transactions as the overarching goal, an emphasis can also be put on the contribution to sustainability. If market power is a means to support sustainability, then market power could be something that is fairly positive. Therefore, we must understand power as an instrument that is used to achieve an overarching goal.

This conclusion and the statements in Section 5.1 may appear to be contradictory; however, Section 5.1 illustrates that the promotion of market power for the sake of a transition to sustainability does not align with neoliberal economic theory. Despite that fact, market power per se does not need to be demonized.

The utility discussion usually conceals or prevents an exploration of the conditions under which the market system may generate the best outcomes for everyone. But according to Smith, overall welfare increases not by magic, but by a (higher) power pushing people to act according to certain moral standards (Evensky 1993). Human beings' self-interest is guided by moral guidelines, and these moral guidelines make the difference between a positive or negative effect of market interactions on humanity (Porter and Kramer 2011, Bonefeld 2013). Power does not have to be negative; it can be repressive or productive (Ahlborg 2017). An entity may have the power to change the world for the better (Leat, Revoredo-Giha et al. 2011).

If sustainability were the new predominant paradigm, then we would need to ask how to achieve this goal. Is it possible to maintain the status quo and simply green the system (Porter and Kramer 2011, Luke 2016)? Or do we need a new system altogether (Barry 2016)? Will subjects create a critical mass to bring about the needed change through self-regulation? Or will governments create the conditions for such a transformation? Or will companies with enough power be the leverage? Will powerful companies support the transformation or block it? The future will show whether a sustainability transition will occur and which actors will steer the change.

6. Analyzing the Relationship between Market Power and Sustainability

The extended definition of market power presented here allows for not only a comprehensive analysis of market power, but also a linkage to other concepts, such as sustainability. In this final section, we briefly elucidate on how an analysis of the relationship between market power and sustainability could be undertaken, and how the theoretical foundations outlined in this paper can help researchers and practitioners.

First, sustainability may be understood differently, depending on the perspective. Discussions on the definition of sustainability can be found elsewhere (Hediger 1999, Jabareen 2008, Quental, Lourenço et al. 2011, Lankoski 2016), but an analysis must take the ambiguity of the concept into account. For example, the relationship between market power and strong sustainability may be different to the relationship between market power and weak sustainability. The same is true

if one understands sustainability merely in economic terms, which is only one aspect of sustainability. Therefore, researchers must first clarify the meaning of sustainability. In addition, scholars may study the effect of power on the discussion and interpretation of a sustainability concept or on the aspects of sustainability itself. Finally, any analysis may be framed as a one-way street in which power is the only active force, or as a two-way street in which power itself is exploited in the struggle of opposing paradigms.

Regarding the analysis of power, we draw on the different dimensions and their respective elements that we have outlined. Based on Foucault's (1982) guidance on how to analyze power, we suggest examining the following points. When analyzing the relationship between market power and sustainability, two different perspectives can be taken. The first one would be to assume that the current socio-economic system does permit sustainability, the second would be to negate this possibility. In the following the former case is referred to as weak sustainability, the latter to as strong sustainability.

1. Freedom: If market power is in place, freedom is restricted to a certain extent. For example, consumers may have a reduced product choice, or farmers have limited options to sell their harvest. Regarding weak sustainability, this does not necessarily imply being negative. If companies exerting market power reduce consumer choice but reduce them to sustainable ones, it could be understood to support sustainability and thus, it can be regarded as positive. If we consider strong sustainability, it would rather be understood to not comply with sustainability. That is, as all aspects of sustainability need to be taken into account. Restricting people's freedom can be viewed as infringing on social sustainability. The reduced choice is related to power that got accumulated by certain actors. This does not comply with equity, which is part of sustainability.
2. Dependency: Dependency and freedom are different sides of the same coin. To the extent to which dependency increases, to the same extent does freedom decrease. Nevertheless, dependency was included in the taxonomy, as it better relates to the concept of demand and supply elasticity. Demand and supply elasticity exist on a continuum, is thus not merely dichotomous. If we look at dependency and freedom under this condition, one understands that deciding whether something may permit sustainability is a thin line. That does however not so much apply to weak sustainability, but rather to strong sustainability. Does sustainability in this context mean to create a completely egalitarian society or may there still be some difference among people? If so, how much inequality would be allowed? Are disparities limited to such an extent that market power would not become an issue? There are many shades of sustainability. Even within strong sustainability different grades exist. Thus, it is all but clear where to draw the line. Nevertheless, for strong sustainability,

disparities should never grow to an extent to which a public decision upon the legitimacy of the disparity is not granted.

3. Potential: In the realm of market power potential is more relevant than in other areas of power. This is as market power is illegal and thus, most likely concealed. Market power is for reasons illegal, that is as it can reduce welfare. Sustainability can be understood through a welfare perspective. For weak sustainability, overall welfare needs to be maintained or increased to fulfill the sustainability criteria. Hence, for this case, market power may be understood to be positive, if the overall welfare does not decrease. Then anti-trust legislation should not intervene. For strong sustainability the situation is different. This is as not only overall welfare counts, but different dimensions of sustainability. One dimension cannot simply be traded off with another one. Then anti-trust legislation should intervene, even if one aspect of sustainability is improved.
4. Capacities: Pertaining the determination of market power, this constitutes a classic field of market power analysis. One can locate quantifiable elements, such as market share (NEIO approach) under this element of power. Not only market power can be quantified, but sustainability achievements too. Analysis could combine market power and sustainability research by for example evaluating the impact of large companies in certain sustainability fields. This can be done for weak and strong sustainability; whereat strong sustainability would not permit (perfect) substitution among sustainability dimensions and market power would be at least limited (as discussed in point two).
5. Communication: Typically, communication relates to lobbying, but it can also include the introduction of labels. More generally, issues of asymmetric information can guide investigations here. In addition, the influence of market players on discourse can be investigated. For weak sustainability, communication can be used within the current socio-economic system to increase sustainability and eventually get to a sustainable state. For strong sustainability this is not the case as the control over communication needs to be unbiased. Even if companies (with market power) provide a sustainable product, it needs to be questioned, if not other or better products could be offered in a situation without market power. This refers to a narrative as well. A singular narrative can be provided by those in power, or multiple narratives can be provided, and it is up to the global community to decide which one(s) to follow. For strong sustainability it can be questioned how market power limits the narratives (the communication) which could provide multiple solutions to sustainability problems. This narrative applies also to the socio-economic system itself. Is a growth-based system the only possibility or not?

6. Structure: Structural elements which are related to communication are standards and labels. However, everything related to legislation, institutions, or the general rules of the game can be analyzed under the market power element. Such as, how do certain institutions support the occurrence of power imbalances? Further, are these institutions the expression of power imbalances themselves? Finally, elements of market structure as understood in IO theory should be considered here. For weak sustainability it is understood that the current structures, not least the structure of our socio-economic system, permit sustainability. It may be up to debate whether certain minor adaptations to the structures and rules need to be undertaken. However, the system itself does not need to be changed. It is accepted that market power issues are a result of the socio-economic system and the ways in which market power can support or hinder sustainability are investigated. Market power is then understood to be positive if overall welfare increases. For strong sustainability, such a perspective would not work. This is for two reasons. First, it is understood that the current structures lead to sustainability problems. Second, since market power is an expression of inequality, and since market power is supported by the structures of the socio-economic system, the structures would need to change.

7. Paradigm: What is the overall imperative for action? For weak sustainability the current paradigm is not seen as a hindrance to achieve sustainability. It is understood that economic growth can reduce poverty and spur technological innovation. The advancements brought about by economic growth are used to solve sustainability problems. Market power, being a consequence of the growth paradigm, is evaluated against the ability to potentially support sustainability. Thus, for weak sustainability, it is possible to remain within the current paradigm, use all available instruments, and achieve a state of sustainability. For strong sustainability this is not possible. That is as the growth paradigm causes environmental as well as social problems. Advancements in one dimension of sustainability can largely not be traded off with another sustainability dimension. Furthermore, market power itself would be understood as a symptom of an unsustainable system, since it is an expression of inequality.

These points show that connections between market power and sustainability can be found for each element of the dimensions of power. Although an analysis can be undertaken, the results of the analysis will depend on the perspective taken. The perspectives can be manyfold, but for simplicity reasons they have here been divided in weak and strong sustainability. Clearly if one takes on a weak sustainability perspective market power can be employed to support sustainability. This is however not the case for the strong sustainability perspective.

An analysis on each listed element can not only investigate the connection between market power and sustainability in general, but could focus on specific aspects. For example, sustainability as business strategy to increase market share could be investigated. Another example could be analyzing whether market power leads to greater product differentiation, or to the introduction of labels, standards, or institutions that affect sustainability. Pulker, Trapp et al. (2017) undertook such an analysis, which was focused on the market power of supermarkets and the effect on consumer health. Smythe (2009) analyzed the process of developing intentional labels within the World Trade Organization (WTO) for food products containing genetically modified organisms (GMOs), which shed light on lobbying (communication) and labeling (structure). Moreover, GMOs are a highly contested topic due to different paradigms that supporters and opponents follow, and it is also related to sustainability (e.g., social sustainability: the right to food (General Assembly 2009) versus food security (Moseley 2017)). Following the framework that we have outlined, researchers could study how power affects sustainability that is channeled through the different elements of power, depending on the sustainability perspective taken. Fuchs, Kalfagianni et al. (2009) undertook an analysis of retail power, relating it to sustainability, using two different elements of power. They pointed out the relevance of concentration on environmental and social sustainability, or the impact of structural power on foreclosing other players, and thus, on consolidating their market power. Their analysis indicated that the effect of power on sustainability can be a double-edged sword. The analysis of Senker (2015) is an interesting example of how the framework developed in this paper could be used. He discussed how power contributed to the neoliberal economic system becoming and remaining the predominant system (see also Harvey 2007). Senker's analysis is an example of how the exercise of power at the microlevels supports the macrolevel, and with this the dominance of the neoliberal system. A system that, as he portrayed it, affects sustainability negatively in many ways. Nevertheless, there is no simple answer to the question of how market power affects sustainability. Thus, an analysis of the relationship between power and sustainability needs to embrace a comprehensive perspective on the matter. A shortsighted analysis could result in biased conclusions, which may adversely impact corporate and political decisions.

The concept of paradigm is particularly important to an analysis of the relationship between market power and sustainability, as it could be questioned whether sustainability is a strategy to fulfill another predominant paradigm, or whether it is itself a paradigm vying for domination (Levy and Egan 2003, Senker 2015). If so, it could be questioned as to whether companies with market power are better supporters in this struggle than companies without market power.

Following the example of organic farming that has been sketched above, the developed framework can be used to analyze how the dynamics between market power and sustainability play out in a transformation process that aims at

overhauling our current system towards increased sustainability. Such an analysis would also need to reflect on the existing body of transition theory and transition management (Geels 2005, Markard, Raven et al. 2012, Ross, Richerson et al. 2014, Avelino and Wittmayer 2016, Kenis, Bono et al. 2016).

This short outline of possible avenues for investigation illustrates that the comprehensive definition of (market) power that we have developed can help to illuminate the matter itself, as well as the relationship between market power and sustainability from different perspectives.

7. Conclusions

In this chapter, the understanding of market power provided in orthodox economic theory was amended. With Foucault's work as the framework, we were able to include other theoretical discussions of power, and to integrate the economic view, illustrating that market power is more than market shares and markups. We have offered definitions of power and market power that are conceptually concrete, but allow flexibility for the actual analysis of (market) power.

The usefulness of the conceptualization of (market) power that we have presented must be tested through further research, not only through case studies, but through developed qualitative and quantitative methods, and new indicators to identify (market) power. We have pointed out, however, that the manifestation of (market) power can be very subtle and diverse, which is why a fixed set of methods and indicators may not cover (market) power comprehensively. Thus, we do not understand this paper as an end-point, but as a starting point for further investigations.

The importance of an amended understanding of power is exemplified by the call of the European Parliament to target unfair trading practices, which are not covered by antitrust legislation. Therefore, an amended understanding of market power may support policymakers who seek to tackle subtler types of harmful market power.

In addition, as we have discussed the importance of the ethics underlying paradigms governing actions, we call once more for an overdue and thorough deliberation of "our" values. Consequently, we must ask ourselves whether the overall paradigm aligns with these values, and/or whether the system governs us.

Chapter 4.

The idea of weak sustainability is illegitimate

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1. Introduction

Since the introduction of the sustainability challenge (Juma 2002, Clark and Dickson 2003, Steffen, Persson et al. 2011) an intensive debate has been going on whether humans should pursue weak or strong sustainability (Redclift 2005). The scientific community is divided, whereat, to be precise, it is the economic discipline that introduced and keeps arguing about the two possible interpretations of sustainability (Davies 2013). This division can be vividly seen through the existence of two economic schools of thought; environmental (weak) and ecological (strong) economics (van den Bergh 2001, Quental, Lourenço et al. 2011).

Either a scientist chooses color and consequently conducts research that supports their decision, or looks for a middle way (Davies 2013) to keep all doors open. Is it essential to share one definition or a common understanding of sustainability? There are at least two adverse effects of not defining sustainability. First, the sustainability term became blurry, allowing everyone to call everything sustainable, without reflecting on what this really means. As a result we can find creations like sustainable competition (Song 2009), or the most contested one; sustainable growth (Daly 1996, Redclift 2005, Brand 2012). This leads not only to problems within science, but has also implications for practice. People do not know what sustainability really means and decision makers can use the term to their advantage. This leads to the second drawback. By not stating what sustainability really means usually the current economic system is promoted (Pearce, 1992; Van Hoogstraten, 2001: p.: 52). However, the current economic system is the system we want to get rid of in order to get a sustainable economic system. Thus, a state of deadlock was reached were humanity is not progressing much towards the sustainable economic system. Davies (2013) suggests taking a middle way, trying to overcome this deadlock. He argues that this is necessary for two reasons. First technological solutions are not always available and secondly not all people are willing to change their behavior. However, these two arguments are weak. First, even if technology is available technology does not guarantee an absolute decrease in resource consumption, as can be shown by the rebound effect (Alcott 2005, Alcott 2008) and the up to date inability to create absolute decoupling (Krysiak 2006, Ward, Sutton et al. 2016, Hickel and Kallis 2020). Second, it is not a question if people are willing to change their life-style. As Meadows (2010) illustrates, if the system collapses, humans have to change, they simply have no choice. Davies (2013) is right in stating that a strategy is needed to get out of the deadlock. Still, it is argued here, that a pragmatic solution accommodating both, is neither helpful, as it circumvents tackling the real

challenges such as sufficiency, absolute reduction of resource usage and waste creation; as well as the real provision and enhancement of happiness.

Indeed this is not the first paper claiming that strong sustainability is the only legitimate interpretation of sustainability (Ekins, Simon et al. 2003). However, prior arguments lead to a softening of the strong sustainability approach, as they allowed substitutability of non-critical natural capital. Thus, such arguments, similarly to Davies' approach, also suggest a middle way. Since, humans need to use natural resources to survive, such an approach is of course helpful (Trucost 2013). Though, there are too many uncertainties related to the evaluation of non-critical natural capital¹³, as to understand this approach as solution to the sustainability challenge. Moreover, the preservation of natural capital involves the clarification of critical normative questions (Redclift 2005). In this chapter, it is argued that the reason for the illegitimacy of the weak sustainability interpretation, also leads to the conclusion that humans tend to underestimate the complexity of the environmental system. Thus, humans need to be much humbler in their ability to estimate what is critical for human survival. It needs to be emphasized that this paper is not about the measurement of sustainability goals. Rather, it is aimed to illustrate that weak sustainability and the prioritization that comes along with it, is invalid. This is accomplished by referring to one specific example, the Green Revolution. While this is only one example it can be expanded to others as well. However, this example illustrates that the logic behind the weak sustainability concept does not lead to sustainability.

In the following section a short introduction of the sustainability concept is given, followed by a section on the green economy and decoupling. Thereafter, we expand on the first incidence of decoupling and its tradeoffs. Finally, we conclude unraveling the illegitimacy of the weak sustainability concept.

2. Weak and strong sustainability

It is not aimed to give a detailed analysis of sustainability understandings and what the differences between the two understandings is, as this can be found elsewhere (see for example: Hediger 1999, Jabareen 2008, Quental, Lourenço et al. 2011). However, a brief introduction is provided in order to follow the

¹³ Ekins, P., S. Simon, L. Deutsch, C. Folke and R. De Groot (2003). "A framework for the practical application of the concepts of critical natural capital and strong sustainability." Ecological Economics 44(2-3): 165-185. do also acknowledge these uncertainties and call for caution.

subsequent argumentation. There is one mainly accepted definition of sustainability:

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.” (WCED 1987).

This definition left enough space to give birth two different interpretations: weak and strong sustainability. Generally, sustainability is understood to consist of at least three different aspects; social, environmental and economic. Weak sustainability is characterized by allowing tradeoffs between these three aspects. Representatives of this interpretation argue mostly that economic aspects can be traded off for environmental aspects. This is reasoned by the belief and trust in technology, which will permit future generations wellbeing with the usage of less resources. Thus, current exploitation of resources is reinvested in the development of technologies that allow to live with less material and energy inputs (and outputs). The basic assumption behind this mechanism is the possibility to decouple economic growth from resource usage (Pearce 1992). Strong sustainability, in contrast, is not such generous with tradeoffs between the different aspects of sustainability. There are variations of the extent to which humans are allowed to destroy the environment for their wellbeing (Ekins, Simon et al. 2003, Davies 2013). However, the main difference, is that the economy is not seen as superior to the environment and that technological innovations will not provide the sole solution for the sustainability challenge (Ekins, Simon et al. 2003). Basically, representatives of this interpretation call for a fundamental change of the economic system (Daly 1996). This short outline of the two interpretations illustrate that they are founded on two completely different mindsets.

3. The suggested solution to the sustainability challenge:

Sustainable economy – green economy

While the term Green Economy became popular only recently it is a much older idea developed by Pearce, Markandya and Barbier (1989) . In 1992 Pearce outlines the ideas of the Green Economy again, stating that it takes the middle road between the two extremes of deep ecology and pure neoliberal thinking. Brand (2012) argues that Green Economy is, similarly like the sustainability concept, an empty shell and the new oxymoron. However, taking UNEP's

understanding of Green Economy it is clear that it is in line with weak sustainability. In 2009 UNEP started its Green Economy initiative (UNDESA 2012), and published the Global Green New Deal Policy Brief (GGND) that draws on US President Franklin D. Roosevelt's New Deal, which intended to end the Great Depression through governmental spending (UNEP 2009). This clearly implicates that promoting further growth is one of the three targets of Green Economy proposed by UNEP from 2009 onward. Moreover, economic growth remains unquestioned within the concept of Green Economy indicated by the continuous hope that is put into decoupling (UNEP 2008, UNEP 2009, UNEP 2010, UNEP 2011). Probably economic growth within the Green Economy concept developed new prominence through the multiple crises in 2008. In UNEP's Year Book 2010, Green Economy is presented as a tool that can "hit two birds with one bullet"; jump starting economic growth and protecting the environment (UNEP 2010). Hence, the magic key that allows to disentangle economic growth from resource input and output is decoupling.

Decoupling has two specifications, relative and absolute decoupling. The latter means that the absolute resource input decreases while GDP rises; hence resource use is decreasing in absolute terms. The former describes the incident that resource use per unit GDP declines, while the absolute amount of resource use further increases, but at a slower pace than GDP (Haberl, Fischer-Kowalski et al. 2004, Behrens, Giljum et al. 2007, Alcott 2008, FoEI 2009).

However, this promising scenario is in contrast to scientific evidence regarding absolute decoupling. A Friends of the Earth report (FoEI 2009) points out that the world economy today is 30% less resource intensive than 30 years ago. Still, current data does not indicate that absolute decoupling is possible (Behrens, Giljum et al. 2007, Huesemann and Huesemann 2008, FoEI 2009, Krausmann, Gingrich et al. 2009). Krausmann, Gingrich et al. (2009) state that absolute decoupling could not be observed throughout the history. The only occasions when resource use in absolute terms declined or stagnated were during times of economic downturn or stagnation. Anyway, some evidence for relative decoupling exists (Steinberger and Roberts 2010).

4. The first incidence of relative decoupling

Promoting Green Economy Pearce (1992) states: "Maybe the problem of scale dominates and as fast as we lower the coefficient between growth and environment the scale effect will put us back on some path to doom. We do not know because we have not tried. The problem is that we have not tried the alternatives either. Relying on some spontaneous spiritual green uprising could be risky – it may not happen. Relying on forcible change in attitudes presupposes

two imponderables: that people will take it, and that the costs in terms of the suppression of human freedoms are outweighed by the benefits of extended survival." There is some truth in this citation; the discussion around decoupling illustrates the importance of scale once again (Csereklyei and Stern 2015). Still, it is hoped that decoupling will seal the deal. However, it is not true that we do not know if decoupling will work and what effects it will have. Human society has much experience in the working and effect of decoupling as the following example will show.

In classical economics, we can still find resources as an important factor within economics, being the limiting factor for economic growth (Daly 1996, Gómez-Baggethun, de Groot et al. 2010). Land was understood as a limiting factor. Malthus had the opinion that progress will be restricted by land availability. However, this changed fundamentally with the Green Revolution. Through modern technologies and production practices more could be produced with less (Steffen, Persson et al. 2011). This is the fundamental condition for economic and population growth. People could be freed from agricultural work and became available for industrial production (Rostow 1969, Pinstrup-Andersen and Hazell 1985, Huesemann and Huesemann 2008, Meadows 2010). This first incidence of relative decoupling is the very basis of the economic system that we have now, that permitted the take-off towards the mass consumption society of today.

Figure 10 shows relative decoupling of agricultural output from agricultural land. While global GDP and global agricultural production are increasing, agricultural land remained stable. Huesemann and Huesemann (2008) even provides the example of the US corn production which could decouple in absolute terms for a certain period.

Although it was believed that the new technologies and practices will hardly have any negative effects on the environment (Pinstrup-Andersen and Hazell 1985) it turned out to be the opposite. The increase in agricultural production is owed to the increased usage of fertilizers and energy, as Figure 11 shows. Increases in fertilizer application outstrip by far increases in arable land (Foley, Ramankutty et al. 2011). Although intensification allowed humans to meet growing food demands, the means by which this was and is accomplished are unsustainable (Tilman, Fargione et al. 2001, Smith 2013). Industrial agriculture is one of the main sources of anthropocentric greenhouse gases (Olivier, Van Aardenne et al. 2005, Smith P. and C. Mbow 2014). Apart from greenhouse gases, industrial agriculture causes eutrophication, land degradation, sinking water tables, water pollution and loss of biodiversity (Vitousek, Mooney et al. 1997, Altieri 1998, Meadows 2010). Meadows (2010), using a systems thinking approach, illustrates the flaws of the industrial agricultural production system and foreshadowed the land scarcity that we are increasingly facing (FAO 2011). Problems caused by

industrial agriculture are part of the root cause of the sustainability challenge we are facing (Rockstrom, Steffen et al. 2009, Rockström, Edenhofer et al. 2020).

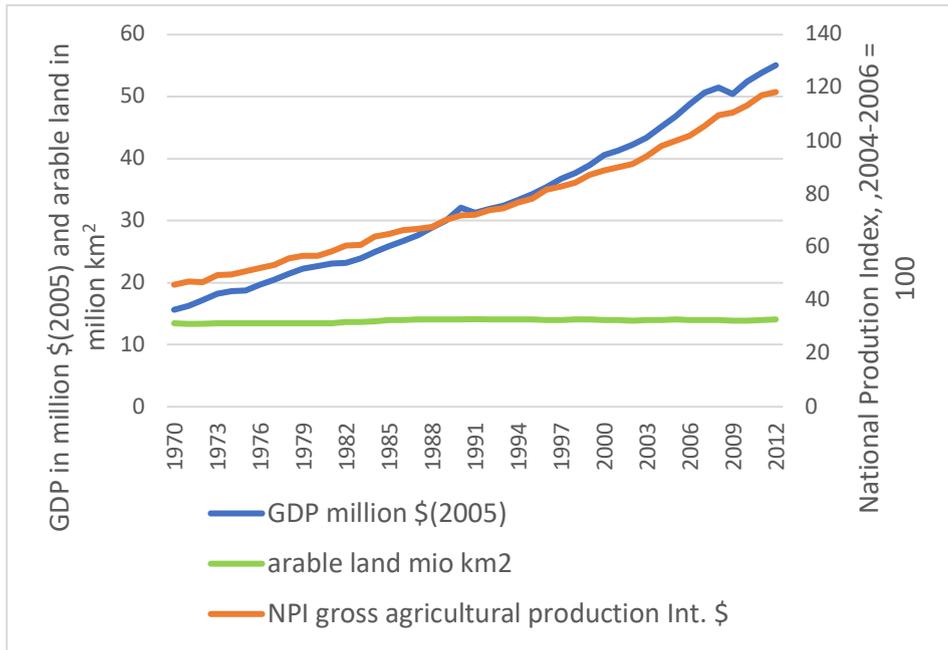


Figure 10: Decoupling agricultural output from agricultural land. (Data from FAOSTAT and own calculation (http://faostat3.fao.org/browse/Q/*/E))

The agriculture example illustrates that decoupling has to be dealt with caution. Not only because of the afore mentioned rebound effect, but also because of the potential to shift a problem from one area to another (Huesemann and Huesemann 2008, Scott 2011). For example the electric car may be promising to decouple transportation from CO₂ emissions (Van Mierlo and Maggetto 2007). Taking the source of electricity into account the environmental impact of electric cars can be greater than that of fossil fuel powered ones depending on the energy mix (Wilson 2013). Another example are biofuels. Apart from the food versus fuel problem and negative environmental impacts of growing the crops, more energy input is needed for its production than they deliver (Pimentel and Patzek 2005). Another example is plastic. While there are great advantages regarding energy savings of plastic (Andrady and Neal 2009), it also causes massive environmental problems (Cole, Lindeque et al. 2011, Wright, Thompson et al. 2013). UNEP's Green Economy Report illustrates the belief in decoupling by presenting a

promising scenario that accommodates economic growth and the reduction of resource consumption in absolute terms (UNEP 2011). However, this goal can only be reached through the employment of nuclear energy. Although nuclear energy can reduce CO₂ emissions (Kessler 2002, Duffey 2005), it has its tradeoffs related to nuclear waste, mining or safety. Nuclear energy allows to shift the problem to another area, in the presumably far future. As the nuclear disaster in Fukushima showed, problems created by technology may be more imminent than thought (Blowers 2011). Moreover, Dittmar (2012) points out that peak uranium will not allow the *green economy scenario* to come true. The trust in technology, born in times of industrial revolution (Kastenberg, Hauser-Kastenberg et al. 2005) peaks in self-deception (Nel and Ward 2015) in order to keep the current system alive. The insight that technology may cause more harm than cure is, however, not recent as the article by Burton (1968) exemplifies. In 1968 he wrote: "The Achilles heel of the technologists' approach is, of course, that the present problems of environmental quality arise precisely from the application of technological solutions to problems in the past. The new technologies now being developed may in their turn prove to be only palliatives that will pile up greater difficulties to be confronted at a later date" (ibid.).

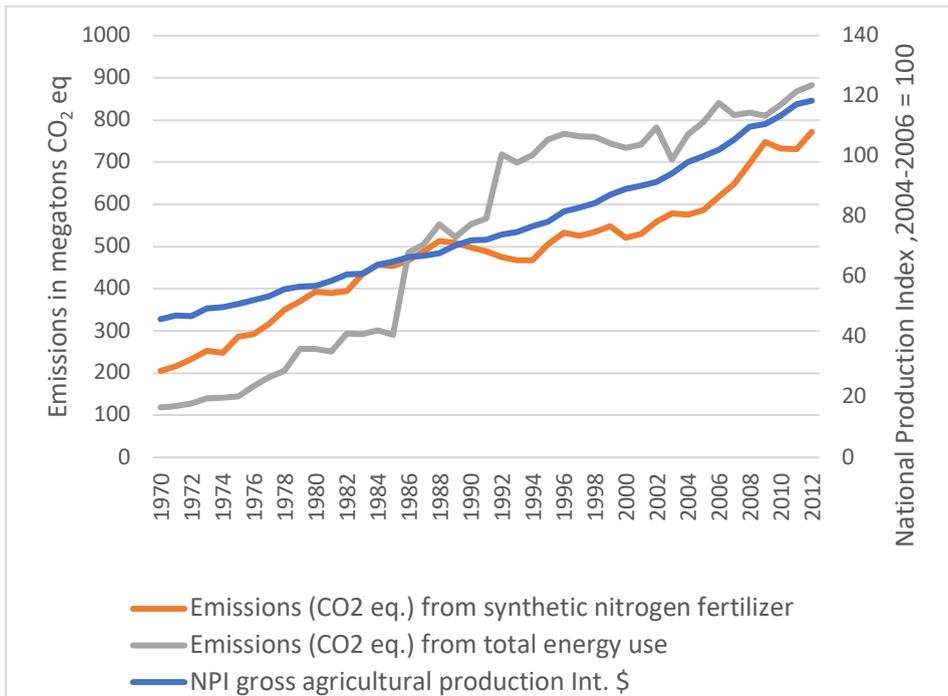


Figure 11: Joint rise of agricultural emissions with agricultural output. (Data from FAOSTAT and own calculation (http://faostat3.fao.org/browse/Q/*/E))

5. The illegitimacy of weak sustainability

In fact, the term sustainability stems from forestry, describing a management practice that allows having an at least constant stock of trees, whereat the usage of this management practice dates back to the 16th century (Weber-Blaschke, Mosandl et al. 2005). However, it was not until the groundbreaking book "Silent Spring" by Rachel Carson in 1962 that a debate about sustainability gained momentum in the political arena (Shrivastava and Berger 2010, Ishwaran 2012). It was not only a book about the adverse effects of industrial agriculture, but also a book giving rise to the understanding of the interconnectedness and complexity of the socio-economic system (Hardin 1970).

Whittaker and Likens (1975) outlined human's predisposition to reacting to complex problems with a quick fix, tackling symptoms instead of dealing with the cause of the problem, in an early scientific contribution discussing human appropriation of net primary production. Weak sustainability is the quick fix that has been pursued in the political arena and has been supported by many economists.

The concept of sustainability is teleological, striving towards a certain normative goal (Costanza and Patten 1995). The sustainability challenge consists of a transition from an unsustainable state to a sustainable one. It was outlined above that it is acknowledged that the current economic system is understood to be unsustainable, which is why the shift towards the Green Economy is proposed. However, such a shift means not a shift towards sustainability, but rather the continuation of the current system. As explained, the Green Economy is in line with weak sustainability and thus calls for decoupling. Anyway, decoupling has been one of the driving forces at the origin of the current unsustainable economic system. As was briefly indicated, this decoupling had major drawbacks, and has been partially creating the sustainability problems we are facing now. This idea of the Green Economy follows, therefore, exactly the same evolutionary pathway as our current economy. Hence, it is not as Pearce argued that we did not try this path; we tried it already and it failed. It would be illogic to employ the same mechanisms as solution that created the problem (Kastenberg, Hauser-Kastenberg et al. 2005).

Understanding the current economic system as being based on weak sustainability, leads to the deduction that weak sustainability does not exist, as the current economic system is identified as being unsustainable. More precisely, it shows that weak sustainability does not lead to any form of a sustainable future. Thus, the interpretation of weak sustainability is a contradiction in itself and thus should be abandoned. Identifying the weak sustainability concept as illegitimate and accepting this fact, allows to end the discussion between weak and strong sustainability and to pursue the latter one. This allows human society to move

beyond the development path that was set out in the second half of the 20th century, to pass the stage of "mass consumption" (Rostow 1969) and to enter the stage of sustainability.

Chapter 5.

Causal Loop Diagrams to Systematically analyze Market Power in the Belgian Sugar Value Chain

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1. Introduction

The increasing concentration in the agro-food system is a process captured by the corporate food regime (which can be subsumed under the third food regime (McMichael 2009)). While governments try to prevent companies from exercising illegal forms of market power, more subtle ways (see Chapter 2 and 3) of market power exist, that soon will also be banned in the European Union (European Commission 2018).

Market power estimations are often based on the market concentration. However, empirical studies provide mixed results regarding the adverse effects of market concentration (Swinnen and Vandeplass 2010). Moreover, market share alone may not be a sufficient condition for exerting market power. For example, competition among a few large companies might still not allow to charge a mark-up. Also, concentration at one point of the value chain may be counterbalanced by concentration up and / or downstream the value chain, as the example of this case study will show. Moreover, the identification of market concentration depends on the market definition (Podszun 2016). Furthermore, due to the lack of data market power is often hard to estimate (Cabral 2000).

Value chain analysis can be a useful tool to understand value creation and absorption within highly complex global value chains (Gereffi, Humphrey et al. 2005) characteristic for the third food regime. The creation and absorption of value is indicative of the power structure within the value chain. Gereffi, Humphrey et al. (2005) and Cox et al. (2001) illustrate the importance of understanding the power distribution along the value chain. According to Cox, Sanderson et al. (2001), mapping the value chain is not enough. Only by understanding the power structure within the value chain it becomes apparent how and why commodities are produced as well as whether it is worthwhile to participate in the chain.

Gereffi, Humphrey et al. (2005) as well as Cox, Sanderson et al. (2001) use a qualitative approach to describe the power distribution along the value chain. Critical to their work is that the structure of the chain determines the power distribution. A structure that is caused by factors such as the number of actors or the complexity of transactions. Within Industrial Organization (IO) economics the Structure Conduct Performance (SCP) paradigm supports the idea that the structure of the market affects power. However, due to endogeneity problems the SCP paradigm has been criticized (Slade 2004), and replaced by the New Empirical Industrial Organization (NEIO) framework which focuses on conduct, rather than on structure (Ferguson and Ferguson 1994). The NEIO framework is neither

without its shortcomings (Perloff and Shen 2012) and new research indicates the validity of the SCP paradigm (Martin 2012). Thus, the appropriateness of the two distinct approaches is an ongoing debate.

We do not intend to participate in this debate, but rather illustrate how systems thinking can be used to analyze market power within a value chain. While the SCP paradigm struggles with the feedback between structure and conduct, systems thinking embraces feedback mechanisms. Moreover, systems thinking supports the understanding of dynamic behavior (Sterman 2000), which are fundamental feature of global value chains (Gereffi, Humphrey et al. 2005).

The aim of this chapter is to explore the possibility of using systems thinking to study the interrelationships between value chain structure and market power using the sugar beet case study in Belgium. We will show how causal loop diagrams can help structuring complexity and thus support understanding dynamic market power mechanisms caused by the structure of the system. Grether (1970), in his review of the usefulness of the SCP approach, assessed the opinion of experts within the field of IO about the contribution and weakness of as well as future suggestions for IO research. One suggestion for future research within the field of IO was the reexamination and reformulation of the SCP concept through systems analysis. This paper follows this suggestion.

In the remainder of this paper we will first introduce the case study. Next, the method employed will be outlined, and we will explain how we used systems thinking in our analysis as well as how we built causal loop diagrams from qualitative data. The successive section outlines the analysis of the case study by expanding on the causal loop diagram. Finally, results are briefly discussed.

2. Case study introduction: the Belgian sugar value chain

Sugar beet production within Belgium takes up an important role, since it is the crop with the highest production (in tons), occupying 9.2% of the harvest area (55.504 ha) in 2016 (FAOSTAT 2017), distributed among 7.398 sugar beet farms (FOD Economie 2017). Despite being an important crop, the number of sugar beet farmers has been declining substantially from 36.114 in 1986. The most pronounced decline of sugar beet farms occurred between 2007 and 2008 due to policy reforms of the sugar quota system, reducing the overall quotas issued. While this reduction led to increased concentration on farm level, the same can be observed on the processing level. In 1872 Belgium hosted 174 sugar beet factories, today only three are left, owned by two companies (CBB 2017). Up until the 2015/16 sugar beet campaign market concentration did not pose a problem, due to the regulatory framework within the European Economic Community (EEC)

and later the European Union (EU). The quota regulation, that has been in place until September 2017, stabilized prices and sugar beet production within the EU. Over time, regulations were softened, which led to a reduction of guaranteed minimum prices for sugar beet. The reduction of prices should facilitate the transition towards a liberalized market. Regulations not only controlled prices and quantities, but also contractual terms between farmers and refineries. According to the regulations, refineries shall not negotiate with farmers individually, but via the farmers' union¹⁴. This is a mechanism that particularly now, with the termination of the quota system, supports the creation of a level playing field in this highly concentrated market.

In Belgium, sugar beet farmers have only one sales channel, via the Confederatie van de Belgische Bietenplanters (CBB), which is a Producer Organization that was established in 1965. Its goal is to represent and defend the interests of Belgian sugar beet farmers at local, regional and national level. In this respect one of the most important tasks is to negotiate the sales of the crop to sugar refineries. CBB also controls the reception of the crop in the refineries. This means that in each factory up to five CBB inspectors are permanently present to control the work of the personnel of the sugar refinery and to test whether all reception conditions are fulfilled. They moreover control the pulp and report their results to the farmers (CBB 2017).

Sugar beet marketing is regulated by interprofessional agreements concluded between each refinery and the farmers' union (CBB). Under the quota regulation, the minimum price was set by the European council of ministers. In this period farmers were certain to sell all their contracted output at least at the minimum price. However, since 2006 the minimum price declined and with the termination of the quota system in September 2017 prices may fall even further. For the plantation year 2017/18 the overall acreage sown with sugar beet has increased by 14% (CBB 2017). This together with favorable weather conditions led to even higher yields. Sugar beet prices for August 2018 are at an unprecedented low level (VILT 2018). It is questionable whether sugar beet cultivation will be profitable, if prices maintain at such a low level. Not only the future strategies of farmers depend on the sugar beet price, but also the strategies of the two refineries. In the marketing year 2016/17 the two refineries had different approaches. While one maintained their past pricing strategy, the price offered by the other was reduced. The coming years will show how prices will develop and whether pricing strategies of refineries will change in accordance.

¹⁴ Relevant regulations: (EEC) No 741/75, (EC) No 1260/2001, (EC) No 318/2006, (EC) No 1234/2007, (EU) No 1308/2013.

As sugar beet farmers are faced with falling prices, the creation of value on farm level is of pivotal importance to increase or maintain the profitability of sugar beet cultivation. Accordingly, we apply a value chain perspective in which the farm level is at the center of our analysis. While a supply chain refers to the process of assembling a final product throughout the chain, value chain refers to the creation of value within a chain (Gereffi, Humphrey et al. 2005).

3. Method

To unravel the causes of market imperfections, in particular of market power, in the Belgian sugar beet sector, we used a systems thinking approach. The usefulness of systems thinking for the analysis of the agri-food value chain is illustrated by Gereffi, Humphrey et al. (2005). They point out the importance of structure and link it to competition and value creation along the value chain. Gereffi, Humphrey et al. (2005) point out that systems maps are a form of representation with two benefits: “[...] first, it constitutes the framework on which the subsequent stages of the study are built and which ensures that the study meets the necessary criteria of repeatability and comparability; second, it provides the first descriptive result of the technical and functional characteristics that distinguish the specific agri-food system under investigation.”

Similar to the SCP paradigm, systems thinking understands conduct (system behavior) as a result of the structure (Ferguson and Ferguson 1994, Sterman 2000). Thus, both approaches suggest the examination of the structure to infer insights about a specific behavior, such as market power. As we pointed out in the introduction, grounding market power analysis on data struggles with three problems (apart from data availability). First, deviation of price data may not be caused by market power, but by other causes, that may not be apparent to researchers (Mason 1939, Ferguson and Ferguson 1994). Thus, the results of an analysis may be misinterpreted. The misinterpretation of data relates to the second problem, market power which is not revealed in price data. The discussion pertaining unfair trading practices (see Chapter 1) emphasizes this issue (Jan Fałkowski, Claude Ménard et al. 2017). Third, as Ferguson and Ferguson (1994) point out, the analysis of price data resembles a symptom treatment as opposed to treating the cause. Hence, even if data analysis identifies market power, it is not clear what caused market power. Consequently, it does not allow any statement about whether market power will prevail in the future or not, or how to best tackle it. This is, because the underlying cause for market power in the studied market may change. Accordingly, the cause for market power needs to be analyzed, which is following the SCP paradigm the structure of the market. Understanding the structure of the market may also allow policy makers to tackle the root cause of market power in a specific market situation. Thus, the SCP

paradigm and systems thinking investigate why there is market power, rather than whether the performance measure (price data) indicates market power.

Following the SCP paradigm the “[S]tructure describes the characteristics and composition of markets and industries in an economy” (Ferguson and Ferguson 1994). Mason (1939) identified: a) economic characteristics of the product, b) costs and production characteristics, c) number and relative size of buyers and sellers, d) knowledge possessed, and e) differences in distribution channels as the building blocks of the structure. However, more building blocks can be added (Ferguson and Ferguson 1994: 14). Systems thinking applies a broader take on the meaning of structure, as the approach is not limited to economic analysis. A structure within systems thinking consists of feedback loops, which are built by the causal relations between variables (Sterman 2000).

The main challenge of the SCP paradigm is endogeneity. In other words, does structure cause conduct, or does conduct cause structure? While the SCP paradigm struggles with this challenge systems dynamics centers around the question of causality (Sterman 2000 see chapter 5). Endogeneity is not a challenge, but the core of systems thinking. Structure and performance variables are connected with each other in causal loop diagrams, allowing the mutual relationship to play out over the course of time. Consequently, a systems thinking analysis may allow to give indications pertaining the future structure and performance of a specific market. For example, an analysis could indicate whether a situation of imperfect competition will prevail in the future, or whether imperfect competition will lead to structural changes that will revert the situation. Hence, while the SCP paradigm needs stable market structures to being applied without facing an endogeneity problem, systems thinking embraces circular causality.

A simple example (Figure 12) serves to explain systems thinking. Figure 11a illustrates a basic causal loop, with two variables, *yield* and *farm gate price*. Within the causal loop diagram, a plus at the end of the arrow signifies that the starting point and the end point of the arrow move in the same direction. A minus, in contrast, means that they are moving in opposite directions. For additional visual clarity the negative arrows have a dashed line. The first simple causal loop should exemplify the concept of positive and negative connections. At the farm level, a certain yield is related to a certain price for that commodity. The higher the yield the lower the price will be, given that the demand stays the same (thus, a negative arrow). In turn, the price feeds back into the yield, since the price will determine how much the farmer will sow the next season. Usually, the higher the price the more will be sown and vice versa (thus, a positive arrow). This relationship builds a balancing feedback loop, indicated with a “B” in the center of the loop. A loop is balancing if the behavior of the loop does not lead to a collapse, which would be in this case continuously increasing or reducing production. The behavior of the loop is in line with basic economic considerations, where price functions as a

balancing mechanism to set supply equal demand. A supplementary feature of this causal relation is a delay between price and output, indicated by two parallel lines intersecting the arrow. The delay is caused by farmers' inability to instantaneously adapt output to price. An adaptation process may take up to a couple of seasons, as for example crop rotation needs to be adapted. The same structure can be found on the refinery level, but variable names change. The output is white sugar, and this is related to the amount of sugar beet provided on farm level. The more sugar produced, the higher the price for sugar beet and vice versa. These two feedback loops are connected, with the refinery sending a demand signal to farmers (see Figure 12 b). B2 describes the connection; the higher the farm gate price, the less will be demanded (by the processor), hence the less input will be used by the processor. The less input, the less output (on processing level). The lower the output (on processing level), the lower the demand (for sugar beet), and thus, the lower the price (for sugar beet). This will in turn increase the input purchased by the processor. This simple causal loop structure builds the basis for following causal loop diagrams, which expand on market structure variables, such as number of companies and scale effects.

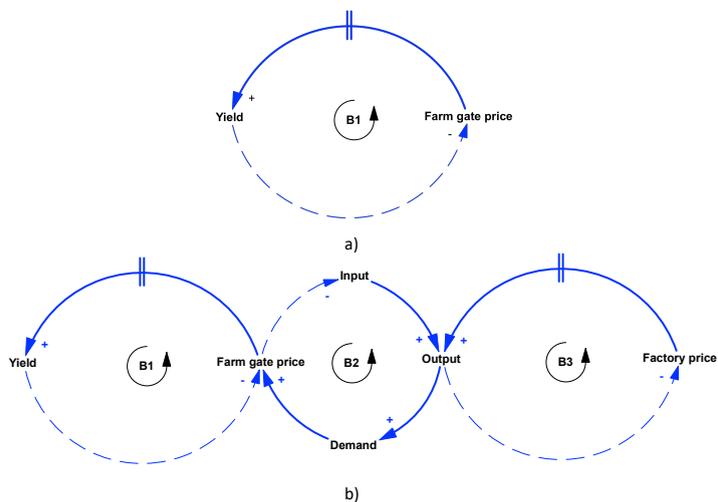


Figure 12: Simple causal relationship building the backbone of following causal loop diagrams. a) balancing feedback loop on farm level, b) balancing loop on farm and refinery level connected by a demand – supply loop.

4. Data collection

In order to gather the necessary information, we applied different qualitative research methods in a stepwise manner; literature research, semi-structured interviews, focus groups and a workshop. Interviewees, focus group as well as workshop participants had to sign an informed consent that guaranteed their anonymity and informed them about data storage, processing and use. Different data collection methods provide a wide variety of insights and are thus a means of triangulation. By stepwise employment of different data collection methods, an iterative process is followed which facilitates in-depth knowledge generation (Carter et al., 2014). Systems thinking calls for an iterative research process (Sterman 2000). Hence, the data collection methodology was selected to support the analysis process.

The research process started with a desk-based investigation. Relevant literature, such as reports, media reports and scientific articles were screened to get an overview of the issue and identify important themes. These themes were the basis for the development of a semi-structured interview outline and were used to construct a conceptual map, which served the research team to get an overview of potentially important themes. Resulting from the desk-based research, identified themes were connected with each other in the conceptual map. Investigations were extended, wherever the research team could not pinpoint the relationship between themes. Upcoming questions were then answered by literature and by the following qualitative research steps.

The second research step consisted of nine interviews with Flemish sugar beet farmers in the summer of 2016. Another interview with a refinery representative was conducted in May 2017. Interviews were transcribed, translated and coded with the support of the NVIVO software, following grounded theory (Strauss and Corbin 1998). Based on the results from the previous research step the conceptual map was further developed. Moreover, the first causal loop diagrams were developed. These causal loop diagrams display a subsystem, the value chain. Causal loop diagram, conceptual map and the codes in conjunction helped identifying blind spots. In order to fill these blind spots, three strategies were applied: consultation of relevant literature, further analysis of the interview transcripts, and development of a semi-structured focus group outline.

The third research step consisted of two focus groups with 14 Flemish sugar beet farmers in February 2017. Both focus groups were recorded, transcribed and coded. Due to the exploratory nature of our research we applied open coding (Strauss and Corbin 1998). Codes developed from the interview transcripts were used for the focus group transcript as well, but new ones were developed if needed. The gathered information was then once more used to refine the causal loop diagram. Finally, in May 2017 a workshop was conducted with value chain

representatives to verify or falsify as well as to refine the gathered results. The workshop data were collected via note keepers and output from the workshop, such as flipcharts and sticky notes.

Coding helped to synthesize the gathered information in the course of the research process. The relationships between codes were transferred into the causal loop diagram. This step is similar to axial coding (Strauss and Corbin 1998), the result of which is a causal loop diagram, presented below. As Spicer (1998) stated, model changes through the repeated process of model building. To understand causal relations, researchers need to identify the reasons for a situation unfolding in a certain way. Only the comprehension of the causes allows to (literally) draw connections and mechanisms can be understood (Strauss and Corbin 1998). Thus, the construction of causal loop diagrams is an iterative process of reexamining data. In order to illustrate this process, in section 5, we included statements of interviewed stakeholders.

5. Results

Our analysis focuses on the farm level, so we aimed at understanding the situation of the farmer within given circumstances. Moreover, a focal point was placed on the economic conditions and, within this realm, on market power issues. This choice was made due to the concentration within the sector, described in Section 2.

The general information about market power allowed us to identify which market power causing themes are relevant for this case study. As the case study description indicates, concentration is an issue. Thus, the variables *number of actors* and *farmers' union* needed to be integrated in the causal loop diagram. The farmers' union is particularly important in the Belgian sugar beet case as all farmers need to be member of it. This means that the factory is not facing a larger number of farmers but one actor; the farmer's union. This, theoretically, equips farmers with more power in negotiations with buyers. Another relevant theme for market power identified at this stage was *substitution*. Sugar (sucrose) can be produced from sugar beet or from sugar cane. Apart from this, sugar (sucrose) can be substituted by other sweeteners. The availability of sweeteners does not translate in a complete substitutability, due to the characteristics of each sweetener (Clemens, Jones et al. 2016). Hence, each type of sweetener has its own demand, that influences the buyer's willingness to pay for the product. Along this line, substitution also affects the price elasticity of demand, a measure to show the responsiveness of the quantity demanded to a change in price. The lower the elasticity of demand, the higher the power of the seller in a non-perfect competitive

market. For example, if a factory is solely able to process sugar beet, the demand for this good is relatively inelastic.

Based on the gathered information on the sugar beet case study, it is clear that the number of actors is pivotal, as there are only two refineries within Belgium. Also demand and supply elasticities, are important. In addition, through the process of analyzing the behavior of players within the chain we could identify additional key factors that influence market power. *Transportability* and *perishability* were identified as a missing link between the value chain structure and market power. The changing product characteristics at each stage of the value chain co-determine market power. At all stages of the value chain, actors are faced with certain demand and supply elasticities and a certain number of buyers and sellers, but transportability and perishability of the product determine the geographic scope of the market and hence the number of buyers and sellers as well as the supply elasticities. We will expand on this below. Another important factor are scale economies, which will also be explained in a following section.

The importance of the dynamics between price and cultivation decision became obvious by farmers referring to the milk quota problem. After the termination of the quota system in the milk sector in Europe in 2015, farmers overproduced, because of initially favorable prices. Later, due to overproduction, prices shrank and with this farmers' income (Pouch and Trouvé 2018). Farmers in our case study described the fear of a similar process happening in the sugar sector. At the same time, some farmers pointed out that there is a difference between the milk and the sugar sector, which is why they think the quota termination would not lead to the same problem.

Erik¹⁵: So if that happens, if this system does not fail elsewhere and we do end up producing 25 percent more in Europe, then we'll end up with a similar scenario to that of milk, in the best of cases, that is. And that's a problem.

Lars: And if you start producing more, the price drops, as you can see with milk at the moment, leaving hardly any margin for the farmers.

Wout: Everyone compares the situation in the sugar sector with the abolition of the milk quota, which was and still is a real disaster. But there is of course a major difference between sugar beets and milk. For example on my farm, if we do not have a quota and we are free to do as we please and the crop is not profitable, we can immediately switch to another crop. Well, maybe not immediately, but we

¹⁵ To guarantee anonymity of interviewees names are replaced with publication names.

can search for a replacement. As for the milk quota, those farmers built sheds and invested heavily. They cannot escape, they have to continue.

The main difference between the situation of the dairy farmers and the one of the sugar beet farmers is asset fixity (see statement of Wout). The asset fixity explains why the feedback mechanism between output, price and demand did not work. As soon as investments have been undertaken by farmers, the relation between output and price is weakened by creating supply inelasticity. Shortly after the quota termination (season 2017/18) one can observe, sugar beet farmers similarly struggle with low prices due to overproduction of sugar beet (VILT 2018). Our analysis already foreshadowed this behavior. Though, when considering the simple causal loop diagram, it is not visible. Thus, in the following we will expand the causal loop diagram to illustrate the anticipated market behavior.

5.1. *Transportability and perishability*

As stated above, the number of buyers (processors) is not the sole cause for market failure in the sugar beet value chain. Suppose the number of buyers would be the only problem, then farmers could either store their crop until prices were better and / or search for alternative buyers in neighboring countries (Germany, France, the Netherlands). However, these strategies are unavailable to the sugar beet farmers due to *perishability* and *transportability* of the crop. Perishability implies the temporal urgency of the crop needing to be processed / consumed. This causes a certain degree of supply elasticity. Transportability indicates the costs for transportation. Both variables have been included in the causal loop diagram (see Figure 13).

Following Sexton et al. (2005), perishability increases with the amount supplied in respect of stable demand. Further the perishability of a product determines the supply elasticity, which is low in the case of sugar beet. Thus, this increases farmers' pressure to sell their yield. Accordingly, their seller power is reduced with subsequent effects on prices (B2). The same can be formulated for the buyer side, whereat the effect is opposite (B4). Transportability is determined by the transportation costs, which are here limited to the factors weight of the crop and the distance to the buyer. The heavier and the more distant the buyer, the higher the costs and thus the lower the transportability. Additionally, perishability also affects transportability, since a highly perishable good cannot be transported far (at least not without increasing costs, e.g. via air transportation). A high transportability has a positive effect on the seller (B3) and a negative one on the buyer (B5). A seller's position is improved by higher transportability, as the number of potential buyers increases. The costs incurred by transportation are reflected in B7 in Figure 14 (next subsection).

Herman: The profitability is partly determined within a 100-km range. They look at how many beets there are, because otherwise the cost – the transport cost – risks getting too high.

Refinery representative: If you go to sugar, all sugar is dry, storable, can be transported all over the world. And this market, this world market has developed since more than 100 years. There are big volumes that are traded by... if you want to sell sugar for a certain price because the world market price is good, you always have a buyer on the other hand.

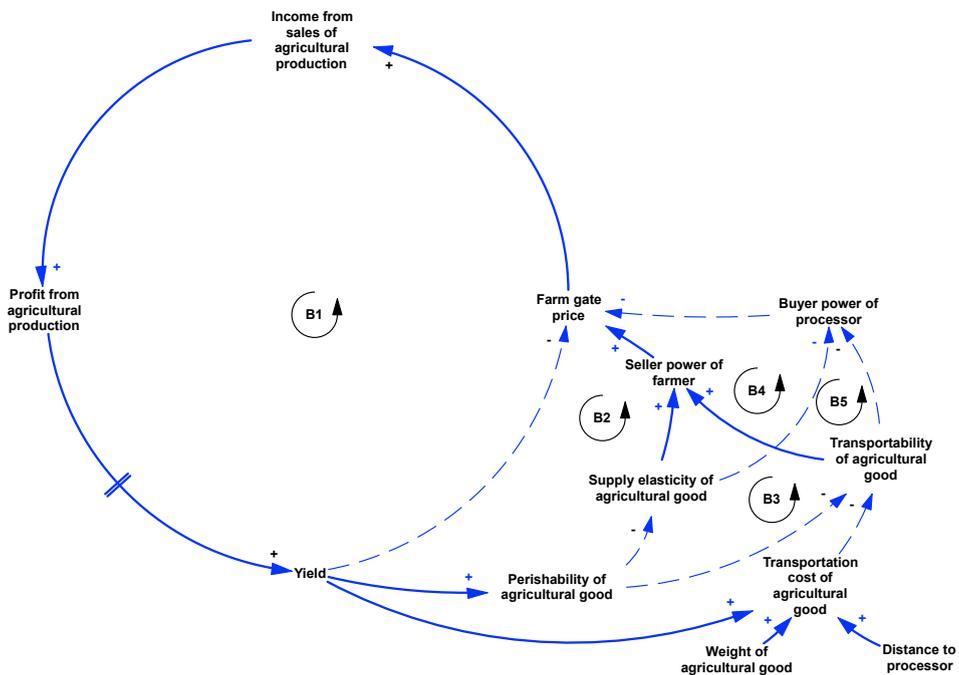


Figure 13: Farm level balancing feedback loop including the feedback loops that capture transportability and perishability

Applied to the situation of sugar beet farmers in Belgium, it follows that the seller power of farmers is reduced compared to the power of the buyers. This effect is based on the product characteristic, which is low transportability and high perishability. Sugar beet needs to be processed quickly, as it constantly loses its

valuable sugar content after harvest. Further, due to sugar beet being a heavy crop, it is uneconomical to transport it farther than needed. These two factors explain why sugar beet is not traded globally, but regionally. The only perfect substitute for sugar beet is sugar cane. However, similar to sugar beet, sugar cane needs to be refined quickly to preserve its sugar content (Solomon 2000). Moreover, refineries in sugar cane cultivating areas have to be close to the field as well in order to minimize transportation costs (Higgins, Thorburn et al. 2007). In contrast raw sugar is traded globally, which is explained by the product characteristics. Figure 15 depicts the farm level linked with the refinery level. Loops having the same number are exact replica of the farm level loops. Although, the processing level would theoretically profit from low perishability and high transportability of raw sugar, seller power is mediated by another factor, the number of buyers.

5.2. *Number of companies*

Figures 14 to 16 represent the complete causal loop diagram of the farm and the refinery level. They are connected with B6, a balancing loop. This loop is in essence the same as B2 in Figure 12, but with more detail. The higher the farm gate price, the higher will be the input costs and thus the total costs. The higher the costs, the lower the profit. The less profit, the less output and thus demand for output, which in turn affects the farm gate price. Figure 14 highlights (in red) the effect of the number of farmers and processors on market power. One factor determining the number of farmers and processors, is the profits made by actors at each segment of the value chain. The higher the profits the higher the incentive for new players entering the market. The more processors, the lower will their buyer power be (B9) and the higher will the seller power of farmers be (B8). Moreover, the more processors there are, the lower will be their seller power (B10a), but the higher will be the buyer power of manufacturers. Note that this would change in the presence of some kind of legal or illegal cooperation among processors. This concept once more covers basic economic considerations (Ferguson and Ferguson 1994).

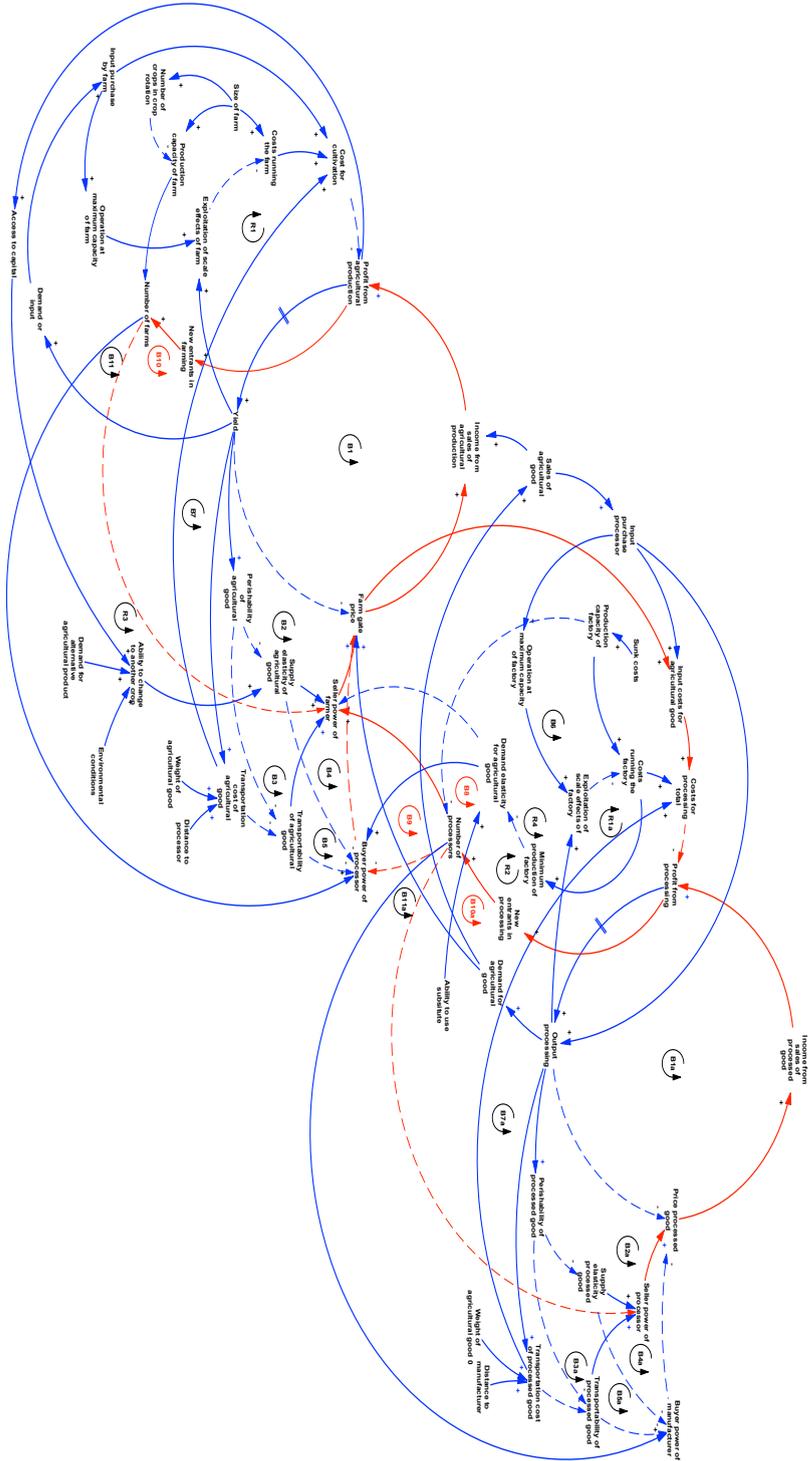


Figure 14: Number of companies: feedback loops within the value chain causal loop diagram

Profits should only be higher than marginal costs at the presence of some degree of market power. In the absence of entry barriers, new players would enter to absorb these profits. Setting up a sugar refinery is a costly endeavor (*sunk cost* in causal loop diagram) and thus forms an entry barrier. This fact explains why there are only two refineries in Belgium.

5.3. Scale effects

Entry barriers are not only affecting the number of players in the market, but they also explain another factor that needs to be included in the causal loop diagram: scale effects. The outlined causal relations do not explain why processors intend to increase their output. We have so far established that Belgian sugar processors have buyer power due to the characteristics of the crop and the number of refineries in close proximity to farmers. According to economic theory processors should have no interest in increasing output, since this would reduce their profit. Still, this was their intention when the quota period terminated.

Teun: We're always expected to produce more and more—it's the same for milk.

Stijn: Why I phoned asking to join? Well, for the same reasons as Laurent's but mainly because I feel like this is a crucial and dangerous moment for sugar beets, especially because the industry wants us to produce 20% more. In reality, that's what they're asking, right?

Jan: De [...] Suikerraffinaderij is a good company, but they aim for a longer production period to reduce their fixed costs.

As profit maximizing corporations, processors would want to further increase their profit. Competing on the global market for sugar, they can only harvest additional profits, by providing high quality sugar at a competitive price. Clearly, reducing the input price is one strategy to achieve this goal. Increasing production, would however, rather increase costs and thus profits would not increase, unless scale effects can be engaged.

Refinery representative: Of course, but our business is risky as well. If the yield is low, like last year, they have a lower yield per hectare, but we also have less sugar and we have our fixed costs which stay there. Our variable costs might be low, but the fixed costs they are there. There is no discussion about it. And this is really the big trigger in the sugar sector that we have to try to manage this risk of the fixed cost. That is also why we want to increase our production, to reduce our fixed cost per ton produced.

Johan: As for upscaling, we have a few very clear scale effects that will manifest themselves in the upcoming decade. Our farmers are, on average, 56 years old,

all of them. [...] A colleague who now has 10 or 20 hectares can take over and boost his beet production up to 20 or 30 hectares. [...] Financially speaking, you're better off with 10 or 15 than with 5. You need the same amount of pesticides and your day-to-day activities and operations, I can see a difference there from a business and economic perspective. So we're evolving toward larger-sized farms, [...].

Scale effects (R1) cause the formation of a reinforcing loop which explains why a processor would want to increase production. The scale effects are shown in Figure 15 (colored in red). The more scale effects are exploited the lower the fixed costs of the factory. A strategy that has been employed all over Europe after the quota termination (VILT 2018). The lower the fixed costs, the lower the total costs, and the lower the total costs, the higher the profit. Eventually, the exploitation of scale effects will be zero (when optimum capacity of the factory is reached). If exploitation of scale effects becomes zero, there will no longer be a reduction of fixed costs and thus this will no longer be an incentive for increased production (hence a balancing loop will kick in). The larger the exploitation of scale effects, the larger is the incentive to increase production. A similar pattern could be applied for the farm level, where farmers who were so far not able to increase production due to the quota regulation, strive to increase production in the post quota period. Scale effects are triggered by the size of the plant, which are also related to sunk costs. Not only does the dimension of one factory determine the potential scale effects, it also acts as an entry barrier in three ways. First, high investment costs may deter potential newcomers. Second, the ability of existing processors to instantaneously step up production if threatened by new entrants, functions as an entry barrier. Third, the larger the processors' factories, the less factories will be needed to cover the demand (Ferguson and Ferguson 1994).

5.4. *Demand and supply elasticity*

The relevant loops for demand and supply elasticity are emphasized in Figure 16 (colored in red). Demand and supply elasticities explain why farmers are not simply switching to another crop, when faced with crumbling prices. Although it was pointed out that the investments in sugar beet farming are much lower compared to animal husbandry, asset fixity is still relevant (for an explanation of asset fixity see: Ferguson and Ferguson 1994). Belgian sugar beet farmers hold shares of the refineries (SOPABE or SPABE-T), which must be sold if sugar beet cultivation is discontinued. Further a replacement for the income from sugar beet needs to be found. A task that is coupled with some obstacles. Environmental, economic as well as legal factors need to be considered. Stated differently, a crop that fits within the rotation cycle, the climate and soil conditions, for which a market better than the sugar beet market exists needs to be found. Other crops may further require the farmer to undertake new investments (e.g. storage, machinery, knowledge). These factors influence the supply elasticity, which also

affect the seller power of farmers. The supply elasticity has already been discussed, whereat it was limited to perishability (B2) and the delay within loop B1. Though, one could further distinguish between short term and long-term supply elasticities. The farmers' ability to change to another crop determines the long-term supply elasticity and with this their seller power (R3). Elasticities are also a factor on the refinery level. The production capacity and related costs influence the minimum production of the factory and hence the demand elasticity for sugar beet. The higher the minimum production and the more restricted the supply, the higher will be the selling power of farmers and the lower the buying power of refineries (R4). Similar to the farm level the long-term demand elasticity of the processor depends on whether or not it is possible to use substitutes. Which is not the case on refinery level. An interesting result of this analysis is the identification of R3 and R4. The ability to adapt the cultivation in the long run, is a key factor improving the position of farmers. Thus, in order to empower farmers' position within the value chain, their ability to adapt should be supported. R4 indicates that large production facilities counteract a favorable position of processors, as it reduces their demand elasticity. This is a fact very well known by the farmers. The overproduction after the quota termination indicates that farmers have not yet exploited the R4 to their favor.

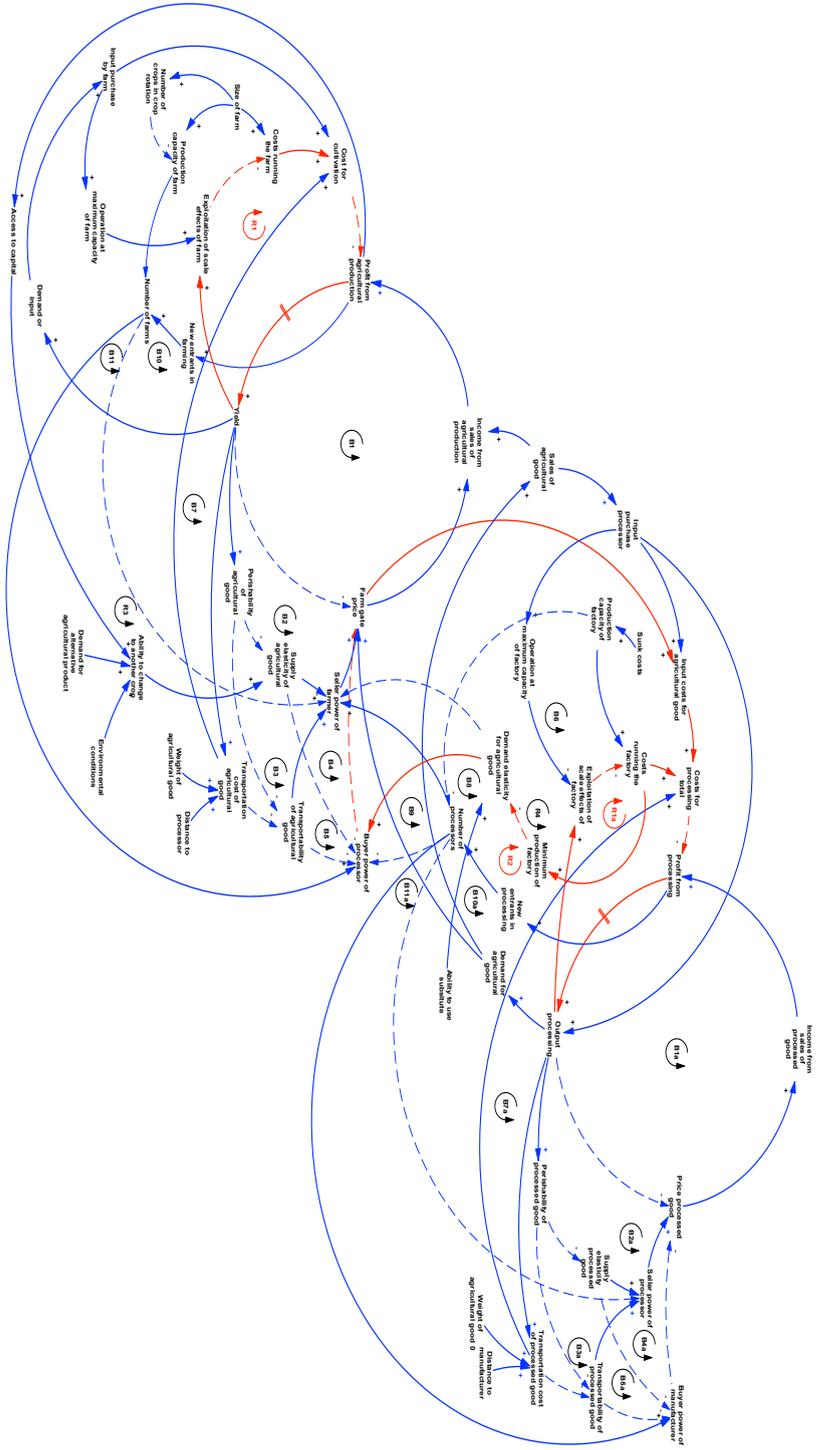


Figure 15: Scale effects loops: feedback loops within the value chain causal loop diagram.

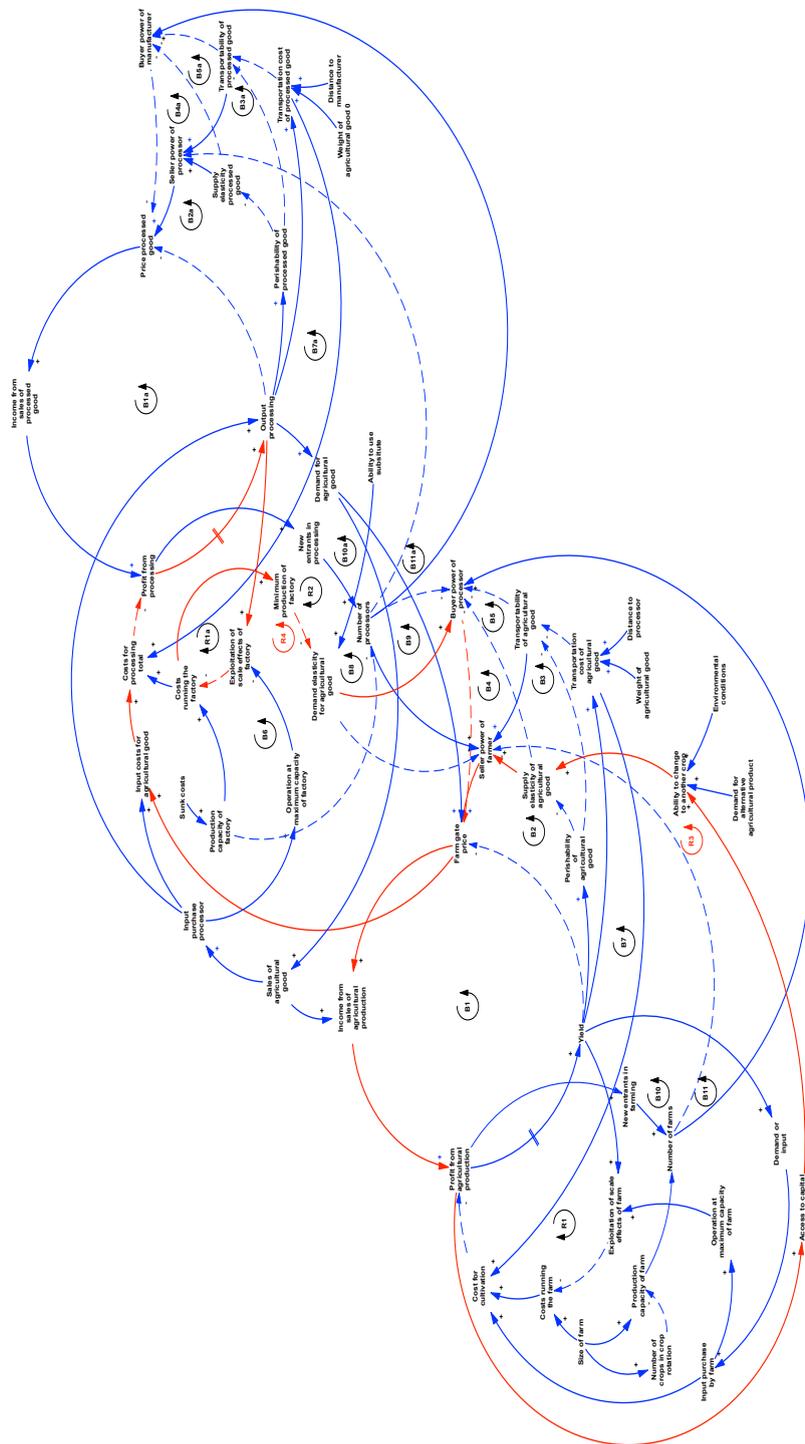


Figure 16: Demand and supply elasticity: feedback loops within the value chain causal loop diagram

6. Discussion

During one focus group, it was emphasized that an important strategy in the post quota period is the stabilization of sugar beet cultivation in order to maintain the price level. The causal loop diagram explains the reasoning for this strategy. Supply is the only leverage farmers have at this point (B1). The factory needs more sugar beet to increase profitability (R1). If farmers increased their production, they would worsen their situation (because of the reduced farm gate price), while improving the situation of the refinery (by reducing their unit costs). Interestingly understanding the effects of increased productions did not prevent overproduction to happen. Hence, while systems thinking can help understand why the current situation led to overproduction, it cannot explain seemingly irrational behavior of stakeholders. Research on bounded rationality may deliver insights pertaining this issue (Kahneman 2003, Malawska and Topping 2016). It is beyond the aim of this paper to expand on problems of bounded rationality. However, it is necessary to point out that the understanding of a particular circumstance may still not be enough to act rationally. Having said that, it is not to downgrade the usefulness of systems thinking. Rather it is the call to include more perspectives.

In the course of data collection opposing views, pertaining the need to reduce sugar beet prices, came to the surface. Farmers were partially not understanding why the Belgian market is dictated by the world market. On refinery level, on the other hand, it is not understood, why farmers do not apprehend that refineries are forced to obey the world market. The subsection on perishability and transportability gives some indication for the reason of this misunderstanding. Changing product characteristics determine the geographic scope of the market at each level of the value chain. Liberal markets render impossible the ability of market agents to shield from global market impacts. While farmers are naturally shielded due to product characteristics, this is not the case on refinery level. In order to remain competitive, market agents need to produce at lower costs. If sugar refineries would not reduce their prices, they might lose globally active customers. This would result in lower demand for Belgian sugar beet and hence in lower prices for the crop. Accordingly, buyer power of manufacturers who can choose the best offer on the global market is transmitted upstream the value chain. Therefore, farmers who want to continue cultivating sugar beet have two choices. Cultivating less at a lower price, or cultivating more at a lower price. If farmers are able to exploit scale effects they will go for the second option.

We do not intend to focus on policy interventions in this analysis. However, due to the situation of the Belgian sugar market, it is necessary to briefly address the main ones relevant to the case and market power. Although the quota regulation

has terminated, the market is not completely liberalized. Sugar imports are still limited. This of course affects competition on processing as well as manufacturing level. Further, our causal loop diagram indicates that the higher the number of actors the lower their market power. Cooperation among market actors is usually forbidden by antitrust legislation. Though, farmers are allowed to cooperate and form producer organizations. This means that the number of farmers does not reduce their market power. Rather the contrary is the case. The power of a producer organization, can be determined by the number of farmers within the organization as well as the proportion of farmers being and not being member of the organization. All Belgian sugar beet farmers are part of the farmers' union CBB. This equips them with the highest possible degree of power, with each farmer leaving the union decreasing it¹⁶. The power of this union can also be evaluated in the light of a new cooperative sugar refinery that is about to be built in Belgium (ABW 2018). This constitutes a new strategy that was brought up by a farmer during the second focus group. At that time, it was a mere hypothetical discussion. Though the capital intense castle in the air is becoming real. As we have pointed out, high investment costs for setting up a sugar refinery constitute an entrance barrier. Finances necessary for the investment are mainly covered by the farmers (equity and credit). Already joint forces of sugar beet farmers, allowed them to quickly react to worsening conditions on the sugar market. Moreover, the plans for a new refinery will also receive (financial) support by the regional government (ABW 2018). Such policy interventions affect the power balance within a market. Though, they may be necessary due to the oligopolistic¹⁷ situation on the processing level on Belgian sugar beet market. These new developments indicate that Belgian sugar beet farmers intend to create a new market situation, that may offer a third option; producing more for a higher price. A new situation which may cause R4 to take over to the detriment of the existing Belgian refineries. In essence, one of the existing refineries may be forced to close down if not enough sugar beet supply is secured.

7. Conclusion

The analysis has shown that causal loop diagrams can be a powerful tool to help understanding a complex situation. We could illustrate that market power is not simply a factor of the number of players at each level of the supply chain, as already pointed out by Mason (1939). Thus, the structure of the market is not merely defined by the size or the number of actors. Rather we could identify,

¹⁶ A potential problem that was pointed out by farmers several times during data collection.

¹⁷ Oligopoly is a situation with two buyers on the market who have buyer power.

similar to Mason (1939), that product characteristics as well as supply and demand elasticities need to be included. Systems thinking, allows to include a wide range of factors and to jointly analyze their effect within the system. Further, systems thinking does share the notion that the structure of the system evokes a particular behavior and thus performance. Moreover, the distinction between intrinsic structural variables and derived structural variables¹⁸ (Lee 2007) turns out to be pivotal for the analysis presented in this paper.

The structure of the causal loop diagram explains the behavior of different chain participants. Causal loop diagrams are not only an interesting tool to understand the behavior by the structure, but also to understand how structures may change because of behavior. Regarding our sugar beet case, the new cooperative refinery constitutes such a structural change. The market structure determining factor *number of companies* changes, which may in turn affect conduct and performance of the companies within the market. The structural change that is about to happen, was triggered by conduct and performance of the companies currently in place. Hence, systems thinking is not limited to linear thinking, but employs circular thinking resolving the problem of endogeneity.

The causal loop diagram allows to investigate market power issues, in a situation of lacking data. While the lack of data is a common problem for market power estimations, the sugar beet case also suffers from (policy) distortions that make market power estimations even more difficult. Thus, traditional market power estimations would need price data in the post quota period over a long time period. Estimations that reveal market power issues can then come too late for policy makers to design appropriate policy instruments. Hence, systems thinking is a useful tool to assess a situation *ex ante* and to support policy making. An understanding of the market structure and the underlying factors constructing this structure, may help policymakers to tackle the root cause of a problem instead of treating a symptom. Though, it has to be pointed out that the development of causal loop diagrams is an intense process depending on detailed data.

Market power issues may not be caused by the ill will of economic agents, but by factors that bring into life a market structure prone to market power issues.

¹⁸ "(a) Intrinsic structural variables—those determined by the nature of products and available production and marketing technologies. (b) Derived structural variables—those determined by firms and government such as barriers of entry, seller and buyer concentration and product differentiation" Lee, C. (2007). SCP, NEIO and Beyond. Working Paper Series Vol. 2007-05. U. o. Nottingham.

Factors such as product characteristics or the need for scale economies, need to be considered when counteracting market power problems along the value chain. The sugar beet example shows that the sugar beet crop inherently involves dependencies. Accordingly, policies may be needed to protect farmers from these dependencies. Similarly, other factors such as the need for scale economies and the resulting increased risk for bankruptcy due to high fixed costs, may call for the attention of policy makers. Wherever markets are confronted with issues of dependencies and high risk, counteracting policies could be considered, as these markets may not fulfill the requirements to function perfectly competitive.

This paper constitutes an attempt to access the SCP paradigm via the tool of systems thinking as suggested by Grether (1970), drawing from value chain research performed by Gereffi, Humphrey et al. (2005) and Cox, Sanderson et al. (2001). Further research could compare different markets to investigate if they have distinct structures that then cause market specific behavioral patterns, as proposed by Mason (1939). Another future research avenue could be the extension of the causal loop diagram, by applying system dynamics. This would allow building scenarios, that could be used to inform policy makers.

Chapter 6.

Vertical integration as strategy to increase value absorption by primary producers: the Belgian sugar beet and the German rapeseed case

This chapter is based on the conference paper presented at the 13th European IFSA Symposium, 1-5 July 2018 in Chania, Crete - Greece. It has been presented as Biely, K.; Von Münchhausen, S.; Van Passel, S. (2018) [Vertical integration as future strategy to increase value absorption of primary producers: the Belgian sugar beet and the German rapeseed case](#)

1. Introduction

The term value chain refers to the creation of value within the supply chain (Al-Mudimigh, Zairi et al. 2004, Gereffi, Humphrey et al. 2005), while supply chain, describes the sequential combination of commodities to assemble a final product. When the focus is on where value within the chain is created and which company absorbs it, the term value chain is rather suitable.

The term supply chain is (despite its common usage) unclear (Mentzer, DeWitt et al. 2001, Bertazzoli, Fiorini et al. 2011) and often confused with the term value chain¹⁹. Horvath (2001) even argues that the only relevant chain is the value chain, with supply or demand chains only describing a different entry point. We follow the definition of Bertazzoli, Fiorini et al. (2011) who defined the value chain²⁰ "[...] as a group of economic entities involved in fulfilling the functions of production, transformation, and distribution of the agri-food product, and which are linked by functional and structural relationships aimed at meeting the food requirements on the demand side." Their definition is very similar to the one of Mentzer, DeWitt et al. (2001), who defined supply chain more in general terms, rather than for the agri-food sector specifically. The agri-food supply chain links three sectors; agriculture, food processing and distribution (Bukeviciute, Dierx et al. 2009).

Companies may only operate in one part, in a couple of parts of this chain or they may integrate all parts of the value chain (Cox 1999, Gereffi, Humphrey et al.

¹⁹ See for example the definition of Gereffi, G., J. Humphrey and T. Sturgeon (2005). "The governance of global value chains." Review of International Political Economy **12**(1): 78-104. For a value chain: "In its most basic form, a value-added chain is 'the process by which technology is combined with material and labor inputs, and then processed inputs are assembled, marketed, and distributed.'" This does not differ from the definition of a supply chain provided by Mentzer, J. T., W. DeWitt, J. S. Keebler, S. Min, N. W. Nix, C. D. Smith and Z. G. Zacharia (2001). "Defining supply chain management." Journal of Business Logistics **22**. or Gereffi, G., J. Humphrey and T. Sturgeon (2005). "The governance of global value chains." Review of International Political Economy **12**(1): 78-104.

²⁰ They are using the term supply chain.

2005). For the profitability of a company, it is pivotal to decide in which parts of the value chain to operate (Gereffi, Humphrey et al. 2005). The degree of integration is not only determined by profit considerations but also by the commodity type. Standardization allows a higher degree of fragmentation, for example. Other factors that influence integration are knowledge and technology (Gereffi, Humphrey et al. 2005). Value chain management is in a continuous process of reorganization, reacting to changing circumstances regarding production processes and technologies as well as consumer demand (Al-Mudimigh, Zairi et al. 2004). Some research suggests (core competence theory) that companies operate more profitably if they only perform core activities, while outsourcing and subcontracting less profitable activities. Subcontracting and outsourcing allows companies to maintain control over the value chain, while not being directly responsible for them (Gereffi, Humphrey et al. 2005). Gereffi, Humphrey et al. (2005) provides a schematic categorization of how value chains can be organized and how this relates to power asymmetries.

Companies can gain higher profits by reducing costs (Al-Mudimigh, Zairi et al. 2004), by for example reducing transaction costs along the value chain (Gereffi, Humphrey et al. 2005). Reducing transaction costs, may induce companies to vertically integrate other segments of the value chain (Díez-Vial 2007). Profits can also be increased if an actor has higher bargaining power and imposes less favorable contracts on up- and / or downstream actors. Hence, this allows raising profits without increasing vertical integration (Bukeviciute, Dierx et al. 2009). Vertical integration may also be incentivized by market power considerations of companies (Díez-Vial 2007), as vertical integration can increase or consolidate a company's market power. Imperfect price transmission can be an indication for power imbalances along the value chain. While market concentration downstream the value chain could be related to imperfect price transmission, Assefa, Kuiper et al. (2014) demonstrate that concentration on the farm level may not counterbalance downstream concentration.

Another approach is to improve the characteristics of a commodity to increase the consumer's valuation of that commodity (Al-Mudimigh, Zairi et al. 2004, Manning 2015). The latter point is related to product differentiation and the branding of the product (Manning 2015). A product can appear of higher value to the consumer not only because of better performance (technologically, ethically), but also due to design characteristics (like Apple products). The ability of a company to fetch created value along the supply chain is indeed related to their competitiveness (Gereffi, Humphrey et al. 2005). Due to the homogeneity of those agricultural products that must be processed before consumption, farmer's ability in augmenting consumer's valuation of their raw product is limited. In contrast refinement and processing of agricultural commodity crops can increase product differentiation and thus, create higher value (Stevenson and Pirog, 2008).

Not only vertical integration but also horizontal integration is related to the competitiveness of a company (Cox 1999). "While vertical integration [...] requires the acquisition of different types of capacities, horizontal integration requires capacities that are similar. The strategy of horizontal integration aims at increasing market share, diminishing competition and increasing cost competitiveness" (Pellinen, Teittinen et al. 2016). The European Commission (2011) acknowledges the economic benefits of horizontal cooperation, while also pointing out the danger of creating power imbalances.

In a report on the future of the Common Agricultural Policy (CAP) The European Parliament (2011) pointed out the decreasing economic profitability of farm operations, due to market concentration downstream the value chain. Therefore, measures to improve the bargaining position of primary producers are suggested. The CAP acknowledges this by supporting producer organizations and inter-branch organisations (Velázquez and Buffaria 2017). A producer organisation fosters "joint production or marketing of agricultural products or the use of joint facilities, unless such joint action excludes competition [...]" (EU 2013). An inter-branch organization is a self-organized, vertically integrated entity created by different players and branches of the agri-food chain, including always representatives linked to production and at least one partner from another part of the supply chain (EU 2013). Hence, the EU supports horizontal cooperation as well as vertical integration in the agricultural sector. Horizontal cooperation and vertical integration are potent means to improve the economic situation of primary producers (Bertazzoli, Fiorini et al. 2011, Severini and Sorrentino 2017, Velázquez and Buffaria 2017). However, while producer organisations establish horizontal coordination, they may in some cases not be potent enough to maintain or improve the economic situation of farms (Assefa, Kuiper et al. 2014). Therefore, additionally vertical integration may be necessary to support the economic profitability of primary production.

The following analysis will expand on the limited success of horizontal cooperation for the sugar beet cultivation in Belgium and the oilseed rape cultivation in Germany. First the methodology employed for the analysis is outlined. Then the two case studies are briefly introduced. Thereafter, the current situation and challenges as well as strategies of primary producers are discussed. Finally, comparing the two case studies allows to draw conclusions.

2. Methodology

In order to understand the situation of European farmers several research steps were conducted. Due to the exploratory character of the research question qualitative research was performed. Qualitative research was split up in four

stages 1) desk-based research, 2) interviews, 3) focus groups, and 4) workshop aiming to collect various perspectives for an encompassing analysis (see Table 5:).

Results from each step served to refine subsequent research steps. Thus, the desk-based research aimed at getting acquainted with the general situation as well as preparing the next research step. Interviews with nine Belgian farmers and with eight stakeholders of the German rapeseed industry were conducted. Interviews were analysed and main challenges identified, which were further investigated in focus groups with farmers. Once more, results were analysed and further discussed in workshops with representatives of the value chain.

<i>Research step</i>	<i>Sugar beet case</i>	<i>Rape seed case</i>
Interviews	9 semi structured face to face interviews	8 telephone interviews with case study stakeholders and experts from the processing industry
Focus groups	2 with 14 farmers	1 with farmers 12
Workshops	1 with 12 representatives from the value chain including farmers	1 with 10 representatives from the value chain including farmers

Table 5: Qualitative research steps for both case studies

In the Belgian case study the semi-structured face to face interviews and focus groups were audio recorded, transcribed, translated to English and analysed according to grounded theory (Strauss and Corbin 1998) with the assistance of the NVIVO software. As mentioned, interviews followed a semi structured format, the same is true for the focus groups and the workshop. Aiding material during the focus group were *strategy cards*. These cards contained key words, such as upscaling, additional income or innovation, as well as an illustration that briefly described the identified strategy. These cards were reused during the workshop. The analysis of the workshop was based on notes taken by two note keepers as well as on flip charts and sticky notes created during the workshop. Direct statements of farmers that are used within this article are anonymized, hence names of farmers were changed. Moreover, company names were replaced to preserve their integrity.

In the German case study, notes were taken while conducting the eight explorative, open ended telephone interviews. Reoccurring issues, were further investigated in following interviews to gain additional information and insights. Key statements were cross-checked in subsequent interviews. Methodologically, the interview approach was based on the concept of grounded theory (Strauss and Corbin 1998). During the focus group, in which 12 farmers participated, a research team member took notes and prepared minutes after the event. A flow chart with drivers, (potential) strategies, and reached/aimed results served as template. During the discussion, this chart was completed. Currently lacking strategies crystalized through this focus group process. The resulting strategy-focused chart served as starting point for the stakeholder workshop. The focus group discussion was audio recorded. After the focus group, the minutes were circulated aiming at giving participants the opportunity to comment and clarify. Statements of participants were anonymised and the minutes of the focus group were translated to English. Participants of the final workshop were representatives of the oilseed value chain. During the workshop discussion cards showing relevant key issues were collected on pin boards.

3. Case study description

Rapeseed and sugar beet cultivation are chosen for this analysis due to similarities pertaining the crop as well as the role of the farmers' organization. Furthermore, both case study regions are located in neighbouring European countries with relatively similar production systems and natural conditions. Both are commodity crops that need processing and refinement before final consumption. Processing is an expensive activity that needs to make use of scale effects in order to be profitable (Gunstone 2009). Therefore, primary producers cannot take over refinement individually. They either have to sell their harvest to a refinery or they need to cooperate and invest in their own common processing facilities. In both cases, farmers are organized horizontally to improve bargaining power and conclude favourable contracts with the processing enterprise. Additionally, to farmers' dependency from the processors, the raw product is relatively homogenous. A main distinction is organic versus conventional products. However, if refineries do not demand and pay for product differences, farmers cannot cultivate them. Thus, value creation may rather happen through further processing in food and beverage manufacturing than by quality properties of the commodity crop. Since sugar as well as oil make up only one part of complex final products, the value of primary producers' input is low. Moreover, through the globalization of sugar and vegetable oil markets, primary producers have to compete with world market prices.

3.1. *Sugar beet in Belgium*

Sugar beet makes up a particularly interesting case due to the termination of the quota system in September 2017. Already since 2006, the quota system has gone through a major overhaul aiming at a stepwise adaptation to free market conditions. This meant not only a reduction of distributed quota, but also a considerable reduction of the minimum price for sugar beet. From the sugar beet campaign 2016/17 sugar beet farmers are vulnerable to market price fluctuations, putting an end to the secured profitability of sugar beet cultivation. Apart from this, sugar beet is an interesting case study due to the high concentration on manufacturing level. The number of sugar beet refineries has reduced dramatically since 1970. Today only two sugar beet refining companies, and three refineries, remain in Belgium. While this instance did not pose major problems in the past, concerns regarding market power are now raised (Aragrande, Bruni et al. 2017). During the quota period, sugar beet farmers in Belgium negotiated interprofessional agreements collectively through the farmers' sugar beet association (CBB) with the refineries. Thus, all aspects apart from the price (which was predetermined by the EU) were negotiated commonly. This approach aimed at creating a level playing field among farmers, by increasing transparency and setting common conditions for all farmers, as well as between farmers and refineries by counterbalancing the concentration on refinery level. Up until the campaign of 2016/17 this approach seemed to have worked well.

Belgium is the fifth largest sugar beet producer in the EU with total harvested sugar beet area of about 60.000 hectares in the 2014/2015-crop season. This represents about 4,5% of the agricultural area in Belgium. In Belgium, the total sugar production from sugar beet is about 646.000 tons (CBB 2017), produced by about 7500 farmers. Between 1968 and 2015 the number of sugar beet farmers reduced from 36.114 to 7.513. Alone since 2006, 6.184 farmers terminated sugar beet cultivation. The number of sugar beet growers has been declining steadily over the last decade with a sharp decline occurring between 2007 and 2008. The concentration on the refinery level is even more pronounced. While there are only two refining companies left, in 1872 174 sugar beet factories could be found in Belgium (CBB 2017).

3.2. *Rape seed in Germany*

Rapeseed is an oilseed cash crop that competes on international markets for vegetable oil and meals. In 2014, the rapeseed harvest accounted for 6,2 million tonnes but around 9,6 million tonnes were processed in Germany. A volume of 3,8 million tonnes were imported, mainly from France and Poland (OVID, 2016). Consequently, the development of the rapeseed price in Germany depends on international markets, and changes with prices for crude oil, soy, and soybeans. Rape seed oil prices are coupled with crude oil prices as rape seed oil can be used

as food or energy provider. Regional fluctuations in yields have no impact on rapeseed prices.

In Germany, the oil mills usually set prices following the given market conditions and key quality criteria which are the oil content, the humidity and the contamination of seeds. This system is well established and widely accepted. Rapeseed supply chains have bottleneck structures because the seeds have to be cleaned, dried and pressed for vegetable oil production. Due to the concentration process within the sector, Germany has only 10 oil mill companies.

Since Germany is a large country with a large variety of regions driven by heterogeneous conditions for farming, we selected one area (Wetterau district) to highlight exemplarily farmers' cooperation and the challenges for an integration of the value chain. The Wetterau district is located in the middle of the German Federal State of Hessen. Both rural and urban structures characterise the area due its rural towns and villages and the proximity to the Rhine-Main conurbation. The region is one of the most productive agrarian regions in Germany: the climate is moderate and the soil is very fertile. Intensive agriculture is widely spread. Arable crop rotation with wheat, oilseed rape or sugar beet is characteristic. Sometimes pork production or dairy is linked to arable farming. Over decades, a steady decrease of livestock farming took place. Only the number of horses increased over time. Around 1.300 farms are located in the area. About 55% are full time farms. Due to a prosperous regional economy with various industry and service enterprises, unemployment rates are low. Back in history, the Wetterau was the fertile backyard of the growing cities of the Rhine-Main area. Farmers' entrepreneurial orientation and close cooperation has a long tradition because they always aimed to address the requirements of these complex marketplaces.

4. Results

4.1. The role of horizontal cooperation in the supply chain

4.1.1. The Belgian sugar beet case

Since September 2017 the quota system has been terminated. This means that for the campaign 2016/17 the farmers' association had to negotiate sugar beet prices with the refineries. While in 2013 the termination of the quota system was seen as an opportunity (CBB 2013), the negotiation process for the campaign 2016/17 changed this perception, at least for some farmers.

Since the campaign 2016/17 the two remaining sugar refineries can offer different sugar beet prices. While one refinery maintained the prices of the previous

campaign, the other refinery changed their pricing strategy. Farmers delivering to the former refinery were satisfied with their contract, the contrary was the case for farmers delivering to the latter refinery. The results were negotiations lasting for months, which could only conclude due to the involvement of political actors (VILT 2017). For the campaign 2017/18 a similar scenario is taking place. While the negotiations with one refinery were concluded quickly, the opposite is the case for the other refinery.

The main concern for farmers regarding the conditions offered by the second refinery is that they are much less predictable. Farmers are payed in steps within one campaign, whereat the actual price farmers receive is only determined later within the campaign. Therefore, farmers have to deal with price insecurities. Moreover, farmers criticized that the negotiations with the second refinery are more difficult, since the refinery has to report back to the parent company.

Generally, farmers fear that increased production will lead to reduced prices, making sugar beet cultivation unprofitable. For the plantation year 2017/18 the overall sugar beet sowing increased (CBB 2017). Interviews and focus group discussions revealed that farmers already depend on subsidies, because of the low revenue from sales. Though, farmers stated that this is not a desirable situation. Rather farmers should be able to live from their sales. A further reduction of the income from sugar beet will require farmers to pick up new strategies.

4.1.2. The German rapeseed case

Farmers' close cooperation has a long tradition in the Wetterau district, with a machinery ring (MR Wetterau) established in the 1980s. The MR Wetterau has two daughter enterprises, one of which is HERA (Hessische Erzeugerorganisation für Raps w. V.) an economic association particularly for oil rape. HERA was founded in 1994: Back then, it was called NAWARO – Renewable Materials Organization. NAWARO supported farmers in aligning with and profiting from legislative changes that have taken place since the 1990s. The aim of the legal changes was to reduce overproduction of food based on the MacSharry reform in 1992 (Daugbjerg 2003). Moreover, the production of biofuels was expected to grow due to the Electricity Feed-in Law' (Stromeinspeisungsgesetz or StromEinspG, 1991) and the Renewable Energy Law in 2000 Erneuerbare-Energien-Gesetz or EEG (Clearingstelle EEG|KWKG 1990). Both regulations define the framework for financial support in order to ensure profitability of the cropping for biofuel production.

In the 1990s, NAWARO activities focused on negotiations among a biofuel processor in Nordrhein-Westfalen and farmers' representatives. This initiative started with 150 members and 500 ha of rape from set-aside-areas. The aim was

to realize the highest possible price for the member farmers and to manage the registration and subsidy payment for their set-aside-land for its members (HERA 2016). The NAWARO association offered biodiesel, biodiesel-service stations and biodegradable lubricants, and provided farm advice. The initiative managed to set-up a regional market for biofuels in cooperation with other distributors and machinery rings in the wider region. The consortium of steadily expanding farmers' organisations was a success model realizing a higher added value for rape seed.

Although nationally produced biofuel volumes and the proportion of biofuel in fuel mixtures for vehicles has remained relatively stable in Germany even after the economic crisis of 2007/08, the area for rape cultivation for biofuel shrank (DBV 2016, Deutschlandfunk 2016). However, the production of renewable energy from Wetterau farming was less cost-effective than in other areas, and the NAWARO association adjusted its strategy and switched to sales with the food industry. This restructuring led to a reorientation of NAWARO, which became HERA.

For several years, HERA was very successful with a contract-based cooperation with a large-scale food processor. This contract included environmental standards and payments for participating farmers (HERA 2016). Farmers received a slightly higher price (1-2 €/ton) for their environmentally friendly production. During these years, HERA was the role model for this international processing enterprise but the involved oil mill closed down, and the food corporation shifted its vegetable oil production to northern Germany. Moreover, the CEOs of the corporation lost interest in this enterprise branch that should be outsourced (Dierschke, 5/2017). Due to these changes in the food corporation, Wetterau farmers experienced reduced profits from arable farming and higher economic risks with oilseed rape cultivation.

4.2. Comparison of past strategies aiming to tackle current challenges

As pointed out above, farmers need to develop strategies to maintain or improve their financial situation. The interviews allowed us to identify a number of potential strategies (see Table 6). Most of these strategies were either fully exploited or only of theoretical nature. One of these strategies is vertical integration. Given the importance of vertical and horizontal integration to improve the economic stability of the farm, we are interested in further investigating these strategies. Before doing so, other potential strategies are briefly outlined below, and explained why they are not applicable.

Strategy	Sugar beet case study	Rapeseed case study
Choosing another manufacturer	In fact, it is impossible to choose another refinery due to high transportation costs and no alternative choice in proximity.	Farmers have alternative options to sell rapeseed: to mills, distributors, at commodity exchanges, futures exchanges (different types of contracts). However, these sales channels do not ensure profitability in low price years and do not cover additional environmental standards.
Innovation	This strategy refers to innovation regarding cultivation technique, inputs and seeds. Innovation is seen as the most important strategy of the past, but farmers indicated that a limit has been reached	Innovation has been an important strategy to maintain or even increase income. However, by now this strategy is not sufficient to maintain income.
Intensification – upscaling	Intensification in terms of more output per hectare, is covered by innovation. As stated, this strategy might be exhausted. Upscaling refers to increased farm size to make advantage of scale effects. However, farmland is limited and most farmers do not have the possibility to expand their operations.	The very same is true for the German rape seed case for both, the exhaustion of innovation as strategy, as well as regarding the availability of land for agricultural purposes.
Alternative crops	For some farmers, this will be an option. Still, several factors have to be taken into account when this strategy is considered. If a larger proportion of sugar beet farmers switches to another	Rape has a positive effect in crop rotation with wheat and other cereal crops. Without rape, rotational benefits would vanish. Risks will be higher, and the system's resilience will

	<p>crop, the market for the alternative crop may crash. Generally, the market situation for alternative crops need to be considered. Other factors that limit the viability of this strategy are, crop rotation, soil and climatic conditions or the lack of buyers.</p>	<p>be lower. Rape is expected to realize a higher profit. Without this crop, economic sustainability of the arable system as a whole might be at risk.</p>
Risk management	<p>Other insurance mechanisms were suggested that are more synchronized with climatic and market conditions. Though there might be some scope, it was not mentioned as a main strategy.</p>	<p>On the EU level, some stakeholders promote policy support for insurance mechanisms, though German policy is not supporting this initiative. The traditional insurance system is well-working with farmers deciding which yield insurance type they want to choose.</p>
Branding	<p>One sugar refinery is already using a brand that has a high customer recognition within Belgium. Though, this does not affect the farmers' revenue positively.</p>	<p>The food industry has sustainability standards for their <i>B2B</i> marketing. These standards do not cover production systems on the farm. There is not enough demand from retailers (consumers) for e.g. higher agri-environmental standards in rape cultivation.</p>
Alternative end-products	<p>With, sustainability becoming more and more important other end-products may increase demand and thus prices. However, alternative end-products such as biofuels</p>	<p>There are several alternative end-products from oilseed rape. However, none of these ensures higher prices for higher sustainability</p>

	or bioplastics, that are both competing with products based on cheap petroleum, are not yet generating enough demand.	standards because they are <i>anonymous</i> commodity inputs in various types of products such as animal feed, pharmaceutical crèmes, lubricants, etc.
Additional income	Within the farm household often already at least one member has an employment outside the farm. Thus, this strategy is exhausted.	If farming was no longer profitable, farmers would find an alternative employment in the area. Due to low unemployment rates and high income in non-agricultural sectors, farmers would stop farming.
Striking for better prices	Farmers pointed out that if they would not deliver their crop within a campaign, the refinery would need to close down permanently. Hence, this strategy is counterproductive and not picked up.	Rape seed farmers would not be able to improve their situation with striking, since their commodity is substitutable by global supply.
Strengthening the farmers' union	The CBB is already a role model for a farmers' association. It was not stated that the organization could be improved considerably, or that such a change would improve the farmers' position.	Farmers mostly intend to stay with HERA, since they believe in the association's potential to develop new strategies ensuring profitability of rape production.
Freedom of choice	This strategy referred to farmers' being able to decide themselves, when to sow and when to harvest their crop. While this was mentioned during interviews, farmers did not expand on it. Mainly, restrictions are caused due to	Since most oil mills have often insufficient storage capacities for oilseeds during the harvesting season (farmers have no storage). Farmers cannot expand or change the harvesting time due to

	<p>logistic reasons, as refineries cannot process all sugar beets at the same time. While certain improvements may be possible in this regard, this strategy will not be a solution to farmer's problem</p>	<p>quality reasons and weather conditions.</p>
<p>Leaving the farmers' union</p>	<p>Sugar beet farmers in Belgium are obliged to be part of the CBB. Only some farmers would prefer abandoning the farmers union. Most probably only large farms would profit from individual contracting.</p>	<p>Since prices realized by the PO were lower than expected recently, more farmers seek for individual sales. This strategy only works for larger farm businesses with higher volumes. Small farms with reduced negotiation power do not realize higher prices.</p>
<p>Sustainability</p>	<p>On the one hand, sugar beet is perceived as being superior compared to sugar cane regarding the sustainability of production process (including environmental as well as social variables). On the other hand, sugary products are products that are potentially less consumed by environmentally conscious consumers. Thus, the willingness of consumers to pay for a sustainable product is low.</p>	<p>Contract farming with the food corporation generated additional income and farmers implemented higher agri-environmental standards. This model solution of vertical integration ended. Since then, farmers tried out different approaches in the last years aiming to realize again financial compensation for sustainability standards. An agreement with a local water supplier that compensated for reduced N-levels, has a risk of non-compliance under unfavorable weather conditions.</p>

Table 6: Comparison of past strategies between both case studies

To summarize the most important aspects for the sugar beet case, farmers are faced with a monopoly, having no option to sell their crop to another buyer. All strategies seem to be exhausted or close to exhaustion. Additionally, the characteristic of the crop increases the inflexibility of farmers. Due to the perishability of sugar beet, the crop needs to be processed short after harvest. Thus, farmers cannot store the crop and wait for better prices. Farmers cannot sell their product directly to a final consumer, since the crop needs refinement. The traditional refinement process is cost intensive, rendering it impossible for individual farmers to further process their crop themselves.

The situation for the Wetterau rape seed farmers is similar. Global competition reduces their space for maneuver to negotiate better prices. According to the consulted farmers, on-farm strategies to maintain or increase their income are exhausted. The invisibility of rapeseed oil within final food products, reduces transparency and hence the ability to raise awareness about a high-value ingredient. Direct marketing is, again, difficult, since the seeds need processing, which is expensive and less efficient on a small scale.

This ostensibly hopeless situation calls for new pathways. The remaining strategy that has not been discussed yet, is vertical integration. In the next section the potential of this last strategy will be outlined.

4.3. *Vertical integration as major future strategy*

4.3.1. *The Belgian sugar beet case*

As described above, horizontal integration in the Belgian sugar beet sector can be regarded as exemplary. Therefore, 1) it can be stated that this is a strategy already implemented successfully, but that this strategy is 2) not sufficient to balance off market concentration on the refinery level²¹. From this it can be concluded that further cooperation may be needed. Vertical integration was a topic often mentioned by farmers mostly related to farmers being engaged in the sugar production.

Another option mentioned by farmers was *selling the land to the refinery*. This was a cynical statement by a farmer during the interviews. Despite the cynical character of the statement it was taken up as a potential strategy to be further discussed during the focus groups. As soon as the strategy card *selling land to refinery* was discovered a controversial discussion started. Initially, there was no understanding why such a strategy card was even put on the table, but in the

²¹ Note that based on the results of Chapter 5, the reader may already recognize that the inability to balance off market power is related to the upstream value chain.

course of the discussion it became clear that for some farmers this is a last resort. Selling the land to the refinery would allow farmers to stay in business and retain them from shame of losing their property. While selling land to other farmers would make such a step public, selling land to the buyer remains undisclosed. However, the focus group discussion revealed that such a step is related to a hopeless future perspective and is thus not a strategy that aims at maintaining the farm business on the long run.

The other strategy regarding vertical integration is getting involved in sugar production. Although farmers do hold shares within the sugar refineries, it was bitterly stated that not taking over the refinery as it was offered for sale was a missed opportunity. The shares do not allow Belgian sugar beet farmers to compensate for lower sugar beet prices, neither do they equip them with an increased right to say within the refinery. This situation is compared to Germany, where farmers commonly hold more than 50% of the refinery they are delivering to. In contrast, according to the interviews, farmers hold only about six percent of each of the Belgian refineries.

The ability to harvest dividends is perceived as an advantage of German farmers. Moreover, one interviewee indicated that the German farmers do not understand the Belgian farmers and thus, do not understand why the Belgian farmers need different conditions than the German farmers. Anyhow, it is also understood that farmers in Germany can neither dictate the price, since they are also obliged to increase profits to satisfy the other shareholders.

Therefore, it may not come as a surprise that a model that gives farmers more control over the production is palatable. The Dutch sugar refinery serves farmers as example in this regard. For some farmers getting involved in sugar processing to a larger extent is a potent strategy to reduce the risks caused by price volatility.

In fact, in course of the case study investigations, Belgian sugar beet farmers started planning the cooperative sugar refinery which shall be operating September 2021. Belgian sugar beet farmers had two options. The first option is buying more shares. However, this is not the option taken up by the farmers. This might be due to the fact, that buying shares of a foreign company may only increase their income in terms of dividends, but does not improve the communication flow or the right to say within the company. Another option, that is indeed much more venturous, is building their own cooperative refinery.

In one of the focus groups the possibility to build a cooperative refinery was first mentioned (February, 2017). At this time the idea was not well developed. Though, a couple of months later, the idea got more concrete and a feasibility study was commissioned (Belge 2017, Boom 2017, Meijering 2017). After a positive estimation pertaining the feasibility, in the beginning of 2018, farmers

decided to build the refinery. Not much is made public up until now, however, the short report in the De Bietplanter (2017) indicates that the amount of sugar beet refined within one campaign will be more than for the international Belgian sugar refinery. As we know from the focus groups, the new refinery is the result of the internationally connected Belgian sugar refinery not accommodating the needs of the sugar beet farmers. During the focus group, it became apparent that instead of additionally planting sugar beet for the new cooperative refinery, farmers would switch to the new cooperative refinery. Subsequently, this would mean the end of refining sugar for the internationally connected Belgian sugar refinery. This also means that instead of meeting farmers half way, the German parent enterprise prefers to lose one of its most profitable subsidiary companies. In the beginning of 2019 a potential closure of sugar refineries was communicated by the internationally operating sugar refinery (VILT 2019).

The future will show, if the new strategy will be successful and how the market will react to it. Building a new refinery is nothing that can be implemented easily. While committed farmers could be found to finance the new cooperative refinery many other hurdles need to be taken. Buyers for the end product need to be found that are willing to pay a price farmers envision.

4.3.2. The German rapeseed case

HERA association and individual farmers face the competition of the global market for oilseed crops. For that reason, they aim to develop a new strategy that helps to tackle the economic challenges. The objective is to realize prices or payments that compensate for agri-environmental services above the legal baseline such as reduced fertilizer application, bee protection measures, etc. Since standards of arable farming and the related controls are relatively high in comparison to e.g. some Eastern European countries, farmers agreed that either a self-organized marketing channel for the high-value product would be necessary, or a payment for environmental-services would be needed. However, adequate strategies to implement such a business goal are still missing.

Since there is no public or private program available for the support of higher agri-environmental standards in rape cultivation, this idea was dismissed by the farmers' group. However, the development of a regional marketing strategy for vegetable oil from rape cultivation in Wetterau is currently discussed as a potential strategy.

During the period of legislative support of alternative energy production, farmers' strategy with the producer association in Wetterau was a success story. However, with changing economic conditions, the producer organization adjusted its strategy focusing instead on supplying the food industry, having a model contract including agri-environmental payments with a food corporation. As pointed out,

with increasing global competition and the lacking engagement in sustainable oil production of the business partner, this path was no longer profitable. During recent years, the producer organization sold the farmers' harvest to different processors or sales companies. However, price negotiations are difficult due to the strong competition on the commodity market for oilseed crops. The highly concentrated processing industry purchases nationally and internationally. There are three potential strategies for the future that are related to vertical integration: a) direct marketing of individual sales, b) increasing public awareness, and c) common marketing within Wetterau for a regional product.

The idea pertaining direct marketing of individual sales has been realized. The producer organization supported an initiative of some farmers and farm shops to produce a small amount of vegetable oil in glass bottles. Around 1.000 bottles per year have been produced annually in the area. However, HERA managers cannot identify a potential market for increasing sales; thus, this is not a sufficient strategy for rape seed farmers in the region. Apart from the lack of an ample market, storage time of the final product is limited because the oil needs to be used within one year for quality reasons.

Farmers wish to increase the public awareness about their sustainable production systems to customers, and thus create an added value. They agree that self-marketing of the high-value production process would be necessary, but an adequate strategy is still missing. They argue that regional and GMO-free production are appreciated by consumers, but currently not paid. Social media could be a suitable instrument to reach a wider public and (potential) consumers within the Wetterau area communicating quality aspects of their product. It should be possible to highlight the quality asset of oilseed rape produced in Germany compared to imports.

Finally, common marketing within Wetterau for a regional high-quality product could be a promising strategy. Members of the producer organization and the farmers' union representatives are currently in the process of negotiations with a retailer, who is currently interested in strengthening its regional and high-quality assortment. However, various issues have to be discussed. The processing needs to be subcontracted by a large-scale oil mill. Transport of seeds to the mill and the transport back into the region represents an additional effort. Processing in the mills needs to be separated from other seeds, otherwise the project risks credibility. The size of containers or bottles is a key decision addressing the final buyer (individual households or catering/processing businesses). Regional production cannot depend on only one customer as it would increase risk. Some meetings between key persons took place already and time will show if a vertical integration strategy will emerge from the initiative aiming to establish a marketing channel for a locally produced high-quality rapeseed oil.

5. Discussion

The above presented analysis compares two case studies, sugar beet in Belgium and oilseed rape in Wetterau, Germany. Although farmers are located in different countries and produce different crops they share similar challenges, which are related to the characteristic of their production and the liberalization of markets. In both cases farmers face the obstacle of direct marketing to final consumers due to the necessity to process the raw product. While, it is possible that farmers process the crop themselves, this step is connected with substantial investment costs. Moreover, since profitable processing calls for a minimum scale, vertical integration is also related to logistical challenges. For these reasons in the past, farmers of our case studies abstained from this step and rather sold their crop to a processor. However, due to changing conditions this sales strategy is no longer profitable.

The need for processing, and the potential invisibility of the product in other food and non-food products has the effect that increasing consumers' value for their product is difficult. Consumer valuation could be increased by awareness raising strategies. While there seems to be some scope in the rapeseed case, there is less so in the sugar beet case. The low valuation of the two case study crops by consumers, reduces farmers' ability to negotiate higher prices.

It has been pointed out that farmers of both case studies identified and experimented with various strategies to maintain or increase their income. Though, a bottleneck has been reached, as past strategies are exhausted. Therefore, new pathways need to be taken. In the sugar beet case, farmers strive to set up their own refinery. Wetterau rapeseed farmers assess three different pathways. A main aspect of these is increasing consumers' awareness about the product in order to in tandem increase the visibility of the product and consumers' valuation of rape seed oil. This together with either direct marketing or a strong partner who supports the marketing of the product may be a fruitful future strategy.

Sugar beet farmers as well as rape seed farmers use horizontal cooperation to develop and explore new pathways and intend to go one step farther in the supply chain; getting engaged in the production process and / or aspire to become active in sales promotion.

Both cases vividly illustrate that primary production require farmers to be businessmen, who proactively observe the market and develop new creative strategies. Even if vertical integration is a potent future strategy, the Wetterau case showed that despite a well-established chain integration, farmers suffered from significant changes and therefore, business strategies require on-going adjustments or even radical changes.

Chapter 7.

Conclusions

1. General conclusions

This thesis was dedicated to answering the question of whether market power and sustainability are related. Both phenomena are associated with ethical and political questions. In order to narrow the investigations down, a main focus was set on the agri-food sector.

Markets organize and govern much of human life, building the socio-economic system we live in. Although, Adam Smith (Smith 1776: 349) proposed that the invisible hand should increase the wellbeing of all, it needs to be admitted that this proposition has limitations. Externalities and missing markets are market failures that long have been identified for causing inequalities regarding the distribution and overconsumption of natural resources (Pasqual and Souto 2003, Common and Stagl 2005: 327ff., Wiesmeth 2012). Initiatives that for example assess and create markets for natural resources (e.g. The Economics of Ecosystems and Biodiversity, TEEB) try to solve the problems caused by externalities and missing markets. The well-known impact of the market failures, externalities and missing markets, affecting sustainability, trigger the question of whether other market failures (such as market power) do so too.

Market power is a problem of increasing importance (De Loecker and Eeckhout 2017, De Loecker and Eeckhout 2018). If market power was a minor issue, the investigation of the connection between market power and sustainability would be of less relevance. However, particularly in the agri-food sector concentration has been reported (Murphy 2006, Murphy 2008, Bertazzoli, Fiorini et al. 2011, Bonanno, Russo et al. 2018, Ryan 2020). Moreover, the connection between sustainability and the agri-food sector is obvious. The agri-food sector depends on and affects natural resources. As pointed out in Chapter 4, the agri-food sector is to blame for many environmental problems. Given the relevance of sustainability and of market power within the agri-food sector, it presents a good starting point to investigate the relationship between the two phenomena.

The quest to investigate the relationship between market power and sustainability was triggered by a) known connections between other market failures and sustainability, and b) by the relevance of market power particularly in the agri-food sector.

To review the results of this thesis, the research questions are discussed in the following sections.

1.1. Are market power and sustainability related in agri-food systems?

To answer the main research question several steps were undertaken. Chapter 1 concludes that market power and sustainability are connected. Prominent examples of how market power and sustainability can be related are DuPont's intervention in the phasing out of CFCs (Maxwell and Briscoe 1997, Bjørnåvold and Van Passel 2017), or the greening of Walmart's supply chain (Meeks and Chen 2011). Chapter 1 does also refer to Hotelling (Solow 1974, Devarajan and Fisher 1981), who in 1931 did already connect market power and resource depletion; an aspect of sustainability. Many studies analyzing the effect of market power on resource management followed (Datta and Mirman 1999, Gopinath and Wu 1999, Cinner, Marnane et al. 2005, Damania and Bulte 2007, Halsema and Withagen 2008, Kotchen and Salant 2009, Fischer and Laxminarayan 2010, Fischer 2011, van der Ploeg and Withagen 2012, Cabo, Martín-Herrán et al. 2014). Thus, the realization that market power and sustainability are connected is not new. Nevertheless, analysis resulting from Hotelling's work only focus on one aspect of sustainability. Since, sustainability encompasses more than resource management, further analysis is necessary.

Given the fact that sustainability as well as market power are complex, the analysis of Chapter 1 was insufficient to answer follow-up questions about the exact character of the relationship between the two phenomena. It needs to be highlighted, that the understanding of market power needed to be extended to fully capture the connections between the two phenomena. Chapter 2 made clear that not market power, but aspects of market power need to be studied. In Chapter 3 market power was analyzed even further, to develop a comprehensive understanding of the phenomena, that transcends the economics sphere.

1.2. How are market power and sustainability related?

Due to the relevance of both phenomena it was expected that research about their connection already existed. Accordingly, a literature review was performed to investigate what information is already provided by the research community.

Interestingly, no direct relation between market power and sustainability could be found in the analyzed literature. Nevertheless, the analysis allowed to further improve the understanding about the connection between the two phenomena. Five aspects that cause market power could be identified within the literature. These five are: a) Innovation, b) Differentiation, c) Lobbying, d) Standards and labels, and f) Policies. Furthermore, these five aspects are of relevance in the quest for sustainability. Entry barriers were in the literature mostly connected to

patents; these are indeed related to innovations. Patents provide a monopoly position to the patent holder, and thus are creating market power. Though, it needs to be pointed out that even without patents, the development and marketing of innovations can represent an entry barrier. This is as the development and marketing of innovations involve high investment costs. These investment costs can form an entry barrier (Bjørnåvold and Van Passel 2017). Entry barriers can be the cause of market power. The relevance of innovations has also been discussed in Chapter 4 (there the focus was on decoupling). Lobbying was also connected to market power, as larger firms may have more budget for lobbying activities. By influencing policy makers, the market position of larger firms may be further stabilized or even increased. Examples have been provided, in which lobbying activities hampered and supported sustainability endeavors. The importance of standards and labels increases with sustainability becoming urgent. Though, the ability to comply with standards and labels can be related with firm size. Finally, sustainability promoting policies have been identified to support market power.

Chapter 2 allows to understand the complex relationship between market power and sustainability. The two phenomena are related in various ways. The above listed five aspects of how market power and sustainability can be connected were revealed in the literature review. It has to be emphasized that the connections between market power and sustainability have not been stated directly in the screened literature. Thus, more aspects that allow a connection between market power and sustainability exist and further research could add to the aspect that were revealed in Chapter 2. However, the results from Chapter 2 illustrate that there are several connection points between the two phenomena and that it is necessary to take a broader understanding of market power to identify these potential connection points.

1.3. Is the relationship between market power and sustainability unidirectional or bidirectional?

Sub-question number two asked whether the phenomena are affecting each other or not. Chapter 2 provided an answer to this question. The reviewed literature presented different examples of how one phenomenon (indirectly) affects the other. The lobbying examples indicate that market power affects sustainability. Influential firms can lobby for or against the implementation of new regulations. However, sustainability can also affect market power. Knowing that sustainable productions or products can provide a competitive advantage (e.g. more efficient production or increasing brand value), it can be a company's strategy to support sustainability enhancing policies. The same can be stated for innovation. A firm may actively strive to develop innovations promoting sustainability. This in turn may increase a firm's market share. This logic can be applied to all identified

aspects. As soon as a company opts in for the sustainability strategy and manages to generate a competitive advantage, market power may be a result. Thus, the relation between market power and sustainability is bidirectional.

Market power is understood to be a market failure which should be inhibited. It is not without reasons that antitrust legislations are in place to prohibit companies from gaining too much market power and/or abuse their power. However, if a sustainability strategy increases market power, we find that a desirable behavior leads to an undesirable side-effect. The analysis indicated that companies follow a sustainability strategy because of economic reasons, rather than due to altruism. In Chapter 3 it was pointed out that Adam Smith already recognized that the appearance of market power is an inherent weakness of the economic system he advocated. Market power is a natural consequence of the dynamics of our economic system which strives for continuous growth. This instance is further discussed in Chapter 4. It is logic that a company will only take up a certain strategy, if this strategy promises to contribute to the company's growth. Thus, it is doubtful that a company would apply a sustainability strategy out of altruism.

If all of this holds true then a) antitrust investigation will become ever more important and b) other incentives and schemes need to be envisioned and developed. Moreover, if sustainability leads to more market power, thus more market concentration, we have to consider the feedback effect onto the economic system. One aspect that needs to be considered is resilience. It will be discussed below as theme for future research. However, it can be stated that increased concentration reduces resilience. Though, resilience is an important factor to secure the sustainability of a system. Thus, by adopting a sustainability strategy, the sustainability of the system might be jeopardized.

Freedom and dependency have been mentioned as aspects of the nature of power (Chapter 3). Market concentration means reducing the freedom of choice and in turn means increasing dependency. Let us think of the event of a global crisis (which is as we have experienced not unlikely), the breakdown of one or two critical points within the system can cause the collapse of the whole system. The question is of course if some back up facility or buffer is in place, how quickly this back up can be jumpstarted and whether this buffer is big enough. To apply this to the agri-food sector. If agricultural inputs are provided by only two major players and these players get in trouble for some reason, we are dealing with a potential systemic failure. It is up for the society to decide whether such risks should be taken. If they are, policy makers have to think about proper back up facilities and buffers.

1.4. *Is the relationship between market power and sustainability positive or negative for sustainability?*

Sub-question number three cannot be answered in a simplistic way. First of all, positive and negative are indeed normative terms. What is positive for one person, may be evaluated as negative from another person's perspective. Apart from this, it is impossible to make a general statement about the positivity or negativity of the relationship between market power and sustainability, as this will differ from case to case. It has been established in Chapter 3 that power *per se* is neither positive nor negative. The question is what is the power used for? Thus, the question can only be answered by taking a look at a respective market agent and to what end this agent is using power for. The examples of the literature review clearly showed that firms try to support or hamper sustainability endeavors, depending on their own situation. One example (see Chapter 2) indicated that the relevance of Corporate Social Responsibility (CSR) depends on the country a firm is operating in. If the population demands companies to follow some CSR measures, companies are more likely to invest in these CSR measures. If a company supplies customers who value sustainability, a sustainability strategy may benefit the firm and thus it is more likely that the firm will follow such a strategy. The same is true for technologies that companies have readily available, which provide them with a competitive advantage. That market power can have positive and negative effects on sustainability can be seen with the example of DuPont. While DuPont lobbied for the facing out of CFCs as they had a new more environmentally friendly technology ready (Maxwell and Briscoe 1997), they (Chemours, a spin-off of DuPont) later lobbied for the introduction of a new chemical in the automotive sector which is less environmentally friendly than other available alternatives (Bjørnåvold and Van Passel 2017). Another more well-known example within economics is the assumption that a monopolist will automatically slow down the exhaustion of natural resources to maximize profits (Solow 1974). While this is true in some cases (Damania and Bulte 2007, Cabo, Martín-Herrán et al. 2014), it is not generally like this (Cinner, Marnane et al. 2005, Chen and Skonhoft 2013). Literature even shows that due to spillover effects market power can lead to the under exploitation in one area and over exploitation in another one (Fischer and Laxminarayan 2010). Thus, depending on the environment, the circumstances and on how the firm positions itself within this environment, sustainability may be promoted or not.

The comparative case study of Chapter 6 does also indicate that market power is not enough as a condition to positively affect sustainability. For sugar beet in Belgium there is little demand for organic sugar, which is why refineries did not invest in this avenue. However, in other countries sugar refineries are very well investing in this product due to higher consumer demand. Sugar beet can not only be used for the production of sugar, but also for the production of biofuels or

bioplastics. Investments to enter these industries are high. However, due to subsidies and increasing demand companies are aiming to invest in these new products. The rapeseed case in Germany also illustrated that sustainable production is only supported if higher production costs are covered by higher prices and consumers' willingness to pay. For the German case, farmers found that there is not enough consumer support to invest in sustainable production. Farmers are lacking alliances with more powerful players (such as processors) to generate increasing demand for sustainable products. While the production of biofuels is promoted and the demand is stable in Germany, farmers still did not profit in the long run. Processors shifted their supply to other areas to cover the demand. This example illustrates that when one intends to analyze sustainability, the socio-economic factors should be considered as well. Even if a sustainable product²² is promoted, it does not mean that the sourcing or production process is also aligned with sustainability goals.

1.5. What does the nature of the relationship between market power and sustainability imply?

This sub-question calls for further broadening the understanding of market power. The previous sub-question developed that whether the effect of market power on sustainability is positive or negative depends on the circumstances and on the goals of the respective firms. What power is ultimately used for was discussed in Chapter 4. There it was established that market power as such cannot be demonized as it depends on what it is used for. Indeed, it needs to be pointed out that it is another ethical and political question, to be answered in a social discourse, whether power imbalances are accepted or not if they support sustainability.

Market power *per se* is not negative or positive. Accordingly, market power is not *per se* negative or positive for sustainability. What is "good" or "bad" is a normative question. This is highlighted by taking a historic view at how markets were organized (see Chapter 4). Furthermore, one also needs to first define what sustainability really means. Chapter 5. underscored that weak sustainability is an oxymoron and thus an illegitimate construct. The analysis in Chapter 5. shows that any kind of assimilation of sustainability within the current paradigm (the growth paradigm) will lead to weak sustainability. Still, it cannot be stated whether market power is negative under such circumstances. To answer this further research in the realm of transition theory would be necessary. This is as a change can come from within the system. Thus, a powerful market player could,

²² Of course, it needs debate to decide whether biofuels are sustainable or not.

because of its power, transform and revolutionize the system. This idea is captured in Chapter 3, as visualized in Figure 17 (see below).

Figure 17 summarized the main findings of Chapter 3. The dynamic notion of the power struggle was highlighted. It was established that all categories of power (capacity, structure, communication) are subordinated to the paradigm. The paradigm forms the highest goal the whole system is oriented towards. In order to reach that goal, power is deployed. The current economic system organizes and determines the socio-economic sphere humans live in. It is a system that is oriented towards economic growth. The effect of the growth paradigm assimilating sustainability was discussed in Chapter 4 using the example of the Green Revolution.

Finally, the importance of the paradigm is also mentioned in the case studies. In Chapter 5 market power in the Belgian sugar beet sector was analyzed. The logic of the causal loop diagram follows basic economic concepts, which are themselves supporting the growth paradigm. Thus, the underlying logic is to increase profits. An example is the demand and supply elasticity of the crop (sugar beet). It was argued that farmers have troubles finding an alternative for sugar beet. The main rationale for the selection of an alternative, but already the consideration to change crop, is based on profitability. Sure, an alternative needs to fit within the crop cycle, and the regional ecological conditions. However, the best fitting alternative crop will not be cultivated if farmers cannot generate income from it. Thus, sustainability considerations are only of secondary importance. Since everyone involved knows that profitability is the main concern, it is easier to make use of this knowledge to the own advantage. For example, refineries knowing about the dependency of farmers from a certain crop, equips refineries with power in negotiations with farmers. In this special situation, in which farmers cannot choose processors, refineries have even more power. Another example from the sugar beet case, which was however mentioned in Chapter 6 is that organic sugar is not produced due to the lack of demand. Again, economic considerations are prioritized before environmental ones. Chapter 6 compared the sugar beet value chain to the rapeseed chain in Wetterau region in Germany. In this case as well, sustainability considerations were not the priority. Farmers were unable to produce rapeseed oil products that follow higher environmental standards as demand and willingness to pay was lacking.

Thus, the case studies are an example of how the paradigm determines actions within a system. The question of whether market power (or any other power) can genuinely support the sustainability transition depends on whether sustainability becomes assimilated by the current paradigm or not. Knowing that a sustainability transition is urgently needed, Chapter 4 pledges for getting the paradigm right and Chapter 5 aids at understanding that only strong sustainability will serve as new paradigm to guide the transformation.

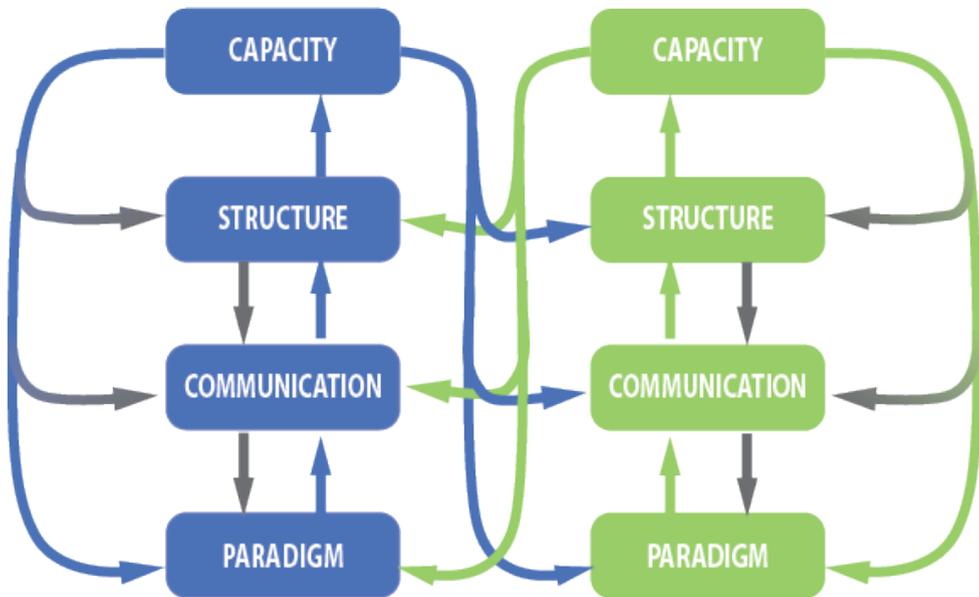


Figure 17: Power struggle between paradigms.

1.6. Market power and strong sustainability

In the previous section a general conclusion regarding the connection between market power and sustainability was presented. While it is argued that weak sustainability does not lead to sustainability (see also Chapter 4) the conclusion did not exclude the notion of weak sustainability and rather looked at sustainability in a broader sense. Within this thesis two different possibilities were presented. In the previous section the possibility of market power supporting sustainability and even bringing about a sustainability transition was granted (see also Chapter 3). In this section this possibility is negated. This is result of the two main interpretations of sustainability. If one considers weak sustainability, certain options become viable, which are not when strong sustainability is considered. Arguing from a weak sustainability perspective can help to understand the logic that is applied by proponents of weak sustainability and the growth paradigm. However, since, it is apparent that weak sustainability is a *contradictio in adiecto*, this section will only look at strong sustainability and its relationship to market power. It has been pointed out that the decision to follow strong sustainability necessitates to take ethical and normative decisions. Decisions that are urgently needed, given the acuteness and severity of sustainability problems humanity is

facing. Arguably the reason for strong sustainability not being applied is also related to (market) power issues.

This subsection treats market power and strong sustainability on two levels 1) market power is not in line with social equity and is thus, not conform with strong sustainability, 2) market power is a synonym of the growth paradigm, which contradicts strong sustainability.

Let us undertake a thought experiment assuming that instead of the growth paradigm a strong sustainability paradigm is in place. What would happen with market power under such circumstances? Would market power be no longer an issue? The question of power has always been part of civilizations. The intensification of agriculture allowed the introduction of hierarchical social structures and the formation of center-periphery structures that were as well an expression of power (Chew 2001). Resource endowment whether on individual or on an aggregate level has always been a means to generate, maintain as well as to display power (Magee and Galinsky 2008). It is yet another discussion whether a society without (market) power can exist. The intention of the next paragraphs is to discuss whether market power can be part of or support the transition towards the strong sustainability concept.

It has been discussed that sustainability or sustainable development do consist of at least three dimensions, one of which is the social dimension. Due to the development debate, equity, thus the question of distribution of wealth, became an integral part of sustainability. It is not only about eradicating poverty, but about how wealth is distributed (UN 2015). Clearly, not only the environmental dimension, but also the social dimension allows for two different perspectives (Attfield 2013). Those of weak and those of strong sustainability. Some argue that weak sustainability follows welfare economics considerations (Beckerman 1994). Welfare economics deals with the maximization of overall welfare, rather than with the equitable distribution of welfare. This is as Pareto efficiency²³ does not guarantee equal distribution of welfare (Hansson 2004, Aydin 2014). This aim of maximizing overall welfare without taking equity into account does generally fit to the world view of weak sustainability. As outlined in Chapter 1, weak sustainability does allow tradeoffs among sustainability dimensions. Thus, the overall *result* matters, rather than the performance of individual dimensions of sustainability. Strong sustainability in contrast would not allow a system that is not based on equity. Social equity is an integral part of strong sustainability and is also reflected in the claim to take all sustainability dimensions into account.

²³ An economic concept describing the situation in which no one can be made better off without making someone else worse off.

Market power is the result of unequal distribution of resources (material or immaterial). Thus, market power is a symptom of inequality. From that follows that under strong sustainability market power must not exist. It is the aim of strong sustainability to establish equity. Therefore, no base for market power would exist in a system governed by strong sustainability.

The second reason why market power would have no place within a strong sustainability scenario is that market power is a symptom of the growth paradigm, which, as has been discussed in Chapter 4, is in itself not sustainable. Within this thesis it has been pointed out that sustainability can represent a business strategy. Companies engage in sustainability activities if they can generate some profit from it²⁴. While this would *per se* not be deleterious to sustainability, the fundamental dynamics of the economic system do not allow sustainability. Since we are living on a finite planet any action that is not adapted to the planetary resource limitations will lead to overexploitation and is thus unsustainable. The current economic system is based on the growth paradigm (see Chapter 3). Therefore, all efforts are employed to align with the overarching goal of economic growth. So far absolute decoupling is not possible (see Chapter 4), hence the current economic system has no choice but being unsustainable.

Finally, there is the idea that companies with market power can bring about the needed transformation towards strong sustainability. While this sounds like a palatable scenario, it is unlikely as it would lead to self-destruction. Unless those who have market power realize that their current behavior will lead to the collapse of the system and thus to the complete loss of their power, they will not undercut the very system that allowed them to generate their power in the first place. Even if, sustainability as a business strategy has the side effect that some sustainability goals are achieved, it does not permit the whole system to become sustainable. As discussed in Chapter 3 and 4, the situation is even more deceitful. Since those in power have interest to maintain the current system (growth paradigm) influences are integrated that may pose a risk to this system. This is why sustainability became a business strategy. This is why we can observe the conventionalization of agriculture or green washing of business activities. Superficially the society is moving towards *sustainability*, while the society will never achieve it as the system itself does not permit sustainability. Though, these superficial activities convey the false image of a society that is transiting towards sustainability, which then inhibits tackling the fundamental structures that caused sustainability problems in the first place. Thus, if we assume that strong

²⁴ See the example presented by Schumacher about a chemistry company (Scott Bader & Co. Ltd.) that could provide alternative company strategies. Schumacher, E. F. (1973). Small is beautiful: die Rückkehr zum menschlichen Maß. München, OEKOM.

sustainability is the type of sustainability that we should strive for, market power is not going to bring the needed transition; at least it did not do so in the past.

While not addressing how this transition will take place, it is clear that market power must not have a place in a system guided by strong sustainability. What that also means is that the current economic system needs to be replaced by a new economic system. Ideas on how a new economic system could look like do exist²⁵. They are usually belittled, as they bring about certain problems for which solutions are not yet found (such as unemployment). To these arguments, one can reply that the current system does also bring about problems to which solutions are not found and that since it obviously failed in many aspects, a different system should be given a chance. Further, one does get the impression that the current economic system is set in stone; as if it would be based on natural laws. This is, however, not the case. Any economic system is manmade and can thus be adjusted and reinvented as needed. The inability and the reluctance to adapt or replace something that is not working, is not a sign of human ingenuity.

1.7. Power and strong sustainability

The discussion about market power and strong sustainability made clear that large power disparities must not be part of a system governed by strong sustainability. Then the next question would be how to regulate an even distribution of resources and thus power? In Chapter 3 it has been pointed out that governments may neither be suited to regulate power as they are as well prone to accumulate power and abuse it to solidify it. Since strong sustainability would not allow a disproportionate distribution of power in any sphere (economic, social, or political), governmental power would need to be regulated as well. Modern democracies do have checks in place to at least hamper the installment of dictatorships or dictatorship-like political systems. Nevertheless, there is a continuum of possibilities of how this can exactly be implemented (such as, direct democracy, representative democracy, or constitutional democracy).

²⁵ Degrowth, steady state, sharing economy, basic income, economics of happiness. See for example: Gomiero, T. (2017). "Agriculture and degrowth: State of the art and assessment of organic and biotech-based agriculture from a degrowth perspective." [Journal of Cleaner Production](#). Miralles, I., D. Dentoni and S. Pascucci (2017). "Understanding the organization of sharing economy in agri-food systems: evidence from alternative food networks in Valencia." [Agriculture and Human Values](#) **34**(4): 833-854. Zsolnai, L. (1993). "A Framework of Alternative Economics." [International Journal of Social Economics](#) **20**(2): 65-75.

In essence strong sustainability calls for an egalitarian system. The installation of an egalitarian society may be a utopian idea. Given the failure of the current system, utopian ideas should be considered. It remains an unanswered question whether an egalitarian society could exist. Even if humans would be able to tame their hunger for more, a certain stratification or structure might be needed to organize societies (Magee and Galinsky 2008). It seems to be a natural human trait to strive for more (e.g. resources, power). The regulation of this endless strive is not a new concept. The philosophy of ascetism is one example of the idea to reach happiness through self-regulation. Similar ideas can be found in yogic philosophy or in religious texts. Potentially, if humans adhere to self-regulation even the current economic system could be sustainable (Jamieson 2007). If humans followed the principle of self-regulation, market power would neither be an issue. This is as no one (and thus no business) would strive to accumulate a disproportionate amount of power. The minimalism movement is an example of humans realizing that the accumulation of stuff does not make one happier. Thus, they voluntarily reduce their consumption to a minimum. This requires one to thoroughly think about what makes one happy. Such a behavior does oppose the growth paradigm and exhibits a revolutionary process. If all humans followed minimalism, the current economic system would collapse.

The conclusion may be that the sustainability debate asks humans to accept that there are limits and that we have to self-regulate. If humans adhered to certain ethical principles, no unsustainable system could evolve. Thus, the installation of a system that is governed by strong sustainability may depend on every single individual and on a collective (mental) evolution.

2. Analysing market power and sustainability

Market power and sustainability can be analyzed remaining at the level and understanding as it is described in orthodox economics. One example of such an analysis would be the work of Gopinath and Wu (1999), who investigated the effect of market power on fertilizer usage. Given the fact that overuse of fertilizer is environmentally harmful, a mark-up that causes a reduced application supports sustainability. While such investigations are useful and necessary, they are overlooking other aspects of market power. These other aspects have been identified in Chapter 2. Chapter 3 offers a further refinement of these aspects considering three dimensions of power.

Table 7 and 8 from Chapter 2 and 3 illustrate the further development of the aspects of power. Chapter 2 focused on the "Origin of Power". Within this dimension three categories were identified (Capacity, Communication and Structure). These categories summarize aspects of market power that could be

identified in the reviewed literature. These aspects partly build on orthodox economic theory regarding market power. Thus, using this scheme to analyze market power does allow to build on existing theory. However, the scheme does also allow to go beyond disciplinary frontiers. This is necessary as market power transcends the economic sphere. This is even more so, when one wants to analyze market power and sustainability at the same time. Interdisciplinary research does fertilize rigid discussions and allows to gain new perspectives.

Unfair trading practices have been mentioned before as an acknowledged example of market power transcending its usual understanding described in economic theory. The scheme developed in this thesis can be a useful tool to investigate market power applying a comprehensive perspective on the phenomenon.

Capacity		Communication		Structure
Innovation	Differentiation	Lobbying	Standards and labels	Policies

Table 7: Market power aspects

Table 8 illustrates the evolution of research performed in the quest to understand market power. This scheme provides an even richer matrix to analyze and understand market power. It could be shown that other categorizations of power fit within this scheme. This is an indication for the comprehensiveness of this scheme, which is based on Foucault's work. Analysis of market power can focus on one dimension, category or aspect alone or on all of the afore mentioned together. If all dimensions are used, a rich understanding of a market power incidences can be established. Clearly, a thorough analysis is necessary to cover the whole scheme and resources may not always be available. However, the comprehensiveness of the scheme allows to analyze market power instances from different perspectives. Hence, market power may be identified which might be overlooked otherwise. This is particularly the case when one considers the aspect "potential". In Chapter 3, it was explained that market power may not be obvious as the power play is concealed by the current power structures. This is one of the strengths of this scheme as it allows to go beyond the obvious. Classic economic market power estimations may not detect market power based on for example price data. Price data, that could reveal mark-ups, are a symptom for the market power problem. Though, the problem can be a-symptomatic, or it can have different symptoms. Maybe even symptoms that have not been observed yet. When analyzing different "Manifestations of Power", the third dimension of power, one should bear in mind that the ability to conceal a power struggle can be an indication of power. It has been pointed out before (Chapter 3) that due to the anti-trust legislations in place, agents with power actually must aim at concealing

their power. As soon as market power gets obvious and does infringe on anti-trust legislation, power would be lost in order to comply with the rules.

While this sounds as if power becomes intangible, one is reminded that the other categories and aspects can be used in the analysis to uncover the concealed. One example would be to look at the aspects of freedom and dependency. The degree of dependency can indicate the degree of power at play. The same can be true for example for the category communication and the aspect of lobbying. As already mentioned more aspects may exist. Due to the potential subtlety of market power, the analyst needs an alert mind to recognize how power is created and the ways in which power manifests.

Nature of Power			
Freedom	Dependency	Potential	
Origin of Power			
Capacity	Communication	Structure	Paradigm
Manifestation of Power			

Table 8: Dimensions of power

The dimension “Origin of Power” was complemented with another category; paradigm. This was lent from systems thinking and the idea of leverage points developed by Meadows (1999). Adding a systems thinking perspective to the analysis of power permits to integrate dynamics. It has been established in Chapter 3 that power is not static, but dynamic. Even if some power structures seem to be cemented, the power play remains dynamic and may always lead to a restructuring. Transition theory researchers may profit from the enhanced scheme that was developed in Chapter 3. Adding the paradigm and systems thinking allows to understand why endeavors to support sustainability could not yet initiate a transformation. It explains phenomena such as green washing or sustainability strategies that mainly aim at increasing revenue. Chapter 5 made use of systems thinking to understand market power in the Belgian sugar beet sector. Common market power estimations would have been difficult to implement due to the obvious concentration on the processing level. However, systems thinking allowed to understand which factors caused market power issues along the value chain. Thus, potential market power issues were not only understood at one point within the chain, but up and downstream. Causal loop diagrams and systems thinking allowed to understand the direct and indirect connections within

the chain. Hence, systems thinking was not only of theoretical relevance within this thesis, but of practical as well.

Figure 17 illustrates how two paradigms fight for predominance and how another paradigm can be assimilated. While this assimilation did so far not lead to the urgently needed transformation, it may still lead to a revolution from within. Taking a Gramscian approach it could be possible to transform the system from within (Butko 2006). Further research on this would be needed. However, it is a key finding within this thesis that new ideas do not simply coexist with the old ones, but that there is a dynamic interaction among them. Each idea fights for predominance. It can be understood as a sign of resilience if a paradigm maintains its position by adapting and integrating new ideas. While from within the order of the paradigm such changes may seem to be innovative, from the outside they are not.

In this thesis novel approaches to the understanding and analysis of market power have been developed. These approaches permit a comprehensive, interdisciplinary take on market power. Furthermore, they allow to analyze the complex relationship between market power and sustainability thoroughly. Sustainability as well as market power are multi-dimensional phenomena. Thus, any analysis that claims to be complete needs to take a comprehensive approach. Therefore, this thesis builds a crucial contribution to understand how the economic sphere can support or hinder the sustainability transition.

Practical examples

In Chapter 3 based on Foucault's (1982) guidance on how to analyze power, it was suggested to follow seven points for the analysis of market power and sustainability. As pointed out before, it may not be possible to follow all dimensions, categories and aspects. The presented case studies in the Chapters 5 and 6 illustrate how some of the raised points can be included. Table 9 serves to give a concise overview in this regard. It has to be noted that a focus was given on market power, rather than on the connection between market power and sustainability. Hence the case studies exemplify the various aspects of market power that were at play. Nevertheless, the relevance for sustainability becomes obvious when integrating the paradigm aspect. In both case studies farmers could not implement more sustainable farm practices for economic reasons. Sustainability clearly subordinates economic requirements. Without financial benefit farmers will hardly change farm practices. At least farmers should not be worse off, when choosing a sustainability strategy. Organic sugar for example was not understood to be a financially viable option in Belgium. For rapeseed, sustainable rapeseed products could only be marketed with governmental support. However, without this support such production was no longer viable. Biofuels made out of rapeseed form another example here. In both cases biofuel

production is only viable with governmental support. It can be observed that it needs a strong lobby to support the implementation of biofuels such as E10 (Ulmanen, Verbong et al. 2009, Linares and Pérez-Arriaga 2013).

Chapter 3	Chapter 5	Chapter 6
Dependency	Missing options were one main problem within this case study. Farmers could only sell to a specific refinery. Furthermore, farmers were struggling to find lucrative alternative crops to substitute for sugar beets.	Similarly, missing options were one main problem within this case study. Rapeseed farmers were also struggling to find buyers or ways to diversify their raw product.
Capacities	Market share was a critical aspect in the sugar beet case, due to the high concentration on the refinery level. Entry barriers form another problem. Although a new farmers' owned refinery is planned, financing is up until now the main hurdle.	Market concentration is an issue for the comparative case study. Although small scale mills could be an option, there seems to be a lack of expertise to implement new strategies.
Communication	The introduction of new labels is not an issue here. Though, one of the brands has a good reputation being a known national brand. Lobbying is difficult to identify. Nevertheless, it can be stated that the farmers are well organized and could attract political support for their new refinery.	The introduction of a label for locally produced sustainable rapeseed oil was discussed as a potential strategy. However, it could not yet be implemented. Regarding lobbying, the introduction of the E10 fuel mixture was pushed by lobbying endeavors.
Structure	The structural aspect was thoroughly investigated	The comparative case study was approached by

	using a causal loop diagram. This allowed to understand the factors that cause market power issues in the sugar beet value chain.	analyzing the value chain. Coping strategies of farmers were investigated. Among those was vertical and horizontal integration, which turned out to not being efficient enough to maintain or strengthen the farmers' position.
Paradigm	The paradigm was not discussed in this case study. However, the growth paradigm was the underlying assumption to develop the causal loop diagram.	The paradigm was not discussed. Though, all strategies were viewed to fit the growth paradigm. This is also true for environmentally friendly farming. The rape seed case indicated that farmers are not able to apply sustainable farm practices if they are not in line with the growth paradigm.

Table 9: Aspects to consider when analyzing market power. These points were developed in Chapter 3 and are here confronted with the analysis done in Chapter 5 and 6.

Within this thesis it is argued that market power is more than market share, firm size or markups. The previous pages aimed at providing alternative access points for the analysis of market power. It has been argued that while there is an established means to connect market power to sustainability, this path is limited as it only relates to price distortions and resource depletion / management. However, market power is more than price distortions, and sustainability is more than resource management. Thus, the view on and understanding of market power is broadened. Table 9 summarizes how an analysis of market power based on a broadened understanding of market power could look like. The case studies showed that some sort of power play is involved, even if this is not measurable by a markup. The power play becomes obvious when one looks at the aspect of dependency, which is central in both cases. Another question is whether the dependency manifest in the abuse of power. The abuse of power may be measurable by price distortions, but can be more subtle leading to, for example,

unfair trading practices. Even if this may not be the case, the insecurity that is born out of being at the mercy of the powerful party can already be seen as an unfavorable position. Thus, an analysis should clarify the aspects of dependency, freedom and the potential to abuse power. In the sugar beet case, for example, the dependency and freedom became problematic through the change of regulations (structural aspect), which then only gave room for the potential to abuse power. From this it can be seen, that an analysis should not stop at this level but should expand on the level of the origin of power. Changing regulations, created vulnerability and led to a situation of dependency. What are then the capacities of actors to overcome this vulnerability? In the case of sugar beet farmers vertical integration is aspired. This, as well as the case of rape seed, show however, that such a plan is not easy to implement, which again tells much about the power of these actors. If actors cannot reduce dependency themselves, they could strive to change the structure in their favor. This can be done by lobbying for regulations. Taking all these elements into account it can be seen that farmers in both cases have been unable to improve the situation to their favor. This is an indication of their (lacking) market power. Finally, the growth paradigm can be considered. Indeed, currently the growth paradigm dictates and legitimizes actions. The better one is at delivering under the growth paradigm the more power will one have. This is as growth means accumulation, and this in turn means power. If one is not able to accumulate and grow, one loses power and thus the room for maneuver to change circumstances to one's favor. Clearly this may be different under a different paradigm, such as the strong sustainability paradigm, where unequal distribution of assets and thus power must be avoided.

It has been pointed out that this scheme mostly looks at market power and does not connect to sustainability. Nevertheless, this extension can be done as well. An interesting question would be how a change towards a strong sustainability paradigm would affect sugar beet farmers. Without expanding on this topic, one could argue that sugar production would be reduced to a minimum due to, for example, consumer health concerns. Therefore, it is not said that certain activities would be permitted to continue under strong sustainability. In the case of sugar beet, farmers may need to look for an alternative crop anyway.

The application of the developed scheme shows how the analysis of market power could be performed, without focusing on the usual market power indicators and elements. This is not only useful in the case of lacking quantitative data, but it also opens up market power analysis to other disciplines than economics.

3. The role of innovation

Innovation has shown to be of importance throughout the performed research. It is not only relevant for market power, but for sustainability as well. Further it has shown to be of relevance for the connection between market power and sustainability.

Innovation will be key to achieve sustainability. This pertains not only to technology but also to how our socio-economic system is organized. In Chapter 2 the key role of innovation within research dealing with market power and sustainability was illustrated. Innovation was one of the main topics (see Figure 4) within the literature review. Thus, this leads to the conclusion that within research the central role of innovation for market power and sustainability is acknowledged. Nevertheless, it is not clear what effect innovation has on market power or how market power affects innovation. It has been pointed out that due to the complexity of our socio-economic system this relationship will have to be investigated individually.

The downside of innovation is illustrated in Chapter 4. There the Green Revolution and the notion of decoupling is discussed. The data for that particular example showed that innovations could solve one problem but caused several new problems. Thus, the relationship between innovation and sustainability is neither simple and straight forward. Once more the complexity of our socio-economic system necessitates a comprehensive analysis of each innovation.

For the comparative study presented in Chapter 6, potential strategies to maintain or increase farmers' income were outlined (see Table 6). One of these strategies was innovation. In both cases innovation was perceived as an exhausted strategy, despite value chain representatives evaluating innovation being the most promising option. In the sugar beet case innovation mostly referred to cultivation techniques, inputs and seeds. Stakeholders stated that innovations in these areas have reached a plateau. Innovations on refinery level were not evaluated as promising by value chain representatives. Another aspect of innovation are alternative end products, such as bioplastics and biofuels. In the Belgian case these have not been understood to be promising. The argument was that these alternatives are not demanded enough and, regarding consumer prizes, that they cannot compete with the conventional alternatives. Biofuels have been a of greater importance in Germany as explained by the rapeseed case. Nevertheless, biofuels did neither offer a promising alternative in this case study.

The other main theme within the literature review was resource management. Although there was no connection between innovation and resource management within the reviewed literature, it has to be highlighted that they are connected. Chapter 4 clearly illustrates this connection. Decoupling describes the (absolute

or relative) reduction of resource use, due to new technologies or even innovations. Clearly innovations that support sustainability have to be related with how we use and manage our limited resources. This connection can be clearly seen in the sugar beet case study, where innovations on the farm level intend to increase production, while keeping or even reducing resource use. When these new innovations are evaluated against sustainability goals, it is pivotal importance to undertake a thorough and comprehensive analysis to also capture unintended side-effects. A multitude of methods can be applied for such analysis. Systems thinking may be mentioned here as it allows to identify connections and feedback loops taking the wider socio-economic system into account.

4. Final remarks

Every year 12000 scientific articles are published within the field of sustainability science (Kajikawa, Tacao et al. 2014). Books have been filled with discussions about power. Despite the effort to cover both phenomena as comprehensive as possible, it needs to be pointed out that it is impossible to cover both phenomena in all their richness. This is of course also true, for the analysis of the connection between the two. Needless to say, if aspects of the phenomena have been overlooked or not been covered due to resource constraints, potential connection points between the two will be lacking as well.

This thesis attempted to present a broadened understanding of market power that will open up its analysis to a wider research community. This will allow market power to become a theme to be studied by inter- or transdisciplinary research teams. Broadening up the understanding of market power, however, aimed in the first place at finding connection points with sustainability. Certain limitations remain, from which future research ideas can be developed.

4.1. Limitations

The relevant aspects of market power that have shown to also be of relevance for sustainability have been identified by a literature review. Literature was searched and selected following certain criteria. With changing criteria, the literature sample will most probably be different. Hence, the results from the literature review of course only reflect what was found within the respective literature. Whether results can be generalized will have to be proven by future research.

A reference to hermeneutics is required as well (Boell and Cecez-Kecmanovic 2010, Huaxia 2010). Not only the literature review was influenced by the previously screened literature, the extracted information therein and the gained insights. Of course, the researcher herself, even with the highest pursuit to

objectivism, is influenced by the socio-cultural context. This context influences the scientific process itself, the choice of methods, the scientific lens applied, the approach, etc. By no means does this imply that the performed research is invalid. If at all a researcher's awareness of hermeneutics does contribute to the quality of the research. This is as the awareness of hermeneutics does help to constantly question the undertaken research. However, it needs to be pointed out that due to the previous knowledge, for example, the focus on a specific research question may differ. Therefore, if someone else would investigate the same question different insights might be generated.

Problems of hermeneutics are not only limited to social sciences. However, this thesis did make use of qualitative research methods. These of course require interpretation. The causal loop diagram was built using basic economic theories as well as insights from performed field studies. Thus, the development of and the final causal loop diagram may also differ if it would have been built by someone else. The same is true for results presented in Chapter 5 and 6. Nevertheless, at the same time it needs to be emphasized that the research compiled within this thesis did undergo processes of review. These increase the validity of the whole research process as well as the results. Research was presented at conferences and underwent review in the publishing process.

The development of the causal loop diagram was data intensive and was constructed to represent a specific case. Thus, the results cannot be generalized. The same is true for the analysis and the results of Chapter 6. Chapter 6 compared strategies that could potentially be implemented by farmers. While it was revealed that most suggested strategies were exhausted that must not be the case in other instances. Chapter 5 was dedicated to understanding the market power dynamics in the sugar beet value chain in Belgium. While the crop characteristics or refinery concentration are similar in many European countries other factors may differ considerably. One example is the level of organization of farmers or their integration into the value chain. Thus, although some factors may be the same all over Europe no general statements about market power in the sugar beet value chain can be made. However, the factors taken into account can be used to study other cases.

4.2. *Suggestions for further research*

It has repeatedly been pointed out that this thesis is of course not exhaustive in discussing the complex relationship between market power and sustainability. Further research could prove and could add on what has been developed on the previous pages. The literature review indicated that there might be structural aspects regarding the themes of innovation as well as resource management. The former could be related to asymmetric information and the latter to vertical integration. Not enough data points have been found within this research to prove

such structural correlations. Thus, future research to investigate the prevalence of certain market power aspects and sustainability issues could bring further clarity. Such a clarification would potentially also help informing policy makers to intervene if unwanted structures are created by the sustainability quest.

The limitations section highlighted that the literature review only reflected what was present in the literature. It can be stated that sustainability could mostly be connected with market power by the environmental dimension of sustainability. The social aspect is underrepresented. Further research could focus exclusively on the social dimension of sustainability and its connection with market power. Thus, this is not only about inequality, which is the basis of market power, but about the, for examples, inequalities that are influenced by market power.

A causal loop diagram has been developed in Chapter 5. It would be interesting to see if the connections and feedbacks within the diagram could be transformed in a stock and flow model. If so, further research using system dynamics could be performed. This would allow to analyze changes within the system. Such an analysis could be useful for policy makers as it would allow an evaluation of potential effects *ex ante*.

As pointed out in the previous sections, future research could put the schemes developed within this thesis to the test. Does the scheme developed in this thesis help to understand and analyze market power and does this then help to connect it with sustainability? Specific case studies could serve in this regard. The case studies within this thesis already aimed at understanding market power in a comprehensive way. However, the connection to sustainability was not pronounced within these research endeavors. Thus, this represents a gap that could be filled in the future.

The dynamics of the power play and the role of the paradigm could also be investigated further. Of particular interest could be the combination with transition theory (Avelino and Wittmayer 2016, Avelino 2017) to investigate why a sustainability transition has not yet taken place or how this transition could be promoted. In this regard not only market power could be looked at, but also the power of markets. Further the role of power in a (strong) sustainability driven system could be investigated with more depth as well. Given the urgency of the sustainability debate, this would form highly relevant research.

Another avenue for future research would be to investigate the connection among market power, sustainability and resilience. Resilience is a relevant factor when evaluating the relationship between market power and sustainability (Xue 2000, Bhamra, Dani et al. 2011). On the one hand market power can be understood as an agent increasing the resilience of the growth paradigm and

thus increasing the systems sustainability (as discussed in Chapter 3)²⁶. On the other hand, market power can be understood as reducing resilience and thus sustainability. This may occur on market as well as on product level, by reducing the number of companies within an industry or the product choices on the market. All of these aspects need further research to support humanities quest in creating a sustainable socio-economic system.

²⁶ Here sustainability is understood as longevity of the system, rather than as sustainability as defined in the Brundtland report.

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APPENDIX

#	Title	Summary	Key word 1	Key word 2	Key word 3	Key word 4
1	A novel approach for assessment of candidate technologies with respect to their innovation potentials: Quick innovation intelligence process	The assessment of potential innovation in terms of their profitability, measured by the time to commercialization, the commercial potential and the danger of being imitated.	Innovation	Monopoly		
2	Business highlights (Volume 2, Issue1)	Business news in the sector of biofuels	Merger	Synergies	Biofuels	Lobbying
3	Cooperation and competition in the context of organic and mechanic worldviews - a theoretical and case based discussion	Competition versus cooperation, these are also compared within two world views a mechanistic and an organic one.	Competition	Cooperation	World view	
4	Externalities, Market Power, and Resource Extraction	Market power in the fisheries sector, while also taking environmental and dynamic externalities into account.	Market	Resource	Fisheries	Common
5	Global artificial photosynthesis project: a scientific and legal introduction	Innovation in the energy sector to support sustainability	Innovation	Ethics	Property	Energy
6	Safety and socio-economic issues raised by modern biotechnology	Innovation in the field of biotechnology. They discuss questions of ethics, risk, patenting, monopolies	Innovation	Patenting	Biotechn	Ethics

7	The involvement of the private sector in water servicing: effects on the urban poor in the case of Aguascalientes, Mexico	Privatization of the water sector leading to high prizes, which caused problems for the poor inhabitants.	Infrastructu	Water Monopoly
8	Market and regulatory factors influencing smart-grid investment in Europe: Evidence from pilot projects and implications for reform	Innovation in the energy sector to support sustainability. The focus is on smart grids and how innovation can be spurred in the energy sector to support smart grids.	Innovation	Market Infrastructure Energy
9	Addressing challenges to sustainable development with innovative energy technologies in a competitive electric industry	Innovation in the energy sector to support sustainable development. They generally discuss the problems of our present energy provision and point out the opportunities for a changed energy sector.	Competitive	Infrastructure Innovation Governmental
10	Clean Air regulation and heterogeneity in US gasoline prices	Market power through differentiation in the US fuel market. This paper shows that market power needs to be considered by policy makers when implementing regulations.	Market power	Policies Differentiation
11	How U.S. ocean policy and market power can reform the coral reef wildlife trade	The possibility to influence sustainable resource management through national market power, by demanding the compliance to standards in trade agreements.	Resource	Standards Trade policies
12	Intertemporal Emissions Trading and Allocation Rules: Gainers, Losers and the Spectre of Market Power	Modeling trading permits under market power conditions.	Permission	Market Policies

13	Managing multiple fishery pools: property rights regimes and market structures	Modelling resource management in the fisheries sector, taking into account different property rights regimes and market structures.	Property rights	Resource	Market power	Fisheries
14	Managing partially protected resources under uncertainty	Modelling price and quantity under different market scenarios to deduct resource management options. This paper deals with questions of property rights, common goods, resource management, spillover effects of regulations, taxes or quotas. An interesting aspect is that market power may lead to an under-exploitation of resources in one area, but to an over-exploitation in another one due to spillover effects.	Resource management	Property rights	Spillover effects	Policies
15	Private Governance Undermined: India and the Roundtable on Sustainable Palm Oil	About the problem that private governance initiatives for sustainability does not work in south-south business cooperation. Consumers in developing countries have other priorities and the market structure is different.	Market power	CSR	Developing countries	
16	Scotland's Food and Drink Policy Discussion: Sustainability Issues in the Food Supply Chain	Evaluating a policy in Scotland, market power as well as sustainability aspects have been mentioned. Further it is pointed out that supermarkets with their market power can positively influence sustainability.	Market power	Food		

17	The Beverage Can in the United States: Achieving a 100% Recycled Aluminum Can through Supply Chain Innovation	Innovation in markets with market power by an external innovator who disrupts the market equilibrium (Schumpeter).	Market	Innovation	
18	The corporate shaping of GM crops as a technology for the poor	Biotechnology in the agri-business as solution to poverty in developing countries. This is about Monsanto's involvement in biotechnology and their aim to sell it to poor farmers.	Innovation	Biotechnology	Developing
19	The higher price of cleaner fuels: Market power in the rail transport of fuel ethanol	An analysis of ethanol prices. It is shown that prices are influenced by competition and governmental regulations. It is indicated that governmental regulations can lead to market power	Market power	Policies	Fuel
20	The potential benefits of herbicide-resistant transgenic rice in Uruguay: Lessons for small developing countries	Analyzing incentives to develop geographically adapted transgenic rice seeds. They focus on mark ups received by monopolists due to the protection of Intellectual property rights.	Innovation	Market power	Biotechnology
21	Trade, technology, and the environment: Does access to technology promote environmental regulation?	Modelling the likelihood to implement environmental regulations in the coal sector. Factors such as prices, the size of the economy and market power are taken into consideration.	Policies	Market power	Energy

22 Energy technology investments in competitive and regulatory environments	Analysis of abatement costs under Cournot and Bertrand behavior. They also include imperfect competition pointing out that taxes generate better results under imperfect competition.	Policies Imperfect Innovation
23 The economics of wildlife farming and endangered species conservation	Modelling wild-life trade under Bertrand or Cournot and varying competition. They find that increasing competition leads to resource depletion.	Resource Policies Imperfect
24 Upstream and downstream pollution taxations in vertically related markets with imperfect competition	Modelling down and upstream pollution taxes, with monopoly at the input side of the supply chain. The paper indicates the importance of taking imperfect competition into consideration.	Policies Imperfect Pollution
25 A new insight into environmental innovation: Does the maturity of environmental management systems matter?	Modelling the relationship between ISO maturity, firm age and market concentration on R&D expenses. Market concentration increases R&D expenses.	Market Innovation Standards
26 Import-based Indicator for the Geopolitical Supply Risk of Raw Materials in Life Cycle Sustainability Assessments	An analysis of the geopolitical aspects of supply risks of raw materials. They consider market concentration in their risk assessment as key aspect causing risk. They mention that the geopolitical aspects of supply are important for sustainability.	Market concentration Geopolitics Resilience

27	Policy design and technological substitution: Investigating the REACH regulation in an agent-based model	Illustrating that policy intervention calling for green innovation leads to market concentration.	Market	Policy	Innovation
28	Sustainability and innovation in staple crop production in the US Midwest	Analyzing the sustainability and resilience US crops. They show that increased concentration led to a reduction of diversity, which negatively affects resilience.	Resilience	Market	Biodiversity Food
29	The Food and Human Security Index: Rethinking Food Security and 'Growth'	An index is introduced that connects ecological sustainability with market concentration (amongst others).	Market	Food	Food
30	Corporate social responsibility to build strong Brazilian bank brand	CSR to increases brand value of a Brazilian bank. A competitive advantage is achieved through CSR.	Brand	CSR	Competiti
31	A gendered analysis of wine export value chains from South Africa to Sweden	Analyses the sustainability of two wine value chain in South Africa. The wine is for export, bought by a European monopoly.	Monopoly	Product	Food
32	Biodiversity, ownership, and indigenous knowledge: Exploring legal frameworks for community, farmers, and intellectual property rights in Africa	Explains the development of a suggested law for intellectual property within Africa. The law should protect the intellectual property of Africans, while reducing the power of monopolists.	Resource	Monopoly	Biodiversity Legislation

<p>33 BP: Social Responsibility and the Easy Life of the Monopolist</p>	<p>CSR, it is about the fact, that the bigger a company the likelier that they invest in CSR. A small company does not have the means to do this. It is stated that only companies with monopoly power can have non-normal profits, the precondition for having money to spend on CSR.</p>	<p>CSR Monopoly</p>
<p>34 Building more just energy infrastructure: lessons from the past</p>	<p>Energy infrastructure, is related to environmental destruction at the extraction site but also along the provisioning line. Those distant from these places profit from cheap energy and monopolists benefit financially. It is stated that those who control the infrastructure have the power.</p>	<p>Pollution Justice Infrastructure Monopoly</p>
<p>35 Changes in fisheries management in Mexico: Effects of increasing scientific input and public participation</p>	<p>Analyses the reform of the Mexican fisheries policy to support sustainable fishing and solve socio-economic problems such as monopoly. The paper discusses two groups of fishermen, industrial and artisanal. Market power is not discussed as such, though it is mentioned that on the artisanal fishery sector perfect competition can be found.</p>	<p>Policy Resource management Fisheries</p>

36	Competitive investment in clean technology and uninformed green consumers	Modelling a company's strategic interest in investing in green technologies under asymmetric information and perfect information.	Innovation	Competition	Asymmetric
37	Trade, Tenure, and Tradition: Influence of Sociocultural Factors on Resource Use in Melanesia	Marine resource exploitation (lime production though coral extraction) is increased due to monopoly and the fear of losing this position. This is a reported case where monopoly leads to resource overexploitation.	Resource	Monopoly	Common property
38	ECONOMIC SUSTAINABILITY OF AN ALTERNATIVE FORM OF INCENTIVIZING PHARMACEUTICAL INNOVATION: THOMAS POGGE'S PROPOSAL	Discussion of an alternative system to compensate companies for innovations in the pharmaceutical sector to incentivize R&D for less profitable illnesses. The sustainability aspect is that the aim is to increase R&D for less profitable illnesses.	Monopoly	Patents	Innovation Pharmaceuticals
39	Ethics, patents and the sustainability of the biotech business model	In this paper the downside of patents in the biotechnology (pharmaceuticals) sector is discussed. They show that monopolies lead not only to higher prices, which create large costs for the society, but also that research is inhibited.	Monopoly	Patents	Innovation Biotechnology
40	Growth, environment and innovation--a model with production vintages and environmentally oriented research	Modelling different regimes (planner, regulator & laissez-faire) that aim at supporting environmentally friendly production when producers seek for monopoly rents.	Innovation	Monopoly	Policies

<p>41 Is there really a green paradox?</p>	<p>Modelling the green paradox. They also model this assuming market power. They are not conclusive pertaining the green paradox under market power, but they state that generally oil stays longer unexploited, as a monopolist wants to increase profits.</p>	<p>Fuel Resource management Resource management Monopoly</p>
<p>42 ON THE MANAGEMENT OF INTERCONNECTED WILDLIFE POPULATIONS</p>	<p>Modelling common good management for moose under different market conditions (perfect competition monopoly and duopoly). They show that competition has better resource preservation effects than monopoly.</p>	<p>Policies Competition Resource management</p>
<p>43 Problems with specialist subcontracting in the construction industry</p>	<p>This article argues that sustainability (amongst others) leads to the application of new technologies in the construction sector. This technology leads to market power. This in turn will either lead to higher prices for the construction or, to higher maintenance costs.</p>	<p>Innovation Market power</p>

44	Property rights for natural resources and sustainable growth in a two-country trade model	Economic growth for leading and following economies that exchange via trade technology and a common good that is needed for input. They compare 1) monopoly when either the leading or the following nation/company owns the resource, 2) when the resource is owned by many. Monopoly is better for keeping the resource stock high.	Monopoly	Resource management
45	Quality assessment of public and private modes of solid waste collection in Accra, Ghana	Liberalization of the waste sector in Accra, Ghana. The sector kept monopoly but is not well monitored. Thus, the effects are rather negative.	Monopoly	Infrastructure
46	Really sustainable? Inherent risks of eco-labeling in fisheries	Discussing sustainable fisheries and labels, particularly MSC which is the monopoly label. There are some critiques about it.	Monopoly	Fisheries Resource Product
47	Sequential development and exploitation of an exhaustible resource: do monopoly rights promote conservation?	The monopoly in the bioengineering and pharmaceutical sector is discussed. They argue that these products are exhaustible, and that management depends on several factors. Understanding these factors will help to formulate right policies to postpone exhaustibility.	Patents	Policies Biotechnology Resource management

48	Technological Systems and Momentum Change: American Electric Utilities, Restructuring, and Distributed Generation Technologies	About decentralized energy provision that is now seen as the more efficient one. So far large-scale production was favored, leading to scale effects and market power. However, for newer technologies decentralized installation is seen as more efficient and it is better due to terrorism and more resilient to shows.	Innovation Infrastructure Market power
49	The lack of strategic sustainability orientation in German water companies	Analyzing the sustainability management in the water sector, which is characterized by a monopolistic market.	Market Infrastructure
50	The rise of territorial eco-certifications: New politics of transnational sustainability governance in the fishery sector	The paper discusses the monopoly of the MSC label in the fisheries industry. Other countries want to introduce their own labels. This means that the aspects of sustainable fisheries are up to debate.	Fisheries Resource Product label Competition
51	Water Pricing in Germany between Control of Abusive Practice and Sustainability	Discussing how to control prices in the monopolistic German water provision market. They discuss issues such as prices being too high and too low at the same time. This is due to factors such as efficiency versus external costs (environmental aspects).	Efficiency Monopoly Infrastructure

52	A free lunch in the commons	Modelling common property and the effect of taxes or efficiency reducing policies on the profits of companies and on resource extraction. They compare oligopoly with commons.	Common property	Resource	Oligopoly	Policies
53	The strategic use of innovation to influence regulatory standards	Modelling the effect of regulations on innovations in a monopoly and oligopoly setting. For the duopoly there is an effect that causes the competitors higher costs. Thus, innovation is undertaken to have a competitive advantage.	Innovation	Duopoly	Policies	Lobbying
54	Governing the teak furniture business: A global value chain system dynamic modelling approach	System dynamics analysis of the value chain of Teak wood. The introduction of fair trade and vertical integration are discussed. The latter may lead to entry barriers due to the lead firm's imposed standards.	Resource	Vertical integration	Standards	
55	Investments of oil majors in liquid biofuels: The role of diversification, integration and technological lock-ins	An analysis of oil majors' investment in alternative fuels. Aspects of path dependency, vertical integration and differentiation are discussed. A concluding remark is that the path will most likely be determined by the oil majors.	Path dependency	Vertical integration	Differentiation	Biofuel

56	Opportunist dealing in the UK pig meat supply chain: Trader mentalities and alternatives	Describing the UK pig market and the behavior of the major supermarkets who hold market power. Vertical integration is presented as solution to abusive behavior of supermarket's market power.	Vertical integration	Unfair trading	Food
57	The effectiveness of market-based conservation in the tropics: Forest certification in Ecuador and Bolivia	Forest certification in Bolivia and Ecuador, they state that bigger companies that have a vertical integrated supply chain make it easier to implement certification.	Vertical	Product label	Resource