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Conceptualizing the Role of the Financial Industry in Sustainability Transitions in Agriculture

A Conceptual and Methodological Contribution to the Multi-Level Perspective

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Abstract

This thesis explores the way that the Multi-Level Perspective (MLP) can be used to understand the role of financial business services in sustainable transitions in agriculture. In doing so this thesis answered the following questions: How could the Multi-Level Perspective be used to understand the role of financial business services in sustainability transitions in agriculture? What questions may this be useful in answering? Firstly, by taking a structured approach to testing a novel approach to the MLP that can potentially contend with prior critiques to the MLP. This novel conceptual framework was constructed employing literature adjacent to the MLP to advance understandings of the way that the FBS industry affects sustainable socio-technical transitions in agronomy.

Secondly, this thesis answered the focusing questions by testing the conceptual framework by operationalizing a conceptual model based on the causation theory of critical realism. This highlighted strengths and weaknesses of the framework. This then informed what questions that the current state of this novel MLP framework can be useful in answering (given sufficient information), and what changes might need to be made to improve it.

This operationalization was fruitful, insofar as it tested the theoretical framework and produced some insights into the phenomena of interest in the Swedish context. It also provided insights into what data and reconceptualization's would improve the framework going forward. Notable strengths being: Breaking down general differences in business model components between the business models of identified niche and regime firms allows for an understanding of how intra-firm dynamics factor into multi-level and multi-regime conceptions of sustainable socio-technical transitions in agronomy. Relational proximities were useful for conceptualizing how multi-level dynamics materialize through networks of

diverse actors, with different interests, embedded in different spatial contexts. The contract was found to be a particularly useful as information on the potential contracts, and why they might differ in reaction to different farms was able to be found via desk research and correspondences. Lastly, the critical realist model of causation proved an invaluable way of structuring the complicated theoretical framework.

The most notable weaknesses were that: The conceptual model is blind to the spectrum of farms with different shares of organic and conventional agronomy that the operationalization of the model does not factor in multi-level dynamics within the FBS regime, that the model does not account for the role of cropping in the broader business model of a farm, and that there are notable gaps in data regarding the actual models and financial structures of farms in Sweden. Also, limited understandings were developed regarding actual spatial dynamics and outcomes regarding the development of more sustainable business models in agronomy.

Key Words: Multi-Level Perspective, Geography, Insurance, Lending, Banking, Agronomy, Business Models

Word Count: Approximately 19000

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1. Introduction

The environmental challenges faced by society call for major socio-technical transitions towards sustainability (Geddes & Schmidt, 2020). The implementation of sustainable modes of production within agriculture will likely require substantial financial investments and risk management. The mobilization of the required financial resources would likely require reforms of the financial system, such as changes in credit rating agencies, commercial banks, insurance companies, and pension funds. However, before making informed decisions on how to do so, insightful understandings into the contemporary role of the financial industry in the uneven development in sustainable development should be made.

This thesis then seeks to answer how the Multi-Level Perspective (MLP) and its adjacent literature can be employed to understand the dynamics of sustainable change. This has been done by developing a conceptual framework to answer how this could be done. The conceptual framework is then tested through a conceptual model to find the strengths and weaknesses of this framework. This then shows how the MLP could be used to understand the role of financial services plays a role in sustainable transitions in agriculture. Insurance and lending services, and agronomy will be used as examples of sectors within the wider financial and agricultural industries to discuss the dynamics of such relationships. Agronomy being a subcategory of agriculture. With agronomy referring specifically to crops grown in open fields. This conceptual framework works to combine insights from the multi-level perspective, institutional thinking, the multi-regime perspective, relational conceptions of space within the MLP, and business model studies to create this conceptual framework.

The intention is to display how work on the financial systems role in sustainability transitions might be undertaken. The hope is then that this thesis will produce a conceptual and methodological framework that respects the interplay between the agency, structure, and place of two

linked industries. For the means of informing future research into the role of the financial industry in sustainability transitions more generally.

2. Questions and Aims

2.1. Questions

1. How could the Multi-Level Perspective be used to understand the role of financial business services in sustainability transitions in agronomy?
2. What questions may this be useful in answering?

2.2. Aim

The overarching aim of this paper is to answer the focusing questions. This aim is however founded on two sub-aims. The first being to contribute to filling the apparent gap in the multi-level perspective literature regarding the financial industries role in the sustainable socio-technical transitions of other industries. This is thought to be important due to the still lacking understanding of the nature of financial capital, structures, and actors in relation to sustainability transitions. This importance is thought to be particularly important due to the sometimes-unfathomable wealth which is concentrated in the hands of private financial firms.

The second sub-aim being to critically engage with the MLP. This is considered important, as it is an increasingly popular conceptual framework for understanding sustainability transitions. Which has thus attracted various critiques.

3. Theoretical Framework

This section will introduce conceptual work that will be used in informing the conceptual model and guiding the methodology and methods. The first subsection outlines the MLP and some critiques, MLP adjacent concepts

from institutional theory, the financial business services of interest to this thesis, literature outlining different agronomical practices in relation to environmental sustainability and finances and MLP adjacent literature.

The Second subsection will introduce elaborations on the MLP that have been chosen to respond to criticisms of the MLP, that will be used for developing a conceptual framework for answering the focusing questions. These elaborations being, the multi-regime perspective (an elaboration focuses on two industries in relation to one another), geography in the MLP, and sustainable business models.

3.1. The Multi-Level Perspective

The MLP, drawing on evolutionary economics, sociology of innovation, and institutional theory, has become a popular framework for analysing sustainability transitions (Geels, 2019). Its popularity stems from its capacity to conceptualize interactions between micro-level innovations and macro sociotechnical systems (Roberts & Geels, 2019; Sutherland et al., 2015). The multi-faceted nature of such changes are dealt with by employing the concept of socio-technical systems together with multi-level dynamics. Socio-technical systems are composed of networks of actors, economic structures, institutions, understandings and the social and technological means and modes of production (see figure 1) (Geddes & Schmidt, 2020; Geels, 2019).

Figure 1: Regime Actor Network Model (Geels, 2002)

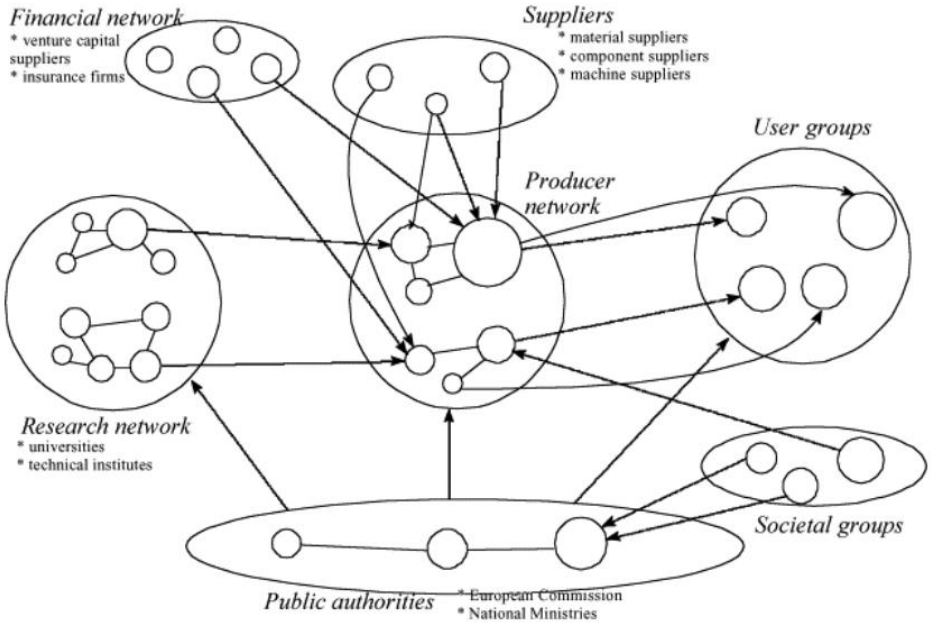

Figure 1: This figure is a representation of actor networks involved in producing and reproducing regimes. Taken from page 1260 F. Geels (2002).

Regarding multi-level dynamics, the MLP conceives of industries as consisting of many competing and/or complementary firms. These firms are grouped into two levels, the niche and regime. The third level, the landscape level, encapsulates broader scale happenings in culture, politics, economy, ecology, climate etc. It is important to note that each of these levels are conceived of in a coevolutionary sense, so each of the levels shifts in relation to the others (see figures 2 & 3).

Figure 2: Conceptual Model of the Multi-Level Perspective (Geels, 2002)

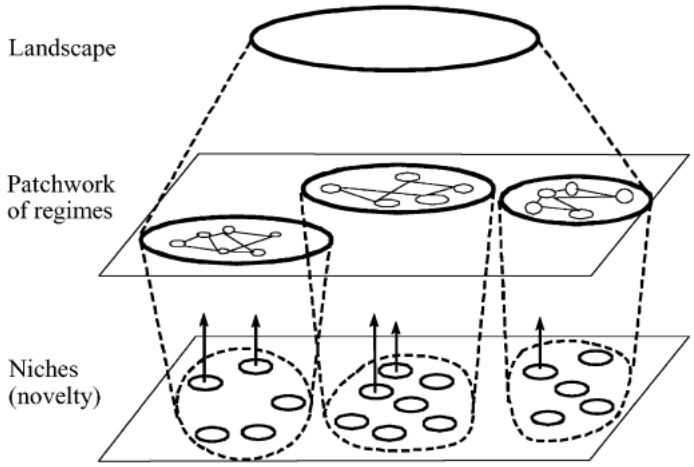

Figure 2: This figure is F. Geels (2002) conceptual model of the multi-level perspective (Geels, 2002).

Niches can be described as the implementation of novel socio-technical systems, made up of one or more; novel technologies or ways of organizing people (e.g. business models) (Geels, 2001). Generally, in the MLP literature, the reasons for the emergence of niches is a reaction to a failure of regime-level socio-technical systems to react to its impact on landscape-level phenomena, such as climate change and ecological decline. An example of such a niche socio-technical system in agriculture is regenerative agriculture, as it differs largely in its mode of production to the common 'intensive' agricultural methods. The different ways in which specific novelties emerge or become common in different industries differs between industries due to the differences in how the industries operate. These dynamics then discussed in length elsewhere (e.g. (Geddes & Schmidt, 2020; Geels, 2001, 2019). An example of a such a dynamic identified in other sustainability transitions are the 'stretch & transform' and 'fit and conform' (Geddes & Schmidt, 2020). Fit and conform processes allow niches to survive in the existing business landscape by conforming to the current rules and institutions(Geddes & Schmidt, 2020). Stretch and conform processes then entails an altering of the business

environment via changed rules, institutions, networks, consumer culture etc., in ways that may benefit the niche, and perhaps undermine the regime (Geddes & Schmidt, 2020). Such changes may meet resistance, as the many social and technical components in a sociotechnical system are often more aligned with more common systems (Geels, 2001).

Figure 3: Conceptual Model of Socio-Technical Transition Processes (Geels, 2005)

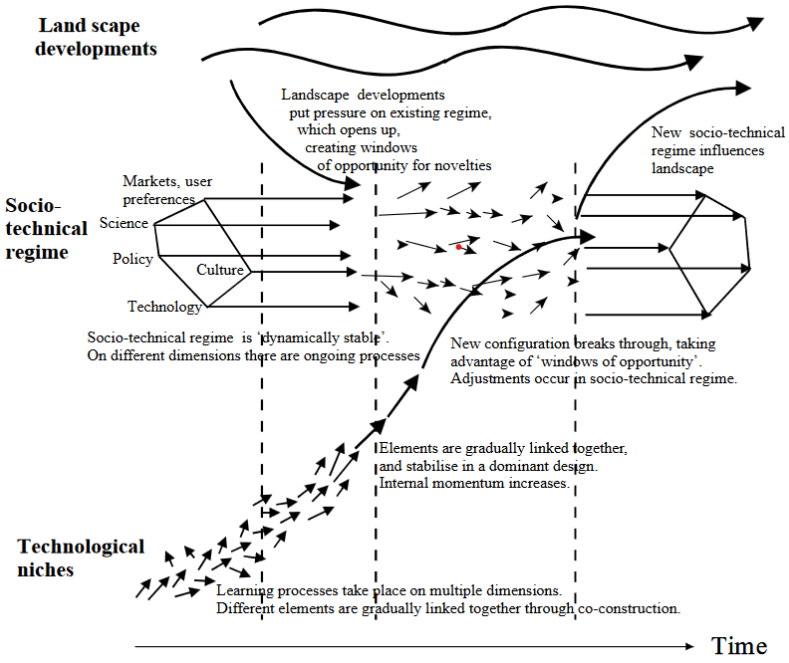

Figure 3: This figure is a representation of socio-technical transitions as a process, and the dynamics of the multi-level perspective on an innovation being accepted by the socio-technical regime, and its dependence on ebbs and flows at the landscape level. Taken from page 369 F. Geels (2005).

Regimes are then the dominant socio-technical systems (Geels, 2006). Definitions of the regime level often highlight actors, technical systems and rules/institutions (Geels, 2011). Regimes become dominant in each context due to the degree of compatibility with the landscape-level (see figure 3). It is then through a relationship with the regime and the landscape that a niche socio-technical systems can be adopted into a regime. An example of a socio-technical transition that became rigid in agriculture was the rise of

intensive industrialized farming systems. It became a dominant practice during the post-war Green Revolution when a combination of phenomena (like new discoveries in botany and chemistry, high rates of global food insecurity, and powerful business interests) led to its rise (Cullather, 2004). High and consistent yields, as well as lower labour cost due to artificial pesticides, artificial/mineral fertilizers, gene edited crops, and tractors led to this system to become dominant. As well as this aligning with external interests in finance, chemical companies, politicians, etc., led to a rigid regime.

The landscape level is then defined as a set of deep, and large scale structural trends in the economy, politics, and society, as well as the interaction between each (Geddes & Schmidt, 2020; F. Geels, 2013). Examples of landscape factors specified in previous MLP works on agriculture include; globalization and 'slow-balisation', population growth, global financial crises, changes in diets and lifestyles, (neo)-liberalization, international treaties in economics and trade, geo-political developments, concerns about animal welfare and the environment, and last but certainly not least, climate change (El Bilali, 2019). The landscape level is unfortunately overlooked in many works employing the MLP, and is criticized for being used as a "residual garbage can" to put whatever does not fit into niche or regime categories (El Bilali, 2019). This thesis will then be sure to be specific about what will be included in the landscape and why it belongs in the landscape level and not the niche.

This multi-level perspective was pioneered by and employed in many of F. Geels empirical and conceptual works (e.g. Geels, 2005, 2013, 2001, & 2002) and has become popular for analysing sustainable socio-technical transitions. In an early publication (Geels, 2001), he discussed how socio-technical transitions are not just changes in technology, as technology on its own is useless. Thus, socio-technical transitions are regarded as

simultaneous changes in the use of technology *and* the social fabric of an industry, e.g., the practices and routines of users, regulations, industrial networks, and symbolic meaning (see figure 3). He asserts in this early work that radical innovations face opposition from the regime to break out of the niche-level, and that changes on the landscape-level can create tensions with the regime. Geels then corroborated these claims in a historical study of TT (Technological Transitions) in water supply sanitation in the Netherlands during the 19th century (Geels, 2005). Where he concluded that the MLP is widely applicable.
In this paper (Geels, 2001) he empirically illustrated the way that transitions can follow the pattern of (a) variation, selection, and retention of niche innovations, and (b) an unfolding and reconfiguration of industry regimes. The three mechanisms of TT described were, (a) niche-cumulation, (b) technological add-on and hybridization, and (c) riding along with market growth.

The MLP has since been met with criticism. Some critiques listed by Geels (2019) which will be contended with are as follows. The MLP gives limited attention to politics, power, and cultural meanings, focuses narrowly on technological innovation, and insufficiently analyses policy-relevant dimensions and processes. Another critique not discussed in Geels' 2019 response paper, was that the conceptual framework lacks geography (Raven et al., 2012).

3.1.1. Institutional thinking

Institutional thinking provides conceptual tools for dealing with the complex socio-spatial constructions that are involved in business models and inter-firm interactions. Theory stemming from institutional theory is commonly used in the TT and MLP literature. Institutions are then much more than government or cultural institutions, a useful way of conceiving

of them is as social rules (Geels, 2006). Institutional approaches highlight the way that actors are connected by social networks which are influenced by different kinds of institutions. It can then provide fruitful ground for adding detail to the spatial context of the case study, as institutional similarities and differences can exist within and between companies or industries, as well as within and between territories that may impact the where and when of socio-technical transitions. Institutional thinking will be used in concert with ideas from geographies of technological transitions and business models' studies to contend with structure and agency in a relational manor.

Geels (2006) categorizes institutions into regulatory, normative, and cognitive institutions. Regulatory institutions are 'official' rules, those like laws and contracts, which (for example) intend to regulate behaviour, and facilitate transactions (Geels, 2006; Gertler, 2018). Normative institutions cover cultural norms, values, role expectations, etc. (Geels, 2006). Cognitive institutions consider perceptions of reality and cognitive frameworks. The relevance of such institutions to this thesis is in the roles that external and internal institutions may play in variably influencing the social, environmental, and economic sustainability of niche/regime farms. Also, relevant insofar as institutions may affect relations between different agricultural business models in relation to FBS. For example, what rules of thumb, or formal rules that FBS have for dealing with farms with different financial profiles.

TT scholars typically focus on regulatory institutions, perhaps because they are more tangible (El Bilali, 2019). This thesis focuses in on insurance and lending contracts between FBS and agricultural firms. On the side of FBS, this institution is necessary for controlling the conditions of financial instruments deployed by FBS as a service to its customers. For farms, it may be necessary for the agricultural firm at times where it may be wanting to maintain or expand its means of production, or access

money in a time between spending and receiving revenue due to the seasonal nature of agronomy.

3.1.2. Financial Business Services and the MLP

This subsection of the literature review aims to introduce literature which outlines some relevant conceptual and empirical work from financial geography and conceptual work on finance in the MLP. According to Geels (2005), the MLP has rarely been used to discuss the financial industry. Geels reportedly suspects that many TT scholars do not sufficiently cover finance in their works because they consider financial firms and markets as being rational and thus not requiring intervention (Geddes & Schmidt, 2020). However, finance is considered an important factor in TTs and is generally present (See figure 2), but is often marginalized in transition frameworks (Geddes & Schmidt, 2020). Exceptions include Perez who showed how investment finance can stimulate transitions in industrial clusters (Perez, 2011), Karltorp who employs the Technological Innovation Systems approach to assess the finance sector's involvement in the renewable energy sector (Karltorp, 2014, 2016; Karltorp et al., 2017), and Geels who employed the MLP to display how financial-economic crises affect investor confidence, capital availability, public concerns, and political will to act on environmental crises (Geels, 2013). But as of yet, no work has been found that conceptualizes the role of insurance and/or lending services within the MLP, let alone how it relates to agriculture within the MLP.

Leading on from this, a basic outline of the relationship between FBS and agronomy is required. Finance, is a term which typically describes external funding which supplements the regular cash flows of an organization (Klagge, 2021). The financial industry can be understood as referring to the sum of the financial actors, systems, and structures, that mobilize money

and other financial assets (such as commodities, securities, real estate titles, and credit) for the means of profit (Klagge, 2021). Contemporary, insurance and lending services in more 'developed' countries can be understood as branches of this industry, that provide funding to firms in different ways. Lending makes money accessible soon after a contract is signed, in exchange for regular payments with compounding interest. A business loan, or mortgage for example. Whereas insurance makes the money *potentially* available in the future under pre-agreed conditions, in exchange for regular payments for access to this potential. For instance, a flood may damage many assets on a farm, but insurance coverage depends on the conditions of the contract.

For farms, these relationships are dependent on the revenue of crop harvests, which are subject to myriad risks, such as environmental hazards, pests, market risk (regarding inputs and outputs) and even national security.

Risk is a useful concept in understanding the relationship between FBS and farms. This is in large part due to the notion that private financial institutions work with uncertain futures for the means of profit, and deal with uncertainties through the lens of risk. Risk determination is then the practice of understanding the risk exposure of an agricultural business, and its effect on their ability to pay the service provider. Risk determination systems are then used to perceive the risk of returns on their financial services, and to find potential ways to reduce said risk. This is often done by employing quantitative data like debt, revenue, profit etc. This data inevitably has gaps, which human actors attempt to fill by interpreting the circumstances via speculation (Booth, 2021). For example, whether the implementation of a new technology is financially viable, given industry standards, consumer tastes, and perhaps perceived future directions of the industry. Firms may then have different expertise in different sectors, values/interests regarding the businesses that they work with, as well as

different risks that they may be willing to take on. This may be useful in understanding how FBS function in relation with farms, due to its potential role in influencing the conditions of agreements between provider and customer.

3.1.3. Agronomy and the MLP

The aim of this subsection is to introduce literature which discusses agriculture within the MLP. As well as the way that different agricultural methods can affect relations with FBS, and environmental outcomes. different environmental and productive effects of the different agronomical practices. A fruitful place to begin going into the content of this subsection is to introduce a systematic literature review by El Bilali (2019) that covers the use of the MLP in agriculture. They found in 43 papers that research employing the MLP on the topic of transitions in the agro-food sector generally suffers from a poor theoretical conceptualization and operationalization of the concepts of niche, regime and landscape. El Bilali (2019) claims that further conceptual and methodological work needs to be done to make the MLP better suited for analysing the sustainability transition dynamics and pathways in the agro-food industry.

Some examples of identified niches in this literature include agro-ecology, organic agriculture, permaculture, conservation agriculture, integrated farming, and alternative food networks (El Bilali, 2019). This literature the generally refers to the conventional industrial agriculture of many industrialized economies as being the regime (El Bilali, 2019). The landscape level is generally overlooked, and when it is considered, it generally refers to macro-economics, international trends and developments (El Bilali, 2019).

Roberts and Geels (2019) published an article which is particularly relevant to this thesis insofar as it conceptualizes agriculture within the MLP and particularly so in how its findings portrayed the role of external actors. Their case studies included the historical transition from traditional mixed agriculture to specialized wheat agriculture and the transition from rail to road transport during the 20th century in the United Kingdom. They focused on the mechanisms of political support shifting from the regime to the niche. In their findings they describe two patterns. One where changes at the landscape level leads to a tipping point in the power of regime and niche actors, and another where external pressure on policymakers (from business interests, the public, etc.) and internal policy developments (like regulatory rearrangements or other legal changes) leads to shifts in support (Roberts & Geels, 2019). This article is then useful to this thesis as it has shown how outside actors like policy makers (or perhaps even FBS) may change their stance on a niche or regime.

3.2. Elaborations on the MLP

3.2.1. The Multi-Regime Perspective

This subsection will introduce the multi-regime perspective via relevant literature that focuses on the dynamics stemming from two socio-technical systems in relation to one another. This literature importantly includes the relationship between agriculture and another industry, and finance in relation to another industry. An apparent gap in this literature is a conceptualization of agronomy in relation to financial business services.

In the limited literature on multi-regime interaction, much of the literature identifies regimes in relation to one another that relate in ways which seemingly differ markedly from the nature of relations between FBS and farms. Mostly convergent relations forming between different producing industries due to landscape pressures (Konrad et al., 2008; Raven & Verbong, 2007; Sutherland et al., 2015). Whereas farms and

FBS have a customer-servant relation. However, some findings in this literature may be relevant. Namely how landscape pressures impact different socio-technical systems (in different or similar ways

Multi-regime interactions are conceived of as occurring through networks made up of both regimes, their niches, and the landscape level (Sutherland et al., 2015). These interactions between niche and/or regime actors are conceived of as embedded in the institutions, economic structures, and technologies of the regimes and niches (Sutherland et al., 2015).

A paper by Sutherland et al. (2015) analysed the way that multi-level interactions between the energy and agricultural systems formed biofuel industries in Germany, the United Kingdom, and the Czech Republic. Of most interest to this thesis is their findings regarding the way that landscape pressures and inter regime relations led to new business models.

Geddes & Schmidt (2020) have also made relevant contributions to the multi-regime relationship between financial firms and perspective sustainable transitions. Their work consisted of empirically analyzing factors steering interactions between the investment branch of the finance regime and niche renewable-energy innovations in Germany, Australia, and the United Kingdom. As well as making conceptual contributions to the nature of multi-regime interactions. A notable contribution was made in conceiving of the financial industry as a regime of its own, instead of being conceived of as a part of the regime (see figure 1). In doing so, they seemingly pioneered an employment of the multi-regime perspective using the financial regime.

They made several findings relating to the interactions between investors, project developers and the state. They found that many low-emission energy projects are perceived as being too risky to fit the risk-return appetites of investors, and thus may not be supported by the investment-finance regime (Geddes & Schmidt, 2020). However, it was also

found that state support for low-emission energy production was found to de-risk (or rather reduce risk) low-emission energy investments (Geddes & Schmidt, 2020). They also explained this regime-niche interaction being due to financiers and other relevant stakeholders being found to have less-developed knowledge and processes for identifying opportunities and mitigating risks in the new asset class (Geddes & Schmidt, 2020). Another being that industry networks were found to be better developed in the regime, which then supported project development and de-risking within the regime. Their findings claim that financial markets are path dependent and not 'technology-neutral' and require intervention to support sustainable transitions (Geddes & Schmidt, 2020). Importantly for this thesis, they also claim that other regimes (for instance, agronomy) can be better understood when in relation to the financial regime.

3.2.2. Geograpies of Technological Transitions

This section aims to introduce geographic thought in the sustainable transitions literature. This is an elaboration that adds much insofar as TT scholars apparently often neglect the geography of technological transitions (Fastenrath & Braun, 2018; Hansen & Coenen, 2015; Munro, 2019). As a branch of the technological transitions literature, this geographic-turn has also occurred in literature engaging with the MLP (Raven et al., 2012). Geographers and transition scholars have then been engaging with this literature to better conceptualize the role of multi-scalar, spatial and place-specificity in socio-technical transitions (Hansen & Coenen, 2015; Meelen et al., 2019; Murphy, 2015; Wieczorek et al., 2015). It is then argued that geographical approaches to TTs, are important to better account for the spatial unevenness of elements such as knowledge, networks, institutions, economic structures, resources, and power asymmetries, and their impact on transition dynamics (Murphy, 2015;

Raven et al., 2012).These geographic lines of inquiry include asking why some places are forerunners while others are left behind, and how different contexts support or resist change (Fastenrath & Braun, 2018; Hansen & Coenen, 2015).

This geographic turn in the MLP is justified by working to fill a number of gaps in the understanding of socio-technical transitions (Raven et al., 2012). Many of which seemingly stem from the use of nations as the geographic unit of analysis for the MLP. This is said to be problematic has as it contributes to reifying the national level as the scale at which innovation takes place (Raven et al., 2012).

Studies employing the MLP that seek to overcome this national focus have used regional or city scales (e.g., Fastenrath & Braun, 2018; Fraske & Bienzeisler, 2020). However, this has also attracted critique from the broader transitions scholarship. One being that this switch in scale can just lead to different sized conceptual 'containers', instead of considering local and non-local territorial characteristics and networks as being important (Raven et al., 2012). For example, the role of tax havens or cheap foreign labour in the functioning of a corporation.

The direction of this thesis will be heavily inspired by Raven et.al. (2012) who sought to create a second generation MLP that conceives of a spatiality of the multiple levels that moves beyond territorial boundaries, and employs elements from relational and absolute space (Raven et al., 2012). This second generation MLP draws from relational geographies, in asserting that space is socially constructed, only has meaning in relation to the perceptions of actors, and that interactions between actors and relational space change in time as actors struggle to construct and maintain relational and physical space in their favour (Raven et al., 2012). However, physical (or absolute) space is also used, to account for place specific institutions, laws, norms etc (Raven et al., 2012). These socio-

spatial ebbs and flows between actors are then seen as being entangled with economic and institutional change at different spatial scales.

This second generation MLP then theorizes multi-level dynamics as occurring in and between unique local, regional, national, and international contexts. Actors are viewed as being framed as acting within socio-economic structures at different interacting spatial levels. Also as producing, maintaining, changing, and deconstructing these structures. Within and across these spatial levels, actors working within, niches, regimes, and landscapes are interacting but not all actors, understand, relate to or meet with each other. To account for this, economic geographers have long emphasized the importance of proximity and co-location for learning, knowledge creation, and innovation (Raven et al., 2012). Raven et al. (2012) then breaks proximity up into several categories. Firstly, cognitive proximity refers to the shared knowledge/understandings between actors. An example relevant to this thesis could be importance of common knowledge/understanding of the risk and profitability of different agricultural practices for conversations between farmers, FBS actors, and policy makers in their collective support of environmentally sustainable agricultural practices (Raven et al., 2012). Another form of proximity is organizational, which refers to the similarity of the organizational backgrounds of actors. Social proximity, refers to the level of inter-actor trust, social standing, friendship, shared experiences etc. (Raven et al., 2012). Lastly, institutional proximity refers to the similarity of cultural norms, values, or laws that you operate within (Raven et al., 2012). Relational and physical proximities are conceived of as acting in concert, together influencing the possibility for actors to interact in ways which foster knowledge sharing, exchanges or imposing their will to change space in their image (Raven et al., 2012). Actors can also be understood as possessing different capacities to interact. Raven et.al. (2012) draws on the concept of relational assets to compliment relational proximities.

Relational assets are social relations, connections, or even loyalties in a network, or place. Which can provide a resilient foundation for comparative advantages in relations. Insofar as it affects the flow of knowledge, skills, capital availability, and navigation of local/regional/national institutions, identity and relational assets of others in the niche regime and landscape.

This then leads on to how this can be used to incorporate a geography that considers for physical and relational space into the MLP. Raven et.al. (2012) proposes to distinguish between niches, regimes, and landscapes by conceiving of them as social networks with differences in relative proximity. Regimes are to be understood as networks of actors, which have had a longer time to develop relative proximity with socio-technical systems. Niches being, actors' networks with low relative proximity to regime networks because they constitute a novel, less-developed socio-technical system. Lastly, the landscape level consists of actor networks with high proximity across multiple regimes.

In this conceptualization, the multiple levels are socially constructed through networks of actors and cut across territories with different physical, cultural and economic characteristics. actors are then theorized as being connected in different networks, with different relational assets. Creating, reconfiguring, and maintaining networks, space, and power within these networks. Leading to changes in the flow of knowledge, resources, and socio-technical systems. A useful addition to this, is the notion that landscapes, regimes, and niches are then heterogeneously spread across relational and absolute space (Meelen et al., 2019; Murphy, 2015; Raven et al., 2012; Truffer et al., 2015). This next-generational MLP also lists ten dynamics that will be useful in answering the focusing questions, as they shed light on the kinds of questions that can be answered by implementing the MLP in investigating the role of FBS in sustainable transitions in agriculture (see figure 4).

Figure 4: Socio-Technical Transition Dynamics of Raven et.al. (2012)

1. Transitions evolve through a process of multi-scalar interactions (time, structure, space);
2. The spatial reach of niches, regimes and landscapes is not a given. Space is always negotiated and constructed by networks of actors;
3. Actor networks allow for the distribution of flows such as knowledge, money and natural resources between socio-spatial locations.
4. Socio-technical regimes are nested both horizontally and vertically (for instance, electricity regimes have national, international and regional features and specificities (vertically nested), as well as exhibiting horizontal differentiation between regimes for households, large industries and so on (horizontally nested);
5. The multi-level nesting of regimes is a source for tensions and misalignments, which can be mobilised by actors in attempts to vision and innovate alternative spaces (niches);
6. Nested regimes have spatially differentiated features; specific niches are more likely to materialize in reconfigured networks and infrastructures in some places than in others, which offer initial spaces for innovative practices;
7. Spatially situated niches can become (inter)nationally connected through existing or new networks, and reconfigure the flows constituting them and the institutions developed to regulate them;
8. To trace how these new connections are made, by whom, when and where are of particular importance for a multi-scalar analysis, because it would provide insight into how and where niches may be upscaled and come to shape regime-shifts;
9. Niches can also remain localized initiatives and stabilize into sub-national regimes, when they stay disconnected from (inter)national spaces, or become international niches when they become connected, but fail to reconfigure existing regimes;
10. Socio-technical landscapes tend to be transnational since they are the results of choices made in many spatially distributed and (partially) connected regimes. Yet, at the same time, landscapes might be perceived differently by spatially separated regime and niche actors and therefore exert a different influence over their development.

3.2.3. Business models

This section will introduce the concept of business models and how they could be used as an elaboration on the MLP. This is done as a means of contending with the advice found in the geographic TT and MLP literature to take a practice focused approach to the MLP (Fastenrath & Braun, 2018; Fraske & Bienzeisler, 2020). It is also an effort to contend with the common critique of the MLP that it overemphasizes 'bottom-up' niche to regime innovation. As the business model literature contends with change in different kinds of businesses.

The business model concept was popularized during the dotcom boom of the 1990's, and research interest in the concept has since been rising (Geissdoerfer et al., 2018). This is seemingly due to diminishing returns of incremental sustainability innovations in many industries, and the apparent promise that innovation in business model innovation presents (Geissdoerfer et al., 2018). A business model can mean many things. The concept of business model is often used in reference to, the components of a business, the operational model of a business, and plans for change (Linder & Cantrell, 2000). Generally speaking, a business model is a conceptual tool for explaining the way that a business adds, delivers and captures value (Bocken et al., 2014; Linder & Cantrell, 2000; Osterwalder et al., 2005). This thesis will conceive of business models as guiding institutions which steer business practices and routines. Which in turn is related to the sustainability of the business, as different agricultural practices have different environmental effects. The business models of interest to this thesis are then of the FBS and of farms.

The relevance of the business model literature for this thesis lies in its usefulness as a conceptual tool for ways in which business models are conceived, change, and the role that sustainability can play in such

conceptions and changes. Three literature reviews have been found that are useful in informing this thesis.

The first being a literature and practice review on the use of the business model concept in the firm (Osterwalder et al., 2005). This review showed that in practice, the business model has diverse roles to play in a firm. This paper is useful insofar as it develops an understanding of the concept and practice of business models. As well as this, this paper outlines nine business model building blocks that will be used to take a structured approach to understanding multi-level pressures on business models to change in the operationalization of the conceptual model (Osterwalder et al., 2005, p. 18).

Table 1: The Four Pillars of Business Models (Osterwalder et al., 2005)

Pillar	Business Model Building Block	Description
Product	Value Proposition	Gives an overall view of a company's bundle of products and services.
Customer Interface	Target Customer	Describes the segments of customers a company wants to offer value to.
	Distribution Channel	Describes the various means of the company to get in touch with its customers.
	Relationship	Explains the kind of links a company establishes between itself and its different customer segments.
Infrastructure Management	Value Configuration	Describes the arrangement of activities and resources.
	Core Competency	Outlines the competencies necessary to execute the company's business model.
	Partner Network	Portrays the network of cooperative agreements with other companies necessary to efficiently offer and commercialize value.
Financial Aspects	Cost Structure	Sums up the monetary consequences of the means employed in the business model.
	Revenue Model	Describes the way a company makes money through a variety of revenue flows.

Table 1: A table presenting the four pillars and nine building blocks of a business model. Sourced from (Osterwalder et al., 2005).

The second paper being a literature and practice review discussing the concept of sustainable business models (Bocken et al., 2014). This paper is firstly useful in establishing a set of archetypal sustainable business models. Then distinguishing between the typical business model concept, and sustainable business models. In their findings, they grouped

their observation of eight archetypal business model innovations into three groups. The first being technological, the architypes falling into this group are business models geared towards maximizing material and energy efficiency, creating value from waste, and substituting production inputs with renewable resources and natural processes. The second group is labelled as social, its architypes are business modes that are meant for delivering the function rather than the ownership of a product, adopting a stewardship role, and encouraging sufficiency. The last group is labelled as organizational, where its architypes include business models which are repurposed for the benefit of society and/or the environment and developed for scaling up solutions to sustainability challenges. In summary, sustainable business models often differ insofar as they are motivated more explicitly by environmental or social sustainability causes, rather than the typical heavy emphasis on the profit motive.

The third literature and practice review is a review of the various paths that sustainable business model innovation can take (Geissdoerfer et al., 2018). These forms fall into different kinds depending on how revolutionary the changes are, if for instance individual elements are changing compared to the fundamental logics or structure of the business were to change. Similar to conventional business models, these changes are conceived by some relevant scholars as a process involving “exploration, adjustment, improvement, redesign, revision, creation, development, adoption, and transformation” (Geissdoerfer et al., 2018). According to Geissdoerfer et.al. (2018), this process is considered sustainable when it aims at either:

"*sustainable development or positive, respectively reduced, negative impacts for the environment, society, and the long-term prosperity of the organisation and its stakeholders*” or “*adopting solutions or characteristics that foster sustainability in its value proposition, creation, and capture elements or its value-network*”.

Since there is much variation amongst businesses in terms of the nature of change in business models, Geissdoerfer et.al. (2018) breaks up sustainable business model change into four kinds. Number one being sustainable start-ups, new organizations with sustainable business models from the beginning. For example, new farmers engaging in regenerative agriculture. Number two being sustainable business model transformation, where business models are changed, resulting in a more sustainable business model. For example, established farms moving towards producing organic produce. Number three being sustainable business model diversification, which is where the core business model does not change, but instead a more sustainable parallel business model is established. For example, an established farm diversifying its fields to include some organic produce alongside non-organic produce. Lastly, number four is sustainable business model acquisition, this is when an external sustainable business model is acquired and then integrated into the organization.

According to Geissdoerfer et.al. (2018) these four modes of business model innovations typically include one or more of the following: Circular business model innovations (Bocken, 2016), this means a reduction of inputs and waste in the system. An example is the use of animal effluent on agricultural fields as a means of fertilization, reducing artificial fertilizer input, and reducing waste; Social enterprises (Defourny & Nyssens, 2010), this business model is one with social sustainability objectives such as non-profit organizations, cooperatives and mutual societies. These innovations are focused towards increasing the quality of life and sustainability of the poorest billion people on the planet. This is less relevant in the Swedish context. And lastly product-service systems (Tukker, 2004), these business model innovations move away from selling products to selling the services of the products and retaining ownership. This can increase the lifespan of products and reduce waste as the company has the means and incentive to repair the product which serves the service. This paper by Geissdoerfer et al., 2018 is useful as it adds to the previous review by distinguishing

between the ways in which businesses conceive of and practice sustainable business model change.

The various distinctions made in these literature and practice reviews could contribute towards answering the research questions, as understanding differences in the kinds of and modes of sustainable business model change can contribute to developing a practice based MLP. The operating models and change models, of farms and FBS could then give rise to insights regarding the inner workings of firms embedded in multi-level or multi-regime dynamics. Then how this may place businesses in a position where a sustainable business model change in agricultural firms may appear more or less desirable and/or realistic.

4. Methodology and Methods

This section will outline a novel conceptual model to contribute to future research into the role of the financial industry in sustainability transitions. This novel conceptual model has been developed to conceptualize the multi-level and multi-regime dynamics of business model change. Regarding methods, this model is accompanied by a suggested approach. This methods approach is retroductive, where the conceptual model of the of FBS in relation to agricultural business models will be developed, and then revised as more data is gathered.

4.1. Methodology

The socio-technical systems of interest to this thesis are the FBS and agronomy sectors. A socio-technical transition is described as by Geels (2005) as a shift from one socio-technical system to another, the product of a process of interaction between the niche, regime, and landscape levels (see figure 3). Which in practicality may result in fundamental changes in technology, routines, institutions, and/or the social fabric of the working place (Geddes & Schmidt, 2020). For this thesis, firms are conceived of as

component structures of the larger, more complex structures of socio-technical systems. With business models then being guiding component structures within firms.

The conceptual model employed in this thesis is a modified version of the critical realist model of causation, employing ideas from institutional theory to deal with the relationships between social structure and agency. The classic critical realist model of causality consists of structures, mechanisms, contingency, and results (See figure 5) (Sayer, 2000).

Figure 5: The Critical Realism Causation Model

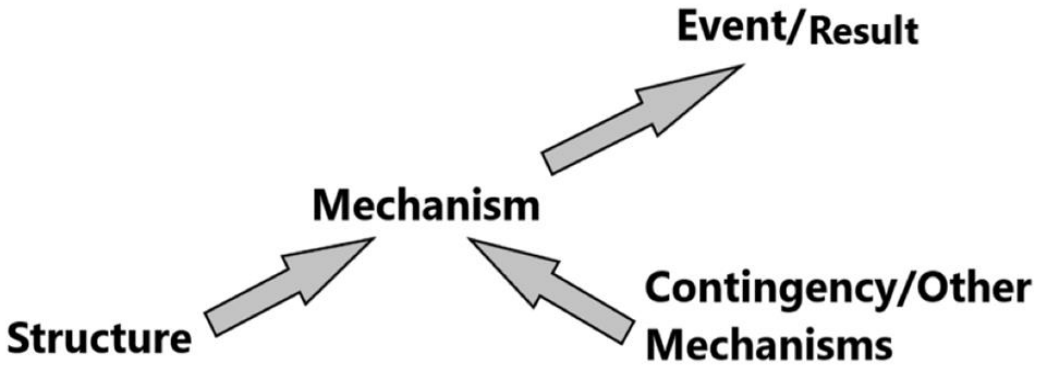

Figure 5: A representation of the critical realist model of causation (Sayer, 2000).

Within Critical realism, as according to Sayer (2000), entities are conceived of as having potential due to the physical attributes of their structures, for example an insurance firm which has protocols for dealing with the risk profiles of farms. All potentials are conceptualized as being contingent on contexts consisting of other objects with their own mechanisms and potentials. In simple terms, structure 'A' can relate with structure 'B' as they have compatible potentials, which under certain conditions, can result in AB (Sayer, 2000). For example, the business model of the farm the and the financial service might be potentially compatible, for example, whether the risk-return profile of a farm is compatible with the risk-return appetite of the FBS, or whether they both operate within the same national context.

The interaction between them then being contingent on external factors such as climatic conditions, proximity, markets, and policy. This understanding can allow us to focus in on the attributes of structures such as business models, and how this, in concert with external variables, affects the potential for different kinds of interactions and results.

The dynamics depicted in the core conceptual model are conceived of as a non-linear process, where the passage of time and the ebbs and flows of relationships between the various elements may result in changes in the business models of firms across the niche and/or regime. The timeframe of the process being unspecified but (as according to the MLP) it is linked to the timeframes of broader scale phenomena such as climate change or economic cycles (see figure 3).

Regarding geography, space is conceived of relationally. Where the spatial embeddedness of relations between agents and actors are of focus. Niches, regimes, and landscapes are then understood as being socially constructed through networks of actors working within the structure of firms. The actors which constitute these networks, are uniquely situated regarding their own relational proximities, relational assets, knowledge, and institutional contexts. These networks then span between places and across boundaries. Places with different physical, institutional, and economic characteristics. It is in this sense that absolute space is considered, whilst relational space is still emphasized.

The multiple levels are then conceived of in this relational sense. Regimes are understood as having had more time and resources to develop relative proximity between agents of socio-technical systems, as well as proximity with landscape agents. Niches are then networks with low relative proximity with regime agents, and particularly low proximity with landscape agents. Lastly, the landscape level consists of agent

networks with high proximity, even across multiple regimes, i.e., agronomy and finance.

Figure 6: The Conceptual Model

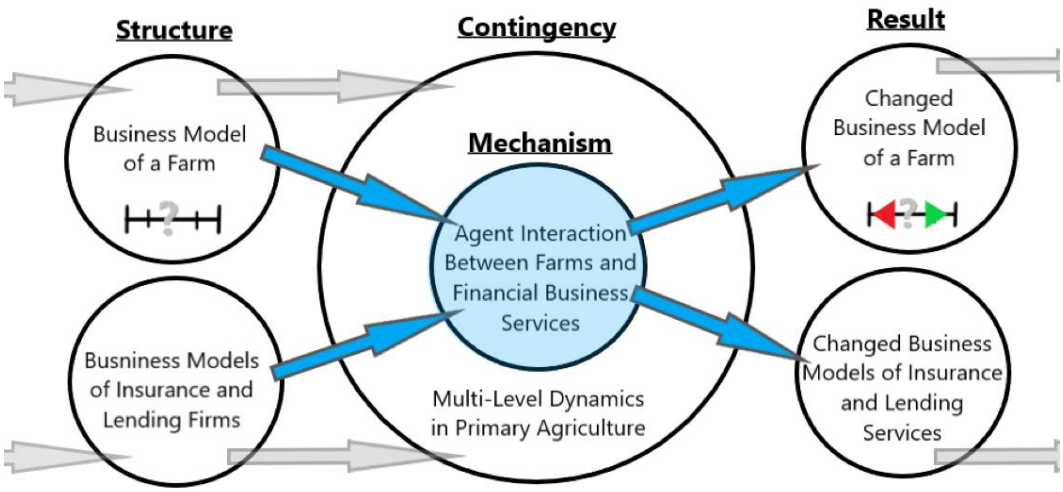

Figure 6. This figure presents the core conceptual model constructed in this thesis. The scale with the question mark represents the sliding agricultural sustainability scale. It is employed here to represent the notion that a change in business model may result in changed agricultural business practices. Which may entail a change in environmental the environmental footprint of the farm.

Figure 6 is the core conceptual model. It portrays business model change as a coevolutionary process where potential change is influenced by the interaction between actors who operate within the structures of the (potentially compatible) business models of FBS and farms.

The question mark with the scale is a simple reminder that the environmental footprint may improve (green arrow) or regress (red arrow) from the structure to the result. The blue arrows represent the conceptualization of change in critical realism (see figure 5). The grey arrows represent the notion that change is a process, where a new business model may continue to change, and that it may have changed in the past (the arrow which goes from the result to the structure), and the

changed structure then influences the broader variables upon which the inter-actor interaction is contingent on (the arrow going between the structure and the contingency circle).

For this model, the nature and possibility of interactions are conceived of as being contingent on the attributes of the structures of business models and the networks of attributes of actors who work within, maintain, and construct these structures. An example being different levels of indebtedness and profitability of farms, or the structure and availability of financial services that lenders and insurers offer. These interactions are conceptualized as being and contingent on multi-level dynamics. An example being the different risk profiles of different agricultural practices and how this may lead to organic or conventional having different interactions with the structures and agents of lending and insurance. Or even state environmental or food regulation meaning that different practices may be at greater risk of being fined for breaking regulation. Actors are then theorized as being connected in different networks, with different relational assets. Creating, reconfiguring, and maintaining networks, space, and power within these networks. Leading to changes in the flow of knowledge, resources, and socio-technical systems. A useful addition to this, is the notion that landscapes, regimes, and niches are then heterogeneously spread across relational and absolute space (Meelen et al., 2019; Murphy, 2015; Raven et al., 2012; Truffer et al., 2015).

The business models of firms engaged in agronomy are the unit of analysis. This was chosen due to the authors background in environmental science, and the significant role that agronomy plays in the land-use footprint of humanity. Whilst business models of financial business services being of interest in how they relate to their agricultural firm. The financial business services chosen were lending and insurance. They were chosen based on an assumption that information regarding their contracts would be more

accessible and because farmers likely often use them. Namely commercial banks in Sweden offering tailored loan services to farms, and Agria, a major market player in Swedish agronomy insurance. The business model in the conceptual model then represents one farm in relation to its insurance and lending services. The larger system is considered in the contingency element of the model, as the MLP works to show how a firm is embedded in a broader industrial context, framed as multi-level dynamics. Business models are conceptualized as a guiding social construction within the firm, consisting of such things as the firm's value proposition, value configuration, partner network, distribution channel, cost structure and revenue model (see table 1.). Business models are then conceived as important institutions in the practices of actors who make up the firms of socio-technical systems. So sustainable changes in business models could mean sustainable changes in the socio-technical systems.

4.2. Methods

The employed method is retroductive, insofar as the understandings of the phenomena of interest will be developed through an exploratory process of incrementally developing hypotheses and reflecting on them by looking to the actual phenomena. The core conceptual model will then be informed by a qualitative case study of the nature of agent interactions. As relational approaches often take the interrelationships between actors as a starting point (Delgato, 2018).

The process would then result in an empirical operationalization of the model to hopefully give insight into the role of insurance and lending services in agronomy in a chosen context. Also, it would hopefully give insight into way in which the dynamics portrayed core conceptual model could be tailored to better reflect the nature of the relations between farmers and FBS in different contexts.

This process is then intended to follow to the version of critical realism employed in the conceptual model. However, through trying to implement this process, it became clear that it is unpractical and perhaps counter-productive to be too rigid in following the structure, mechanism, contingency, result sequence. However, it is suggested that an understanding of the contingency component should be developed first, to inform the researcher on broader trends and contexts that may have led to contemporary business models, as well as the direction that change may take. This would then set the stage for asking informed questions to interviewees, as well as being better equipped for understanding the answers given.

The empirical work in this thesis consisted of correspondence with representatives of regime insurance and lending firms, namely Agria, and SEB. Which consisted of an interview with an agria representative, and email correspondence with representatives from SEB and Landshypotek bank. Many hours of desk research were also conducted into information made available to the public. This desk research was done to understand the regarding the range and conditions of lending and insurance services, organic and conventional agricultural methods and practices, the regulatory and subsidy environment for farmers in Sweden, macro-economic developments, and more. The sources for this are listed respectively in the following section. This was done in an exploratory fashion, guided by the theoretical framework, and the recommendations on structuring questions to inform the structure, contingency, mechanism and result structure.

5. Results

5.1. Background

This subsection will be an example of the resultant operationalization of the conceptual model. It is useful to this thesis, as it in an exemplification of the way that Multi-Level Perspective can be used to understand the role of financial business services in sustainability transitions in agronomy, and what questions that this may be useful in answering.

Firstly, the multiple levels should be clearly defined. The niche, as per the MLP, is not just the businesses meeting a more niche demand in a market. It is a new social and technical way of meeting a societal need, that is more in line with certain landscape developments. This includes marketing, industry certification, logistics, businesses producing inputs, politicians, investors, and more. The regime is then the socio-technical status quo, that has been able to remain viable under previous multi-level dynamics. Practical definitions of the agricultural business models in the niche and regime should then be made. Generally, the productive practices of agronomy can be understood as belonging to two different camps. One being practices which look to replace natural systems with practices such as artificial/mineral fertilizers, and pest control chemicals to maximize productivity. These farms have business models which range from chemically intensive monocropping systems to farms which are to organic certification. The other camp being practices which work to employ natural systems to reduce environmental impact whilst maintaining financially sustainable productivity, by for instance using natural fertilizers, crop rotations and increasing the biodiversity of the farmland. These latter methods are more associated with farms that are certified as being organic. These farms have business models that range from closed-cycle business models that go beyond organic certification guidelines, to more

standard business models that just follow organic certification standards (Reganold & Wachter, 2016).

To give a brief overview of these different practices, this outline of the environmental and production effects of business practice will be limited to the different modes of fertilization, and crop protection. Regarding fertilization, it is the vital practice of providing nutrients to crops. The use of artificial/mineral fertilizers are typically associated with conventional practices. Its known for consistent and high yield harvests. They are however often more environmental damaging. For instance, a life cycle assessment of artificial/mineral fertilizers showed that an increased usage of such fertilizers, increases the emission of pollutants (N2O, NOx, NH3, PO4-P), which contribute to climate change, acidification, heavy metal pollution (Cd, Zn, Co, Se, Hg), and over-nutrification of waterways and marine environments (eutrophication) (Skowrońska & Filipek, 2014). There are nuances to these generalizations. For instance, employing alternative artificial/mineral fertilizer sources (e.g. ammonium nitrate produced using biogas or recycled phosphorous fertilizers) reduced the carbon footprint of the fertilizer (Ahlgren et al., 2010; Linderholm et al., 2012). However, the potential to contribute to pollution (e.g. eutrophication, acidification, heavy metal toxification) increased (Ahlgren et al., 2010; Linderholm et al., 2012).

Some farmers then work to employ the nutrient cycle to avoid artificial/mineral fertilizers. Moving to organic fertilizers can reduce input costs but can lead to lower crop yields (Reganold & Wachter, 2016). Two long term studies in Sweden showed improvements in nearly all nutrient and ecological measures in crop-fields where organic fertilizers where applied (Granstedt & Kjellenberg, 1997; Pettersson, 1982). Although, replacement of artificial/mineral fertilizers with organic ones, have been observed to contribute to eutrophication and acidification (Skowrońska & Filipek, 2014).

Crop rotations are also an important practice for maintaining soil quality, particularly so for organic producers. Crop rotations are the practice of switching between different crops between harvests. Several long-term studies generally found that mixing legumes with other crops increased organic soil carbon and nitrogen in the soil after several decades of rotational cropping (Havlin et al., 1990). Which in turn means that artificial/mineral nitrogen fertilizers would be less necessary.

Pest control is then for controlling pest species of insects, weeds, and fungi. Which is very important for maintaining consistent crop yields. As a means of keeping this section succinct, this discussion is limited to pesticides, and leave out herbicides and fungicides. There is now a very broad range of pesticides with varying effects on productivity, the environment and human health. to exemplify this a study by Jepson et al. (2020) classified 659 pesticides according to select risks to the environment and human health and found much variation with some pesticides being standouts on either end of the spectrum. Some pesticides are even allowed in organic farming (Durán-Lara et al., 2020).

There are ways of minimizing the need for chemical pest controls. Which is very important for organic farmers as they have a limited chemical-arsenal for mitigating crop damage from pests. Many methods to do this is increasing the ecological diversity of fields and the broader agricultural landscape. As diversity can help to mitigate the vulnerability of mono-cropping against pests and diseases, by fostering habitats for the 'natural enemies' of pests (Bianchi et al., 2006; HE et al., 2019). For instance, a study in the Scania region of Sweden, found that the potato pests (aphids) were made less abundant by increasing the population of their natural enemies (hoverflies, lacewings and ladybirds), by planting flower strips consisting of 11 different species (Tschumi et al., 2016). However, using land in less intensive ways that do not prioritize yields may affect the shorter-term profits of a farm.

The link between these practices and financial performance is then important to this thesis. In terms of yields, organic farms typically produce less than conventional agronomy (Reganold & Wachter, 2016). However, a meta-analysis that analysed the financial performance of organic and conventional agronomy (covering 55 crops across five continents) concluded that the premium prices that organic farmers can attract for their organic certified products, and generally lower input goods costs, often means that they are "significantly" more profitable (Reganold & Wachter, 2016). This high profitability can be hampered by higher labour costs (Solfanelli et al., 2021), and potentially lower revenue during the transition period (usually three years) (Reganold & Wachter, 2016). Another factor is the potentially less reliable harvests, but this differs from farm to farm.

This thesis will then consider those farms who are pursuing agronomy methods that are less environmentally damaging as being part of the niche. This would however be difficult to operationalize in the model as the business models of farms vary widely. This thesis will then use of organic farming certifications as a boundary. In the Swedish context, the amount of farmland being used for organic farming was close to 19 percent in 2019 (Ländell & Wahlstedt, 2019; Pekala, 2020), and according to Eurostat, the total land in the EU that is certified organic made up only 9.1% in 2020 (*Organic Farming Statistics*, 2022). This boundary is considered particularly useful as the organic certification of goods has economic, and social meaning.

Regarding lending and insurance, only regime actors will be considered. This is because thoughtfully considering the evolution of the financial socio-technical system is beyond the scope of this thesis. It is then necessary to introduce some specifics of the insurance and lending

services. In terms of insurance, the range of insurance products available to a farm varies internationally, and is dependent on several factors, e.g. state subsidies, regulation, insurance delivery systems, trained insurance staff, the customer base, and the data and systems for them to produce viable insurance products. Something noteworthy in Sweden is the large market share of the insurance firm Agria in agronomy. These products are paid for as services, the major payment is called an insurance premium and is paid under the duration of insurance coverage. An important aspect of agricultural insurance (like other insurance) is that they will likely only ensure customers when insurance premiums can cover their costs. These costs include, money paid out to cover losses, and administration and operating (A&O) costs. A&O covers several costs, for instance, administrative and operating costs, and costs of investigating compliance with contractual obligations, costs of investigating and adjusting losses, and expenses associated with mitigating risk (Smith & Glauber, 2012).
In general, agricultural insurance products fall into three broad categories; specific/named peril products, multiple peril/all-risk products, and index-based products. Specific peril products cover against losses from clearly specified risk, like damage to crops from hail, or crop contamination. Single peril insurance products are common, and are in wide use Sweden (Smith & Glauber, 2012). The others are not offered by the major insurance firm Agria.

Lending services have similar but different relations to agricultural firms. Not all lending services are the same, they operate in different places, in different markets, and are branches of banks with different overarching business models. Generally, commercial banks have been observed to consider agriculture as a high-risk area, since agricultural practices are influenced by weather and pests as well as the often seasonal revenue (Rozhkova, 2021). Lending to agricultural firms should consider the specifics of the industry, which may then require more resources spent on

risk assessment and management (Rozhkova, 2021). Modern banking employs credit evaluation, which is used to estimate the likelihood of customer to repay their agreed upon payment, which is often called 'credit worthiness' (Ioannou, 2021). Credit risk and credit worthiness rating are multidimensional and complicated decision making processes, including qualitative and quantitative data (Bai et al., 2019; Ioannou, 2021). These methods differ between lending services, which may depend on variables such as market size, expertise, and technology and resources available for data collection and processing.

Little has been found on the role of finance in TT in the Swedish context. An exception is a master's thesis by Stockvall-Carlsson (2021). Despite her using a different conceptual framework for analysing TTs, select findings were relevant to this thesis. As it was found that some of the small-holder farmers across Sweden communicated concerns about financial constraints to transitioning to organic agronomy. One quotation portrayed this quite well:

> *"A more general barrier for many farmers is that… Well, I have repaid my bank loans and I'm debt-free and have a freer situation than the vast majority of my colleagues who are over ears in debt. So if you start working with something like this, that no one really understands, then you will be questioned by your financiers on the obstacles of this kind of farming" – Farmer 9*

5.2. Structure

Figure 7: The Structure of the Conceptual Model

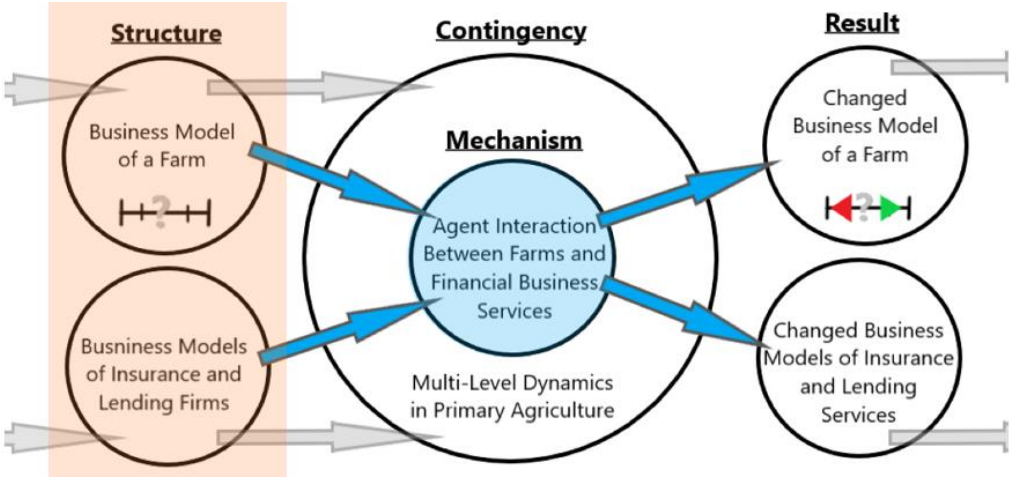

Figure 7. This figure presents the conceptual model constructed in this thesis. Highlighted to show the section of the model that this section will cover.

Table 2: Business Models in Agricultural Niche, Organic certified Agronomy

Business model building block	Description
Value Proposition	Organic agronomy offers value in its better ecological, and climatological footprint during its production of food products and animal feed. Also, in its association with being a healthier food product, as it has less exposure to pesticides.
Target customer	The target customers of farmers are either direct consumers, distribution companies or food processors. They may buy these products because they either want, or want to sell to those who are willing to pay a premium as they are environmentally conscious and/or health conscious and/or consumers who associate organic

	produce as being of a higher quality (Pekala, 2020). The typical retail customer of organic goods are women between 35 and 60 years, which have above-average incomes, and education levels (Pekala, 2020).
Distribution Channel	Distribution channels vary between farms. This may vary between selling goods directly to their customers (e.g. food processors, at farmers markets), but much of this may go through distribution companies that sell the products via retail stores, exports etc. Much of the organic produce produced in Sweden is consumed domestically. Exports of organic food then go mainly to other Nordic countries (mostly Denmark), then Germany. About 60% of the organic food sold in Sweden goes through retail stores, which makes up about 8% of sales in the sector. With ICA making up about a third of these sales, followed by Systembolaget, and Coop (Pekala, 2020). Less than 10% of private food service sales are organic, whereas it is close to 37% in the public food service (Pekala, 2020). With publicly funded school lunches playing a leading role (Pekala, 2020).
Relationship	The most noticeable way that organic farms establish relationships with their different customer bases (companies who buy their produce for processing or selling at retail stores) is by maintaining their status as certified for different organic produce labels. Such as the EU organic standard or the more demanding Swedish KRAV standard.

	As well as this, ensuring that their products meet health regulations, are marketable and are not damaged.
Value Configuration	Most farms in Sweden are still family run enterprises (*Facts about Swedish Agriculture*, n.d.). These value configurations are then embedded in other branches/revenue streams of farms. For instance, some organic agronomical producers have other income streams. Farmers in Sweden often supplement income from their holdings with work in other enterprises (*Facts about Swedish Agriculture*, n.d.). Such as, non-organic produce, and animal products agroforestry, contract work, or other income streams. Value configurations differ from farm to farm. But generally, value begins with the soil, sun, and rain. Access to which is either owned or leased. The soil is then prepared, and crops are sown, which typically requires machinery, fuel, and labour. However, fuel and other input costs are generally lower in organic agronomy, but it is more labour intensive (Durham & Mizik, 2021). Sewn fields then require maintenance, which for organic agronomy may be more labour intensive but with lower input costs. However, you can not just remove certain inputs and not replace them. So many organic farms often have more circular business models. Examples of which are the use of manure and left-over crop material in fertilization. The last step of the value configuration is being the bringing of their (potentially) premium product to market. Value configurations vary regarding products and geographically (Durham & Mizik, 2021). Which is in large

	part dependent on their attainment of an organic certification.
Core Competency	The core competency of organic farmers is in their potential competency in the somewhat novelty of organic methods, which between farmers (source). Examples being efficient use of resources, crop damage mitigation, and yield maximization with a limited amount of chemical aids.
Partner Network	There are many groups in Sweden that organic farmers cooperate with to offer and commercialize value. Farming cooperatives have played an important role historically in politically and economically in supporting farmers in Sweden. Such groups today include LRF (länmännernas Riksförbund), and Läntmännen. There are also many smaller groups who specialize in working with organic farmers to market their produce and advise them on efficient practices. Such as, ekologiska lantbrukarna, Organic Sweden, and KRAV. Krav and other eco labels such as the EU organic Green Leaf are important for ecological farmers in the marketizing of their products, as they can then attract premium prices. EU certification is required to market organic produce (Durham & Mizik, 2021). While KRAV, is a voluntary addition which is more demanding, but it may attract a better price in retail and service sector customers, than if it were just EU certified (Durham & Mizik, 2021).
Cost Structure	Major costs are likely in land, infrastructure, machinery, consumable inputs, and labor. It is generally understood that organic production results in much lower input costs and as well as higher labour costs compared to

	conventional agriculture (Durham & Mizik, 2021). However, some inputs, namely seeds are often more expensive (Solfanelli et al., 2021). Relevant to this thesis are also costs associated with insurance premiums, and interest on loans.
Revenue Maodel	The revenue models may generally be the sale of produce, and animal feed crops to its customer base, and/or using feed crops on the farm to feed livestock in a sort of value-adding implementation of agronomical production. Country level analyses generally show that organic agriculture outperforms conventional systems in terms of financial returns (Durham & Mizik, 2021). This is mostly due to generally lower production costs and higher market price (Durham & Mizik, 2021). This price premium is however very much reliant on organic certification for marketing (Pekala, 2020).

Table 3: Business models in Agricultural Regime, Conventional Agronomy

Business Model Building Block	Description
Value Proposition	Conventional agronomy offers value in its relatively high-yield, and reliable production of food products and animal feed.
Target Customer	It was difficult finding a study specifically looking at the customer base of Swedish conventional agricultural production. However, customers may be grouped into

	being direct customers (food processors, or consumers at food markets), and through distribution companies.
Distribution Channel	Distribution channels vary between farms. This may vary between selling goods directly to their customers (e.g. food processors, at farmers markets), but much of this may go through distribution companies that sell the products to retail stores, service retailers and exports etc. Much of these exports being to other Nordic countries.
Relationship	Relationships are established with major customer segments by (for example) ensuring that their products meet health regulations, are marketable and are not damaged.
Value Configuration	Most of the value configuration of conventional farms is very similar to that of organic farms. Value configurations then differ between farms, but generally, begins with the soil, sun, and rain. Access to which is either owned or leased. The soil is then prepared, and crops are sown, and maintained, which typically requires the sourcing of machinery, fuel, agri-chemicals and labour. However, fuel and other input costs are generally higher in conventional agronomy, but it is generally less labour intensive (Durham & Mizik, 2021). The last component of the value configuration being the marketization of their products to market. Value configurations vary regarding products and geographically (Durham & Mizik, 2021). Most farms in Sweden are still family run enterprises (*Facts about Swedish Agriculture*, n.d.). These value configurations are then embedded in other

	branches/revenue streams of farms. For instance, some organic farmers have other income streams. Farmers in Sweden often supplement income from their holdings with work in other enterprises (*Facts about Swedish Agriculture*, n.d.). Such as, non-organic produce, and animal products agroforestry, contract work, or other income streams.
Core Competency	The core competency of conventional farmers is in their potential competency in the high-yield methods. Examples being efficient use of resources, crop damage mitigation, and yield maximization with conventional production methods.
Partner Network	There are many groups in Sweden that organic farmers cooperate with to offer and commercialize value. Most notable is the role of farming cooperatives, as they have played an important role historically in politically and economically in supporting farmers. Such groups today include LRF (länmännernas Riksförbund), and Läntmännen. Farmers also have the option of working with various expert consulting firms.
Cost Structure	Major costs are likely in land, infrastructure, machinery, consumable inputs, and labour. It is generally understood that conventional production results in higher input costs, but lower higher labour costs when compared with organic agronomy (Durham & Mizik, 2021). Relevant to this thesis are also costs associated with insurance premiums, and interest on loans.
Revenue Model	The revenue models may generally be the sale of produce, and animal feed crops to its customer base, and/or using feed crops on the farm to feed livestock in a sort of value-

	adding implementation of agronomy. Eligibility for EU subsidies may also be an important source of revenue. Country level analyses generally show that organic agriculture outperforms conventional systems in terms of financial returns (Durham & Mizik, 2021). This is attributed to generally lower production costs and higher market price for organic production (Durham & Mizik, 2021).

Table 4: Business Models in the Insurance Regime (Agria)

Business model building block	Description
Value Proposition	Agricultural insurance primarily offers value in its financial de-risking for its customers.
Target Customer	Target customers are farmers (organic and conventional) who have the capacity to pay insurance premiums and who are willing to work to reduce the risk exposure of crops on their farms. Importantly, Agria crop insurance is a branch of the larger Agria insurance organization. Which is a branch of the larger insurance firm called Läntfösäkingar. So, the Agria crop insurance service is a branch designed to maximise the insurance market share of Läntförsäkingar.
Distribution Channel	The distribution channel includes marketing, and ways to engage with farmers. Regarding marketing, this includes in person marketing for example, or marketing from a distance, such as online or physical advertising. Regarding

	ways to engage with farmers, this may be done in person, at field days, and at branches. Or it can be done via their website, a phone call, or email.
Relationship	As a service, an insurance firm maintains its relationship with its customers by providing a service that a customer finds preferable to not being insured by them. However, as agria are leaders in this market in Sweden, so options are limited regarding other firms who are equipped to offer insurance to farmers.
Value Configuration	A way of understanding the activities involved in the value configuration of agria is by breaking its activities up into acquiring and maintaining its customer base, developing services, and providing services. Acquiring and maintaining its customer base is covered by the above explanations of the firm's value proposition, target customer, distribution channel, and relationship. Developing services can be understood as a process of understanding the market and development of the many facets of a service to account for the market. This was described by a representative of Agria as being a continual process, as market conditions change. Providing the service can be understood as a communicative and financial process with the customer. Which may include making them aware of their obligations, and the insurance firm's obligations. Also, where they collect insurance premium payment, as well as the insurance firm proving payments in the event of a claims for damages. Regarding the resources of the value configuration. An important aspect is the insurance firms access to money

	when damages is claimed. Another is the experience and expertise of actors within the insurance firm to carry out the aforementioned activities. The reseeding insurance covers the cost of reseeding a crop. Compensation is based on a standard value (determined by Agria at the beginning of each crop season) for each crop per hectare. Damages to reseeded crops are not reimbursed. Extra reseeding costs associated with alternative practices (namely KRAV) are not covered. Deductibles on damages vary between crop classes.
Core Competency	The core competencies required to execute this business model include having the technical and administrative competency to develop and sell viable insurance products. This viability depending on their competency to develop insurance products that balance the cost to their customer base (paid primarily in insurance premiums), benefit to the customer (what damages can be claimed), cost of development and implementation (e.g. labor, administration, risk analysis, damage assessment, liquid capital access), as well as profits to be paid to shareholders in the company.
Partner Network	Agria Grödaförsäkringar lists some organizations that they cooperate with, most of which are involved with is the AIAG (international association of agricultural production insurers. Which is a forum for private and semi-governmental insurers as well as law firms, specializing in many different agricultural products (including crops) to share knowledge and establish advisory relationships

	regarding new crop insurance systems or market developments. Another cooperation that may be instrumental in executing the business model could be with banks or other lending services for when agria may need liquid capital (money) for when large scale losses in a year exceed the liquid capital on hand. However, understandings of this element of the business model of Agria is currently limited to speculation.
Cost Structure	Costs of implementing the business model consist of paying for office space, IT systems, and labor. Regarding labor, Agria have employees doing a wide variety of work. From office cleaners, risk analysis, damage assessment, risk determination, IT, administration, customer relations, and management. Also, costs stemming from the payment of insurance claims.
Revenue Model	The revenue model is to demand premium payments in return for services. This is a standardized fee for each acre of different classes of crop. Agria does not differentiate between the methods (organic or conventional) that these crops are grown by.

Table 5: Business models in banking Regime

Business model building block	Description
Value Proposition	Lending services for farmers offer value by offering access to liquid capital in exchange for long term repayments with

	interest. when a customer may need to supply, maintain, expand, or change production systems. Financial services vary between banks in Sweden offering specialized loans to agronomy (e.g. SEB, Swedbank, Landshypotek Bank). This can be in the form of various financial packages that offer different value, like business loans (företagslån) seasonal loans (sesånglån) or operating finance (rörelsefinansiering).
Target Customer	The target customer in agronomy are farmers who can pay their interest payments within agreed upon timeframes, and who will not default on loans. This supposedly leads to a bias towards larger farms (Rischen, 2018). However, a bias between organic and not organic is not robustly supported with evidence. The only evidence on the matter is an interview suggesting this bias against regenerative farming methods, which may not be as widely understood when compared to standard organic methods (e.g. EU Green Leaf, or KRAV)
Distribution Channel	The distribution channel includes marketing, and ways to engage with farmers. Regarding marketing, this includes in person marketing, or marketing from a distance, such as online or physical advertising for loans and their terms. Regarding ways to engage with farmers, this may be done in person, at field days, and at branches. Or it can be done via outlining their services on their website, a phone call, or email.
Relationship	As a service, a lending firm maintains its relationship with its customers by providing a service that a customer deems as being beneficial to their interests. However, as agria are leaders in this market in Sweden, so options are limited

	regarding other firms who are equipped to offer insurance to farmers.
Value Configuration	A way of understanding the activities involved in the value configuration of lending services serving agronomy in Sweden is by breaking its activities up into acquiring and maintaining its customer base, developing services, and providing services. Acquiring and maintaining its customer base is covered by the above explanations of the firm's value proposition, target customer, distribution channel, and relationship. Developing services can be understood as a process of understanding the market and development of the many facets of a service to account for the market, as well as specific financial packages for individual customers. For example, SEB (Sveriges Enskilda Bank) states that they outline a customer farm's various financial risks. This may be so that a customer can be evaluated and informed on ways to minimise risk. This is a seemingly common practice that can be called a credit worthiness evaluation. Providing the service can be understood as a communicative and financial process with the customer. Which may include making them aware of their obligations, and the lending firm's demands in return for their service. Importantly, this can be understood as the process where the loan payment, and other payments are collected (e.g. reminder and administrative fees). Also this

	is where the lending firm may possibly changing the interest rate to react to market conditions (depending on the conditions of the loan). Regarding the resources of the value configuration. An important aspect is the cash reserves of the lending firm. Which within banks often stems from the savings accounts of other customers. Another resource is the experience and expertise of actors within the insurance firm to carry out the aforementioned activities.
Core Competency	The core competencies required to execute this business model include having the technical and administrative competency to develop and sell viable lending services. This viability depending on their competency to develop services that balance the risk and cost to the customer (i.e. risk of defaulting on a loan, and the costs of repaying the loan and other costs), the benefit to the customer (usefulness of credit in balance with the risk of taking on the debt), cost of development and implementation (e.g. labor, administration, credit worth), as well as profits to be paid to shareholders in the company.
Partner Network	Due to the many banks who offer lending services, there is not space to outline specifics on individual actor groups that lenders cooperate with to execute their business models. However, types of actors/groups is feasible for this section. There exist networks and Forums (such as MoneyLive Nordic Banking) where bankers and experts can meet and exchange knowledge, and information that may be

	important in implementing the business model. Another cooperation that may be instrumental in executing the business model could be with other banks for interbank lending. As well as the role that the Swedish interbank lending rate (STIBOR and SWESTR) plays in affecting interest rates.
Cost Structure	Costs of implementing the business model consist of paying for office space, IT systems, and labor. Regarding labor, banks have employees doing a wide variety of work. From bank tellers, creditworthiness assessment, IT, app developers, administration, customer relations, and management. Also, costs stemming from losses incurred in the defaulting of loans, or the process of liquidating collateral assets.
Revenue Model	The revenue model consists of taking regular payments, with stable or dynamic interest rates, for offering access to credit.

5.3. Contingency

Contingency, in the conceptual model consists of multi-level dynamics for both regimes. This then consists of matrixes of different proximities, institutions, and physical conditions within which actors at the landscape level, the regimes and the niche interact. The following will then outline landscape level variables and how the niche and the regimes networks are proximate to them. For the sake of brevity this outlining of landscape phenomena will be limited to a few elements of the effects of climate change on national and international institutions, and contemporary macroeconomic conditions.

Figure 8: The Conceptual Model

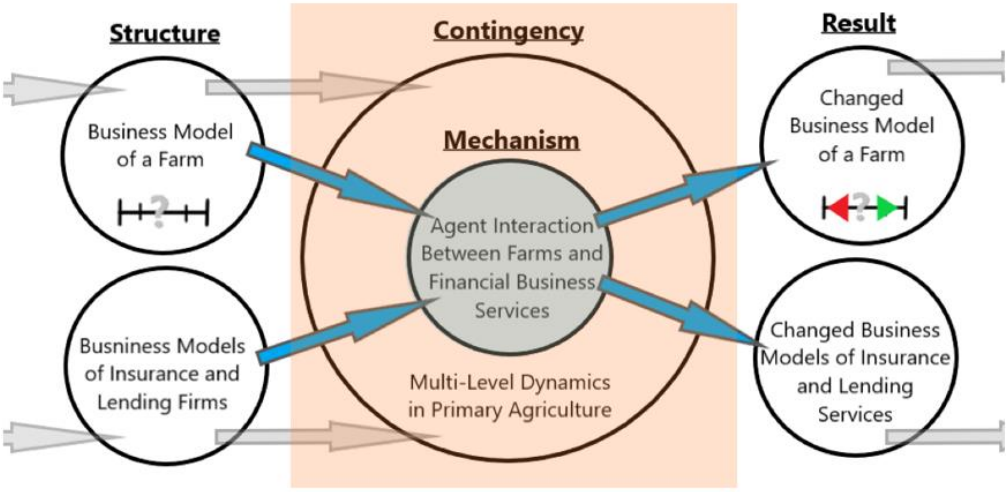

Figure 8. This figure presents the conceptual model constructed in this thesis. Highlighted to show the section of the model that this section will cover.

Regarding climate change and state institutions, the first sections of the 6th IPCC report have been released, advising governments to drastically cut GHG emissions (*Sixth Assessment Report — IPCC*, n.d.). This has added to the scientific consensus that informs the increasing pressure on industries to change their practices to be less damaging to the climate and biodiversity. This has then had an impact on state institutions in Sweden, and their role in multi-level socio-technical change dynamics. Sweden has then made decisions to account for environmental crises, such as stating that they are aiming for net zero greenhouse gas emissions by 2045 (*Sweden's Climate Act and Climate Policy Framework*, n.d.), and 30 percent of farmland to be organically farmed and 60 percent of food served in the public sector to be organic by 2030 (Pekala, 2020).

Agriculture in Sweden should be understood as linked to developments at the European level. The EU has myriad policies which are directly relevant to the financial and ecological sustainability of agricultural production in Sweden. Many such policies fall under the umbrella of the Common Agricultural Policy (CAP) (*The Common Agricultural Policy at a Glance*, n.d.). The CAP is composed of four key policies; which cover rules for direct payments to farmers, the common organization of the markets of

agricultural products, support for rural development, and financing management and monitoring of the CAP (*The Common Agricultural Policy at a Glance*, n.d.). The CAP is also undergoing a transition as of 2021, when it was agreed upon that changes were necessary to make the policy more in line with recent initiatives like the EU Green Deal (*Factsheet-Newcap-Environment-Fairness_en.Pdf*, n.d.). This can be understood in relation to agriculture as a set of national and international regulatory institutions and fiscal policy, constructed by groups with varying interests and influence to steer the future of environmental footprint of agricultural development in Europe. In terms of multi-level dynamics, it can be understood as a shift in the regulatory and normative institutions of the socio-technical system of agriculture in response to landscape developments (e.g. climate change, changing consumer demand) and that this could put increased pressure on the regime to change, potentially giving more space for niches to rise. This may affect niche and regime farms differently, in part because larger farms have been getting more funding as it is distributed on a per-hectare basis. As less than 20 percent of Swedish farmland is organic (Ländell & Wahlstedt, 2019), it can be inferred that more support is going to regime farms. The Swedish state is however supporting organic farms, as a state target of 30 percent organic agriculture has been set for the year 2030 (Pekala, 2020). An organic certified farmer, or a transitioning farmer can then get 1500kr to 5000kr per hectare per year for different vegetables, oil plants and grains (*Ersättningar för ekologisk produktion och omställning till ekologisk produktion*, n.d.). Which would provide an extra incentve for farmers to transition to or maintain their organic certified production.

Regarding international developments, the prices of inputs and products of agronomy have risen following the outbreak of the Covid-19 pandemic in late 2019, and the Invasion of Ukraine by Russian Forces on the 24th of February 2022. A succinct way of portraying the effects of these events on agronomy and their financial services is by highlighting the price swings for

input goods such as fuel and fertilizer, as well as for products (particularly grains and food oils, in the case of the Ukraine war). This is relevant to the business models of farmers, as input costs are relevant to cost structures. Whereas goods prices are relevant to the revenue models of farmers.

Figure 9: Price Fluctuations in Common Fuels in Sweden

Figure 9: A chart showing the changes in price in Euros per liter for diesel and Euro-super 95 fuels from 2015 to 2022. Sourced on the 8/06/2022 from [Fuel prices in Sweden • fuel-prices.eu]

Figure 10: Price Fluctuations in Common Fertilizers

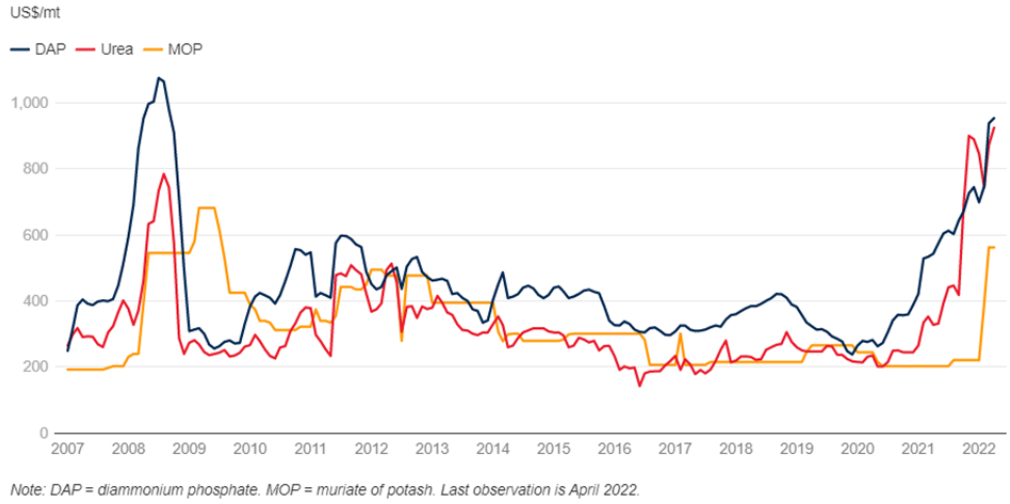

Figure 10: This figure shows price between 2007 and 2022 for Three common fertilizers DAP (diammonium phosphate), Urea, and MOP (muriate of potash). Sourced on the 8/06/2022 from Fertilizer prices expected to remain higher for longer (worldbank.org) (Baffes & Wee, 2022)

Regarding fuels and fertilizers (input goods), the recent price hike in the EU is resultant of a complex confounding of many variables. In a basic sense the Covid-19 pandemic and inputs from Russia and Ukraine have coincided with a rise in prices. The causes of these price hikes are beyond the scope of this thesis. However, what should be understood is the effect that these price hikes have on the operation of the business models of niche and regime agricultural firms. Figure 9 displays the rise of the price of diesel and Euro Super-95 (petrol) in Euros per liter in Sweden. Figure 10 displays the price rise in US$ per meter ton between 2007 and 2022 for three common fertilizers DAP (diammonium phosphate), Urea, and MOP (muriate of potash).

Agronomy depends on fuels, for work vehicles, logistics of inputs and products. Whilst artificial/mineral fertilizers are the modus operandi of nourishing crops in the agricultural regime. A price hike in input goods may then affect the cost structure of a firm. Whilst the effect on their revenue

model may be that a farmer may want to see higher prices on their goods. Which could affect their revenue as customers could chose a rival product, consume less, or the farmer may have to reduce their profit margin to remain competitive. This is an oversimplification, but what is meant to be communicated is that these price hikes likely influence the operation of agricultural business models directly, and perhaps on financial services indirectly.

Regarding outputs, price rises have also coincided with the outbreak of Covid-19 and the invasion of Ukraine. Again, the details of the causes of these price rises are beyond the scope of this thesis. Although some products commonly grown in Sweden have had prices rise since these destabilizing events. These being wheat (see figure 11) and rapeseed oil (see figure 12).

Figure 11: Price Fluctuations in Wheat

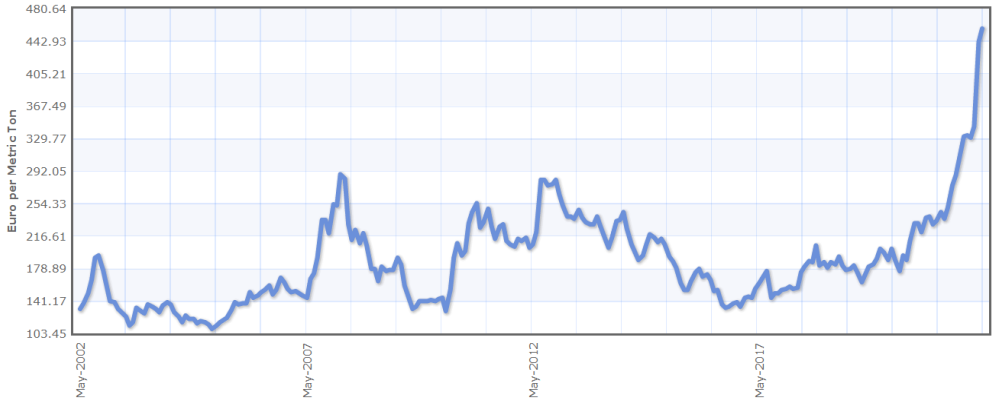

Figure 11: This figure shows the price of wheat in Euros by metric ton between may of 2002 to April 2022. Sourced on 06/10/2022 from Wheat - Monthly Price (Euro per Metric Ton) - Commodity Prices - Price Charts, Data, and News - IndexMundi (*Wheat - Monthly Price (Euro per Metric Ton) - Commodity Prices - Price Charts, Data, and News - IndexMundi*, n.d.).

Figure 11: Price Fluctuations in Wheat

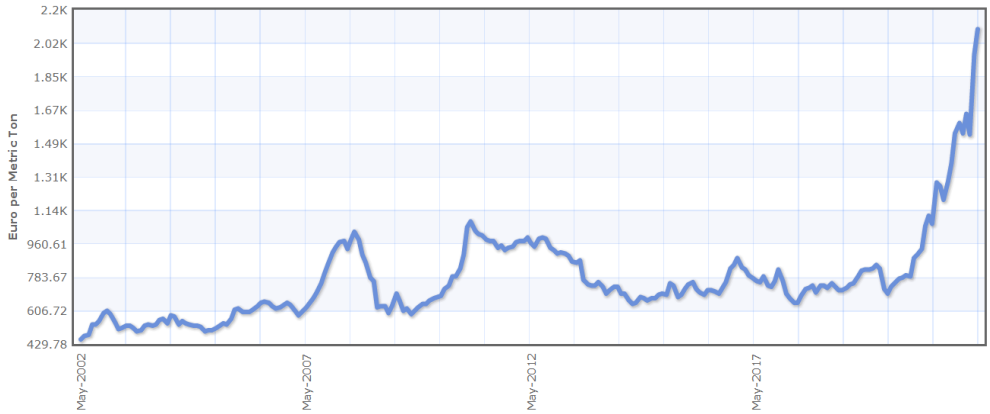

Figure 12: This figure shows the price of rapeseed oil in Euros by metric ton between may of 2002 to April 2022. Sourced on 06/10/2022 from Rapeseed Oil - Monthly Price (Euro per Metric Ton) - Commodity Prices - Price Charts, Data, and News - IndexMundi (*Rapeseed Oil - Monthly Price (Euro per Metric Ton) - Commodity Prices - Price Charts, Data, and News - IndexMundi*, n.d.)

Niche and regime farmers would have different constellations of proximities with actors working directly with national and international institutions, and input and output markets. Cognitive proximity may be relevant insofar as regime farmers may have had more time to develop common understandings with regulators, FBS, and their customers. However, standards like KRAV and the EU Green Leaf may help in standardizing common understandings of products between buyers, sellers of agricultural products. However, competency regrading regulations and markets for organic produce is still a major obstacle in Sweden. Organizational proximity may be relevant insofar as politicians and farmer cooperatives workers may be more familiar with dealing with and representing the interests of regime farmers. However, this may be slowly changing as regulatory and normative institutions are changing in reaction to climatological and ecological crises. Social proximity may be relevant insofar as actors representing the regime may have more social clout and/or relational assets with regulators and financial actors. This may also be changing, as the percentage of Swedish agriculture has been rising, but

stagnant as of late (Pekala, 2020). Institutional proximity may be less relevant as farmers in Sweden operate within the same overarching national regulatory environment, but organic growers must meet the EU Green Leaf label to be allowed to market their goods as organic. Physical proximity may factor in as the physical conditions, and concentration of organic farms differs regionally in Sweden.

Figure 13: Share of organic production in relation to the total area of agricultural land per county

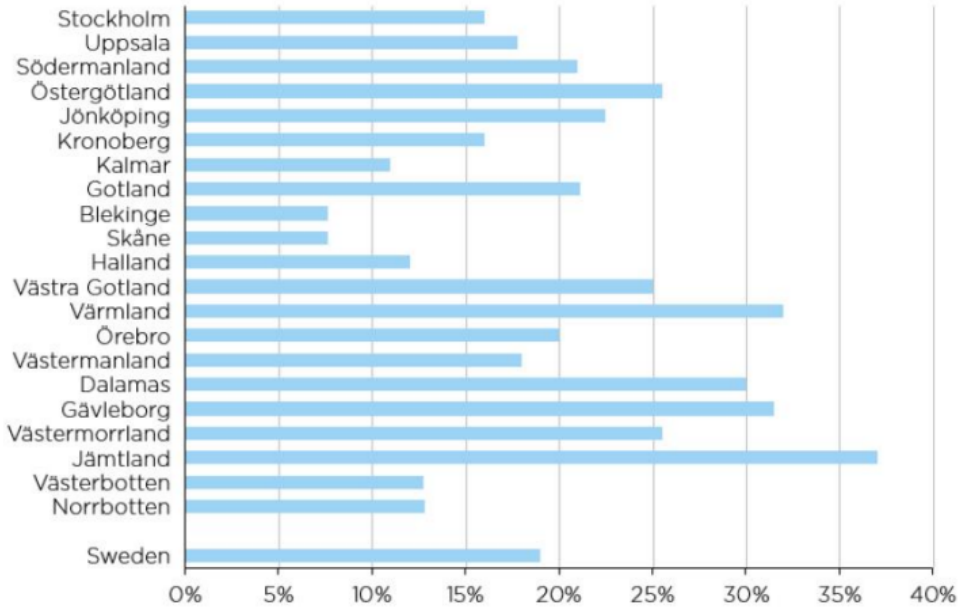

Figure 13: This figure presents the percentage of agricultural land used for organic agriculture per region in Sweden in 2017. It is sourced from Pekala (2020) page 64.

Figure 13 shows displays the percentage of agricultural production per region in Sweden. Absolute proximity for farmers may affect their business models insofar as local networks spread knowledge regarding organic methods. Physical conditions then matter insofar as areas in Sweden with a lot of forestry supposedly helps organic farmers, as they can benefit from the ecosystem services from these forest ecosystems (Reganold & Wachter, 2016).

Regarding financial services, the CAP and Sweden's subsidies and goals can be understood as intervention for producing a stable European market for agricultural products. Which (based on Martin and Clapp's, 2015 assertions) provide assurances for private financial firms to (amongst other things) provide loans and insurance in the European and agricultural sector.

5.4. Mechanism

It is then in the meeting of contingency and the agency of actors working within business models that constitutes the mechanism component of the conceptual model. Namely the contractual financial service agreements made between the two businesses, as well as the relations of negotiation and influence that they impart on one another. Due to the lack of quantitative data on the potential difference financial structure of niche and regime farms in Sweden, it is difficult to draw any conclusions regarding the quantitative nature of relations of between FBS and niche and regime farmers. So, some details regarding the terms of service in arias crop insurance have been excluded. However, what can be inferred is ways in which the niche and regime are treated differently, based on what has been outlined regarding the general differences in their business models. A landscape variable that should be mentioned in this mechanism section, is the role that EU subsidies have in agriculture, and Swedish organic agriculture and conversion subsidies play in de-risking agriculture for FBS. As they would be less vulnerable to missing payments for lending and insurance.

Figure 14: The Mechanism in the Conceptual Model

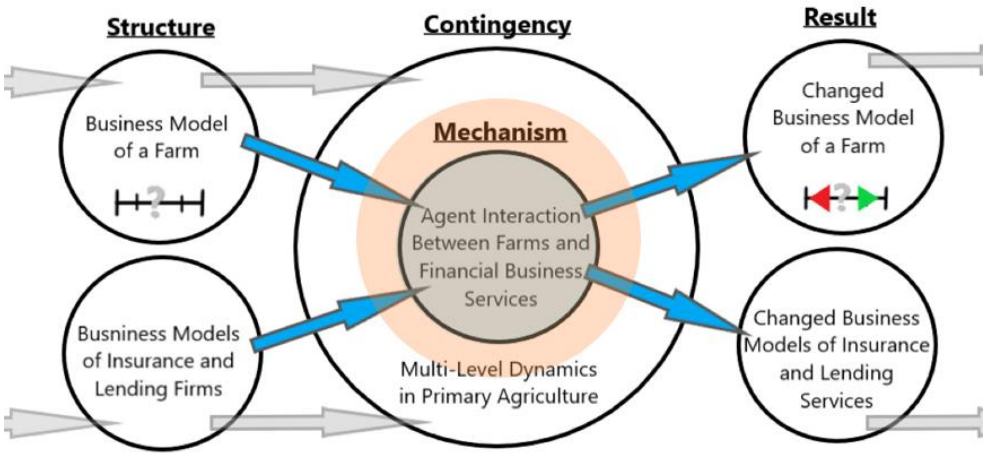

Figure 14. This figure presents the conceptual model constructed in this thesis. Highlighted to show the section of the model that this section will cover.

Regarding the meeting of the business models of niche and regime agronomy with Agria. Agria's crop insurance covers damage from hail, value loss from salmonella contamination. It also covers costs due to having to reseed crops, but only in the spring and autumn. According to an interview with an Agria representative, organic agronomy is understood as having a different risk profile due to lack of conventional risk mitigation techniques such as pesticides and fertilizers. The representative stated that they would like to have the data on different agricultural practices and have financial services that can meet the different demands of their clients. However, they said that their customer base is too small to justify the costs involved in developing and operationalizing this service. The following is then knowledge gained from the terms and conditions of Agria's crop insurance (Villkor Gröda, 2021) and reflections on the business models above.

For hail damage to crops, crops in groups (including KRAV certified products) A, B and C are insured at a standard price that Agria determines before each crop season. This is based on the price of standard crops in these classes over the last three years, with attention paid to

extreme events. Crops in groups D, E and F are reimbursed at a sum based on the expected profit made on the crop (revenue minus costs). Due to this, organic products in class A, B, and C damaged by hail may lead to more revenue loss than a conventional crop damaged by hail. This is because the standard price for the goods which have been damaged is based on standard crops and not premium priced organic crops. Crops in group D, E, and F are not stated to have this system. Compensation is instead based on expected profits after costs are factored in.
For salmonella insurance, only group A crops are covered. They are recompensated at a standard price that Agria determines before each crop season. This may again disadvantage organic producers.

Regarding reseeding insurance, insurance covers reseeding of crops in group A, B, and C (including carrots) that occurs during the first of March and the fifteenth of June. This covers damage to crops from desiccation, hard soil layer formation due to repetitive tilling, frost damage, and soil/sand drift. Damage payments are based on an average cost per hectare for each crop. This average is decided by Agria. Organic agronomy is often associated with being more resilient to dehydration and soil drift due to (for example) higher organic soil matter (Khanal, 2009). So, their paying of insurance where they are at lower risk exposure to this may mean that they are disadvantaged. As farmers with more conventional agronomical practices may have more need for this coverage. Particularly so in areas such as Skåne and Blekinge, where organic agronomy has been less common (see figure 13). Agria also states that they do not cover extra costs associated with extra costs caused by reseeding damage, for example, fertilisation, pest control or extra reseeding costs associated with KRAV certified production.

Regarding the meeting of the business models of niche and regime agronomy with Lending services. Namely, major banks operating in Sweden. The largest commercial banks operating in Sweden are:

Swedbank, Nordea, Handelsbanken and SEB (Banks in Sweden, 2020). These banks have a range of products serving different demands, with either stable or changing interest rates. The interest rate and quantity of money that can be leant is generally based on the risk profile of the customer agricultural firm, amongst other market conditions. Larger loans may also require the customer to put down an asset as collateral in case of default.

Correspondence with a representative from a smaller bank (Landshypotek) stated that they do not differentiate between organic and conventional production methods (or value structures). Rather it is more so that they focus on the financial structure (e.g., revenue model and cost structure) of their customers. A correspondent from SEB stated that they do not necessarily differentiate between conventional and organic methods. Instead, they factor in the perceived ability for a business to manoeuvre their value proposition to meet shifting demands in the market. Given that transitioning to organic agronomy is risky and costly, and that farms implementing more conventional methods may be more supported in the contemporary socio-technical system. It would not be surprising if conventional farms may find better opportunities regarding loans. However, given current macro-economic conditions, they may currently be at higher risk of missing their loan payments. Whilst organic farms are more subsidized in Sweden, and they may see more stable conditions if they manage to control their own relatively high production risk.

5.5. Result

The result covers what this example operationalization of the conceptual model can infer regarding pressures on the business models of farms engaging in agronomy production in contemporary Sweden.

Figure 15: The Result in the Conceptual Model

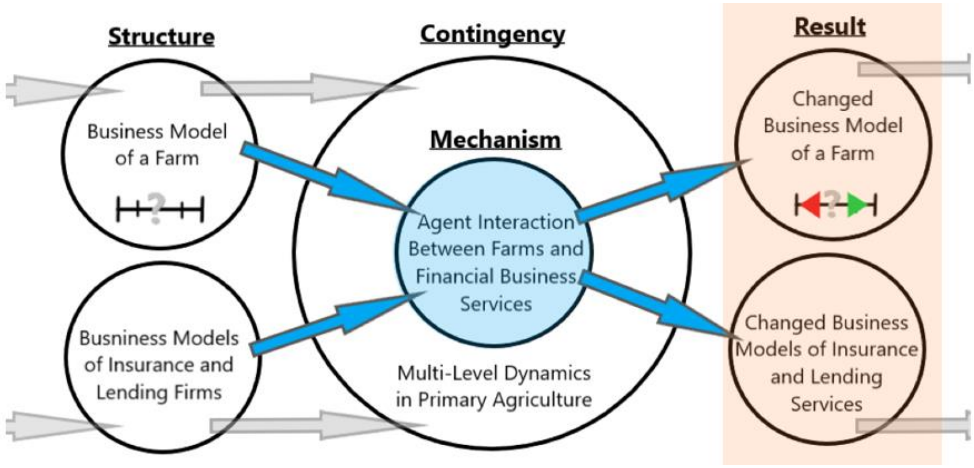

Figure 15. This figure presents the conceptual model constructed in this thesis. Highlighted to show the section of the model that this section will cover.

Landscape level effects are shifting in Sweden and Europe, much of which is incentivizing more sustainable business models. Seemingly it would be an incremental transition of fields to organic practices. Regarding state institutional effects, the revenue model of organic agriculture is seemingly better attuned to the current subsidy landscape, as they can access both EU CAP subsidies as well as Swedish organic agriculture subsidies. Which may factor into farmers looking to change their practices (value structure) to qualify for these subsidies. However, more EU subsidy funding is still being given to conventional farming, as more farmland is still being used conventionally.

This leads on to the effect of such landscape variables on proximity. Regarding cognitive and institutional proximity, the effect of the EU Green Deal on the CAP may help to increase the proximity between policy makers and organic farmers. Whilst organic standards such as the EU Green Leaf and KRAV are seemingly helping to streamline cognitive proximities, or rather understandings of what organic agriculture means. This may be helping to develop common understandings and connections between organic farmers, regulators, FBS, and customers. The growing percentage of organic farming, and the importance of organic subsidies and standards

may be affecting the organizational and social proximity of the niche politicians and farmer cooperatives as there may be more to be gained in representing the interests of organic farmers.

Regarding physical proximity, it is understood that there is somewhat of a north-south divide in the proportion of farmland that is organically worked per region. With extremes in 2017 ranging from about seven percent in Blekinge and Scania, to about thirty-seven percent in Jämtland since (see figure 13). Though based on the understanding of proximities as per Raven et al. (2012) it can be inferred that this would entail divergent developments of networks of farms.

Thus, certain areas in Sweden may have more active networks of actors working with and promoting organic agriculture (Pekala, 2020). Being situated in one of these places may help in increasing a farmer's other forms of proximity. It is difficult to say how proximity may be affecting the business models of farms directly. However, given the conceptual basis laid out by Raven et al. (2012), the spreading of knowledge to and from farmers on production methods help in improving the economic and environmental sustainability of a farmer. In part by their having better understanding of landscape dynamics, but also in having a more influence on regulatory and perhaps normative institutions regarding what food products are desirable. This apparently growing proximity of landscape level actors with organic farming representatives may the in improving landscape conditions for organic farmers. Which may further incentivize farmers in Sweden to change their value proposition. Also, the shifting state institutional frameworks (e.g. the EU Green Deal's potential influence on the CAP, and Sweden's organic farming and conversion subsidy) may incentivize farmers to convert some land to organic production to diversify their value propositions. The spatiality of this apparent phenomena may then be due to such actor networks for farmers to understand how they might take advantage of these developments.

Regarding other landscape pressures. The cost structures and revenue models of organic and conventional farmers are both undergoing unusual circumstances during the current macro-economic situation. However, the price hike in fuels and fertilizers may be more of a perturbance to the cost structure of conventional farmers, as they are often more reliant on fuel, and artificial mineral fertilizers for their production. Price hikes in products then currently may impact the revenue model of niche and regime farmers. However, the details of the impact of these price hikes on the profit of niche and regime farmers is uncertain. Only that the current input prices are likely more impactful on regime farmers. Which may factor into farmers changing their practices (value structure) to reduce the amount spent (cost structure) on such inputs. This would either include choosing rival products that have similar effects or implementing alternative business models such as circular business models.

Something else of note is that the temporality of the costs spent (e.g. labor, fuel, fertilizers) and revenue made are important. For instance, when the cost of planting, and maintenance of crops is high at a point in time where the future prices of input goods and products are relatively uncertain, the farmer may be at risk of not making profit. Which in turn may be a risk to their insurers and lenders. For example, a representative from Agria stated that the current uncertainty and difference in risk profiles of organic and conventional agriculture has led them to consider re-evaluating the insurance products that they offer, as some customers may feel like risk is being spread with other farmers with different risk profiles.

Regarding the effect of lending services. Insights gained where banks in Sweden do not explicitly differentiate between the value structures of farms and rather focus on revenue models and cost structures. However, the reflexivity of farms is factored into the prices of their loans. This may then mean that farms who use both organic and

conventional methods may have an advantage, insofar as they are being allowed better access to loans because they have diversified their production risks and value propositions so they would not be left behind in potential market shifts. Which may have had an impact on the fact that many of their customers have fields of both organic and conventionally grown crops. Turbulent macro-economic conditions, conventional farms are seemingly at higher risk of missing their loan payments than organic farms.

Regarding the meeting of farms and Agria, their insurance is seemingly better attuned for conventional farmers. This is in part due to the use of a system which uses a standard price for certain crops when damages due to hail and salmonella contamination are to be recompensated. So, the organic farmer may lose the revenue associated with the premium price for their product when they are recompensated. For reseeding, organic farmers are at a lower risk of certain damages (desiccation and soil drift) so they are spreading risk with farmers who are at higher risk of these damages and thus may be paying more for their insurance. Agria also states that they do not cover extra costs associated with reseeding damage. These reseeding costs, and extra costs may differ from crop to crop and between organic and conventional. However, organic seeds are often more expensive, so organic firms may be disadvantaged in their reseeding insurance as they will seemingly only get covered according to the costs of conventional seeds (Solfanelli et al., 2021). Agria may then disincentivise organic cropping, and this spread of the share of risks and costs between organic and conventional fields is an indicator that the regime is being better served due to its still greater economic importance to Agria.

Lastly, in regard to transition dynamics. It was found that the transition dynamics of agriculture towards more sustainable transitions followed some dynamics followed those described by Geels (2001), Raven et al.

(2012), and Geddes & Schmidt (2020). The following is then a set of apparent transition dynamics, developed by reflecting on past findings on transition dynamics, conceptualization's, and on the research-process conducted in this thesis.

Figure 16: Transition Dynamics in MLP Between Agronomical Farms and FBS

1. Transitions evolve through a process of shifting proximities and financial relations between actors across multi-regime and multi-level actors. Agricultural space is negotiated and constructed by networks of actors including; farmers with variable levels of organic/conventional value propositions who are potentially willing to make changes to their value propositions and value configurations to optimize the balance between cost and revenue, buyers and sellers of agricultural inputs and outputs who adjust their prices and buying/selling activities for profit, lending service actors with their revenue model whilst controlling the risk to themselves from offering their services by adjusting the interest rates on their loans, insurance firms balancing their administration and operating costs with their revenue models by limiting the range of services that they offer for different agricultural land-use, and politicians at various level representing the environmental, social, and economic interests of those whom they represent.
2. Land use transitions in agricultural firms can follow the pattern of variation, selection, and retention of niche land use models, and an unfolding and reconfiguration of the status quo.
3. Three observed mechanisms of TT are, spatial niche land-use cumulation, business model and add-on and hybridization, and riding along with market growth.
4. Multi-level dynamics of land regimes is a source for tensions with landscape dynamics, which can be mobilized by farmers to experiment with new business models.
5. Market size impacts the revenue available to FBS to cover the administration and operating costs of their risk evaluation process and their range of financial products. Which can disadvantage organic farming, as these financial services will be structured to meet the demands of the more substantial conventional customer base. Particularly so in terms of insurance as the costs of spreading risk is shared amongst organic and conventional cropping systems, whilst the nature of the insurance coverage is tailored towards conventional risk profiles.
6. Diversification between conventional and organic cropping systems can be seen as a positive by lenders, as it displays reflexivity to shifting input and output prices. Which may be understood by lenders to lead to more resilient farms, in return they may then offer lower rates on their loans. In turn, this may incentivize mixed organic and conventional cropping.

6. Discussion

This thesis has been centred around the development a multi-level conceptual framework that can be useful in understanding the role of financial business services in sustainability transitions in agriculture. Initially, the intension was to do an in-depth operationalization of the conceptual framework via the conceptual model. Difficulties in getting sufficient expert interviews during the summer holiday season in Sweden, and difficulties in networking with farmers via Facebook made this not feasible. The goal then became to use desk research, correspondences with insurance and lending representatives and the limited interviews, to do an example operationalization of the conceptual model. This was done to instead explore the sorts of insights than can be gained by employing the framework that was developed to understand how the MLP could be employed to understand the phenomena of interest, and what questions it may be useful for answering.

The conceptual model developed in this thesis has then made some seemingly novel conceptual contributions to the MLP regarding the conceptualization of financial services in sustainable socio-technical system change. As it is asserted in this thesis that, to use the multi-level perspective to understand the role of financial business services in sustainability transitions in agriculture, that elaborations should be made to the MLP. These elaborations are in part inspired by critiques and suggestions made to the MLP. Namely the multi-regime perspective (Sutherland et al., 2015), the relational conception of space in the MLP (or the next generation MLP as Raven et.al. call it) (Raven et al., 2012), and insights from business model studies (e.g. Osterwalder et al., 2005). However, it resulted in a somewhat complicated conceptual framework, but this is apparently justified by the complexity of the phenomena of interest.

The major gap in the MLP that this thesis is engaging with is the notion that the MLP has a conceptual lacking regarding the financial industries role in sustainable transitions. The conceptual model has proved to be a useful heuristic guide for systematizing an understanding of the complex phenomena of such multi-regime dynamics of sustainable socio-technical systems change in agronomy. This was in large part due to the systematic use of structure, contingency, mechanism, and result, as per the critical realism causation model (See figure 6). This is because it helped to break down the complicated theoretical framework built in this thesis into a structured way to identify links between multi-level dynamics, multi-regime dynamics and business models.

The structure component set the stage for empirically and conceptually developing an understanding of the structure of niche and regime business models, which guide the environmental sustainability of day-to-day activities within a firm. The use of the business model as a unit of analysis within the MLP, has contributed to an overall conceptual framework has contributed to addressing two previous critiques made of the MLP. Namely that the MLP narrowly focuses on technological innovation. This has been contended with by taking a practice-based approach, by focusing on the business models within which technology is employed. This has been found to be useful in the example conceptual model operationalization. As breaking down general differences in business model components between the business models of identified niche and regime firms allows for contending with various external relations (for example with financial services, landscape actors, and market conditions). Also, how these relations apply pressures to different parts of the business models of niche and regime firms, and the how a change in one part of the business model affects other parts.

Notable weaknesses with the use of business models in the example model operationalization is a lacking insight into the role of

agronomy in the broader business structure of a farm. Also, that this use of the business models creates a false binary between niche and regime firms. This is firstly because many farms in Sweden have agronomy as a part of their broader income streams. For instance, from animal products, forest holdings, or other employment, and because many farms also have a mixture organic conventional crop products (as per correspondence from a banking representative from SEB). So, future endeavours along this line of inquiry should avoid this misrepresentation. Otherwise, it may be difficult to build empirically supported trends on the trends in business model differences between farms which are differently aligned with landscape developments. However, focusing on business models of a particular kinds of production is still thought to be useful, as organic production can be conceived of as a component of a business model. Where implementing more organic production can be understood as a process of iterative business model innovation. Then how knowledge networks, physical environment, FBS and market conditions may affect decision to change a field to (or from) organic cropping systems.

Although this section has much room for improvement. This section was useful in understanding how the MLP could be employed to understand the phenomena of interest by systematically breaking up the component parts of the regime and niche business models of interest, which facilitated a structured approach to analyzing how they might interact with each other and the landscape. Regarding the second focusing question, this section facilitates the answering of questions regarding the way that structural intra-firm dynamics contribute to multi-level and multi-regime dynamics.

The contingency component was useful in facilitating a structured means of weaving in the macroeconomic and relational space components of the conceptual framework. This was then a means of discussing the spatial embeddedness of business models, which was useful in setting the stage

for developing an understanding of how multi-level dynamics materialize through networks of diverse actors, with different interests, embedded in different spatial contexts. This is important considering the notion that the MLP often disregards spatial components of transitions. Which in turn, set this thesis up for contending with the critique that the MLP gives limited attention to politics, power, and cultural meanings (Geels, 2019). This was in large part due to the capacity of inclusion of relational and physical proximity to supplement the typical use of institutional theory in this framework. As institutional context, and relative and physical proximity may better equip the researcher to understand the nature of interactions with agents who operate within various normative, regulatory, and cognitive institutional frameworks.

A weakness of this component of the conceptual model is that it is understood that it may require a lot of time to develop empirical support for any descriptions of networks of proximities. Which admittedly was not done in this thesis. Understandings of larger constellations of different proximities would be particularly consumptive of time and resources. Another weakness is that this operationalization of the model does little to move beyond regulatory institutions. Which was due to the easy access to information regarding regulatory institutions. These insights have been developed through an exploratory process of working to operationalize the conceptual model and reflecting on how much information would be required to understand the many relations between relevant actors such as farmers, farmers cooperatives, insurance providers, bankers, and policy makers.

This section also has room for improvement. However, the use of proximity and institutions has first contributed to understanding how the MLP could be employed to understand the phenomena of interest. This is because this element of the conceptual framework aids the MLP in developing higher resolution answers questions regarding the role

of financial services in unequal developments of sustainable socio-technical systems. As it facilitates the development understandings regarding inter-actor relations within and across institutional frameworks, consisting of actor networks with varying organizational, social, cognitive, and physical proximities and well as relational assets, in relation to one another. Then regarding the second focusing question, this use of proximity and institutions to build spatial understandings of such variables, is an avenue for developing understandings of differences between agents in and across places that may help to explain divergent development. It may also help to answer questions regarding opportunities and barriers to sustainable socio-technical systems change, as identifying groups, individuals and the nature of networks that result in different relational space contexts, may support, or constrain innovation and knowledge-sharing.

The mechanism section useful insofar as it set the stage for a structured approach to investigating the details of the way that each business model is related. The contract was found to be a particularly useful means of developing this. Insofar as it serves as a powerful regulatory institution, informing the choices of actors. Also, because it is a relatively standard practice, with information available on the way that the broader context, and financial structures of farms affect the nature of financial relations between farms and FBS. It was then possible to infer findings on the relations between farms and the MLP. This was based on prior conceptual contributions to the MLP (namely the multi-regime MLP, the next-generation MLP, and the novel business-model approach to the MLP) and information gathered on the contracts of major lending and insurance services, in concert with findings regarding regulatory institutional, and macro-economic developments. For instance, farms in Sweden with diversified production, regarding organic and non-organic crops, are seemingly advantaged compared to less diversified cropping systems regarding the terms of lending services. Conventional crops are seemingly advantaged by Agria insurance due to their apparently higher exposure to

the covered risks, and that the costs of the risk coverage is spread amongst all customers, including those with a lot of organic production. Also, that conventional cropping is advantaged insofar as the large insurance firm Agria does not cover extra costs associated with costs caused by reseeding damage, for example, fertilisation, pest control or extra reseeding costs associated with KRAV certified production.

A weakness of this section has been in its lack of data on the actual financial structure, and organic/conventional land-use of farms. As well as actual costs and pay-outs to farms from financial services.

This section has been useful for understanding how the Multi-Level Perspective can be used to understand the role of financial business services in sustainability transitions in agriculture. As it displayed a structured approach to the multi-regime and multi-level dynamics between FBS and farms during a potentially more sustainable socio-technical transitions. Notably, the different ways in which insurance and lending services in Sweden apply different pressures to business models which are at different percentages of organic production in their land use models. This section can help answer questions regarding the way that different business models, in context, apply different pressures and/or incentives to other business models, and how this may change over time.

The result section was useful insofar as it set the stage for reflecting on how broader contexts and the meeting of farms and financial firms may incentivize the conversion of farmland to organic cropping. This was done by investigating the pressures on the business models of cropping and then reflecting on business models of different modes of land use.

This was found to be particularly useful in the way that pressures on certain components of business models may be identified, and how they may in turn incentivize different kinds of business model change. For instance, how rising input prices may incentivize more circular business

models, whereas diversified revenue streams being rewarded by lending services may incentivize firms to diversify their value propositions by implementing business models with a mix of organic and conventional land-use. Findings regarding the role of state and inter-state regulatory institutions in the relations between farms and FBS could be made by looking at the role that they play in the risk profile of farms, and how FBS may react in turn. Also, by looking at potential developments in relational proximities, and how this may affect future in multi-level dynamics and pressures on organic and conventional cropping. Lastly, it was useful in facilitating reflections on previous understandings of sustainable socio-technical systems transitions and developing some transition dynamics specific to the phenomena of interest (see figure 3)

The weaknesses of the result section is a product of weaknesses in the earlier sections in the operationalization of the conceptual model. Notably in that the model is blind to the spectrum of farms with different shares of organic and conventional agronomy, that the operationalization of the model does not factor in multi-level dynamics within the FBS regime, that the model does not account for the role of cropping in the broader business model of a farm, and that there are notable gaps in data regarding the actual models and financial structures of farms in Sweden. Also, the actual spatial dynamics and result of the development of more sustainable business models in agronomy were undertheorized in this thesis.

This last section is then useful in answering the first focusing question, as it shows how a researcher can tie all their previous findings together into understandings of the way that multi-level and multi-regime pressures incentivize farms to change their business models. Which can directly answer how the Multi-Level Perspective could be used to understand the role of financial business services in sustainability transitions in agriculture. This section can help in answering how the many variables discussed above may result in spatially uneven developments of increasingly ecologically

sustainable business models. In turn, it can illuminate the dynamics that have this result, and it can then help inform policy makers, community organizers, cooperatives, and policy makers on the dynamics that they can intervene in to promote sustainable business models.

7. Conclusions

This thesis has constructed a novel conceptual framework with literature adjacent to the MLP to advance understandings of the way that the FBS industry affects sustainable socio-technical transitions in agronomy. This included concepts typically associated with the MLP. Such as multi-level dynamics and institutional thinking. These concepts were complimented by more fringe ideas within the MLP. Notably the multi-regime perspective, a relational conception of space and multi-level dynamics called the next generation MLP, and the use of the business model concept. The conceptual framework was operationalized through a conceptual model based on the causal model from critical realism. This was done to test the conceptual framework and answer the focusing questions which were designed to focus inquiry towards exploring how the MLP can be used to understand the role of FBS in sustainable socio-technical transitions.

This operationalization was fruitful, insofar as it tested the theoretical framework and produced some insights into the phenomena of interest in the Swedish context. The testing of the framework showed how the conceptual model was useful in operationalizing the conceptual framework, highlighted strengths, and weaknesses in the conceptual framework. It also provided insights into what data and reconceptualization's would improve the framework going forward. Notable strengths being: Breaking down general differences in business model components between the business models of identified niche and regime firms allows for an understanding of how intra-firm dynamics factor into multi-level and multi-regime conceptions of sustainable socio-technical transitions in agronomy. Relational proximities were useful for

conceptualizing how multi-level dynamics materialize through networks of diverse actors, with different interests, embedded in different spatial contexts. The contract was found to be a particularly useful as information on the potential contracts, and why they might differ in reaction to different farms was able to be found via desk research and correspondences. Lastly, the critical realist model of causation proved an invaluable way of structuring the complicated theoretical framework.

The most notable weaknesses were that: The conceptual model is blind to the spectrum of farms with different shares of organic and conventional agronomy, that the operationalization of the model does not factor in multi-level dynamics within the FBS regime, that the model does not account for the role of cropping in the broader business model of a farm, and that there are notable gaps in data regarding the actual models and financial structures of farms in Sweden. Also, limited understandings were developed regarding actual spatial dynamics and outcomes regarding the development of more sustainable business models in agronomy.

In conclusion this thesis answered the focusing questions: How could the Multi-Level Perspective be used to understand the role of financial business services in sustainability transitions in agronomy? What questions may this be useful in answering? Firstly, by taking a structured approach to testing a novel MLP that can potentially contend with spatial, multi-level, multi-regime, and business practice components of agronomy and FBS socio-technical systems. Then conceptualizing how they how they interrelate and how through their relations, in context can impact sustainable socio-technical systems change. Secondly this testing of the conceptual framework via the conceptual highlighted strengths and weaknesses of the framework for understanding the phenomena of interest via and MLP lens. This then informed what questions that the current state of this novel MLP framework can be useful in answering

(given sufficient information), and what changes might need to be made to improve it.

8. Reference List

Ahlgren, S., Bernesson, S., Nordberg, Å., & Hansson, P.-A. (2010). Nitrogen fertiliser production based on biogas – Energy input, environmental impact and land use. Bioresource Technology, 101(18), 7181–7184. https://doi.org/10.1016/j.biortech.2010.04.006

Bai, C., Shi, B., Liu, F., & Sarkis, J. (2019). Banking credit worthiness: Evaluating the complex relationships. Omega, 83, 26–38.

Banks in Sweden. (2020). Swedish Bankers Association. https://www.swedishbankers.se/media/4617/2005_banks-in-sweden_2019_en03.pdf

Bianchi, F. J. J. A., Booij, C. J. H., & Tscharntke, T. (2006). Sustainable pest regulation in agricultural landscapes: A review on landscape composition, biodiversity and natural pest control. Proceedings of the Royal Society B: Biological Sciences, 273(1595), 1715–1727. https://doi.org/10.1098/rspb.2006.3530

Bocken, N. M. P. (2016). Product design and business model strategies for a circular economy. Journal of Industrial and Production Engineering, 14.

Bocken, N. M. P., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. Journal of Cleaner Production, 65, 42–56. https://doi.org/10.1016/j.jclepro.2013.11.039

Booth, K. (2021). Insurance, and the Prospects of Insurability. In The Routledge Handbook of Financial Geography (1st ed., pp. 400–439).

Cullather, N. (2004). Miracles of modernization: The Green Revolution and the apotheosis of technology. Diplomatic History, 28(2), 227–254.

Defourny, J., & Nyssens, M. (2010). Social enterprise in Europe: At the crossroads of market, public policies and third sector. Policy and Society, 12.

Delgato, M. (2018). Firms in Context: Internal and External Drivers of Success. In The New Oxford Handbook of Economic Geography (First Edition, pp. 179–195). Oxford University Press.

Durán-Lara, E. F., Valderrama, A., & Marican, A. (2020). Natural Organic Compounds for Application in Organic Farming. Agriculture, 10(2), 41. https://doi.org/10.3390/agriculture10020041

Durham, T. C., & Mizik, T. (2021). Comparative Economics of Conventional, Organic, and Alternative Agricultural Production Systems. Economies, 9(2), 64. https://doi.org/10.3390/economies9020064

El Bilali, H. (2019). The Multi-Level Perspective in Research on Sustainability Transitions in Agriculture and Food Systems: A Systematic Review. Agriculture, 9(4), 74. https://doi.org/10.3390/agriculture9040074

Ersättningar för ekologisk produktion och omställning till ekologisk produktion. (n.d.). [Text]. Retrieved 9 August 2022, from https://jordbruksverket.se/stod/lantbruk-skogsbruk-och-tradgard/jordbruksmark/ekologisk-produktion-och-omstallning-till-ekologisk-produktion

Facts about Swedish Agriculture. (n.d.). Jordbruksverket. Retrieved 14 February 2022, from file:///C:/Users/HP/OneDrive/Desktop/ovr2gb.pdf

Factsheet-newcap-environment-fairness_en.pdf. (n.d.). Retrieved 9 February 2022, from https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/key_policies/documents/factsheet-newcap-environment-fairness_en.pdf

Fastenrath, S., & Braun, B. (2018). Lost in Transition? Directions for an Economic Geography of Urban Sustainability Transitions. Sustainability, 10(7), 2434. https://doi.org/10.3390/su10072434

Fraske, T., & Bienzeisler, B. (2020). Toward smart and sustainable traffic solutions: A case study of the geography of transitions in urban logistics. Sustainability: Science, Practice and Policy, 16(1), 353–366. https://doi.org/10.1080/15487733.2020.1840804

Geddes, A., & Schmidt, T. S. (2020). Integrating finance into the multi-level perspective: Technology niche-finance regime interactions and financial policy interventions. Research Policy, 49(6), 103985. https://doi.org/10.1016/j.respol.2020.103985

Geels, F. (2005). Co-evolution of technology and society: The transition in water supply and personal hygiene in the Netherlands (1850–1930)—a case study in multi-level perspective. Technology in Society, 27(3), 363–397. https://doi.org/10.1016/j.techsoc.2005.04.008

Geels, F. (2006). Multi-Level Perspective on System Innovation: Relevance for Industrial Transformation. In Understanding Industrial Transformation: Views From Different Disciplines (Vol. 44, pp. 162–183). Springer. http://ndl.ethernet.edu.et/bitstream/123456789/63069/1/28.pdf#page=176

Geels, F. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. Environmental Innovation and Societal Transitions, 1(1), 24–40. https://doi.org/10.1016/j.eist.2011.02.002

Geels, F. (2013). The impact of the financial–economic crisis on sustainability transitions: Financial investment, governance and public discourse. Environmental Innovation and Societal Transitions, 6, 67–95. https://doi.org/10.1016/j.eist.2012.11.004

Geels, F. (2001). Technological transitions as evolutionary reconfiguration processes: A multi-level perspective and a case-study. Research Policy.

Geels, F. (2002). Understanding the dynamics of technological transitions: A co-evolutionary and socio-technical analysis. Twente University Press.

Geels, F. (2019). Socio-technical transitions to sustainability: A review of criticisms and elaborations of the Multi-Level Perspective. Current Opinion in Environmental Sustainability, 39, 187–201. https://doi.org/10.1016/j.cosust.2019.06.009

Geissdoerfer, M., Vladimirova, D., & Evans, S. (2018). Sustainable business model innovation: A review. Journal of Cleaner Production, 198, 401–416. https://doi.org/10.1016/j.jclepro.2018.06.240

Gertler, M. S. (2018). Institutions, Geography and Economic Life. In The New Oxford Handbook of Economic Geography (First Edition, pp. 230–242). Oxford University Press.

Granstedt, A., & Kjellenberg, L. (1997). Long-Term Field Experiment in Sweden: Effects of Organic and Inorganic Fertilizers on Soil Fertility and Crop Quality. https://www.soilandhealth.org/wp-content/uploads/01aglibrary/Arun/Long%20term%20experiment%20sweden.pdf

Hansen, T., & Coenen, L. (2015). The geography of sustainability transitions: Review, synthesis and reflections on an emergent research field. Environmental Innovation and Societal Transitions, 17, 92–109. https://doi.org/10.1016/j.eist.2014.11.001

Havlin, J. L., Kissel, D. E., Maddux, L. D., Claassen, M. M., & Long, J. H. (1990). Crop Rotation and Tillage Effects on Soil Organic Carbon and Nitrogen. Soil Science Society of America Journal, 54(2), 448–452. https://doi.org/10.2136/sssaj1990.03615995005400020026x

HE, H., LIU, L., Munir, S., Bashir, N. H., Yi, W., Jing, Y., & LI, C. (2019). Crop diversity and pest management in sustainable agriculture. Journal of Integrative Agriculture, 18(9), 1945–1952.

Ioannou, S. (2021). Credit rating Agencies in the Era of Neoliberal Capitalism. In The Routledge Handbook of Financial Geography (pp. 532–552).

Jepson, P., Murray, K., Bach, O., Bonilla, M., & Neumeister, L. (2020). Selection of pesticides to reduce human and environmental health risks: A global guideline and minimum pesticides list. Lancet Planet Health.

Karltorp, K. (2014). Scaling up renewable energy technologies-The role of resource mobilisation in the growth of technological innovation systems. Chalmers University of Technology.

Karltorp, K. (2016). Challenges in mobilising financial resources for renewable energy—The cases of biomass gasification and offshore wind power. Environmental Innovation and Societal Transitions, 19, 96–110.

Karltorp, K., Guo, S., & Sandén, B. A. (2017). Handling financial resource mobilisation in technological innovation systems-The case of chinese wind power. Journal of Cleaner Production, 142, 3872–3882.

Khanal, R. C. (2009). Climate change and organic agriculture. Journal of Agriculture and Environment, 10, 116–127.

Klagge, B. (2021). The Renewable Energy Revolution: Risk, Investor and Financing Structures—With Case Studies from Germany and Kenya. In The Routledge Handbook of Financial Geography (1st ed., pp. 646–666).

Konrad, K., Truffer, B., & Voß, J.-P. (2008). Multi-regime dynamics in the analysis of sectoral transformation potentials: Evidence from German utility sectors. Journal of Cleaner Production, 16(11), 1190–1202.

Ländell, G., & Wahlstedt, G. (2019). Svergies Officiella Statistik. Statistiska meddelanden, 14, 105.

Linder, J., & Cantrell, S. (2000). Changing Business Models: Surveying the Landscape. 15.

Linderholm, K., Tillman, A.-M., & Mattsson, J. E. (2012). Life cycle assessment of phosphorus alternatives for Swedish agriculture. Resources, Conservation and Recycling, 66, 27–39. https://doi.org/10.1016/j.resconrec.2012.04.006

Meelen, T., Frenken, K., & Hobrink, S. (2019). Weak spots for car-sharing in The Netherlands? The geography of socio-technical regimes and the adoption of niche innovations. Energy Research & Social Science, 52, 132–143. https://doi.org/10.1016/j.erss.2019.01.023

Munro, F. R. (2019). The geography of socio-technical transitions: Transition–periphery dynamics. The Geographical Journal, 185(4), 447–458. https://doi.org/10.1111/geoj.12306

Murphy, J. T. (2015). Human geography and socio-technical transition studies: Promising intersections. Environmental Innovation and Societal Transitions, 17, 73–91. https://doi.org/10.1016/j.eist.2015.03.002

Organic farming statistics. (n.d.). Retrieved 28 May 2022, from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Organic_farming_statistics

Osterwalder, A., Pigneur, Y., & Tucci, C. L. (2005). Clarifying Business Models: Origins, Present, and Future of the Concept. Communications of the Association for Information Systems, 16. https://doi.org/10.17705/1CAIS.01601

Pekala, A. (2020). Market analysis of organic foods in the Nordic and Baltic countries (2019:540). Nordic Council of Ministers. https://doi.org/10.6027/TN2019-540

Perez, C. (2011). Finance and technical change: A long-term view. African Journal of Science, Technology, Innovation and Development, 3(1), 10–35.

Pettersson, B. D. (1982). Konventionell och biodynamisk odling. Jämförande försök mellan två odlingssystem. Nordisk Forskningsring, Järna.

Raven, R., Schot, J., & Berkhout, F. (2012). Space and scale in socio-technical transitions. Environmental Innovation and Societal Transitions, 4, 63–78. https://doi.org/10.1016/j.eist.2012.08.001

Raven, R., & Verbong, G. (2007). Multi-regime interactions in the Dutch energy sector: The case of combined heat and power technologies in the Netherlands 1970–2000. Technology Analysis & Strategic Management, 19(4), 491–507.

Reganold, J. P., & Wachter, J. M. (2016). Organic agriculture in the twenty-first century. Nature Plants, 2(2), 15221. https://doi.org/10.1038/nplants.2015.221

Rischen, M. (2018). Farming into the future: A Swedish case study of niche actors' visions on a future food system. https://www.diva-portal.org/smash/get/diva2:1225259/FULLTEXT01.pdf

Roberts, C., & Geels, F. W. (2019). Conditions for politically accelerated transitions: Historical institutionalism, the multi-level perspective, and two historical case studies in transport and agriculture. Technological Forecasting and Social Change, 140, 221–240. https://doi.org/10.1016/j.techfore.2018.11.019

Rozhkova, A. (2021). Features and problems of lending to agricultural enterprises. 677(2), 022045.

Sayer, R. A. (2000). Realism and social science. Sage.

Sixth Assessment Report—IPCC. (n.d.). Retrieved 16 August 2022, from https://www.ipcc.ch/assessment-report/ar6/

Skowrońska, M., & Filipek, T. (2014). Life cycle assessment of fertilizers: A review. International Agrophysics, 28(1), 101–110. https://doi.org/10.2478/intag-2013-0032

Smith, V. H., & Glauber, J. W. (2012). Agricultural Insurance in Developed Countries: Where Have We Been and Where Are We Going? Applied Economic Perspectives and Policy, 34(3), 363–390. https://doi.org/10.1093/aepp/pps029

Solfanelli, F., Ozturk, E., & Zanoli, R. (2021). The State of Organic Seed in Europe. www.liveseed.eu. https://orgprints.org/id/eprint/43740/1/solfanelli-etal-2021-Booklet2-LIVESEED_2021_web.pdf

Stockvall Carlsson, E. (2021). Farmers perspective's on the frictions and tractions of regenerative agriculture in Sweden. https://www.diva-portal.org/smash/get/diva2:1558606/FULLTEXT01.pdf

Sutherland, L.-A., Peter, S., & Zagata, L. (2015). Conceptualising multi-regime interactions: The role of the agriculture sector in renewable energy transitions. Research Policy, 44(8), 1543–1554.

Sweden's Climate Act and Climate Policy Framework. (n.d.). Retrieved 16 August 2022, from https://www.naturvardsverket.se/en/topics/climate-transition/sveriges-klimatarbete/swedens-climate-act-and-climate-policy-framework/

The common agricultural policy at a glance. (n.d.). [Text]. European Commission - European Commission. Retrieved 10 February 2022, from https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/cap-glance_en

Truffer, B., Murphy, J. T., & Raven, R. (2015). The geography of sustainability transitions: Contours of an emerging theme. Environmental Innovation and Societal Transitions, 17, 63–72. https://doi.org/10.1016/j.eist.2015.07.004

Tschumi, M., Albrecht, M., Collatz, J., Dubsky, V., Entling, M. H., Najar-Rodriguez, A. J., & Jacot, K. (2016). Tailored flower strips promote natural enemy biodiversity and pest control in potato crops. Journal of Applied Ecology, 53(4), 1169–1176. https://doi.org/10.1111/1365-2664.12653

Tukker, A. (2004). Eight types of product–service system: Eight ways to sustainability? Experiences from SusProNet. Business Strategy and the Environment, 13(4), 246–260. https://doi.org/10.1002/bse.414

Villkor Gröda. (2021). Agria Djurförsäkring. https://www.agria.se/dokument/villkor/lantbruk/groda/

Wieczorek, A. J., Raven, R., & Berkhout, F. (2015). Transnational linkages in sustainability experiments: A typology and the case of solar photovoltaic energy in India. Environmental Innovation and Societal Transitions, 17, 149–165. https://doi.org/10.1016/j.eist.2015.01.001