04/13

Working Paper

The effect of recessions on firms' boundaries

Eirik S. Knudsen
Kirsten Foss

SNF
Et selskap i NHH-miljøet

SAMFUNNS- OG NÆRINGSLIVSFORSKNING AS

Institute for Research in Economics and Business Administration

SNF
Samfunns- og næringslivsforskning AS

- er et selskap i NHH-miljøet med oppgave å initiere, organisere og utføre eksternfinansiert forskning. Norges Handelshøyskole, Universitetet i Bergen og Stiftelsen SNF er aksjonærer. Virksomheten drives med basis i egen stab og fagmiljøene ved NHH og Institutt for økonomi (UiB).

SNF er Norges største og tyngste forskningsmiljø innen anvendt økonomisk-administrativ forskning, og har gode samarbeidsrelasjoner til andre forskningsmiljøer i Norge og utlandet. SNF utfører forskning og forskningsbaserte utredninger for sentrale beslutningstakere i privat og offentlig sektor. Forskningen organiseres i programmer og prosjekter av langsiktig og mer kortsiktig karakter. Alle publikasjoner er offentlig tilgjengelig.

SNF
Institute for Research in Economics and Business Administration

- is a company within the NHH group. Its objective is to initiate, organize and conduct externally financed research. The company shareholders are the Norwegian School of Economics and Business Administration (NHH), the University of Bergen (UiB) and the SNF Foundation. Research is carried out by SNF´s own staff as well as faculty members at NHH and the Department of Economics at UiB.

SNF is Norway´s largest and leading research environment within applied economic administrative research. It has excellent working relations with other research environments in Norway as well as abroad. SNF conducts research and prepares research-based reports for major decision-makers both in the private and the public sector. Research is organized in programmes and projects on a long-term as well as a short-term basis. All our publications are publicly available.

Working Paper No 04/13

The effect of recessions on firms' boundaries

by

Eirik S. Knudsen
Kirsten Foss

SNF project no 1306 "Crisis, Restructuring and Growth"

CRISIS, RESTRUCTURING AND GROWTH

This working paper is one of a series of papers and reports published by the Institute for Research in Economics and Business Administration (SNF) as part of its research programme "Crisis, Restructuring and Growth". The aim of the programme is to map the causes of the crisis and the subsequent real economic downturn, and to identify and analyze the consequences for restructuring needs and ability as well as the consequences for the long-term economic growth in Norway and other western countries. The programme is part of a major initiative by the NHH environment and is conducted in collaboration with The Norwegian Ministry of Trade and Industry, The Research Council of Norway, The Confederation of Norwegian Enterprise/ABELIA and Sparebanken Vest/Bergen Chamber of Trade and Industry/Stavanger Chamber of Trade and Industry.

INSTITUTE FOR RESEARCH IN ECONOMICS AND BUSINESS ADMINISTRATION
BERGEN, JANUARY 2013
ISSN 1503-2140

THE EFFECT OF RECESSIONS ON FIRMS' BOUNDARIES

Eirik Sjåholm Knudsen and Kirsten Foss

Department of Strategy and Management

NHH Norwegian School of Economics

Helleveien 30; 5045 Bergen; Norge

eirik.knudsen@nhh.no; kirsten.foss@nhh.no

Abstract

The economic theory of the firm offers conflicting predictions of how the two major effects of recessions, i.e. changes in demand and access to credit, affect firm boundaries. Using data on Norwegian firms in the recent recession, we find support for both increased and reduced vertical integration of core activities in response to such changes. Further, we find that access to credit negatively moderates the effect of reductions in demand on vertical integration. The latter finding may highlight a possible explanation for the conflicting theoretical predictions.

1. Introduction

Economic crises influence the business environment in ways that require many firms to adjust their type and level of activities. In this paper we explore the influence of the economic crises on firm boundary decisions. Two central features of economic crises are reductions in demand and reductions in access to credit. These are relevant in most recessions, but firms may experience them in different degrees and different combinations (Tong & Wei, 2008). The questions we pose are how do reduction in demand and reduction in access to credit affect firm boundary decisions? We address these questions using the theory of economic organization (aka the economic theory of the firm), as this theory explicitly addresses the issues of firm boundaries.

Within the economics branch of the theory of the firm there is a common understanding of transaction costs as the factor that explains both the existence and boundaries of firms. Much of the research has centered on identifying the different variables that cause costs of carrying out a particular transactions to be higher in markets relative to within firms (e.g. Hart, 1995; Williamson, 1975; Williamson, 1985). Taking the transaction as the unit of analysis, changes in firm boundaries has been analyzed in terms of changes at either the firm level or in the relations between firms. Thus, research has not focused much on how changes in the macro environment impact on firms' boundary decisions. However, this does not imply that the macro environment is completely absent in the theory of the firm as all economic explanations of the existence and boundaries of firms emphasize uncertainty (Coase, 1937; Williamson, 1996) as a necessary condition for firm organization. Changes in the level of uncertainty impact the choice between firm and market organization. For example, Williamson, argue that increases in the number and severity of disturbances push transactions from market governance toward firm governance[1]. Likewise, Coase (1937) points out that uncertainty increases as the time horizon of transactions increase. A higher level of uncertainty implies more adaptations of transactions to unforeseen changes and those adaptations may more easily be carried out within the boundaries of a firm. Some later work on the theory of the firm has included more specific macro determinants of the boundaries of

[1] Of course, "disturbances" are in general important to causing "hold-up" (Williamson, 1996).

the firm, notably technology and the law (e.g. Milgrom & Roberts, 1995; Williamson, 1991). However, there have been no analyzes of how firms gradually adjust their boundaries to changes in the level of demand they face or in their access to capital for financing their investments, although these clearly are variables that affect business transactions.

The approach we take in this paper is to identify how an economic crisis indirectly influences firm decisions to out- or insource activities. Thus, we use the economic theory of the firm to identify the transaction and firm level variables that explain firm boundaries. We then ask how a reduction in the demand firms face and constraints in access to credits may impact on the variables that explain firm boundaries. We do not measure the impact of the economic crises on the explanatory variables. Instead we derive hypothesis regarding the consequences on firm boundary decisions of the likely changes in the explanatory variables. We then test the extent to which the economic crises have produced the predicted changes in firm boundaries in terms of firms' in- or outsourcing of activities.

The field of economic organization reveals different positions regarding the nature of firms and the coordination problems they solve. These different positions hold different views on what is the core rationale for the existence of firms and what determine the efficient boundaries of firms. An important difference among the various approaches is their emphasis on asset specificity in transactions as a necessary condition for transactions to be organized in firms. Coase, who is the founding father of economic theory of the firm, argues that asset specificity is not a necessary condition (Coase, 1991) whereas Williamson(1975; 1985; 1986; 1991) and others (e.g. Grossman & Hart, 1986; Hart, 1991, 1995; Hart & Moore, 1990; Klein, 1986; Klein, Crawford, & Alchian, 1978) stresses its importance in determining firm organization of transactions. We focus our attention on the Coasian view of the theory of the firm and on the Williamson view as representatives of different approaches an economic theory of the firm.

The Coasian and Williamson transaction cost theories lead to some conflicting hypothesis regarding the impact of reduction in demand on firms' decision to in- or outsource activities. Our results indicate that firms both in- and out-source activities and that they do so in patterns that are predicted by both of the conflicting hypothesis. Thus, one interpretation may be that in- and out sourcing as a response to an economic crisis may to some extent be explained by the Coasian view and to some extent by the Williamson view of the theory of the firm. Another interpretation is that the economic crisis did not influence the central explanatory

variables in the ways we expected and for that reason our hypothesis do not capture the exact causal influence of an economic crisis on firm boundaries. More empirical work will be needed in order to better understand the impact of an economic crisis on firm boundary decisions. However, we also found that firms' access to credit may have an important influence on firms boundary decisions as access to credit influence the extent to which firms are able to finance in-sourcing of activities. Empirically we find that the likelihood of insourcing was negatively influenced by the interaction effect between reduction in demand and reductions in access to credit. The interaction effect may in part explain why our contradictory hypotheses were confirmed as this finding may indicate that reductions in demand increases firms' incentives to vertically integrate core activities, while their ability to actually do so depend on their access to credit. More importantly the interaction effect indicates that financial market may be important in influencing economic organization. This aspect of the macro environment is not explicitly dealt with in the economic theory of the firm.

The paper is structured as follows. First we discuss economic theory of the firm with particular focus on the Coasian and the Transaction Cost Perspective, and use these to develop hypotheses regarding the effect of changes in demand and credit on firms' boundary choices. Then we present data and measurement procedures, before presenting the empirical findings of our analyses. We close the paper with conclusions, implications and suggestions for future research.

2. Theory and Hypotheses

2.1 Economic theories of the firm

Economic theories of the firm can be grouped into three different positions that reflect differences regarding the nature of firms and the coordination problems they solve. These positions may broadly be characterized as the "Coasian perspective, (Coase, 1937)" the "Transaction Cost perspective, (e.g. Klein, 1986; Klein et al., 1978; Williamson, 1975; 1985; 1986; 1991) and the "Property Rights perspective (e.g. Grossman & Hart, 1986; Hart, 1991, 1995; Hart & Moore, 1990). The different contributions to the theory of the firm share the – sometimes-implicit – assumption that if complete contingent markets had existed, price coordination between independent agent and asset owners would suffice and there would be

no firms. The different contributions also have in common the notion that it is the combination of uncertainty and transaction costs that explains why complete contingent markets do not exist and why firms exist to fill the void of the price system. The Coasian and the Transaction cost perspectives represents those perspectives that most explicitly view firms as a distinct governance structures that handles coordination and incentives differently than markets whereas the property rights perspective perceive firms as a distinct ownership pattern.

In the following we use the Coasian and the Transaction Costs branches of the theory of the firm to develop testable hypotheses on the impact of the economic crisis on firms' decisions to out- or insource activities. These two branches are best suited for an analysis of the impact of a crisis on firm boundaries as they have a broader view of the role of firms in markets as well as a boarder view of uncertainty compared to the Property Rights perspective.

2.1.1 The Coasian Perspective on the Firm

Coase (1937) argue that firms exist because of transaction costs. According to Coase, transaction costs are 'the costs of using the price mechanism' where the '[m]ost obvious cost of "organizing" production through the price mechanism is that of discovering what the relevant prices are' (Ibid, 1937: 21). The cost of discovering the relevant price increase with uncertainty as unforeseeable changes in demand and supply may change the relative value (opportunity cost) of different courses of actions. However, economic agents are forward-looking, and may anticipate that future changes will take place that will make it desirable to adapt contractual relations. Uncertainty alone does not explain why firms exist. There must also be costs of negotiation and concluding a separate contract since otherwise it would be costless to adaptation contractual relations to changes as they materialize.

In his original paper Coase argue that the cost of re-negotiations increase with increased frequency of activities that will have to be adapted in term of e.g. time and place of execution. As an example, Coase (1937) mentions the use of secretary services. However, in an amendment to his original paper Coase (1991) remarks that a full firm-type relationship 'will not come about unless several such [incomplete] contracts are made with people and for things which cooperate with one another' (ibid: 64). This amendment implies that costs of re-contracting across markets also increase when economic activities are characterized by strong degrees of interdependencies (Thompson, 1967).

Firms emerge as a substitute to contractual renegotiation as managerial directions substitute for the use of the price mechanism. An activity will be performed internally in a firm if the costs associated with doing so are lower than the costs of using the market, and the overall outcome of this trade-off result in an optimal division of labor between firms and markets (Slater, 2003).

The cost of using firm organization is of a different nature than the costs of using markets. Within firms costs of using managerial direction stems mainly from the 'increasing opportunity costs due to the failure of entrepreneurs to make the best use of the factor of production' (Coase, 1937: 23). For example, Coase (1937) argued that the cost of using managerial direction increase 'with an increase in the spatial distribution of transactions organized, in the dissimilarity of the transactions, and in the probability of changes in the relevant prices' (ibid: 25). Finally, Coase also mentions that changes in relevant prices increase the costs of internal organizations. It is unclear how changes in relevant market prices influence the costs of internal organization. However, if an economy experiences changes in relative prices managers may have to form new judgments on what are the best (non-priced) uses of the particular labor services and inputs over which they hold managerial discretion. Thus, changes in relative prices increase the risk of making managerial mistakes. Managers, in other words, have limited capacity to 'discover the relevant prices' and these limitations are challenged as they have to deal with change and diversity in activities (cf. also Penrose, 1959; Richardson, 1972).

Coase's framework is very general and it is difficult to specify and measure the costs associated with using either markets or firm organization. Williamson (1975, 1985) and others have extended Coase's insights into a more specific theory of transaction costs that are easier to operationalize.

2.1.2 The Transaction Cost Perspective

Williamson (1975, 1985) laid the foundation for the 'transaction costs branch' of economic organization. According to Williamson, markets fail to produce the proper incentives for investments when economic agents face a combination of uncertainty and high asset specificity in their investments. The transaction cost perspective rests on two fundamental behavioral assumptions, namely the bounded rationality- and opportunistic behavior of economic actors (Williamson, 1985). Bounded rationality means that economic agents are

intentionally rational, but due to imperfect information and limited cognitive capacity, they are not able to make perfectly rational choices. Therefore, agents cannot predict the future even if they have access to all available information, and they can make mistakes. However, agents are aware of their own limitations, and this will influence their actions and choices. Opportunism, on the other hand, is defined by Williamson as "self-interest with guile", implying that economic agents are willing to cheat and break contracts if it is in their interest to do so.

Transactions differ with regard to; the degree of asset specificity (assets that have a lower value outside- than in the transaction); level of uncertainty; and frequency. The efficient organization of a transaction is determined by these three characteristics. The level of asset specificity positively influence vertical integration as the quasi rents on the investment will be lost if the transaction is terminated. Uncertainty, affects vertical integration decisions by making contracts incomplete as tools for adapting to environmental changes that influence the value creation in the transaction. The kind of environmental uncertainty that causes contracts to be incomplete is not very clearly spelled out in the work of Williamson but he does argue that environment uncertainty makes sequential adaptation of the contractual relation economically efficient. Such adaptation may give rise to contractual disputes, which ultimately will have to be settled by courts. Court settlements of disputes may not be efficient as bounded rationality apply not just to contractual partners, but also to courts. For example, courts may be unaware of the exact reasons why either of the parties to a transaction may want changes to be made in contracts. Thus, courts may allow contrived cancelation of contracts. This is particular important when courts are dealing with disputes involving transaction- specific investments as it makes a hold-up of the firm that has made the transaction specific investment possible (e.g. Masten, 1991; Vandenberghe & Siegers, 2000; Williamson, 1985).

Within firms the exercise of managerial discretion substitutes dispute resolution by courts. In fact, Williamson (1996: 27) describes a firm as 'its own court of ultimate appeal' and perceives the firm as a governance structure that is supported by a legal frame of employment law and forbearance (Masten, 1991). Similar to Coase (1937) Williamson also compare the cost of market transaction with the cost of internal organization but he stresses that the costs of internal organization mainly arise from lack of proper incentives. Thus, firm governance is limited by rising agency costs and by 'the impossibility of selective intervention' (Williamson, 1985). The impossibility of selective intervention refers to the idea that

managers cannot commit to intervene in decentralized decisions where the intervention is for the benefit to the entire organization (Williamson, 1985). Thus, managers intervene for private interests or on behalf of units that use their specific information and position to influence managers' decisions (Foss, Foss, & Vázquez, 2006).

Holding cost of internal organization constant across all type of transactions, the transaction cost perspective predicts that vertical integration increase with increased uncertainty, higher degrees of asset specificity and higher levels of frequency. Frequency relates positively to the decision to vertically integrate as the fixed costs of setting up a firm governance structure for the transaction is spread over more transactions.

2.2 Firm Boundaries and Recessions

There are two important ways in which crises impact on firm boundaries. One is through changes in demand for firms' products and services and the other is through capital market imperfections that reduce access to or increase cost of credit. In the following, we derive hypothesis regarding the impact of these two factors on firms' decisions to change their boundaries by in-or outsource activities.

2.2.1 The Impact of Reductions in Demand on Firms' Boundary Decisions.

Reductions in demand leave firms with two options. Either they can keep their (now inefficient) level of capacity and wait until the demand adjusts back to 'normal levels' or they can alter their capacity according to the new level of demand. The latter includes the option of outsourcing some of the activities to suppliers and let the supplier be a buffer for changes in demand.

The effect of reduction in demand is not explicitly treated in the works of either Coase or Williamson. However, both theories provide some insights into how firm boundary choices are influenced by *in*creases in demand. In such a setting the (increased number) of transactions that the firm must undertake to service a growing demand may raises cost of market renegotiations (Coase, 1937), as well as raise transaction frequency above threshold levels to be internalized in the firm (Williamson, 1985). We may thus expect reduction in demand to negatively mirror the changes we expect from increases in demand. However, the growth and decline of firm boundaries need not be symmetric processes as expansion entails

sunk cost investments in physical assets and knowledge. Nevertheless, we can gain some insights to firms' reaction to decreasing demand by examining what types of transactions firms are likely to internalize during their path of expansion.

In the Coasian perspective, substituting many market transactions with managerial direction reduce cost of renegotiation contracts (Coase, 1991; Foss, 2010) and firms expand their boundaries as increased demand increases their need for re-contracting for labor and other type input increases. However, we should expect firms to first internalize those transactions where adaptations of contracts are anticipated and where the cost of making these adaptations across markets are the most costly. This point to the internalization of transaction among input factors that are characterized by strong interdependencies. Moreover, in order for firms to ensure low cost of coordination, managers must have a cognitive capacity based e.g. on relevant experience and expertise. Thus, coordination of strongly interdependent transactions, which require similar kind of experience, should be the core of the firm's activities. Firms keep expanding their boundaries until the marginal cost of doing so exceed the marginal benefits. As demand grows firms may engage in an increasing number of transactions for inputs, which are not strongly interdependent with the core activities. For example, firms with core activities in production of goods may internalize the running of a cantina to reduce cost of re-contracting for this type of services. When demand decline we should expect firms to first out-source the marginal transactions. These transactions would be those that are not within the core of the firm's activities and which at high levels of re-contracting are only marginally less costly to coordinate within the boundary of the firm. In sum, we should expect firms to adapt their boundaries to decrease in demand by primarily outsourcing non-core activities.

The transaction cost perspective also explains firm growth as partly related to the level of frequency of transactions. For transaction frequencies above a threshold level firms should internalize all transactions that are characterized by high levels of asset specificity to avoid the potential hold-up problems. In a market of growing demand more and more different type of transactions may reach the threshold level were internalization becomes an attractive alternative to market transactions. With growing demand we should expect firms to increasingly internalize transactions characterized by medium or even low level of asset specificity. When demand decline and the frequency of transactions are reduced, vertically integrated transactions with medium or low levels of asset specificity becomes too expensive to sustain within the boundary of a firm. Thus, we should expect firms to adapt their

boundaries to decreases in demand by primary out-sourcing the non-core activities (transaction with low level of asset specificity) as these transactions may then fall below the threshold. Based on the above discussion, we therefore suggest the following hypothesis:

H1: Reductions in demand are positively related to outsourcing of non-core activities.

For transactions involving higher levels of asset specificity and/or high level of complementarity among transactions, the theoretical predictions regarding reductions in demand are less clear. These (core) transactions are less likely to be affected by changes in the frequency of transactions. Instead both the Coasian and transaction cost perspective indicate that changes in the level of uncertainty influence how such (core) transactions are organized. Both perspectives emphasize that environmental uncertainty makes contracts incomplete introducing a need for sequential adaptation of transactions. Thus, increases in the level of uncertainty (all else equal) may make more transactions fall within the category of core-transactions. In accordance with both the Coasian perspective and the transaction cost perspective, we should expect firms to internalize more transactions as uncertainty increase. Neither the Coasian nor the transaction cost perspective explicitly discusses the kind of environmental uncertainty that may cause firms to internalize transactions. However, a sudden decrease in demand along with the uncertainty surrounding the emergence of a new equilibrium of demand may cause firms to expect more adaptation of transactions. For core-type transaction characterized by interdependencies or asset specificity adaptations may be less costly within firm boundaries.

In the transaction cost perspective uncertainty also has a behavioral component, which stems from the inclination of economic actors to act opportunistically. Also, behavioral uncertainty may increase with reductions in demand because the structure of supplier and buyer markets may change as more firms go bankrupt during recessions. Thus, some firms that have high sunk cost investments may all of a sudden find themselves in a small number bargaining situation. This is a setting that increase proclivity of suppliers or buyers to act opportunistic and hold up the firm (Klein, Crawford, & Alchian, 1978).

Thus far we have argued that both the Coasian and the transaction cost perspective predicts that decreases in demand (giving rise to higher uncertainty) increases firms incentives to integrate vertically, but it is not given that the firms will actually do so. Williamson (1986)

argues that firms face two different solutions to situations with increased behavioral- or environmental uncertainty. Firstly, they can integrate vertically by increasing governance efforts related to the transaction, or secondly, they can start using market governance by sacrificing specificity in favor of more standardized investments. Which one of these responses firms will choose is difficult to predict. This is also reflected in the ambiguous findings in the literature related to the effect of uncertainty on firms' boundary decisions.

In a literature review, David and Han (2004) found that the empirical evidence regarding the effect of uncertainty on firms' boundary decisions was inconsistent as there was almost as much evidence of uncertainty causing less integration as there was empirical evidence suggesting the opposite relationship predicted by transaction cost economics. Shelanski and Klein (1995) suggest that this inconsistency can be explained by "confusion" in the treatment of uncertainty as a factor that raises transaction costs. Several studies, they write, treat uncertainty as an independent variable without including measures of asset specificity. Doing so may give misleading results as uncertainty only affects transactions with a significant presence of relation specific investments (Williamson, 1985). Another possible explanation could be that firms' in some situations prefer to sacrifice specificity and use market governance. However, even though the empirical evidence of whether or not firms actually integrate vertically as a response to increased uncertainty is somewhat ambiguous, it seems clear that the reductions in demand will positively influence firms' incentives to take actions regarding the governance of its core-activities, either in the form of increased vertical integration or by sacrificing specificity and increase their outsourcing. Thus, it follows that recessions are positively related to both out- and insourcing decisions, which makes us suggest the following hypotheses:

H2: Reductions in demand is positively related to outsourcing of core activities.

H3: Reductions in demand is positively related to insourcing of core activities.

2.2.2 The effect of a decrease in access to credit on firm boundaries.

The other major characteristic of an economic crisis is the shortage of risk willing capital. The shortage of capital is in fact a decrease in the supply of capital for financing transactions (credits) and investments leading to higher costs of carrying out transactions and investments.

Again, we find no explicit treatments in either Coasian, or in the transaction cost perspective of how cost of financing transactions influence firms' boundary choice. The implicit assumption seems to be that if a transaction is efficient it will be financed and the cost of financing it is independent of whether it is internalized or conducted across markets. However, in both perspectives we find that the explanatory variables can be influenced by the cost of financing transactions allowing for an indirect influence on firm boundary choice.

Starting with non-core activities, we expect that an increase in cost of short-term credit increase the cost of carrying out those transactions where such credits are important. As the average total cost of a transaction increase we should expect fewer transactions to be carried out. This effect, we expect, does not differ depending on the transaction being carried out within a firm or across a market. Thus, there is no theoretical reason why problems of accessing credit should affect the decision to in- or out-source non-core activities. We will, on the other hand, expect that the in- and outsourcing decisions related to transactions characterized as core activities are affected by higher costs of finance.

The transaction cost perspective directs attention to the influence that cost of finance has on the choice between transaction specific investments and general type investments. The cost of finance increase with increasing riskiness of investments and this is true for internalized as well as for market transactions. However, transactions involving specific assets are considered to be more risky than general type investments and perhaps even more so during an economic crisis (when environmental and behavioral uncertainty increase). The implication is that transaction specific investments become relatively more costly compared to general type investments that may turn the latter in to inefficient investments and make more transactions market based. Now, while these argument seems to effect only those firms that are about to make new investments, they may in fact also have an impact on firms that have already invested in transaction specific assets as these investments may also become inefficient with rising cost of re-financing the investment. Thus, some firms may decide to write-off the loss from the sunk cost investment and invest in the general type asset.

The Coasian (1937, 1991) perspective directs attention to the influence that cost of finance has on the cost of making managerial mistakes. According to Coase (1937), the cost of organizing transactions within the boundary of a firm increase with increasing managerial mistake, and making the wrong (inefficient) investment is one of the possible mistakes that managers can make. When cost of finance increase, it increases the cost of managerial

mistakes.[2] Increased cost of managerial mistakes change the point where the marginal benefits exceed the marginal cost of internalizing transactions. The implication is that a reduction in access to credit is positively related to outsourcing of core activities for firms. Thus, we suggest the following hypothesis:

H4: Reductions in access to credit is positively related outsourcing of core activities

As with reductions in demand, there are theoretical arguments implying that a reduction in access to credit also may work in the opposite direction by being positively related to in-sourcing of core activities. Based on the Coasian perspective we can argue that managers' ability to assess the efficiency of an investment depend on their firm specific experience. In particular, managers may have informational advantages compared to outside agents that stem from their experience with the core-activities of their firms (experience that is unique to the core activities of the particular firm) (Foss, 2010). The implication is that for core firm activities managers are more likely to decide on the efficient investments compared to outside agents. Thus, relying on market transaction may sometimes imply forgoing efficient investments as outside agents are unable to fully assess the cost and benefits of these investments. With an increase in the cost of finance managers' informational advantage become more important as many efficient investments in firm core activities will only be undertaken if the transaction internalized. Based on these arguments we suggest the following hypothesis:

H5: Reductions in access to credit is positively related to insourcing of core activities

2.2.3 Interaction effects of reductions in demand- and access to credit.

Building on the above argumentation, the effect of reductions in demand and in access to credits are somewhat ambiguous as firms can respond either by integrating vertically or by outsourcing an activity to the market. Reduction in demand and increased cost of finance both pull investment from transaction specific to more general type investments thus reinforcing one another in causing firms to outsource. However, reduction in demand and

[2] For example, Stiglitz and Weiss (1981) argue that higher interest rates may induce investors to undertake more risky projects as they do carry all the risk of failure. Our argument is different as it relies on the uncertainty that managers face with respect to assessing the payoff from investment projects. Holding the portfolio of investment project constant, higher cost of finance implies that investment failures become more costly to the firm.

increased cost of finance also reinforce one another in causing firms to insource activities. That is decrease in demand increase environmental and behavioral uncertainty thus puling toward insourcing of activities. Increased cost of finance may increase the importance of market imperfections in capital market and likewise pull toward more insourcing of activities.

However, reduction in access to capital may also increase cost of finance to the extent where efficient investment cannot be financed. Thus, while it may be efficient for a firm to respond to reductions in demand by insourcing an activity, it needs to finance the vertical integration either internally or externally. So, while the incentives to vertically integrate may be strong the ability to do so depends on firms' access to capital that can finance the integration. More specifically, a reduction in access to credit should negatively moderate the effect of reduced demand on insourcing of core activities. Based on the above argumentation, we therefore suggest the following hypothesis:

> *H6: There is a negative interaction effect between reductions in demand and –access to credit on insourcing of core activities*

3. Data and Methods

3.1 Data and Sample

The recent financial crisis and subsequent recession was weaker in Norway than in other western economies, but substantial enough to constitute a sharp treatment effect on the Norwegian firms. Between 2007 and 2009, GDP growth in Norway dropped from 2.7 to -1.5 per cent, growth in gross capital investments dropped from 16.1 to -7 per cent in 2009 and the number of bankruptcies increased with 106 percent (StatisticsNorway, 2010). According to Meyer (Meyer, 1995:151), "[…] good natural experiments are studies in which there is a transparent exogenous source of variation in the explanatory variables that determine the treatment assignment". The fact that the financial crisis of 2008 did not originate in Norway increases the exogenous dimension of the shock on Norwegian firms and thus makes it an appropriate empirical setting for our research question.

3.1.1 Data

To study the effect of changes in demand and access to credit on firms' boundary decisions, we combined data from an extensive questionnaire about the effects of the recent financial crisis on Norwegian firms with publicly available secondary financial data. The questionnaire was constructed based on a literature review and went through a number of revision rounds before a complete draft was tested on 12 CEOs to make sure that the questions were clearly phrased and to avoid ambiguities. The final questionnaire was divided into three sections. The first section focused on issues regarding the pre-crisis period, the second on how firms were affected by the recession and how they responded to it, while the third focused on firms' expectations for the future.

3.1.2 Sample

We excluded a number of firms and industries from our sample frame to make the empirical setting as representative as possible of the population of Norwegian firms. Cut off limits were set on the basis of 2007 data, the year before the crisis, and included the following. First, we removed firms with an annual turnover lower than NOK 10 million (approximately $ 1.7 million) to avoid very small firms to dominate the sample and to exclude holding and real estate firms with no day-to-day operations. Second, we removed firms with labor and social expenses lower than NOK 3 million (approximately $ 0.5 million) to ensure that the firms at least had a few employees. Setting a limit on number of employees would be preferable, but unfortunately not possible as the employee variable in the registry data was incomplete. Third, we excluded all state owned firms, as these are less likely to be motivated by profits, and fifth, we removed a total of 13 two-digit NACE-industries that were believed to disturb the generality of the sample. Industries from the finance and insurance sector were removed as their financial reporting tends to differ from that of other firms, while the agriculture, health and culture sectors were removed as their close connections to the public sector make them less likely to experience normal market forces or to be motivated by profits. This left us with the total sample frame of 17.312 firms from which 5000 firms were randomly selected to receive the questionnaire. The survey was distributed to the CEO of these firms in November 2010, with two reminders being sent out in December 2010. The data collection was completed at the end of January 2011 with a total of 1248 usable responses, yielding a response rate of 25 %. However, due to missing data on one or more of the variables used in this study reduced the effective sample to 1130 respondents.

3.1.3 Data concerns

A number of potential biases are present when using survey data. First, we may have respondent biases, e.g. that the firms that answered the survey are different from the firms that did not answer it. To investigate if this was the case, we used register data to check if the firms that responded differ from the sample of 5000 firms that received the questionnaire. Differences were checked on a number of variables, including size, pre-crisis growth, pre-crisis debt ratio, pre-crisis profitability, pre-crisis total assets, geography, industry, ownership, age and legal form. We found no indications of any respondent biases. Second, as our survey data is retrospective, an obvious concern is biases associated with the accuracy of the memory of the respondents. Unfortunately, there is no way we can check for such biases but as the questionnaire was sent out relatively close up to the recession, we have, hopefully, minimized this problem. Further, it seems little likely that memory biases are distributed across firms in any systematic way, which implies that potential biases will appear in our data as random sources of error. Also, outsourcing/insourcing activities are decisions so considerable for a firm that the likelihood of the CEOs to remember that they have done so should be very high. Third, our data is also vulnerable to single respondent biases as there was only one respondent in each firm, the CEO. This is problematic if there are any systematic biases of CEOs' responses, such as self-serving bias where poor performance is blamed on the recession. But again, the uncontroversial nature of in/outsourcing decisions makes this less of a problem. Fourth, our data is also vulnerable to survivor biases as the survey was distributed only to surviving firms and not to the firms that disappeared during the recession. The most vulnerable and adversely hit firms are therefore underrepresented in our data.

3.2 Variables and Measurement Development

3.2.1 Dependent variables

We had three dependent variables measuring actions related to changes in firm boundaries, namely *outsourcing of core activities* (OUT_CORE), *outsourcing of non-core activities* (OUT_NCORE) and *insourcing of core activities* (IN_CORE). All three are binary, and were constructed based on the following questions in the questionnaire: "Have the crisis made your firm change which activities that are performed within the firm (insourcing and outsourcing?

If yes, please specify". Then the firms could choose between the categories "Outsourced production activities", "Outsourced administrative/ support activities", "Insourced production activities (that used to be bought in the market)" and "insourced administrative/ support activities (that used to be bought in the market)". To each of these four questions, respondents could choose between the three categories "Yes, within the firms core activities", "Yes, outside the firm's core activities" and "No". The firms that answered yes to one or both of the two questions regarding outsourcing where given the value 1 for the two variables OUT_CORE and OUT_NCORE respectively, while the others were given the value zero. Similarly, firms that answered, "yes, within core activities" to one or two of the questions regarding insourcing were given the value 1 for the variable IN_CORE.

Our three dependent variables make no distinctions between different types of activities other than whether the firms themselves regard them as core to the firms operations or not. This leaves us with an empirical definition of outsourcing as the act of moving hitherto firm-internal economic activities outside the boundaries of that firm and in-sourcing as the act of moving economic activities conducted across markets within the boundary of a firm. This is a very general definition that only leaves out boundary changes that follow from decisions to expand or reduce the scale of existing capacity. Frequency tables for the three dependent variables are presented in table 1.

[INSERT TABLE 1 HERE]

3.2.2 Independent variables

We had two independent variables, *changes in access to credit* and *changes in demand*, of which both where based on questions from on the questionnaire. *Changes in access to credit* was based on a question where the respondents rated how their access to credit were affected by the crisis on a scale from -3 (reduced) to + 3 (increased) with 0 indicating no change. The scale was then reversed so the higher value of the variable, the more reductions in access to credit the firm experienced. *Changes in demand* were constructed by summing up two items from the survey on how the crisis had affected the demand for the firms' products and services and how it had affected their capacity utilization. The two scales ranged from -3 (reduced) to +3 (increased) with 0 indicating no change. The two items was then summed up and reversed so that the higher value of the variable, the more reductions in demand a firm

experienced. To avoid multicollinearity problems when testing interaction effects, both variables were mean centered (Cohen, Cohen, West, & Aiken, 2003).

3.2.3 Control variables

As control variables, we included five pre-recession firm- and industry characteristics. *Firm profits* and *firm leverage* are measured as the industry adjusted operating profits and debt-to-total assets in 2007[3]. To avoid extreme values on the firm profits variable to interfere with our results, this measure were trimmed by excluding firms with profits larger than +/- two standard deviations from the mean. This operation excluded a total of 40 firms. All analyses where conducted both with and without this operation, and it had no substantial effects on the results other than improving model fit and the statistical significance of the firm profit variable. *Firm size* is measured as the natural logarithm of number of employees in 2007, and was collected from the questionnaire. Further, we included two controls on vertical bargaining power. These were each based on a seven point likert scale items from the survey where firms evaluated the degree to which their customers- and providers could influence terms and conditions such as prices, delivery, terms of payment etc.

The means, standard deviations and correlations of all independent variables are shown in table 2 below.

[INSERT TABLE 2 HERE]

3.3 Statistical Approach

Given the dichotomous nature of our dependent variables, we use binary logistic regressions to test our hypotheses. The general model is the following:

(1) Logit Y = α + β1 Reductions in demand + β2 Reductions in access to credit + β3- β 7 Controls + ε

Logit Y is the natural logarithm of the odds that a firm actually has insourced/outsourced activities:

[3] 2-digit NACE codes were used

(2) $\ln [p(Y = 1) / (1 - p(Y = 1)]$

We test the interaction effect predicted by hypotheses 6 by including an interaction term between reductions in demand and –access to credit in equation 1. To further investigate the interaction effect, we test conditional effects of the focal predictor at values of a moderator variable using Hayes and Matthes' (2009) modprobe macro for SPSS. This method allows for using both a pick-a-point approach (Aiken & West, 1991; Cohen et al., 2003) and the Johnsen Neyman technique (Johnson & Fay, 1950) to test conditional effects. The pick-a-point approach involves selecting different values of the focal predictor (e.g. high, low and moderate) and we use this method to generate data for graphical visualization of the interaction. We use the Johnson-Neyman technique to estimate regions of statistical significance for the interaction effects.

4. Results

We ran three different logistic regressions models with each of the three dependent variables, one only including the controls (model A), one including the controls and independent variables (model B) and one which also included an interaction term between the independent variables (Model C).

First we used *outsourcing of non-core activities* (OUT_NCORE) as the dependent variable. Model 1a consists of the five control variables and a constant, and the model significant on a 0.05 level with a chi-square value of 11.988 and a pseudo R^2 of 0.031. Model 1b adds the two independent variables to the equation, and is significant on a 0.01 level with a Chi-square value of 20.116 and a pseudo R^2 of 0,052. H1 predicted that reductions in demand would be positively related to outsourcing of non-core activities. From the results we see that the coefficient is positive, but marginally insignificant on a 0.05 level (P-value=0.051). H1 is thus only partially supported. Also, we see that reductions in access to credit do not have any significant effect on the outsourcing of non-core activities, which is just what we expected.

Next, we used *outsourcing of core activities* (OUT_CORE) as the dependent variable. Model 2a consists of the five control variables and a constant, and is significant on a 0.01 level with a Chi-square value of 20.682 and a pseudo R^2 of 0.055. Model 2b adds the two independent variables to the equation, and is significant on a 0.01 level with a Chi-square value of 46.146

and a pseudo R^2 of 0,121. H2 and H4 predicted that reductions in demand and reductions in access to credit would both be positively related to outsourcing of core activities. We see that the two coefficients are indeed positive and significant on a 0.01 level, which makes us conclude that H2 and H4 are supported.

Then, we use *insourcing of core activities* (IN_CORE) as the dependent variable. Similar to above, Model 3a consists of the five control variables and a constant, and is significant on a 0.05 level with a Chi-square value of 14.029 and a pseudo R^2 of 0.043. Model 3b adds the two independent variables to the equation and the model is statistically significant on a 0.01 level with a Chi-square value of 29.048 and a pseudo R^2 of 0,089. H3 and H5 predicted that reductions in demand and reductions in access to credit both would be positively related to outsourcing of core activities, which is exactly what we find. Both coefficients are positive and significant on a 0.05 level, and we conclude that H3 and H5 are supported.

Model 3c adds an interaction term between the two independent variables and the model is statistically significant on a 0.01 level with a Chi-square value of 32.977 and a pseudo R^2 of 0,101. H7 predicted that there would be a negative interaction between reductions in demand and reductions in access to credit on insourcing of core activities. The interaction term is indeed negative and statistically significant on a 0.05 level, and its inclusion in the model added explanatory power to model by increasing the pseudo R^2 from 0.091 to 0.101. These findings indicate that H6 is supported. Further, the two main effects are also statistically significant on a 0.01 level, indicating that both of the variables have a statistically significant effect on the probability that a firm will insource core activities when the other has the value of zero.

[INSERT TABLE 3 HERE]

To further investigate the interaction term, we test for conditional effects of the focal predictor (reductions in demand) for different values of the moderator (reductions in access to credit). First we use a pick-a-point approach to visualize the interaction graphically (Figure 1). For illustrative purposes, we pick values for the “highest”, “lowest” and “no-change” categories

of the reductions-in-access-to-credit-variable and then plot the conditional effects of changes in demand on the probability of insourcing[4].

[INSERT FIGURE 1 HERE]

From figure 1 we clearly see the negative moderation effect of access to credit on reductions in demand. For higher levels of problems accessing credit, the effect of reductions in demand on the probability of insourcing becomes smaller. The next step is to investigate the regions of significance for the interaction effect. Table 4 shows that of the three values of access to credit plotted in figure one, only the lowest and the medium categories are statistical significant. Table 5 shows a Johnson-Neyman estimation of regions of significance, and from the table we see that the moderation is statistical significant for values of access to credit in the interval [-3.3, 0.9], while it is not statistically significant for the highest problems accessing credit. The upper limit of statistical significance, 0.9, is equivalent to a value of 5.2 without the mean centering (1-7 scale). It is somewhat surprising that the interaction term is not statistical significant for the highest levels of reductions in access to credit. However, as the effect is statistical significant for moderate levels of problems accessing credit, we maintain the conclusion that hypothesis 6 is supported.

[INSERT TABLES 4 AND 5 HERE]

Finally, we inspected residual diagnostics and tested the assumptions underlying logistic regression to assess the quality of our models. To look for cases with poor model fit we investigated the studentized- and standardized residuals, and to check whether any cases had a very large influence on our models we inspected influence statistics such as the Cook's distance and Leverage. Further, we tested for the linearity of the logit and multicollinearity. None of these inspections yielded any reasons for concern regarding our models.

5. Discussion and Conclusion

We used a dataset combining primary survey data with secondary financial data for a sample of 1.130 Norwegian firms to investigate how reductions in demand and -in access to credit

[4] The category-values of the access to credit variable shown in figure 1 deviates from the 1-7 likert scale values described in the methods section because we mean centered them before estimating the conditional effects. The values -.3.3, -0.3 and 2,7 are thus the equivalent to 1 (increased access to credit), 4 (no change in access to credit) and 7 (reduced access to credit), respectively.

affect in- and outsourcing of core/non-core activities. To test our hypotheses we applied a series of logistic regressions.

Our first set of hypotheses was related to how reductions in demand affect out- and insourcing. First, we tested how it affected outsourcing of non-core activities, and found a positive and almost statistically significant relationship (p-value of 0,051). Hypothesis one was thus only partially confirmed. The hypothesis was based on two different arguments derived from the Coasian and the transaction cost perspective respectively. Our results are in congruence with both of the theoretical arguments, but unfortunately they do not allow us to make a clear distinction between which of the causes are at work.

Second, we tested hypothesis two and three on how reductions in demand affected outsourcing and insourcing of core activities. We found positive and significant relationships regarding both hypotheses. The theoretical reasoning behind these two hypotheses was that reductions in demand increase uncertainty (behavioral, environmental or both), and that this again affects firms' incentives to take actions regarding which activities they perform within their boundaries. While the Coasian perspective only indicates that firms tend to insource more as uncertainty increase the transaction cost perspective indicated firms may both in or out-source activities. Thus, our findings of reductions in demand being positively related to both in- and outsourcing are in congruence with Williamson's (1986) proposition that firms can respond to uncertainty by either integrating vertically or by sacrificing specificity in favor of more standardized goods and services.

Our second set of hypotheses stated how increases in cost of finance affect in- and outsourcing. We found no statistically significant relationship between reductions in access to credit and outsourcing of non-core activities, which was just as expected. Regarding core activities, we hypothesized that reductions in access to credit should be positively related to both outsourcing and insourcing of activities, which was also what we found.

The theoretical reasoning behind the effect of reduced access to credit on outsourcing can be found in the work of both Williamson and Coase. The transaction cost perspective points to increased riskiness of transaction specific investments as a reason why firms undertake more general type investments and outsource activities. The Coasian perspective directs attention of the increased cost of investment failures within the boundaries of the firm as a reason to expect out sourcing. At the same time one can also expect market agents to face decreasing incentives to undertake investments in transactions that support firm core activities. The

reason for this is that they too have higher cost of making mistakes and that they are more likely to make such mistakes compared to managers with insight knowledge. Our findings of reduced access to credit having a positive effect on the probability that firms insource core activities are in line with both arguments, but again we cannot say which is more relevant.

Our last interest was in the interaction effect of reductions in demand- and access to credit on insourcing on core activities. Here we hypothesized that reductions in demand would increase firms' incentives to vertically integrate core activities, but that the relationship would be moderated by reductions in access to credit. So, if a firm experience reductions in access to credit in addition to reductions in demand, this should hinder its ability to vertically integrate. Hypothesis six was confirmed, although the interaction effect was not statistical significant for the highest levels of reductions in access to credit. The negative interaction effect is an interesting finding as it may shed lights on the somewhat ambiguous theoretical predictions of whether firms respond to reduced demand by integrating vertically or by sacrificing specificity and outsource an activity to the market. Firms' access to credit may therefore be a factor that determines which one of the two options that are chosen. So while the incentives to vertically integrate is increased due to the increased uncertainty accompanied by reductions in demand, the ability to do so depends on the firms access to credit to finance the integration. It would have been preferable to have alternative measures of access to credit to further investigate the interaction effect. One such measure could have been to combine pre-recession debt-levels with survey questions related to if firms changed their sources of finance during the recession, but unfortunately such questions were not included in the survey. Anyhow, our subjective measure of "access to credit" is a more direct measure of reduced access to external finance than pre- or in-recession levels of debt captured from accounting data, as it directly captures problems accessing capital for investments firms want to pursue and not only investments already undertaken.

The findings outlined above have several theoretical implications. First, as advocated by Foss (2010) they emphasize that more focus should be given towards studying how radical changes on macro levels, such as recessions, affect firms' boundary decisions. Second, several of the findings highlight the importance of access to finance when studying changes in firm boundaries. The negative interaction effect between demand- and credit problems on insourcing of core activities indicate that financing issues may influence firms' boundary decisions under periods of increased uncertainty. Future research should, however, go more in detail on the mechanisms at play regarding how demand- and credit problems affect firms'

in- and outsourcing, and also look further into the role of access to finance as a moderator of demand problems on firms' boundary decisions. The latter should be studied in more detail both in "normal times" and in times of severe recessions to investigate how the relationships might change depending on the stability of the business environment.

Acknowledgments

We gratefully acknowledge the "Crisis, Restructuring and Growth"-project at SNF and NHH for financial support, and Lasse B. Lien for valuable comments on earlier drafts of this paper. We also want to thank participants at the 16th Annual Conference of The International Society for New Institutional Economics (ISNIE) at University of Southern California, June 14 – 16, 2012. All errors remain our own.

References

Aiken, L. S., & West, S. G. 1991. ***Multiple regression: testing and interpreting interactions***. Newbury Park, CA: Sage.

Coase, R. H. 1937. The Nature of the firm. In N. J. Foss (Ed.), ***The Theory of the Firm: Critical perspectives in business and management, Vol II***. London: Routledge.

Coase, R. H. 1991. The Nature of the firm: Origin, meaning, influence". In O. E. Williamson, & S. G. Winter (Eds.), ***The Nature of the Firm***. Oxford: Oxford University Press.

Cohen, J., Cohen, p., West, S. G., & Aiken, L. S. 2003. ***Applied multiple regression/ correlation analysis for the behavioral sciences***. Mahwah, N.J.: Lawrence.

David, R. J., & Han, S.-K. 2004. A systematic assessment of the empirical support for transaction cost economics. ***Strategic Management Journal***, 25(1): 39-58.

Foss, K. 2010. How do economic crises impact firm boundaries? ***European Management Review***, 7: 217–227.

Foss, K., Foss, N. J., & Vázquez, X. H. 2006. 'Tying the manager's hands': constraining opportunistic managerial intervention. ***Cambridge Journal of Economics***, 30(5): 797-818.

Grossman, S. J., & Hart, O. D. 1986. The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration. ***Journal of Political Economy***, 94(4): 691-719.

Hart, O. 1991. Incomplete contracts and the theory of the firm. In O. E. Williamson, & S. G. Winter (Eds.), ***The nature of the firm***. Oxford: Oxford University Press.

Hart, O. 1995. ***Firms, contracts, and financial structure***. Oxford: Oxford University Press.

Hart, O., & Moore, J. 1990. Property Rights and the Nature of the Firm. ***Journal of Political Economy***, 98(6): 1119-1158.

Hayes, A., & Matthes, J. 2009. Computational procedures for probing interactions in OLS and logistic regression: SPSS and SAS implementations. ***Behavior Research Methods***, 41(3): 924-936.

Johnson, P., & Fay, L. 1950. The Johnson-Neyman technique, its theory and application. ***Psychometrika***, 15(4): 349-367.

Klein, B. 1986. Vertical Integration as organizational ownership: The Fisher Body-General Motors relationship revisited. ***Journal of Law, Economics and Organization***, 4: 199-213.

Klein, B., Crawford, R. G., & Alchian, A. A. 1978. Vertical Integration, Appropriable Rents, and the Competitive Contracting Process. ***The Journal of Law and Economics***, 21(2): 297.

Masten, S. 1991. "A legal basis for the firm". . In O. E. Williamson, & S. G. Winter (Eds.), ***The nature of the firm: Origins, evolution, and development***. Oxford: Oxford University Press.

Meyer, B. D. 1995. Natural and Quasi-Experiments in Economics. ***Journal of Business & Economic Statistics***, 13(2): 151-161.

Milgrom, P., & Roberts, J. 1995. Complementarities and fit strategy, structure, and organizational change in manufacturing. ***Journal of Accounting and Economics***, 19(2-3): 179-208.

Penrose, E. T. 1959. ***The Theory of the Growth of the Firm***. Oxford Oxford University Press.

Richardson, G. B. 1972. The organization of industry. ***Economic Journal***, 82(327): 883-896.

Shelanski, H. A., & Klein, P. G. 1995. Empirical Research in Transaction Cost Economics: A Review and Assessment. ***Journal of Law, Economics, and Organization***, 11(2): 335-361.

Slater, M. 2003. The Boundary of the Firm In D. O. Faulkner, & D. Campbell (Eds.), ***Oxford Handbook of Strategy***. Oxford: Oxford University Press.

StatisticsNorway. 2010. Statistikkbanken, Vol. 2010.

Stiglitz, J. E., & Weiss, A. 1981. Credit Rationing in Markets with Imperfect Information. ***The American Economic Review***, 71(3): 393-410.

Thompson, J. D. 1967. ***Organizations in action***. New York: McGraw Hill.

Tong, H., & Wei, S.-J. 2008. Real Effects of the Subprime Mortgage Crisis: Is it a Demand or a Finance Shock? ***National Bureau of Economic Research Working Paper Series***, No. 14205.

Vandenberghe, A. S., & Siegers, J. 2000. Employees versus independent contractors for the exchange of labor services: Authority as distinguished characteristics?, ***Paper for the 17th Annual Conference on the European Association of Law and Economics, Gent, 14-16 September***.

Williamson, O. E. 1975. ***Markets and Hierarchies***. New York: Free Press.

Williamson, O. E. 1985. ***The Economic Institutions of Capitalism***. New York Free Press.

Williamson, O. E. 1986. Transaction-Cost Economics: The Governance of Contractual Relations. In O. E. Willamson (Ed.), ***Economic Organization: Firms, Markets and Policy Control***: 101-130. New York New York University Press.

Williamson, O. E. 1991. Comparative economic organization: the analysis of discrete structural alternatives. ***Administrative Science Quarterly*** 36: 269–296.

Williamson, O. E. 1996. ***The mechanisms of governance***. Oxford: Oxford University Press.

Table 1 Frequencies Dependent Variables

	Out_Core		Out_Ncore		In_Core	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
0	1186	95,0	1182	94,7	1199	96,1
1	62	5,0	66	5,3	49	3,9
Total	1248	100,0	1248	100,0	1248	100,0

Table 2 Means, standard deviatons and correlation coefficients of independent variables

	Mean	Std. Deviation	1	2	3	4	5	6	7
1. Firm profits 2007	,014	,069	1						
2. Firm leverage 2007	-,018	,246	-.231***	1					
3. Firm Size	3,232	1,017	-.019	-.017	1				
4. Bargaining power downstream	3,980	1,601	.075***	-.031	-0.077***	1			
5. Bargaining power upstream	4,166	1,446	-..003	-.020	.006	-.188***	1		
6. Reductions in access to credit	4,300	1,031	-.068**	.033	.101***	-.004	.035	1	
7. Reductions in demand	9,635	2,358	.000	-.012	.128***	-.027	.038	.278***	1

***, **, and * represent statistical significance (2-tailed), at the 1, 5, and 10 percent levels respectively.

Table 3 Logistic regression output

Dependent variable	OUT_NCORE		OUT_CORE			IN_CORE		
	Model 1a	*Model 1b*	*Model 2a*	*Model 2b*	*Model 2c*	*Model 3a*	*Model 3b*	*Model 3c*
Independent variables								
Reductions in demand		0.119*		0.204***	0.233***		0.162**	0.227***
		(0.061)		(0.066)	(0.071)		(0.071)	(0.078)
Reductions in access to credit		0.181		0.354***	0.450***		0.328**	0.478***
		(0.125)		(0.122)	(0.145)		(0.136)	(1.148)
Reductions in demand x Reductions credit					-0.056			-0.106**
					(0.051)			(0.052)
Control variables								
Firm profits 2007	-2.657	-2.594	-2.828	-2.523	-2.338	-5.450**	-5.015**	-4.652*
	(2.074)	(2.072)	(2.173)	(2.185)	(2.191)	(2.508)	(2.492)	(2.516)
Firm leverage 2007	0.030	-0.055	0.836	0.784	0.813	0.088	-0.052	-0.033
	(0.707)	(0.737)	(0.658)	(0.716)	(0.724)	(0.756)	(0.833)	(0.849)
Firm size	0.292**	0.234**	0.369***	0.264**	0.269**	0.309**	0.221	0.232*
	(0.116)	(0.119)	(0.116)	(0.121)	(0.121)	(0.136)	(0.140)	(0.139)
Bargaining power downstream	-0.133	-0.128	-0.145	-0.144	-0.152	-0.007	0.011	-0.006
	(0.088)	(0.089)	(0.092)	(0.093)	(0.094)	(0.100)	(0.102)	(0.102)
Bargaining power upstream	-0.099	-0.111	0.153	0.128	0.128	0.214*	0.184	0.183
	(0.095)	(0.095)	(0.101)	(0.102)	(0.102)	(0.113)	(0.113)	(0.114)
Constant	-2.932***	-2.777***	-4.286***	-4.502***	-4.066***	-5.169***	-4.932***	-4.948***
	(0.715)	(0.714)	(0.781)	(0.784)	(0.782)	(0.896)	(0.898)	(0.895)
-2LL	457.044	448.916	430.902	405.438	404.245	364.252	349.234	345.304
Model Chi-square	11.988**	20.116***	20.682***	46.146***	47.339***	14.029**	29.048***	32.977***
Hosmer and Lemeshow Test (P-value)	0.162	0.434	0.644	0.599	0.393	0.526	0.485	0.856
Nagelkerke R2	0.031	0.052	0.055	0.121	0.125	0.043	0.089	0.101

Standard errors in parantheses. ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively. N=1130

Table 4 Conditional Effect of Focal Predictor at Values of the Moderator Variable

Problems accessing credit		b	SE	Z	p-value	LLCI(b)	ULCI(b)	Wald
Reduced	-3,3	0,5765	0,2226	2,5892	0,0096	0,1401	1,0128	6,704
No change	-0,3	0,2593	0,087	2,9797	0,0029	0,0887	0,4298	8,8785
Increased	2,7	-0,0579	0,1219	-0,475	0,6348	-0,2969	0,1811	0,2256

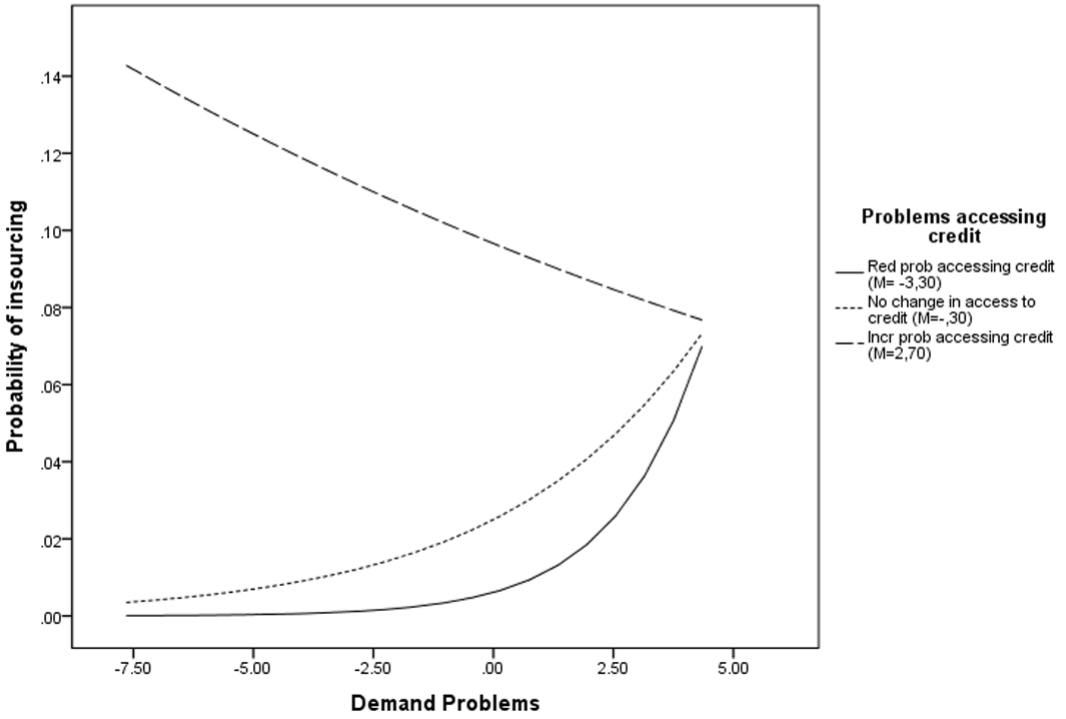
Note: Alpha level used for confidence intervals: 0,5; The focal predictor and moderator were mean centered prior to analysis; 95% CI = Confidence interval; LL = Lower limit; UL = Upper limit

Table 5 Johnson-Neyman method: Conditional Effect of Focal Predictor at Values of the Moderator Variable

Problems accessing credit	b	SE	Z	p-value	LLCI(b)	ULCI(b)	Wald
-3,2965	0,5761	0,2225	2,5896	0,0096	0,1401	1,0121	6,706
-2,9965	0,5444	0,2076	2,6228	0,0087	0,1376	0,9512	6,8791
-2,6965	0,5127	0,1928	2,6594	0,0078	0,1348	0,8905	7,0727
-2,3965	0,4809	0,1781	2,6998	0,0069	0,1318	0,8301	7,2889
-2,0965	0,4492	0,1637	2,744	0,0061	0,1284	0,7701	7,5298
-1,7965	0,4175	0,1495	2,7921	0,0052	0,1244	0,7106	7,7956
-1,4965	0,3858	0,1357	2,8431	0,0045	0,1198	0,6517	8,0832
-1,1965	0,3541	0,1223	2,895	0,0038	0,1144	0,5938	8,3811
-0,8965	0,3223	0,1095	2,9431	0,0032	0,1077	0,537	8,6618
-0,5965	0,2906	0,0976	2,9775	0,0029	0,0993	0,4819	8,8655
-0,2965	0,2589	0,0869	2,9794	0,0029	0,0886	0,4292	8,8769
0,0035	0,2272	0,0779	2,9164	0,0035	0,0745	0,3799	8,5052
0,3035	0,1955	0,0713	2,7428	0,0061	0,0558	0,3351	7,5231
0,6035	0,1637	0,0677	2,4191	0,0156	0,0311	0,2964	5,8522
0,8986	0,1325	0,0676	1,96	0,05	0	0,2651	3,8415
0,9035	0,132	0,0677	1,9514	0,051	-0,0006	0,2646	3,8078
1,2035	0,1003	0,0712	1,4092	0,1588	-0,0392	0,2398	1,9858
1,5035	0,0686	0,0778	0,8819	0,3778	-0,0838	0,221	0,7777
1,8035	0,0369	0,0867	0,425	0,6708	-0,1331	0,2069	0,1806
2,1035	0,0051	0,0974	0,0528	0,9579	-0,1858	0,1961	0,0028
2,4035	-0,0266	0,1093	-0,2431	0,8079	-0,2408	0,1877	0,0591
2,7035	-0,0583	0,1221	-0,4775	0,633	-0,2976	0,181	0,228

Note: Alpha level used for Johnson-Neyman method and confidence intervals: 0,5; The focal predictor and moderator were mean centered prior to analysis. 95% CI = Confidence interval; LL = Lower limit; UL = Upper limit

Figure 1 Predicting probability of insourcing by demand problems moderated by problems accessing credit



PUBLICATIONS WITHIN SNF'S RESEARCH PROGRAMME "CRISIS, RESTRUCTURING AND GROWTH"

2010-

Eirik S. Knudsen Kirsten Foss	*The effect of recessions on firms' boundaries* SNF Working Paper No 04/13
Eirik S. Knudsen Lasse B. Lien	*Investments in Recessions* SNF Working Paper No 03/13
Ann Mari Fjelltveit Ingrid Humlung	*Hvor stabilt er prestasjonsnivået til norske bedrifter under nedgangstider?* *En empirisk studie av effekten av nedgangstidene på 2000-tallet* SNF Working Paper No 45/12
Pernille M. Kvaslerud Nora B. Henriksen	*Konkursprediksjon gjennom ulike konjunkturfaser* *En studie om hvordan en empirisk konkursprediksjons-Modell endrer seg gjennom ulike konjunkturfaser, i tids-Perioden 2001 til 2009* SNF Working Paper No 44/12
Marcus Selart Svein T. Johansen Synnøve Nesse	*Employee evaluation of leader-initiated crisis preparation* SNF Working Paper No 35/12
Eirik S. Knudsen Lasse B. Lien	*Knowledge investments in recessions:* *The effects of demand and credit* SNF Working Paper No 34/12
Per Heum Eva Benedicte Norman Victor D. Norman Linda Orvedal	*Tørrskodd Vestland - Arbeidsmarkedsvirkninger av ferjefritt samband Bergen-Stavanger* SNF Working Paper No 33/12
Geir Drage Berentsen Bård Støve Dag Tjøstheim Tommy Nordbø	*Recognizing and visualizing copulas: an approach using local Gaussian approximation* SNF Working Paper No 12/12
Siri Sollid Robstad Ingvild Almås	*Modernisert men urettferdig folketrygd?* SNF Working Paper No 04/12
Per Heum	*Hvordan vurdere godheten i næringspolitiske virkemidler?* SNF Working Paper No 03/12
Øystein Thøgersen	*Pengepolitikkens evolusjon* SNF Working Paper No 36/11

Guttorm Schjelderup	*Sekretessejurisdiksjoner, korrupsjon og økonomisk kriminalitet* SNF Working Paper No 33/11
Lasse B. Lien Tore Hillestad	*Recession, HR and change* SNF Working Paper No 20/11
Eirik S. Knudsen	*Shadow of trouble: The effect of pre-recession characteristics on the severity of recession impact* SNF Working Paper No 19/11
Bård Støve Dag Tjøstheim Karl Ove Hufthammer	*Using local Gaussian correlation in a nonlinear re-examination of financial contagion* SNF Working Paper No 14/11
Armando J. Garcia Pires Tom Stephan Jensen	*Effects of flat tax reforms on economic growth in the OECD countries* SNF Working Paper No 12/11
Kirsten Foss	*How do economic crises impact firm boundaries?* European Management Review, Vol. 7, No. 4, pp. 217-227, 2010
Kjell G. Nyborg Per Östberg	*Liquidity, ideas and the financial crisis* SNF Working Paper No 17/10
Lasse B. Lien	*Recessions across industries: a survey* SNF Working Paper No 16/10
Ingvild Almås Gernot Doppelhofer Jens Chr. Haatvedt Jan Tore Klovland Krisztina Molnar Øystein Thøgersen	*Crisis, restructuring and growth: A macroeconomic perspective* SNF Report No 05/10

The economic theory of the firm offers conflicting predictions of how the two major effects of recessions, changes in demand and access to credit, affect firm boundaries. Using data on Norwegian firms in the recent recession, we find support for both increased- and reduced vertical integration of core activities in response to such changes. Further, we find that access to credit negatively moderates the effect of reductions in demand on vertical integration. The latter finding may highlight a possible explanation for the conflicting theoretical predictions.

SNF
Et selskap i NHH-miljøet

SAMFUNNS- OG NÆRINGSLIVSFORSKNING AS

Institute for Research in Economics and Business Administration

Breiviksveien 40
N-5045 Bergen
Norway
Phone: (+47) 55 95 95 00
Fax: (+47) 55 95 94 39
E-mail: publikasjon@snf.no
Internet: http://www.snf.no/

Trykk: Allkopi Bergen