



Risk taking at the corporate level: the search for sustainable growth

Gudrun Johnsen

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THÈSE DE DOCTORAT
DE L'UNIVERSITÉ PSL

Préparée à ÉCOLE NORMALE SUPÉRIEURE

**Prise de risque au niveau de l'entreprise: à la recherche
d'une croissance durable**

Soutenue par

Gudrun Johnsen

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með öðrum er hann meir'en hann sjálfur
Og knapinn á hestbaki er kóngur um stund
krónulaus á hann ríki og álfur.
Einar Benediktsson

L'homme seul n'est que la moitié,
avec les autres ils est plus que lui.
Et á cheval, le cavalier est roi pour un moment,
sans le trône, Il possède l'état et le continent.
Einar Benediktsson
(translation by Gudrun Johnsen)

Standing at the end of the road of my formal education, I realize it better than ever, that I would have never made it this far without the companionship, inspiration, encouragement, lift and support of so many that have traveled with me; some for the longer haul, others for the shorter. They are too many to mention in this short acknowledgement, but they include my family, fellow students, former colleagues, co-authors, teachers from elementary school and onwards, good bosses and good friends. The ones that took this last bit of the journey with me to the edge of this road need to be mentioned and thanked to the degree possible with only few words.

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I conclude this journey with the words of Einar Ben (1864-1940), the celebrated Icelandic poet, Francophile and cosmopolitan: “The man, alone, is less than half - with others he is more than himself – On the horseback, the chevalier is a king for a moment - without the crown, he owns the lands and the continents.”

Paris, October 4th 2019

Gudrun Johnsen

Introduction

It is widely recognized that the field of economics got somewhat upended during and after the Great Financial Crisis, as it hit many economists by surprise. Prior to the crisis they were few and far between who warned of the impending catastrophe, but many came up with explanations as to why it happened after the fact. Hilbers, Pazarbasiglou, Otker-Robe and Johnsen (2005), published their research in the working paper series at the IMF in 2005, with the purpose of educating policy makers on how to tame rapid credit growth. That paper used a simple univariate analysis developed by Gourinchas, Valdez and Landerretche (2001) to show how far bank credit to the private sector had deviated from long term trends in Central and Eastern Europe using a benchmark of developed economies growing faster than the OECD average since the 1960s. The paper listed up policy recommendations and actions that needed to take place in at least the 13 countries, that were shown to be close to the peak of their credit cycle, that could burst and lead to a full fledged financial and economic crisis in the relevant countries. Twelve of these countries became customers of the IMF three years later.

One country separated itself from the rest on their list for its severity of credit growth and later the severity of its crisis; i.e. Iceland. A large country with rich natural resources, yet a small population of 330.000, which managed to grow its banking sector to 10 times its annual gross domestic product, over a remarkably short period of time of 5 years, after privatizing its banking sector. At this same time another noteworthy paper came out by an IMF economist and his co-authors Ranciere, Tornell, and Westermann (2005) (published in 2008), which showed that even though a country suffers a severe economic crisis following the liberalization of its financial sector, it will still harvest higher long term economic growth, on average, as a result. Drawing on their work, financial liberalization is a sound economic policy, which will leave the aggregate economy better off, in spite of the risk and the short term sacrifice of a systemic crisis. Looking at the economic history of Iceland, it matches very well with the narrative put forward in Ranciere et al (2008).

Although the long term macro picture is rosy, one has to wonder whether economic policy makers can not do better in their economic management by avoiding the impending crises, following the increased competition among financial institutions. Intergenerational sacrifices and gains will differ greatly if economies are doomed to experience severe financial crises in order to graduate to the class of developed nations. During a financial crisis, idle, educated workforce loses its possibility of wealth building, migration is the only solution for many, leading to brain drain, psychological stress and family conflicts that follow, which are, at the very least, likely to poke holes in the social fabric. The winners are usually those with the deepest pockets before-hand, who can enrich themselves further due to the impending fire-sales taking place. By that, inequality grows with the dangers of social unrest and/or the possible rise of extremist political regimes.

A good crisis shall not be wasted for the purpose of learning, however. This PhD thesis is written for that exact reason, to conclude my own formal education. It is also an attempt to provide additional advice to economic policy makers, so that the strong pull of rapid credit growth towards economic gloom, following increased competition in the financial sector, can be better managed or abated. This is carried with the hope that financial liberalization and economic development can happen without the human suffering that history of the numerous and recent financial crises tells us.

The obvious questions to answer at this stage are among other: During a rapid credit growth episode, how does the demand side of credit look like? How and why is aggregate credit allocated at a rate much faster than economic growth, at any given point in time and in particular following a financial liberalization? Can there be a systemic error in the way we allocate credit? During the run up to a crisis, why do we repeatedly lend money into firms and households in a way that the bulk of the money is never returned, toppling over systemic financial institutions?

The first chapter of this thesis, co-authored with Yu Zheng, is an attempt to answer an important part of these questions. We explore the demand side of credit during and after a rapid credit growth episode. More specifically we explore the credit risk associated with business group lending. In that pursuit, we offer a new perspective on why business groups are formed. Specifically, we ask if additional firms forming the business group are used as a credit enhancement vehicle on the expectation of a government bailout that lowers the group-affiliated firms' cost of capital. Using a quasi-natural experiment, we show that group-affiliated firms paid lower interest when government bailout was expected. But as soon as the bailout expectation was removed, bankers had to write down their assets in the form of credit to group-affiliated firms with greater likelihood, and increase the cost of capital to group-affiliated firms. As risk associated with group affiliated firms is systemically underestimated, it follows that the funding of this type of a financial network carries a negative externality along with it.

We use a novel database gathered by the credit rating agency, CreditInfo, that has collected and archived annual financial statements and ownership data of all registered firm in Iceland, from 2008-2015.

One of the explanations offered as the cause of the Great Financial Crisis was the much publicized comment made by the French finance minister at the time, Christine Lagarde. Her explanation was that the Western world would not have endured this economic calamity had it been Lehman Sisters who reigned the world of finance, alluding to women being more conservative and responsible in their risk taking. This is not a far fetched explanation, since behavioral studies have time and again shown that women tend to be more risk averse than men. So, could that be the solution leading to a more sustainable economic

development: recruiting women to head financial institutions and powerful business enterprises? By that, are we bound to experience a slower economic growth, as women running the firms are more reluctant to take on high level of risk, on average?

Since we have now shown that bankers were systemically underestimating risk associated with business group lending, could it simply be the result of the bankers and business leaders being predominantly male? Can we truly attribute firm outcomes; firm profitability, level of leverage, probability of firm debt default to the gender of the firm leadership?

The second chapter of the thesis, co-authored with Yu Zheng, is aimed at answering that question. It studies the causal relationships between female corporate leadership, risk aversion and profitability, using CreditInfo's annual, firm-level data from Iceland between 2008-2014. We introduce a new measure of firm leadership by focusing on the gender of the firms' majority ownership, which ameliorates the selection problem. Methodologically, we contribute two new instruments: the gender of the first born and the gender ratio of children within a family firm. Contrary to existing studies, our results detect no gender difference in firm leverage, profitability or survival rate. This new result can be attributed to: (1) the Icelandic data that is much more gender-balanced, which greatly ameliorates the usual selection problem; (2) our new instruments improve upon the previous generation's instruments, whose exclusion restrictions are not satisfied with high probability.

The short answer to Lagarde's hypothesis is that we can't be sure that Lehman Sisters would have saved us from the disasters of the financial crisis, on the account that they were women. The follow up question arises: is there a system inside the credit allocating institutions, that specifically encourages excessive risk taking, even recklessness, that leads to wealth being lost and not gained at a massive scale? I look for answers to that question in the third chapter. In spite of the rich literature on how we discipline managers in general, how optimally we induce them to take necessary risks, the literature is plagued by unobservable factors and identification challenges that we as researchers can not easily overcome with the available data. We can however learn from history in this regard. Hence, I turn in the evidence I found by investigating incentive schemes in the failed Icelandic bank. As part of a parliamentary special investigation commission, I was tasked to seek answers to whether causes of the collapse of the Icelandic banks were to be found in the bankers' incentive pay systems. The evidence presented paints a grim picture of business practices and credit allocation inside these banks in the run up to their demise. Although we can not state a causal effect, using parametric estimations, we are not able to escape the conclusions which legal, economic, and accounting evidence obviously shows us, that incentive schemes were partly to blame for in the colossal failure of these Icelandic banks.

This third and final chapter of my thesis describes the executive compensation arrangements at the failed Icelandic banks and how incentive schemes led to misreporting of equity levels, embezzlement of funds of publicly traded companies and massive market manipulation, keeping the promises of the incentives schemes alive for bankers, whilst the investing public was defrauded and financial supervisors derailed with false market signals.

The chapter draws on the data published by the Icelandic Parliament's Special Investigation Commission (SIC, 2010), which showed how compensation schemes evolved over time in the failed institutions using salary and loan book data from 2004-2008, derived from the bankrupt estates. Although the banks' chief executives lost significant wealth, which they had accumulated during their 2-6-year-tenure at the banks through incentive pay, they cashed out significant amounts in salary, bonuses and dividends from stocks that were largely funded by the banks they operated. Intentionally or not, staff were used as a vehicles to falsify equity through the inappropriate hedging of options via off-balance sheet special purpose vehicles and the excessive lending to purchase own stocks, while only pledging the purchased stocks as collateral.

Introduction

Il est largement reconnu que le domaine de l'économie s'est vu quelque peu bouleversé pendant et après la grande crise financière, frappant de nombreux économistes par surprise. Avant la crise, rares étaient ceux qui avertissaient de la catastrophe imminente ; ils furent plus nombreux à expliquer les raisons après les faits. Hilbers, Pazarbasiglou, Otter-Robe et Johnsen (2005) ont publié leurs travaux de recherche dans la série de documents de travail du FMI en 2005, dans le but d'informer les décideurs politiques sur la façon de maîtriser la croissance rapide du crédit. Ce document utilisait une simple analyse à une variable développée par Gourinchas, Valdez et Landerretche (2001), pour montrer à quel point le crédit bancaire au secteur privé s'était écarté des tendances à long terme en Europe centrale et orientale, en utilisant un indicateur des économies développées affichant une croissance supérieure à la moyenne de l'OCDE depuis les années 1960. Le document énumère les recommandations politiques et les actions à mener dans au moins 13 pays, indiquant que si le cycle de crédit atteignait son apogée, cela pourrait éclater et conduire à une crise financière et économique de grande ampleur dans les pays concernés. Une douzaine de ces pays sont devenus clients du FMI trois ans plus tard.

Un pays s'est séparé du reste de sa liste en raison de la gravité de sa croissance du crédit et, plus tard, de la gravité de sa crise ; il s'agit de l'Islande. Grand pays doté de riches ressources naturelles et d'une population de 330 000 habitants, son secteur bancaire a été

porté à 10 fois son produit intérieur brut annuel sur une période remarquablement courte de 5 ans, après la privatisation de son secteur bancaire. À la même époque, un économiste du FMI et ses co-auteurs, Ranciere, Tornell et Westermann (2005) (publié en 2008) ont publié un autre article remarquable qui montrait que même si un pays connaissait une crise économique grave à la suite de la libéralisation de son secteur financier, il en résulterait toujours une croissance économique moyenne supérieure à long terme. Si l'on s'appuie sur leurs travaux, on considérera que la libéralisation financière constitue une politique économique saine, qui améliorera l'économie globale, en dépit du risque et du sacrifice à court terme d'une crise systémique. L'histoire économique de l'Islande va très bien dans le sens de la description de Ranciere et al (2008).

Bien que la situation macroéconomique à long terme semble favorable, il convient de se demander si les responsables des politiques économiques ne peuvent pas améliorer leur gestion économique en évitant les crises imminentes, à la suite de la concurrence accrue entre institutions financières. Les sacrifices et les gains intergénérationnels varieront considérablement si les économies sont condamnées à faire face à de graves et régulières crises financières afin de pouvoir accéder à la catégorie des pays développés. En période de crise financière, une main-d'œuvre inutilisée et éduquée perd sa possibilité de créer de la richesse. La migration est la seule solution pour beaucoup d'entre eux, entraînant une fuite de cerveaux, un stress psychologique et des conflits familiaux qui risquent à tout le moins de faire des trous le tissu social. Les gagnants sont généralement ceux qui ont les poches les plus profondes avant, qui peuvent s'enrichir davantage lors de ventes précipitées ou au rabais. De ce fait, l'inégalité grandit avec les dangers de troubles sociaux et/ou la montée possible de régimes politiques extrémistes.

Une bonne crise ne doit cependant pas être gaspillée, il faut profiter pour en tirer les leçons. Cette thèse de doctorat est écrite pour cette raison exacte, pour conclure ma propre éducation formelle. C'est également une tentative de fournir des conseils supplémentaires aux marqueurs de politique économique, de sorte que la forte attraction d'une croissance rapide du crédit vers une morosité économique, consécutive à une concurrence accrue dans le secteur financier, puisse être mieux gérée ou atténuée. Ceci dans l'espoir que la libéralisation financière et le développement économique puissent se produire sans la souffrance humaine racontée par l'histoire des nombreuses et récentes crises financières.

Les questions évidentes auxquelles il faut répondre à ce stade sont entre autres : Pendant un épisode de croissance rapide du crédit, à quoi ressemble le côté demande du crédit ? Comment et pourquoi le crédit global est-il alloué à un taux beaucoup plus rapide que la croissance économique, à un moment donné et en particulier à la suite d'une libéralisation financière ? Peut-il y avoir une erreur systémique dans la façon dont nous allouons le crédit ? Pendant la période qui précède une crise, pourquoi prêtons-nous à plusieurs reprises de

l'argent à des entreprises et à des ménages de manière à ce que la majeure partie de cet argent ne soit jamais restitué, renversant des institutions financières systémiques ?

Le premier chapitre de cette thèse, co-écrit avec Yu Zheng, tente de répondre à une partie importante de ces questions. Nous explorons le côté demande du crédit pendant et après un épisode de croissance rapide du crédit. Plus spécifiquement, nous explorons le risque de crédit associé aux prêts aux groupes d'entreprises. Dans cette optique, nous offrons une nouvelle perspective sur la raison pour laquelle les groupes d'entreprises sont formés. Plus précisément, nous nous demandons si faire appel à d'autres entreprises du groupe constitue un moyen d'améliorer le crédit dans l'attente d'un plan de sauvetage des pouvoirs publics qui réduirait le coût du capital des entreprises appartenant au groupe. En utilisant une expérience quasi naturelle, nous montrons que les sociétés affiliées à un groupe paient des intérêts moins élevés lorsque le sauvetage de l'État était prévu. Mais dès que les espoirs de sauvetage ont été supprimés, les banquiers ont dû déprécier plus vraisemblablement leurs actifs sous forme de crédit aux entreprises liées au groupe, et augmenter le coût du capital pour les entreprises affiliées au groupe. Les risques associés aux entreprises du groupe étant systématiquement sous-estimés, il s'ensuit que le financement de ce type de réseau financier est accompagné d'une externalité négative.

Nous utilisons une nouvelle base de données créée par l'agence de notation de crédit CreditInfo, qui a collecté et archivé les états financiers annuels et les données sur la propriété de toutes les sociétés enregistrées en Islande de 2008 à 2015.

L'une des explications avancées en tant que cause de la grande crise financière est le commentaire très médiatisé de la ministre des Finances française de l'époque, Christine Lagarde. Son explication était que le monde occidental n'aurait pas enduré cette calamité économique si c'étaient des Sœurs Lehman qui régnaient sur le monde de la finance, faisant allusion au fait que les femmes étaient plus conservatrices et responsables dans leur prise de risque. Cette explication n'est pas exagérée, car des études comportementales ont maintes et maintes fois montré que les femmes ont tendance à être plus opposées au risque que les hommes. Alors, est-ce que cela pourrait être la solution menant à un développement économique plus durable : recruter des femmes pour diriger des institutions financières et des entreprises puissantes ? Sommes-nous alors obligés de connaître un ralentissement de la croissance économique, car les femmes qui dirigent les entreprises sont plus réticentes à prendre des risques élevés, en moyenne ?

Puisque nous avons maintenant montré que les banquiers sous-estimaient systématiquement le risque associé aux prêts aux groupes d'entreprises, cela pourrait-il simplement résulter de la prédominance masculine des banquiers et des chefs d'entreprise ? Pouvons-nous vraiment attribuer des résultats concrets ? rentabilité des entreprises, niveau

d'endettement, probabilité de défaillance de l'endettement par rapport au sexe du dirigeant de l'entreprise ?

Le deuxième chapitre de la thèse, co-écrit avec Yu Zheng, vise à répondre à cette question. Il étudie les relations de cause à effet entre le leadership des femmes dans l'entreprise, l'aversion pour le risque et la rentabilité, en utilisant les données annuelles de CreditInfo au niveau de l'entreprise en Islande entre 2008 et 2014. Nous introduisons une nouvelle mesure du leadership des entreprises en mettant l'accent sur le sexe de la participation majoritaire dans les entreprises, ce qui atténue le problème de sélection. Méthodologiquement, nous apportons deux nouveaux instruments : le sexe du premier-né et le ratio hommes-femmes des enfants au sein d'une entreprise familiale. Contrairement aux études existantes, nos résultats ne détectent aucune différence entre les sexes en termes d'endettement, de rentabilité ou de taux de survie des entreprises. Ce nouveau résultat peut être attribué aux facteurs suivants : (1) les données islandaises sont beaucoup plus équilibrées en termes de genre, ce qui atténue considérablement le problème de sélection habituel ; (2) nos nouveaux instruments améliorent les instruments de la génération précédente, dont les restrictions d'exclusion ne sont pas satisfaites avec une probabilité élevée.

La réponse brève à l'hypothèse de Lagarde est que nous ne pouvons pas être sûrs que Les Sœurs Lehman nous auraient sauvés des catastrophes de la crise financière, au motif qu'elles étaient des femmes. La question suivante se pose : existe-t-il un système au sein des institutions d'allocation de crédit, qui encourage spécifiquement la prise de risque excessive, voire l'insouciance, qui conduit à une perte de richesse et à une non-acquisition massive ? Je cherche des réponses à cette question dans le troisième chapitre. En dépit de la richesse de la littérature sur la manière dont nous formons les gestionnaires, en les incitant de manière optimale à prendre les risques nécessaires, le corpus est fragilisé par l'importance des facteurs non observables et des défis d'identification que les chercheurs ne peuvent pas facilement surmonter avec les données disponibles. Nous pouvons toutefois tirer des enseignements de l'histoire à cet égard. Par conséquent, je présente les preuves que j'ai trouvées en enquêtant sur des systèmes d'incitation dans la banque islandaise en faillite. En tant que membre d'une commission d'enquête parlementaire spéciale, j'ai été chargée de déterminer si les causes de l'effondrement des banques islandaises se trouvaient dans les systèmes de rémunération au rendement des banquiers. Les éléments de preuves présentés brossent un tableau sombre des pratiques commerciales et de l'allocation de crédit au sein de ces banques à la veille de leur disparition. Bien que nous ne puissions pas affirmer un effet causal, en utilisant des estimations paramétriques, nous ne pouvons pas échapper aux conclusions. Les preuves économiques et comptables nous montrent bien que les systèmes d'incitation étaient en partie responsables de la faillite colossale de ces banques islandaises.

Ce troisième et dernier chapitre de ma thèse décrit les dispositions prises en matière de rémunération des dirigeants par les banques islandaises en faillite et explique comment les systèmes d'incitation ont conduit à une déclaration erronée des fonds propres, au détournement de fonds de sociétés cotées en bourse et à des manipulations de marché massives, permettant ainsi de continuer à faire aux banquiers des promesses de rentabilité, alors que le public investisseur a été escroqué et que les autorités de contrôle financier ont déraillé avec de faux signaux du marché.

Le chapitre s'inspire des données publiées par la Commission d'enquête spéciale du Parlement islandais (SIC, 2010), qui montrent comment les régimes de compensation ont évolué au fil du temps dans les institutions défaillantes, en utilisant les données des salaires et des carnets de prêt de 2004-2008, tirées des successions en faillite. Bien que les dirigeants des banques aient perdu d'importantes richesses accumulées au cours de leur mandat de deux à six ans auprès des banques grâce à une rémunération incitative, ils ont encaissé d'importantes sommes en salaires, primes et dividendes sur des actions largement financées par les banques dans lesquelles ils ont opéré. Que ce soit intentionnellement ou non, le personnel a été utilisé comme un moyen de falsifier les capitaux propres par une couverture inappropriée d'options, par le biais de véhicules à usage spécial hors bilan et par des prêts excessifs pour acheter ses propres actions, tout en mettant en gage les actions achetées en garantie.

Chapter 1

The Logic of Business Groups: A Moral Hazard Perspective

1.1. Introduction

Since the seminal work by La Porta, Lopez-De-Silanes and Shleifer (2002), academic interest in business groups has been revived. In the past two decades, scholars have formed many theories about their formation motives. Proponents of business groups argue that they play an important role, during a catch-up phase of underdeveloped economies, where rule of law and institutions are typically weak, stifling labor, financial and product markets, which businesses are able to overcome by creating their own intragroup markets. Hence, business groups tend to be star performers during economic development due to their enhanced operational efficiencies via better integration, and lessened agency problem improving survival chance via intra-group insurances, Khanna & Yafeh (2007). Others argue that business group formation motive lies in their risk management opportunities, as they serve as shock absorbers during financial instability. Since more creditors are impacted from a default of any individual firm or financial institution, business groups shield the rest of the system against losses, Allan & Gale, (2000), Freixas, Parigi & Rochet, (2000). On the other hand, there are also cautionary tales that reveal time inconsistencies of business groups and their formation. After successfully serving economic development the tycoons sitting at their helm, have little incentive to see their economy graduating to the developed class of economies, which would sprout increased competition, stronger institutions, rule of law and creditors rights, that will eventually weaken their own stronghold, resulting in a “middle-income trap” as coined by Morck, et al. (2005), Morck & Yeung (2014). Looking at literature from the days of the Great Depression, pyramids are formed to allow a family to achieve controls of a firm using only a small equity stake. This is particularly useful when private benefits of control are large, which suggests that business groups are a means to separate cash flow rights from voting rights, Berle and Means (1932) and Graham and Dodd (1934). As pointed out by Almeida and Wolfenzon (2006) business groups are not needed for the that purpose, however since dual class shares will work equally well for that aim. Almeida and Wolfenzon build a theoretical model showing that as investors’ protection is imperfect, the family (or business tycoons) extracts private benefits from the firms it controls at the expense of minority shareholders. They also show the incentive of the family to continue weaving the web of a financial network of this type, as investment opportunities arise, supporting the

diversification motive. Almeida and Wolfenzon's theory of business groups speaks directly into, Johnson, La Porta, Lopez-de-Silanes and Shleifer (2000), published earlier. They show that business groups can be a product of crony capitalism, where ultimate controlling owners tunnel cash out of its weaker affiliates at the expense of minority shareholders during good times, Johnson, et al. (2000), Bertrand, Mehta & Mullainathan (2002), using them as dumpsters to spin off toxic assets during bad times, and to avoid taxes (Beuselinck and Deloof, 2014).

Due to data limitation and identification challenges, the literature is still open on why business groups are formed, their role in financial stability and excessive inequality.

This paper proposes a new perspective on the motives for business group formation: Moral hazard. We study whether expectation of government bailout made it possible for business groups to obtain cheaper and bigger loans. Once corroborated, this perspective has three important implications: 1) First of all, it suggests that group-affiliated firms' higher profitability may also arise from cheaper financing, rather than integration-induced efficiency enhancement alone. Thus the business group model should not be emulated without acknowledging the systemic risk it imposes. 2) Secondly, while the cheaper financing can be incentive compatible for all parties involved, it can impose negative externality on taxpayers. From bankers' perspective, lending to group-affiliated business is less risky due to its high profitability and explicit or implicit guarantee from related firms and the government; from the government's perspective, it can be in the nation's interest to develop strong brand presence during normal times, and when a financial crisis hit, the government has every incentive to bail out these group-affiliated firms first, to prevent or arrest the domino effect. Unfortunately, the only loser in the game is the taxpayer – for the bailout is funded directly using tax dollars, or indirectly through inflation. 3) Finally, when lending to group-affiliated firms, bankers should not be awed by a firm's group affiliation status. Rather, they must entertain the possibility that its implicit or explicit guarantors may be unwilling or unable to bail it out, and price the risk accordingly – even if the guarantor seems infallible. Failing to do so might result in inordinate loss during a financial crisis, as we will show in the paper. Unabated credit allocation during credit boom, into concentrated ownership structures, might even bring one about.

This paper exploits an exogenous shock to Icelandic government's willingness to bailout its economy in 2010, and study how it affected lending practices to group-affiliated firms. The rest of the paper is structured as follows: 1) We first build the textual evidence that Icelandic government's unwillingness (or inability) to bailout its economy was truly unanticipated by all market players, and did not crystallize until March 2010; 2) Using data, we document how the exogenous shock forced bankers to absorb greater losses on lending to

group-affiliated firms 3) We study how this corporate restructure experience changed bankers' lending practices to group-affiliated firms, using annual results from OLS and FE regressions; 4) We discuss how these empirical estimates support the moral hazard perspective of business group formation. 5) We discuss alternative explanations that would also be consistent with our findings, and perform some auxiliary tests.

1.2. Bailout or No Bailout? The Icelandic Surprise

In this section, we aim to establish March 2010 as exogenous shock to bankers' expectation of government bailout. The textual evidences are grouped into 2 sets:

1. Prior to March 2010, it was widely expected that the Icelandic government would bailout systemically important banks and subsequently carry all of the restructuring risk of Icelandic corporations, a designation that included group-affiliated firms.
2. In March 2010, it became clear that the government would not bailout any of its banks or businesses. Instead, creditors of the failed banks had to take over as equity holders of the newly established domestic banks as the government mandated banks to write down any bad debt to eligible firms.

1.2.1 Hoping for Bailout: 2006-2010

It was early 2006. The Icelandic economy was already showing signs of weakness. As the crisis developed, the banks' systemic importance and expected government bailout were beyond doubt. On March 7th 2006, Merrill Lynch issued an alarming report on the worsening conditions of the Icelandic Bank, titled "Icelandic Banks: Not What You Are Thinking." In this report, Merrill Lynch (2006) revealed its belief in a banking bailout:

“ However, given the Icelandic government's currently strong fiscal position and low levels of its own external debt, we would assert that Iceland could 'afford' to fix a banking crisis on these (extreme) parameters, though it would almost certainly cost them a notch or two to their current sovereign ratings (Aaa/AA-/Aa-), in our view”

At the same time, JP Morgan (2006) stated its faith that the Icelandic government would bailout its three major banks:

“The logic here is that while the Icelandic part of these firms [the three banks, Glitnir, Kaupthing and Landsbanki] is the most risky it is also the part most likely to be supported by

the sovereign. Obviously investors may wish to use their own factor inputs [...] What would happen if the worse case happened? Such as the economy goes into a sharp recession or the stock market crashes or these firms have insufficient funding – would the government bail them out? We believe the government would bail out the core Icelandic businesses, but we remain unsure about all the overseas divisions.”

On October 6th 2008, the banks were no longer able to refinance their front loaded payment schedule in the next 6 months, which amounted to as much as 20% of Iceland’s GDP. The Icelandic government indeed took over these banks at the height of the crisis, and put the foreign part of them into receivership. A formal banking bailout seemed to be alive in the form of having non-performing loans sitting indefinitely on the balance sheet of these banks, much like what China did with its state-owned conglomerates during the GFC, and what Japan did with its Keiretsu in the Asian Crisis of the nineties. Indeed, even though more than half of the Icelandic firms were technically underwater during this period, we only observe 2 debt write-offs prior to 2010 in our data.

1.2.2 Post 2010: The Case for No Bailout

Yet, things quickly spiraled out of control. By late 2008, the Icelandic economy was in the perfect storm: inflation soared to 18,1%, policy rates were hiked to 18%, unemployment broke 9%, and the currency plummeted by 50%; and seemed to be on an upward trajectory. Hence, capital controls were installed under the IMF program in November 2008. Worse still, once the government took over the three major banks, it quickly realized that the banks were in worse shape than it had previously thought. According to IMF’s calculations, close to 65% of loans in the banking sector were non-performing, while the assets of the three banks totaled more than 10 times the national GDP, IMF (2010). Consequently, the government passed the ownership to the creditors who already were in control of the foreign part of the failed banks. Negotiations on banks’ short term funding and elevated equity funding culminated in a formal agreement between the government and the foreign creditors in March 2010, as foreign creditors took over the newly established domestic arms of Islandsbanki (formerly Glitnir) and Arion banki (formerly Kaupthing) as equity holders. The third bank, Landsbanki, remained in state ownership, as main creditors of Landsbanki were depositors.

Meanwhile, the government ordered a massive debt relief with the enactment of law nr. 107/2009. According to the law, all major financial institutions abided to a coordinated debt relief for individuals and businesses. Households in dire straights would get payment holiday as their case was being processed by the debtor’s ombudsman. In general, households received debt-relief on mortgages exceeding 110% loan-to-value if the owner resided in the property. Businesses were considered eligible for the debt relief program if its management

could, in co-operation with its house bank, show that: 1) the firm would be a going concern with restructuring; 2) prospects of bank recovering would be higher than without restructuring; 3) current management/owners would be essential for materializing prospective upside; 4) current management/owners would allow different creditors to consolidate the debt, if needed, or cooperate with other creditors to reach the necessary type of restructuring to keep the firm afloat; 6) current management/owners would be ready for due diligence performed on their business; and that 7) other creditors would unlikely demand bankruptcy of the firm. Again, once the business proved its eligibility for debt relief, bankers were mandated by law to write down their debt. Aside from the government commanded debt relief, borrowers got another windfall from the courts, who declared FX-indexed debt debenture illegal, alleviating the FX-risk borrowers had taken on by entering into these debt contracts. This bill was footed by the banks themselves, or the foreign creditors and other owners of the new domestic banks. As a second external shock to the banking operations, the court rulings in several court cases involving individual borrowers holding the banks responsible for the FX-risk associated with currency linked debt debenture. The courts ruled in favor of the borrower in most cases, leading to recalculation of many FX loans, whose principles were brought down to reflect the devaluation of the ISK, yet at the present value reflecting the yield of the currency in which the cash-flow of the debenture was linked to.

1.2.3 Summary: Textual Evidence for Quasi-Natural Experiment

The textual analysis we provided in the previous sections shows that:

1. There's a direct shock to banking bailout: In the beginning of the financial crisis, it was widely expected that the government would be willing and able to bailout its major banks. As the crisis developed, the government indeed took over all three of its major banks. But in 2009, once the extent of the non performing loans was uncovered the government was no longer willing to bailout all three banks.
2. There's an indirect shock to business group bailout: Our textual analysis was not directly applied to systemically important business, because the magnitude of the banking crisis (at 10 times GDP) dwarfs any individual business' struggle. Nonetheless, we argue that there's still an indirect, exogenous shock to the supply of lending to business groups. Had the banking bailout been manageable, it would have been conceivable that the next logical step is to bailout systemically important firms. The bailout could have come in two forms: direct assistance to the group, or indirect assistance through a banking bailout, through which the repayment schedule could have been extended without jeopardizing the banks or the businesses' continuous operations. If either materialized, the bankers would

not have to realize the downside risk on lending to these firms – effectively lowering the ex ante risk on loans. Unfortunately, neither materialized. Instead, bankers were mandated to write-down the non-performing loans of any eligible business. Had they expected any form of government assistantship to these systemically important business groups prior to the crisis, they would have been disappointed. Indeed this is what we observe in the data.

1.3. Data

Our dataset is provided by CreditInfo, a credit rating agency in Iceland. The vendor provides annual ownership and financial statement data on all active Icelandic firms in between 2008-2015 (and onwards), from which we constructed a few ownership network based variables. We also extract the firm characteristics control variables as commonly used in this literature.

Note that since this is a crisis data, many financial ratios are outside the usual 0 to 1 interval as we observed in Table 2.1 and Table 2.2. This makes sample selection a very difficult task: if we restrict our attention only to firms that reside in the 0 to 1 intervals, we would greatly reduce the sample size, as more than half of the firms were underwater during the crisis. Moreover, it is conceivable that it is precisely these firms that are generating the effect we're studying here. On the other hand, if we study the entire sample, the effect seems to be too big to be realistic, potentially being influenced by outliers unduly. We therefore resolve to have leverage ratio, earnings ratio and firm size winsorized, trimmed cut at (10,90) level and consider our results to be a conservative lower bound. The resulting sample statistics is presented in Table 1.3.

Table 1.1.

Icelandic Firm Ownership Data and Variable Description:

Summary Statistics					
Variable	nr. Obs	Mean	Std.	Min	Max
distressed:					
1 if liabilities exceed assets	201,674	0.4	0.49	0	1
log_totalAss					
log of Total Assets	191,424	8.31	4.11	-9.21	22.61
liability_to_asset					
Total liabilities/Total Assets	185,821	105.6	4972	-69.51	1378030
birthday					
Firm founding year	201,674	2001.89	9.34	1934	2015
ebitda_to_asset					
EBIDTA* to Total Assets	178,896	-0.47	1085	-114226	395863
intang_to_asset					
Intangible Assets to Total Assets	201,674	0.01	0.09	0	1
fix_ass_to_asset					
Fixed Assets to Total Assets	201,674	0.27	0.36	-1.21	1.66
invent_to_asset					
Inventories to Total Assets	201,674	0.06	0.18	-1.9	2.83
ga_heldByFirm20					
1 if firm is a group affiliated firm held by another firm with 20% ownership threshold	185,935	0.16	0.37	0	1
ga_held_ByInd20					
1 if firm is group affiliated firm held by an individual - 20% ownership threshold	185,935	0.37	0.48	0	1
ga_uo_holdFirm20					
1 if firm is group affiliated firm in an ownership of a holding company - 20% ownership threshold	185,935	0.01	0.07	0	1
holds_Multiple20					
1 if firm is an owner of at least 20% stake in multiple firms, at least 2 or more	185,935	0.04	0.19	0	1

EBITDA*: Earnings Before Interest Payment, Taxes, Depreciation and Amortization

Table 1.2.

Icelandic Firm Ownership Data: Summary Statistics - Firms that received a Write off					
Variable	nr. Obs	Mean	Std.	Min	Max
distressed	1,410	0.708	0.455	0	1
log_totalAss	1,392	10.765	3.023	-9.21	18.72
liability_to_asset	1,376	281.947	5968	0.0001	1378030
birthday	1,410	1998.6	9.767	1954	2009
ebitda_to_asset	1,376	-84.26	3079	-114226	395863
intang_to_asset	1,410	0.0493	0.1708	0	1
fix_ass_to_asset	1,410	0.452	0.364	0	1
invent_to_asset	1,410	0.077	0.174	0	0.998
ga_heldByFirm20	1,337	0.219	0.413	0	1
ga_held_ByInd20	1,337	0.373	0.484	0	1
ga_uo_holdFirm20	1,337	0.015	0.121	0	1
holds_Multiple20	1,337	0.087	0.283	0	1

Table 1.3.

Icelandic Firm Ownership Data:					
Summary Statistics - Earnings, Leverage and Size Trimmed at 10 percent					
Variable	nr. Obs	Mean	Std.	Min	Max
distressed	201,674	0.4	0.49	0	1
log_totalAss	153,121	8.81	1.64	5.72	11.84
liability_to_asset	147,855	0.82	0.64	0	3.01
birthday	201,674	2001.89	9.34	1934	2015
ebitda_to_asset	143,118	0.02	0.16	-0.45	0.41
intang_to_asset	201,674	0.01	0.09	0	1
fix_ass_to_asset	201,674	0.27	0.36	-1.21	1.66
invent_to_asset	201,674	0.06	0.18	-1.9	2.83
ga_heldByFirm20	185,935	0.16	0.37	0	1
ga_held_ByInd20	185,935	0.37	0.48	0	1
ga_uo_holdFirm20	185,935	0.01	0.07	0	1
holds_Multiple20	185,935	0.04	0.19	0	1

1.3.1 Understanding Exogenous Shock Using Data

In Table 1.4, we run a probit regression (1) to understand who is more likely to be underwater in 2008. After controlling for firm-characteristics and industry at 3-digit level, we find that all group affiliated firms are more likely to be distressed, regardless of their hierarchical position within the business group compared to stand-alone firms (our base case/control).

In table 1.4, model 2, we run another probit regression to understand who is more likely to receive a write-off. After controlling for firm characteristics and industry at 3-digit level, the point estimates suggest that all group affiliated firms are more likely to receive a write-down compared to stand-alone firms. But standard error suggest that only the estimate for group affiliated firm held by an individual (ga_heldByIndiv) and group affiliated firms that is a holding company (holdsMultiple20) are significant at 95% level.

We asked conditional on receiving the write-down, which firms would get the bigger write-offs, but the magnitude is quite small (less than 1%) and not significant, noting that the debt relief program of the government was universal, Landsbanki (2012).

Table 1.4
Probit Regressions

This table shows the results of probit regressions estimating the probability of a group affiliated firm being distressed compared to stand-alone firm (base case) compared to stand-alone firm, using the pooled dataset from 2008-2015. Model (1) shows probability of being in financial distress, where liabilities have exceeded the firm's assets, Model (2) shows the probability of receiving a debt write off as a consequence of the comprehensive debt relief program of the Icelandic government and the restructuring efforts made by banks post crisis.

	(1) P(distressed)	(2) Probability of receiving a write off
Dependent variables:		
ga_heldByFirm20	0.08 (0.03)***	0.29 (0.04)***
ga_heldByIndiv20	0.15 (0.02)***	0.1 (0.03)***
ga_uo_holdFirm20	0.39 (0.13)**	0.15 (0.15)
holds_Multiple20	0.32 (0.05)***	0.44 (0.06)***
distressed		0.58 (0.03)***
log_totalAss	-0.11 (0.0001)***	-0.193 (2.22)
birthday	0,001 (0.0001)***	-0.006 (0.002).
ebitda_to_ass	0.00 (0.04)*	
rev_to_ass		0.088 (0.063).
intang_to_ass	1.43 (0.09)***	1.15 (0.12)***
fix_ass_to_ass	1.45 (0.03)***	0.64 (0.04)***
invent_to_ass	1.46 (0.06)***	0.46 (0.09)***
Industry dummies	Included	Included
No. Obs	22,247	22,612
Prob>chi2	0.00**	0.000
pseudo R2	0.15	0.14

Standard errors in parentheses

significant at 10% level*, significant at 5% level**, significant at 1% level***

Calculating the average marginal probabilities we see that firms held by another firm (ga_heldbyFirm20) are 4.1% more likely than stand alone firm to be underwater while firms in a business group owned by an individual (ga_heldbyIndiv20), were 5,5% more likely. However, firms in the ultimate ownership of a holding company and holding companies were 11% and 12.4% more likely to be in financial distress than a stand-alone firm, respectively, during the period 2008-2015.

1.4 Testable Predictions

How would this write-down affect the lending practice to group-affiliated firms? There are two channels: (1) once the bankers realized the increased risk on lending to group affiliated firms, supply shifts left. This suggests that the price of loans would increase, and the quantity of loans would decrease; (2) once these group affiliated firms realized that they can get away with not paying the full amount of the debt, demand shifts right.

Thus, our prediction for interest rate is unambiguous: it would go up.

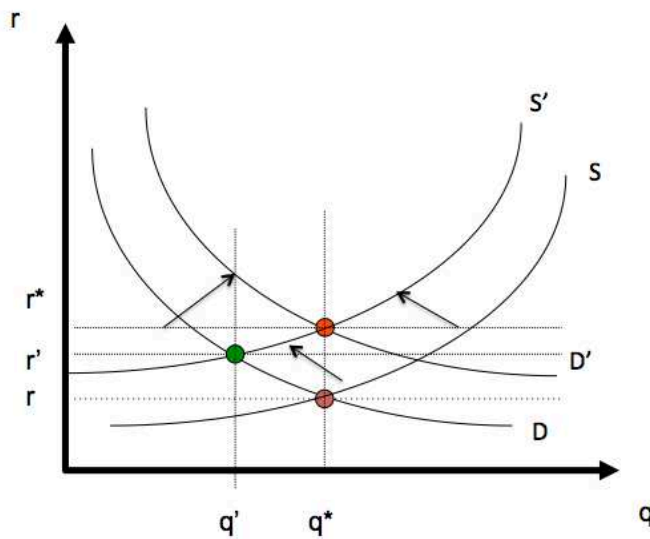


Figure 1 – Change in credit demand and supply to business groups as bailout promises wane

Whether the quantity of loan would go up or down depends on whether the supply or demand shift dominates. Unfortunately we do not have loan level data. So in the following analysis, we use (interest expense to total liability ratio as) a proxy for interest rate.

1.5 Results

1.5.1 Pooled OLS

We then turn to testing whether the pricing of credit to group-affiliated firms changed along with the expectations of a government bailout, as the Icelandic government unexpectedly withdrew their plans on assuming the role of an equity holder in the failed banks, and pushed that risk over to the creditors of the banks. Table 2.5 reports on our test of pooled OLS results on interest rate proxy for the period 2008-2009 (4) and 2011-2014 (5) separately.

With the exception of holdsMultiple20, the two pooled OLS results show that interest rates are lower for all group-affiliated firms both prior and after 2010; but it did increase for group affiliated firms after 2010, consistent with our prediction. The coefficient on holdsMultiple20 is not statistically significant in the 2008-2009 pooled OLS regression, but became significantly negative in the 2011-2015 pooled OLS regression. Before the government intervention of non-bailout, group affiliated firms paid between 0.4% to 1% less interest on their loans than stand-alone firms, with firms in the ownership of holding companies receiving the largest statistically significant discount, at the 95% level. The group-affiliation discount survived the government intervention of a non-bailout, it however dropped by 19-46 basis points, on average, depending on the type of group affiliation.

Now that we've unveiled the changes in pricing of credit risk to group affiliated firms in relations to the exogenous shock of non-bailout event, we look at how leveraged these firms were, compared to stand alone firms. Remembering that the government intervention involved debt relief for all firms, viable and going concern, given certain conditions.¹ In table 1.6, we report pooled OLS results on leverage ratio for the period 2008-2009 (5) and 2011-2015 (6), separately. We found that 1) the coefficients on ga_heldByFirm20, ga_heldByIndividual20 and holdMultiple20 all increased; 2) the coefficient on ga_uo_holdFirm20 decreased.

¹ Debt restructuring for firms that were no longer going concern was thrust upon the bankers, by regulators and the law nr. 107/2009.

Table 1.5

Pooled OLS estimate of cost of capital

This table shows the change of the pricing of credit risk of different type of group affiliated firms versus stand-alone firms (base case), prior and post non-bailout event from 2008-2009 and 2011-2014. (3) shows average cost of capital measured with the interest rate proxy, interest payments/total debt prior to exogenous shock of the government deciding against a bailout, (4) shows cost of capital using the interest rate proxy after the government decided against a bailout. (3) and (4) are functions of the ratio of total liabilities to total assets that have been winsorized at 5% and 95% level.

	(3)	(4)
Dependent variables:	Interest rate proxy 2008-2009	Interest rate proxy 2011-2014
lib_to_assets_tr	0.47%	0.168%
	(0.046)***	(0.043)***
ga_heldByFirm20	-0.868%	-0.600%
	(0.0918%)***	(0.0433)***
ga_heldByIndiv20	-0.418%	-0.227%
	(0.065)***	(0.0305)***
ga_uo_holdFirm20	-0.998%	-0.53%
	(0.436)**	(0.309)
holds_Multiple20	0.126%	-0.3584
	(0.1947).	(0.0816)***
distressed	1.055%	0.3282%
	(0.0941)***	(0.0433)***
log_totalAss_tr	0.544%	0.348%
	(0.018)***	(0.0088)
birthday	-0.0090%	-0.0015%
	(0.0035)***	(0.0016).
ebitda_to_ass_tr	2.2963%	2.036%
	(0.1287)***	(0.0635)***
intang_to_ass	-0.311%	0.2204%
	(0.3205).	(0.1733)***
fix_ass_to_ass	1.5898%	1.1603%
	(0.0999)***	(0.0461)***
invent_to_ass	1.345%	0.7987%
	(1.833)***	(0.0864)***
Industry dummies	Included	Included
No. Obs	29,550	78,324
Prob>chi2	0.00**	0.00**
pseudo R2	0.15	0.1073

Standard errors in parentheses

significant at 10% level*, significant at 5% level**, significant at 1% level***

Table 1.6

Pooled OLS for Leverage Ratio

This table shows the results of an OLS estimation on the changes in the difference between the leverage of group affiliated firms compared to stand alone firms prior and post the non-bailout event, from 2008-2009 and 2011-2015. (5) and (6) shows the difference of debt as share of total assets winsorized at %5 and 95%

Dependent variables:	(5) Level of leverage 2008-2009	(6) Level of leverage 2011-2015
ga_heldByFirm20	-13.030% (0.01%)***	-0.650% (0.001).
ga_heldByIndiv20	2.410% (0.01)***	5.920% (0.01)***
ga_uo_holdFirm20	12.190% (0.07)*	6.56% (0.07)
holds_Multiple20	3.300% (0.03).	6.58% (0.02)***
log_totalAss_tr	4.870% (0.0001)***	-0.840% (0.001)***
birthday	0.2500% (0.0035)***	-0.0900% (0.001)***
ebitda_to_ass_tr	-75.1% (0.02)***	-65.360% (0.001)***
intang_to_ass	58.870% (0.05)***	51.7700% (0.04)***
fix_ass_to_ass	85.3800% (0.01)***	75.3400% (0.001)***
invent_to_ass	106.020% (0.03)***	104.8500% (0.02)***
Industry dummies	Included	Included
No. Obs	29,550	78,324
Prob>chi2	0.00**	0.00**
pseudo R2	0.15	0.1073

Standard errors in parentheses

significant at 10% level*, significant at 5% level**, significant at 1% level***

1.5.3 Fixed effects

Given the repeated measures of firm interest payments and firm leverage over time, we want to show whether business tycoons were affected by the non-bailout event when deciding on affiliation structure or diversification into new related parties or deleveraging by selling off subsidiaries. Hence, we first run our regressions with fixed effects estimator. Table 1.7, model 7 and 8, report the fixed effects results on interest rate proxy for the period 2008-2009 and 2011-2015 separately. These two models show that interest rates are lower for all group-affiliated firms compared to stand-alone firms both prior and after 2010, and the spread did

decrease between all group-affiliated firms compared to stand-alone firms after 2010, consistent with our prediction. In fact, effects are stronger as the discount dropped further for firms in ownership of another firm, and in ownership of an individual, than reported by our OLS estimation.

Table 1.7
**Fixed Effects estimate of
cost of capital prior and post non-bailout event**

This table shows the change of the pricing of credit risk to different types of group affiliated firms versus our base case; stand-alone firms, prior and post non-bailout event from 2008-2009; 2010-2014. Model 7 and 8 show fixed effects estimation of the interest rate proxy, i.e. the ratio of firm's annual interest payments/total debt by group affiliated firms		
Dependent variables:	(7) Interest rate proxy Prior 2008-2009	(8) Interest rate proxy Prior 2011-2015
lib_to_assets_tr	0.45% (0.05)***	0.190% (0.043)***
ga_heldByFirm20	-1.210% (0.1)***	-0.680% (0.005)***
ga_heldByIndiv20	-1.190% (0.07)***	-0.280% (0.04)***
ga_uo_holdFirm20	-1.190% (0.44)***	-0.84% (0.28)***
holds_Multiple20	-0.280% (0.21)	-0.27% (0.09)***
distressed	1.030% (0.1)***	0.2600% (0.04)***
log_totalAss_tr	0.500% (0.02)***	0.300% (0.001)***
birthday	-0.0200% (0.001)***	-0.0100% (0.001)***
ebitda_to_ass_tr	2.0700% (0.12)***	1.520% (0.06)***
intang_to_ass	-0.350% (0.34)	0.5500% (0.19)***
fix_ass_to_ass	1.7100% (0.1)***	1.1000% (0.05)***
invent_to_ass	1.830% (0.19)***	1.0000% (0.09)***
Industry dummies	Included	Included
No. Obs	29,550	78,324
Prob>chi2	0.00**	0.00**
Overall R2	0.14	0.0864

Standard errors in parentheses are clustered at firm and year level
significant at 10% level*, significant at 5% level**, significant at 1% level***

In table 1.8 model 9 and 10, we report fixed effects results on leverage ratio for the period 2008-2009 and 2011-2015 separately. These models show that leverage ratios are higher post-2010 for all group-affiliated firms, with the exception of holdsMultiple20. However, coefficients are insignificant, except for group affiliated firms in the ownership of individuals.

Table 1.8

Fixed effects for Leverage Ratio

This table shows the results of our estimation on the changes in the difference between the leverage of group affiliated firms compared to stand alone firms prior and post the non-bailout event, from 2008-2009 and 2011-2015. Models (5) and (6) shows the difference of debt as share of total assets winsorized at 5% and 95%

	(9)	(10)
Dependent variables:	Level of leverage 2008-2009	Level of leverage 2011-2015
ga_heldByFirm20	-11.76% (0.02)***	-5.05% (0.001)***
ga_heldByIndiv20	0.84% (0.01).	1.940% (0.01)***
ga_uo_holdFirm20	-0.09% (0.05).	0.04% (0.04).
holds_Multiple20	1.840% (0.03).	-0.90% (0.01).
log_totalAss_tr	3.720% (0.0001)***	-0.87% (0.001)***
birthday	0.06% (0.03%).	-0.44% (0.001)***
ebitda_to_ass_tr	-43.9% (0.01)***	-35.66% (0.001)***
intang_to_ass	39.40% (0.03)***	34.53% (0.03)***
fix_ass_to_ass	64.70% (0.01)***	51.79% (0.001)***
invent_to_ass	73.99% (0.03)***	63.96% (0.02)***
Industry dummies	Included	Included
No. Obs	33,127	80,823
Prob>chi2	0.00**	0.00**
Overall R2	0.1875	0.1422

Standard errors in parentheses

significant at 10% level*, significant at 5% level**, significant at 1% level***

Together these models tell us one story: banks had underestimated the risk on loans that they extended to group-affiliated firms prior to the crisis. As the probability of financial distress is higher (table 1.4), group affiliated firms paid significantly lower interest than stand alone firms (table 1.7). This mispricing is particularly acute for firms that hold multiple other firms, and firms that are affiliated to a business group that belongs to an individual.

1.6 Robustness Checks

How do we interpret the FE coefficients, specifically for the group-affiliated dummies? It depends on whether we think the results are obtained by the holding company dummy (holds_Multiple20) being turned on or off.

What would trigger the holding-company-dummy to turn on? Since we already have a dummy controlling for the parent firm status, holding-company-dummy, measures the effect of holding additional child firms. Mechanically, the firm has to be a parent company with exactly 1 child at the beginning of the period, and become a firm with multiple children at the end of the period. If the FE results are obtained by turning on the dummy, it is obtained from parent firm with exactly 1 child, acquiring additional children.

Conversely, what does it mean to turn off the holding company dummy? Since we already have a dummy controlling for parent firm status, holding company dummy measures the effect of dropping the 2nd child. Mechanically, the firm has to be a parent company with at least 2 children at the beginning of the period; and become a firm with exactly 1 child at the end of the period. If the FE results are obtained by turning off the dummy, it is obtained from parent with at least 2 children, abandoning all but 1 child at the end of the period.

We believe that the interpretations of the results hinges on whether the results are obtained from the holding company dummy being turned on or off. If it is obtained from the dummy being turned on, it would provide evidence to the too-interconnected-to-fail interpretation; conversely, it would be a de-leveraging story informing the intra-group insurance motive for business group formation.

Assuming that the FE coefficient for holding company dummy is obtained by the dummy being turned off. The positive coefficient on this dummy for 2008-2009 says that when a parent firm with at least 2 children spin off all but 1 last child, it decreases its leverage ratio more than that of a parent firm with exactly 1 child spinning off that child, see table 1.9. In other words, firms with multiple children had more pressure to sell its children to pay down the debt. The fact that it's no longer statistically significant from 2011-2015 suggests that this effect went away after the corporate write-down program in 2010. We believe this is consistent with a deleveraging interpretation. The 2010 write down helped firms with multiple children write-off bad debt. Thus, they no longer feel the extra need to fire-sell their children to pay down their debt.

Table 1.9

This table explains how fixed effects of holding company dummy can be interpreted as the holding company dummy turns 1 if the firm holds multiple other firms. The fixed effects holding-company-dummy however is the delta of the holding company dummy, meaning when it turns on ($\Delta=1$) it signals the incidence that a firm is a holding company with only one child (subsidiary) at the beginning of the period, but holds multiple children at the end of the period. If the fixed effects holding company dummy is turned off ($\Delta=-1$) it signals a firm that had exactly 2 children (subsidiaries) at the beginning of the period and become a firm with exactly 1 child at the end of the period. The table shows the number of holding companies that were actively acquiring or spinning off subsidiaries during the period in this way.

	# of Firms that Holds Multiple Other Firms	$\Delta=1$ Firms that acquired 2nd child	$\Delta=-1$ Firms that lost 2nd child
2008	846		
2009	891	161	132
2010	929	205	167
2011	988	212	141
2012	1,095	266	169
2013	1,227	307	181
2014	1,302	270	181

Using data, we can directly see whether holding company dummy is being turned on or off in each period. Therefore, we re-run the fixed effects regressions, restricting our attention on the sub-sample where the firms are actively acquiring other firms. Results are presented in Table 1.10, regressions (11), (12), (13), and (14). In (11) and (12) the results for interest rate remain the same qualitatively: while the coefficients on all group affiliated dummies are all significantly negative, compared to stand alone firms pre-2010, they become less negative or in the case of holdsMultiple20, not statistically significant in (13) and (14). This suggest that for the majority of the group affiliate firms, the rightward shift in demand dominated the leftward shift in supply, if there were any.

Table 1.10

Fixed effects estimate Interest Rate Proxy		
Actively Acquiring Firms		
This table shows fixed effects regressions estimating cost of capital to holding companies and other affiliated firms that are actively acquiring firms prior and post the non-bailout event.		
	(11) 2008-2009	(12) 2010-2014
lib_to_assets_tr	0.64% (0.07)***	0.10% (0.043)***
ga_heldByFirm20	-1.21% (0.13)***	-0.58% (0.07)***
ga_heldByIndiv20	-0.60% (0.09)***	-0.29% (0.08)***
ga_uo_holdFirm20	-1.40% (0.58)***	-0.87% (0.53)***
holds_Multiple20	-0.40% (0.23)*	-0.16% (0.13).
distressed	0.88% (0.14)***	0.76% (0.12)***
log_totalAss_tr	0.53% (0.03)***	0.22% (0.02)***
birthday	-0.03% (0.0001)***	-0.05% (0.001)***
ebitda_to_ass_tr	2.18% (0.18)***	1.32% (0.15)***
intang_to_ass	-0.65% (0.45).	0.83% (0.48)*
fix_ass_to_ass	1.63% (0.13)***	0.62% (0.11)***
invent_to_ass	2.27% (0.24)***	0.42% (0.21)***
Industry dummies	Included	Included
No. Obs	15,441	6,801
Prob>chi2	0.00**	0.00**
Overall R2	0.14	0.0864
Standard errors in parentheses		
significant at 10% level*, significant at 5% level**, significant at 1% level***		

Table 1.11

Fixed effects estimate of Leverage Ratio

This table shows the results of an fixed effects estimation on the changes in the difference between the leverage of group affiliated firms compared to stand alone firms prior and post the non-bailout event, from 2008-2009 and 2011-2015 for actively acquiring firms, excluding firms that received a write-off. (13) and (15) shows the difference of debt as share of total assets winsorized at 5% and 95%

	(13)	(14)
Dependent variables:	Leverage Ratio	Leverage Ratio
	2008-2009	2011-2015
ga_heldByFirm20	-20.03%	-17.88%
	(0.02)***	(0.02)***
ga_heldByIndiv20	-2.77%	-7.280%
	(0.01)**	(0.02)***
ga_uo_holdFirm20	-10.47%	1.73%
	(0.08).	(0.11).
holds_Multiple20	3.400%	-13.17%
	(0.03).	(0.03)***
log_totalAss_tr	6.040%	10.14%
	(0.0001)***	(0.001)***
birthday	0.07%	-0.88%
	(0.03%).	(0.001)***
ebitda_to_ass_tr	-71.2%	-39.97%
	(0.01)***	(0.03)***
intang_to_ass	53.00%	14.68%
	(0.06)***	(0.1).
fix_ass_to_ass	76.70%	46.52%
	(0.01)***	(0.02)***
invent_to_ass	102.10%	71.82%
	(0.03)***	(0.04)***
Industry dummies	Included	Included
No. Obs	18,283	6,928
Prob>chi2	0.00**	0.00**
Overall R2	0.2	0.25

Standard errors in parentheses

significant at 10% level*, significant at 5% level**, significant at 1% level***

1.7 Interpretations, alternative explanations and conclusion

Let's focus on the probit regression in Table 1.14 and the last set of FE regressions in Table 1.10, (11) and (12), and Table 1.11 (13) and (14). Taken at face value, these results would be consistent with a leftward shift in loan supply and a rightward shift in loan demand. In other words, while the write-down was painful for the bankers, and decided to price the loans higher to reflect the higher lending risk, group-affiliated borrowers were emboldened by this write-off.

Of course, while the FE regressions got rid of any time-invariant unobservable effect, it is not able to deal with any alternative explanations that involve time-varying unobservable. For example, it is possible that post 2010 as the economy recovers, group-affiliated firms had better investment opportunity than comparable stand-alone firms and therefore had greater

demand for loans. These type of stories are best addressed by loan level data, which is beyond the scope of this paper. All we can say responsibly is that 1) lending to group-affiliated firms seems to be more risky, because they are more likely to be distressed and more likely to be granted a write-off; 2) the fixed effects regressions are consistent with the moral hazard perspective of lending to business groups; but it suffers from the shortcoming of not being able to deal with any time-varying unobservable. While we believe that it is a promising direction for the business formation literature, future research can be improved by 1) obtaining loan-level data to tell the supply and demand effect apart 2) using data on non-crisis period.

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Chapter 2

Nature or Nurture? Revisiting the Gender Risk Aversion Difference in Corporate Finance

2.1 Introduction

“Women are more risk averse than men” Borghans, Golsteyn, Hickman and Meijers, (2009)

Since Borghans, Golsteyn, Hickman and Meijers (2009)’s seminal work, gender difference in risk aversion has been widely replicated in behavioral and experimental economics. It was only a matter of time before it caught financial economists’ interest: could gender difference in risk aversion explain gender gap in firm performance?

Here’s the hypothesis: Since women are more risk averse, they take out smaller loans and expand their business less aggressively. As a result, their firms are more stable, but less profitable. This prediction is consistent with what many researchers have observed in their data, Faccio, Marchica, and Mura (2016), Flabbi, Macis, Moro and Schivardi (2016), Flabbi (2015), Palvia, Vahamma & Vahamma (2015). Female leaders are associated with lower leverage, lower bankruptcy risk, but also lower profitability.

Assuming that the causal identification strategies are sound, the implications of these results are profound. They suggest that (i) female leaders should be appointed to leadership positions in low risk industries or low risk firms; (ii) to the extent that some female leaders exhibit excessive risk aversion, they would allocate capital inefficiently, and thus should not be promoted to leadership positions, regardless of a firm’s risk profile, (iii) from a policy perspective, an universal gender quota might be detrimental to firms’ global competitiveness and economic growth. This, in turn, suggests that a very different approach to gender equality is needed at the national level.

Given the far reaching consequences, it is imperative for the causal relationships among female leadership, risk aversion and profitability to be consistently well-identified. So far, there exists little consensus within the literature: the empirical estimates of female leaders’ impact on corporate finance and profitability vary with researchers’ choice of data, metric and identification strategy.

In this paper, we will use annual firm-level data from Iceland between 2008-2014 to understand if firm performances differ systematically under female owners’ leadership. This paper will contribute to the literature in the following ways. To the best of our knowledge,

this would be the first large-scale paper to study gender gap in the context of firm ownership. Compared to existing studies on female CEOs, CFOs, board memberships and other senior executives positions, using majority ownership as a measure of female leadership leads to cleaner causal identification. In the former case, we do not know whether the appointment of female senior executives has been strategically manipulated by the shareholders. For example, if we detected that firms with female senior executives tend to have lower leverage, should we conclude that female senior executives caused the firms to take on lower risk? Or is it because firms that would like to project a more conservative image strategically choose a female executive to project a low risk image to the market? In contrast, female majority shareholders are not subject to selection bias by others, while the concern about self-selection remains.

To address the self-selection bias, we propose two new instrumental variables: gender of the first born, and the gender ratio of children within a family firm. For any given child, gender is completely random – especially since the technology for selective abortion was not available back when the current generation of firm owners were conceived. To the extent that the gender ratio within a household may be subject to manipulation, we will estimate it as the solution to an optimal stopping problem, and exclude households that exhibit gender bias during the heir selection process. We believe these instruments would improve the causal identification over current instruments in this literature: local supply of educated women and commonness of female executives within the region, Faccio, et al (2016), Pavia et al. (2014). Finally, our dataset is unique in terms of the level of female leadership participation rate. Around 45% of firms in the CreditInfo database are in a majority ownership of female shareholders. This is in stark contrast with the existing literature, where the number of female CEOs and board members are usually between 5%-14%. This difference stems from two sources, with Iceland being a gender equal society, and the dataset being comprised of mostly private SMEs. Having a gender balanced data is important for the purpose of external validity. No matter how well identified a study is, if the causal effect is derived from a highly unequal social and economic environment we would not be able to resolve the nature vs. nurture debate. Specifically, if an average female leader causes a firm to be less risky and less profitable, we can't conclude that women are naturally more risk averse. It could very well be that society and families' different gender expectations led girls to behave more conservatively. Thus, causal estimates derived from these environments would not inform on the counterfactual questions: if girls are raised in a more gender equal society, would their leadership style have been indistinguishable from men?

This paper will be organized as follows. First, we conduct a short literature review on firm performance gender gap and gender difference in risk aversion. We will then introduce

our data and discuss our identification strategies in detail. Finally, we conclude outlining our findings and thoughts about future research.

2.2. Literature Review

Aside from the vast behavioral and experimental literature testing differences in risk aversion based on gender, from which the conventional wisdom is currently built on, such as Borghans, Golsteyn, Heckman, Meijers (2009), Eckel & Grossman (2008) finding that women are more risk averse than men, successful papers by financial economists have been equally unambiguous in their conclusions. On the other hand interesting behavioral studies do find gender difference among whites, but not among any other ethnic group, calling it the white male effect, Finuacane et al, (2000), and a study by Alan, Ertac, Kubilay and Loranth (2018) shows no difference in willingness to take risky decisions on behalf of others among children at an average age of 10, yet the proportion of girls who exhibit leadership willingness drops by 39% going from childhood to adolescence (average age 13), in Istanbul, Turkey. Chen, Katuscak and Ozdenoren (2013), test whether gender differences in first-price and second price sealed-bid auction bidding persist through the menstrual cycle in a laboratory setting. They find that women bid significantly higher and earn significantly less than men do in first-price auction, while they find no gender difference in bidding or earnings in the second-price auction. Furthermore, they find that bidding and earnings gender gap in the first-price auction persist over the entire course of the menstrual cycle, apart from bidding of contraceptive pill users, who's bidding follows a sine like pattern throughout the menstrual cycle, with higher than average bidding in the follicular phase, and lower than average bidding in the luteal phase.

We now turn to the literature in financial economics on risk aversion and firm performance in relations to the gender of the firm leadership. Faccio, Marchica, and Mura (2016) show that firms run by female CEOs have lower leverage, less volatile earnings and higher chance of survival than otherwise similar firms run by male CEOs. This risk avoidance behavior of women, that the authors seem to attribute to the gender of the leadership of the firms under research, leads to distortions in capital allocation that potentially have important macroeconomic implications for long term economic growth. Looking at the Italian textile industry during the eighties and nineties, Flabbi, Macis, Moro and Schivardi (2019) show that female leadership on firm performance increased with the share of women workers, concluding that random assignment of female CEOs into firm leadership is sub-optimal, even value destroying, but leads to productivity enhancement, if women lead firms that have higher proportion of female workers. Palvia, Vahamma and Vahamma (2015) find that bank capital

ratios and default risk are associated with the gender of the bank's Chief Executive Officer (CEO) and Chairperson of the board, and that banks with female CEOs hold more conservative levels of capital. Furthermore they find that smaller banks under female leadership were less likely to fail during the financial crisis, concurring with the view that gender-based behavioral differences may affect corporate decisions. A lot can be said about these studies, in our view, that motivates us to revisit their findings.

In general, data on female leaders are limited, and credible identification strategies are hard to come by. Getting data on female leadership is tough for two reasons: gender is most often not explicitly recorded in datasets that researchers have relied on, hitherto. On the same note, the number of female leaders in the corporate world is extremely small, still. For example, while 2.5% of the senior executives in the Italian manufacturing firm dataset recording firm performance in the eighties and nineties used in Flabbi, Macis, Moro and Schivardi (2016) are female; only 5.4% of U.S. commercial banks have a female CEO, and 5.7% of them have a chairwoman, in the first decade of this century, which was used by Palvia, Vahamma and Vahamma (2014); and in the Amadeus Top 250.000 dataset, less than 40% of the firms have CEO's gender recorded, of which only 9.5% are women, Faccio, Marchica and Mura (2016). As mentioned in the previous section, small sample estimates are extremely noisy, especially when the entire dataset is not very big to begin with; moreover, the external validity of estimates obtained from such an unequal environment is difficult to rely on. Assuming perfect identification, if we detect higher risk aversion and lower profitability for females, we would not know whether it is due to nature or nurture. Specifically, do women play into the image of being more conservative, in order to obtain the top positions?

A byproduct of limited data availability is that the metrics for female leadership are highly varied across papers. Specifically, some papers study female CEOs, while other study female CFOs, chair of boards, or senior executives. In some cases, data is so limited that the authors feel the need to switch from studying CEOs to CFOs, since there are slightly more CFOs than CEOs in the data Paliva, Vahamma, and Vahamma, (2014). Holding all else equal, one would not expect the estimates from these papers to be inconsistent – for there's no reason that the gender gap should be the same across different job functions. It also raises the question: when a gender gap estimate is statistically insignificant, is it because there's no gender gap, or is it because the specific job's impact on a specific firm performance metric is limited?

Similarly, firm performance metrics are highly varied across papers. Some have used sales per person, value added per person, estimated total factor productivity, bank capital ratios, default risk during financial crisis, leverage, earnings volatility, stock prices, social impact initiatives etc. Again, it should come as no surprise that the results can be drastically

different for different firm performance outcome. Indeed, Flabbi, Macis, Moro and Schivardi (2016) show that gender gap is detected when they use sales per person and value added per person as the outcome variable, but statistically insignificant when they use estimated total factor productivity.

Their choice of Tobin's Q as a proxy for efficient capital allocation, Faccio, Marchina and Mura (2016), is somewhat surprising given the large number of private firm in Amadeus top 250,000 dataset. This paper has already garnered 200+ citations to date, hence needs special attention and critique. While the authors acknowledge that market valuation can introduce bias, because markets are not always rational, which seems not to be their biggest challenge. Fundamentally, Tobin's Q has been known to have severe downward bias for private firms, whose equity does not change hands frequently. Together with the stylized fact that more women are heading private firms, it is premature to conclude that females are inefficient at allocating capital, judging only by their firms having a lower, estimated Tobin's Q. Rather it is likely that this result is an artifact of a poorly chosen metric for capital allocation efficiency in the context of private firms.

The most convincing identification strategy, in our view, is the quasi-natural experiment from Norway. In the late 2003, Norway mandated that 40 percent representation of each gender on the board of public limited liability company, which raised the median percentage of female board members among public firms from 0% in 2003 to 40% by 2008. This policy intervention was profound and somewhat unexpected by the major players of the private sector, even though it was proposed first in 2002. Indeed, the Norwegian government had to place increasingly tougher penalties as many firms remained non-compliant in 2005, a year after the law had passed. Using this unexpected, binding increase in female board representation, Johansen and Sandnes (2008) and Ahern and Dittmar (2012) found that firms value dropped with the 2002 announcement. In terms of accounting profit, Matsa and Miller (2013) use Sweden as a control group to show that operating profits declined for affected firms, primarily due to fewer payoffs. Curiously, the 2005 announcement effect has been found to be positive by Nygaard (2011), or value-neutral by Eckbo, Nygaard, and Thornburn (2016). Studies from other countries in a similar spirit has reported mixed results.

Once we cross over to papers written on CEOs, CDOs and senior executives, no such quasi-natural experiment exists. In this realm of the literature, the heavy lifting of causal identification is usually attempted by propensity score matching (PSM), fixed effects (FE) and instrumental variables (IV), with local supply of educated women and commonness of female executives being the popular choices. In the following paragraphs, we would like to briefly discuss the identification assumptions underlying each strategy, and why they might be violated.

PSM's identifying assumptions is that, conditional on all the observable firm characteristics, the assignment of senior female executives is random. This is a highly problematic assumption, because it doesn't address selection on unobservable. What is also troubling is the way it is implemented in this literature, makes one wonder if the selection on the observables is done properly. For example, in Matsa and Miller (2013), the authors estimated propensity score as a function of ROA, sales growth, the natural log of total assets, the natural log of firm age, asset tangibility, the ownership of the largest ultimate shareholder, and the ownership of the CEO within a country-industry-year-public/private status category. They then use the propensity score together with CEO wealth and CEO age for to match firms. This paper did not discuss how matching variables were selected, nor did it show that the matching were successful for variables that are not explicitly matched on.

As for fixed effects, its identifying assumption is that the transition of senior executives is random. In other words, there are no time-varying unobservable that could have affected both the gender of the senior executive and the trajectory of the firm performance. This assumption would be violated if the firms' shareholders strategically choose the gender of its senior executives. For example, a commercial banks that has recently suffered a credibility crisis due to over expansion might want to appoint a female executives, as it project a more conservative risk profile to the market.

The exclusion restriction for instrumental variable, is that it cannot be correlated with the dependent variable, other than through the endogenous variable its instrumenting for. This is unlikely to be satisfied when the instruments are local supply of educated women, or the commonness of female executives within the region. Specifically, countries and states with high percentage of educated women and female executives tend to be regions with better social-economic institutions. Thus when researchers detect higher risk aversion, lower bankruptcy probability, and lower profitability using these instruments, it could potentially be attributed to many confounding factors. For example, it is conceivable that states with higher percentages of educated women and female executives are also the ones with stricter lending and business practice laws, which can also generate lower risk and lower profitability results.

That said, we find that the financial economics literature has not reached a conclusion on whether *ceteris paribus* firm performance can be attributed to the gender of its leadership. In other words, given the current prevalent policy interventions of board gender quotas e.g. we need to know whether women are more risk averse corporate leaders *by nature*, or does the weight of gender expectations and *nurture*, call for women to be more conservative when taking risk whilst running the firm.

2.3 Identification Strategy and Data

Focusing on family firm succession, we propose using the gender of the first born child as an instrument, and gender ratio within the family as a second instrument.

2.3.1. First born child as IV

Exclusion restriction is trivially satisfied, since gender of a given child is completely random – for selective abortion technique was not available back when the current generation of firm owners were conceived. In Iceland that is not of any concern, given the gender equal inheritance practices, the egalitarian nature of the Icelandic society, with gender neutral inheritance practices/law, inheritance is by law distributed equally to heirs that are siblings, no family name tradition etc.

Inclusion restriction requires that families are more likely to pass on the firm to the first born. This can be tested in the data. And a priori, one could believe it to be true, given many studies in economics and sociology suggesting so, see e.g. Bennedsen et al. (2007).

2.3.2. Gender ratio as IV

The exclusion restriction is no longer trivial, as gender ratio can be manipulated by parents who desire a certain gender ratio, which will in turn threaten the inclusion restriction.

The inclusion restriction requires that having more daughters increases the chance of having a second generation female owner. But this might not be the case if the gender ratio is manipulated. Specifically, a gender biased family would keep having children until a son is born. And in their case, having more daughters don't increase the likelihood of having a second generation female owner.

To address this issue, we would estimate the propensity of having an additional child based on the existing gender ratio within the household to detect families that are manipulating the gender ratio. For these families, we will check if they are indeed more likely to pass on the firm to the son (gender bias in succession), or where they simply want a more gender balanced family. If it were a former, exclude these families and their firms from the analysis.

2.3.3. Financial data

Our dataset is provided by CreditInfo – an Icelandic Credit Rating Agency. For every registered firm in Iceland between 2008-2014, in compliance with the legal requirement to

hand in their annual statement to the National Firm Registry, we observe their annual financial statements, ownership structure and other registration information. Using these data, we are able to extract gender from owners' last name for 95% of all observation.

2.3.4. Instrumental Variables: Challenges

To construct our instrumental variables, we obtained data from the Icelandic National Registry. Specifically, we intended to use this dataset to identify family firms, and extract our IV – the gender of the firstborn within a family firm. Unfortunately, the government agency only has digital data going back as far as 1996. Moreover, upon inspection this dataset also suffered from a number of other limitations:

1. Parent-child relationships are censored. When a child becomes 18, she acquires her own household registration number. This makes identification of firstborn child nearly impossible.
2. Cohabiting couples are not registered as a household. In the data, around 70% of the households are missing fathers. This makes the identification of family firms challenging. If a father passed on his baton to his children, we would not be able to observe it using the family registry data.

Upon further exploration, we discovered that a private vendor DeCode genetics has digital access to all family registry going back many generations (back to 1200s in some cases). Unfortunately the negotiations with DeCode has been stalled by legal reviews of data privacy constraint. It remains under discussion of who we can access their data, and whether we can extract our IVs for journal peer reviews.

2.3.5 Instrumental Variables: Plan B

Fearing that the negotiations with DeCode can break down, we implemented Plan B. We constructed a proxy for gender ratio of children by going through a firm's list of owners. Here is the algorithm:

- for each firm, screen the list of shareholders, and see if any two people share the same root in their last names.
- If so, we treat them as siblings and identify this firm as a sibling co-owned firm.
- We then construct firstborn gender and family gender ratio proxies.

2.5 Identification Assumptions

For this approach to work, we need to make the following set of identification assumptions:

1. All children are present on the ownership list;
2. They all have common last name root;
3. We're only studying family firms with more than 1 child, and assume that we can extrapolate findings from this sample. Specifically, we cannot detect family firms with only one child.

These seem to be fairly strong assumptions. But data suggests that they might be quite close to reality. Of 5448 firms that we identified as being co-owned by siblings, 81% have siblings holding exact same shares. In light of this evidence, we believe that the three identification assumptions are likely to hold for the following reasons:

1. The Icelandic inheritance law is interpreted out of the principal that siblings inherit equal amount out of the estate, if there isn't a written will that states otherwise.
2. If a parent endows several children with exact same shares, he/she is likely to value fairness very highly. Thus, it would be against his/her principal if he left a subset of his children the exact same share, but the rest of his children absolutely nothing. It is possible that out of the children who are all endowed with the same shares, there is one who choses to sell her shares to her siblings and set up her own shop. But we are inclined to conclude that no re-balancing has taken place when we observe multiple siblings holding exact number of shares. Thus our first assumption that all children are present on the ownership list is likely to hold with high probability.
3. Similarly, while sharing the same last name root is certainly plausible, it is extremely unlikely for two people who are non-siblings to share the same last root AND hold the exact same amount of shares.
4. According to the Statistics Iceland, the fertility rate in Iceland was mostly above 2 prior to mid-90s. Thus families with 1 child is certainly the exception not the norm. In other words, we have a representative sample for the Icelandic family firms from 2008-2014.

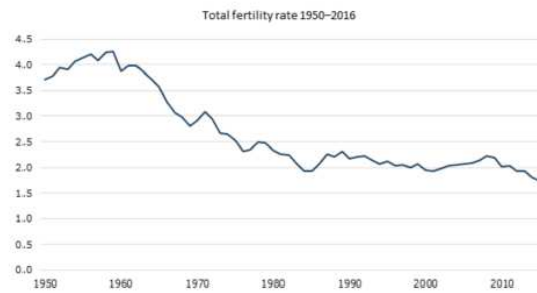


Figure 2.1 Fertility rate of women in Iceland

Sources: Statistics Iceland

Discussion: DeCode data's value-added potentially small. Imagine that we do have the DeCode data. What would the value-added be?

1. We would be able to detect additional family firms, beyond those co-owned by siblings. Specifically, (1) firms with single child; (2) family firms co-owned by half-siblings who do not share the same last name root.
2. Throw out false positives: firms that have more than two unrelated people holding the same number of shares, sharing the same name root.
3. No measurement error in IVs. Right now, even if we focus on firms with tied majority shareholders, we cannot say with 100% certainty that all children within the family is on the ownership list, some may have moved their ownership stake in the family firm over to an off-shore special purpose vehicle.

As we discussed in the previous section, the value added in (2) and (3) are probably not very high, because they are likely to be satisfied already – especially if we restrict our attention to firms with siblings holding exact same shares. Let's turn our attention to (1). We hypothesize that families with business worth passing down to would probably have more than one child to hedge their risks. As for half-siblings who do not share the same last name root, the succession is from mother to children –for half-siblings with the same father would share the same last name root, and thus already captured in our current sample. We imagine that mother passing a firm to children with different fathers are probably going to be a lot less common than the other way around – since the female labor force participation rate was quite low until the 80s.

In conclusion, while the DeCode's data can help us cover many edge cases, it is unlikely to alter our main results.

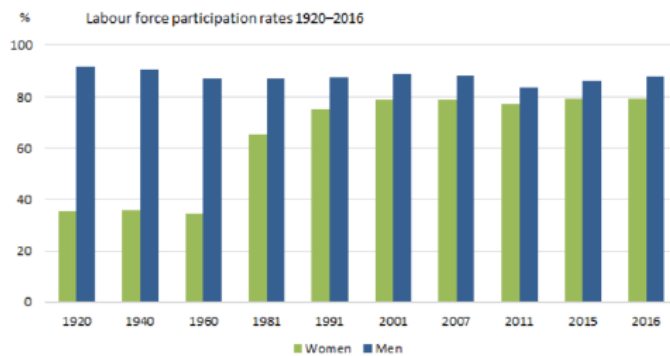


Figure 2.2 Labor force participation in Iceland

Source: Statistics Iceland

2.6 Summary of Statistics

2.6.1 A Highly Gender Equal Sample

Table 2.1 summarizes the entire financial dataset. From the year 2008-2014. We have 145,842 firm-by-year observations, 41.24% of which have a female majority shareholder. This makes our data the most gender-equal sample in the existing literature. The gender ratio of all shareholders seem to be well-balanced: for a firm with a male majority shareholder, on average there's 0.34 female shareholders; for a firm with a female majority shareholder, on average there's 0.27 male shareholders. Having a gender equal sample is very important: even assuming perfect identification, it is possible that the gender effect was not due to nature, but rather an adaptive behavior that females adopted in a gender-biased society.

	Men		Women	
	mean	sd	mean	sd
n_girls (number of girls)	0.34	0.69	1.28	0.62
n_boys (number of boys)	1.18	0.75	0.27	0.52
totalAss Total Assets	80,080	2,198,649	61,999	712,676
totalLib Total Liabilities	75,425	1,941,057	66,881	1,490,213
writeOffs (debt written off)	0.14	7.23	5.35	492.05
lib_to_ass total liabilities to total assets	53.75	1,904.21	55.63	2,501.73
ebitda_to_ass Earnings Before Interest Tax and Amortization to Total Assets	-2.34	401.35	-3.54	518.45
rev_to_ass Total Revenue to Total Assets	3.36	150.70	3.99	178.80
exp_to_ass Total Expenses to Total Assets	5.35	428.85	4.76	223.37
fix_ass_to_ass Fixed assets to total assets	0.29	0.36	0.30	0.36
intang_to_ass Intangible Assets to Total Assets	0.01	0.09	0.01	0.08
Number of Observations	85,702		60,140	

Table 2.1 Summary statistics of variables in the CreditInfo database

2.6.2 No observable gender difference in raw data

At first glance, it seems to corroborate existing studies' finding: firms under male leadership seems to be bigger. But once we turn our attention to the leverage ratio, there seems to be no gender effect even in the raw data. Of course, a closer look at the standard errors suggest that we should not take these means too seriously. The large standard errors is in line with our expectation – as Iceland experienced a catastrophic economic crisis in 2008, making outliers a real concern. This motivate us to run our analysis by truncating the entire sample at 1, 3, 5, 10 percent respectively. The only exception here the intangible asset ratio, which is very well behaved. In order to preserve some variations in this variable, we will not trim it.

The following tables show the summary of statistics for these truncated sample, table 2.2., 2.3a, 2.3b. and 2.4. The main observations remain the same: even in the raw data, there's no observable gender difference.

	Men		Women	
	mean	sd	mean	sd
n_girls	0.34	0.68	1.29	0.62
n_boys	1.18	0.74	0.27	0.52
totalAss	35,572	83,924	31,066	78,051
totalLib	30,440	74,222	27,297	70,125
lib_to_ass	1.68	7.22	1.84	7.44
ebitda_to_ass	-0.03	0.66	-0.05	0.67
rev_to_ass	0.61	1.52	0.69	1.64
exp_to_ass	0.64	1.61	0.73	1.77
fix_ass_to_ass	0.30	0.36	0.30	0.36
intang_to_ass	0.01	0.08	0.01	0.07
Observations	81,760		57,548	

Table 2.2 Summary of Statistics of CreditInfo Variables truncated at 1%

	Men		Women	
	mean	sd	mean	sd
n_girls	0.34	0.68	1.28	0.62
n_boys	1.18	0.73	0.27	0.52
totalAss	26,041	45,196	23,173	41,852
totalLib	21,714	40,069	19,767	37,357
lib_to_ass	0.90	1.33	0.97	1.44
ebitda_to_ass	0.02	0.31	0.01	0.32
rev_to_ass	0.46	1.00	0.50	1.06
exp_to_ass	0.46	1.00	0.51	1.06
fix_ass_to_ass	0.28	0.34	0.28	0.35
intang_to_ass	0.01	0.08	0.01	0.07
Observations	72,114		50,524	

Table 2.3a Icelandic firms: Summary of Statistics (truncated at 3 percent)

	Men		Women	
	mean	sd	mean	sd
n_girls	0.33	0.68	1.28	0.61
n_boys	1.18	0.73	0.27	0.51
totalAss	22,183	32,086	20,345	30,553
totalLib	17,758	28,812	16,686	27,439
lib_to_ass	0.79	0.87	0.83	0.92
ebitda_to_ass	0.03	0.24	0.03	0.24
rev_to_ass	0.39	0.80	0.42	0.84
exp_to_ass	0.38	0.78	0.42	0.81
fix_ass_to_ass	0.28	0.33	0.28	0.34
intang_to_ass	0.01	0.08	0.01	0.07
Observations	60,699		42,373	

Table 2.3b Summary of Statistics of CreditInfo variables, truncated at 5%

2.7 Pooled OLS, Fixed Effects and Probit Results

In this section, we present results from pooled OLS, fixed effect and probit regressions, run on the entire sample and different subsamples for robustness checks.

2.7.1 What we estimate

We estimate firm (i)'s earnings, measured from earnings before interest, tax, depreciation, and amortization as a share of total assets (*ebitda_to_assets*) and it's probability of financial distress (takes value 1 if debt exceeds total assets) as a functions of gender of the majority shareholder, size of the firms (log of total assets), fixed assets-, intangible assets -, and leverage as share of total assets, controlling for industry (j) and time (t), clustering the standard errors at the firm for probit regressions, and firm and year level for OLS, while we include robust standard errors for fixed effects estimations, as explained in further detail below. Since this is a crisis data we winsorize our variables at different levels, 3%, 5%, 10%, for robustness checks.

$$1) \text{Earnings}_{ijt} = \beta_0 + \beta_1 \text{Gender_ratio}_{it} + \beta_2 \text{Size}_{it} + \beta_3 \text{FixedAssets}_{it} + \beta_4 \text{IntangibleAssets}_{it} + \beta_5 \text{Leverage}_{it} + \beta_6 \sum_{j=1}^{247} \sum_{t=08}^{15} \phi_{jt} + \beta_7 \sum_{t=08}^{15} \psi_t + \alpha_i + \varepsilon_{ijt}$$

$$2) \text{Leverage}_{ijt} = \beta_0 + \beta_1 \text{Gender_ratio}_{it} + \beta_2 \text{Size}_{it} + \beta_3 \text{FixedAssets}_{it} + \beta_4 \text{IntangibleAssets}_{it} + \beta_5 \text{Leverage}_{it} + \beta_6 \sum_{j=1}^{247} \sum_{t=08}^{15} \phi_{jt} + \beta_7 \sum_{t=08}^{15} \psi_t + \alpha_i + \varepsilon_{ijt}$$

$$3) \text{Prob(Financial Distress)}_{it} = \beta_0 + \beta_1 \text{Gender_ratio}_{it} + \beta_2 \text{Size}_{it} + \beta_3 \text{FixedAssets}_{it} + \beta_4 \text{IntangibleAssets}_{it} + \beta_5 \text{Leverage}_{it} + \beta_6 \sum_{j=1}^{247} \sum_{t=08}^{15} \phi_{jt} + \beta_7 \sum_{t=08}^{15} \psi_t + \alpha_i + \varepsilon_{ijt}$$

$$4) \text{Prob(Debt Writeoff)}_{ijt} = \beta_0 + \beta_1 \text{Gender_ratio}_{it} + \beta_2 \text{Size}_{it} + \beta_3 \text{FixedAssets}_{it} + \beta_4 \text{IntangibleAssets}_{it} + \beta_5 \text{Leverage}_{it} + \beta_6 \sum_{j=1}^{247} \sum_{t=08}^{15} \phi_{jt} + \beta_7 \sum_{t=08}^{15} \psi_t + \alpha_i + \varepsilon_{ijt}$$

2.7.2 Samples

In this section, we present OLS, FE and Probit regressions for two samples. In the first sample, firms with tied majority shareholders are not included, and the majority ownership gender variable is binary. In the second sample, we focus on firms with tied majority shareholders. Here, the majority ownership gender variable is a continuous variable in between 0 and 1, exclusive. This robustness check is motivated by our concern that gender dynamics may not be symmetric. And thus, it would be helpful to first establish the gender effect using the subsample of firms that have an absolute majority shareholder, before we

extend our analysis to the sample with tied majority shareholders. Upon checking our results, we found that the results for both samples are highly similar.

2.7.3 Pooled OLS Results

In our pooled OLS regressions, standard errors are clustered at the firm by year level, and year and industry fixed effects are included. The dummy variable Gender turns on when the majority shareholder is a female.

	Entire Sample		Trimmed 3%		Trimmed 5%		Trimmed 10%	
	Lev	Earn	Lev	Earn	Lev	Earn	Lev	Earn
Gender	0.17	-1.25	0.0527***	-0.00352*	0.0290**	0.000417	0.0124	-0.0004
	(0.01)	(-0.66)	(4.01)	(-2.56)	(3.30)	(0.30)	(1.86)	(-0.39)
Size	-23.41***	-0.20	0.0286***	0.0132***	0.0362**	0.0446***	0.1000***	0.0337***
	(-4.61)	(-0.51)	(8.09)	(33.43)	(3.05)	(51.75)	(10.08)	(41.78)
Earning	-1.531***		-1.057***		-0.724***		-0.497***	
	(-12.62)		(-37.13)		(-21.81)		(-19.57)	
Fix Ass	-32.05***	1.14	0.739***	-0.0292***	0.725***	-0.0575***	0.558***	-0.0100*
	(-5.66)	(0.56)	(15.75)	(-7.66)	(21.55)	(-11.67)	(18.67)	(-2.56)
Intang	-0.10	-2.09	0.641***	-0.0453*	0.625***	-0.0871***	0.418***	-0.0382***
	(-0.01)	(-1.13)	(5.85)	(-2.33)	(6.74)	(-7.32)	(8.37)	(-6.18)
Lev		-0.07		-0.0559***		-0.0526***		-0.0397***
		(-1.55)		(-29.19)		(-15.51)		(-19.13)
Const	203.4***	-4.48	0.422***	0.01	0.299000	-0.285***	-0.294*	-0.213***
	(4.85)	(-0.70)	(4.11)	(0.37)	(1.80)	(-13.95)	(-2.07)	(-14.25)
N	145,795	145,795	126,078	126,078	108,610	108,610	77,066	77,066

Table 2.4 Pooled OLS: Absolute majority shareholder – standard errors clustered at firm-by-year level

For the second sample, see Table 2.5, where majority shareholder is a continuous variable due to tied majority shareholding, gender effects are not detected in any subsamples.

	Entire Sample		Trimmed 3%		Trimmed 5%		Trimmed 10%	
	Lev	Earn	Lev	Earn	Lev	Earn	Lev	Earn
Gender	78.93	-14.59	0.12	0.0581	0.22	0.0229	0.0985	0.0262
	(0.70)	(-0.96)	(0.82)	(1.94)	(1.89)	(1.00)	(0.88)	(1.07)
Size	-13.68*	0.83	0.0402***	0.0142***	0.0822***	0.0451***	0.131***	0.0336***
	(-2.02)	(0.89)	(7.36)	(9.45)	(3.83)	(15.09)	(8.68)	(18.98)
Earning	-0.814***		-0.815***		-0.687***		-0.441***	
	(-5.29)		(-7.55)		(-6.21)		(-4.14)	
Fix Ass	-24.70*	3.954**	0.575***	0.00296	0.510***	-0.0355*	0.329***	-0.00604
	(-2.26)	(2.76)	(6.42)	(0.14)	(6.44)	(-2.50)	(4.09)	(-0.38)
Intang	7.19	-7.25	-0.215	-0.0113	-0.0171	-0.0412	0.141	-0.0661*
	(0.19)	(-1.01)	(-0.74)	(-0.14)	(-0.08)	(-0.92)	(0.73)	(-2.34)
Lev		-0.03		-0.0435***		-0.0476***		-0.0293***
		(-0.70)		(-8.23)		(-6.96)		(-5.05)
Const	91.91**	-1.85	0.336	-0.0795**	-0.0932	-0.299***	-0.707***	-0.214***
	(3.30)	(-0.31)	(0.98)	(-2.81)	(-0.25)	(-7.34)	(-4.10)	(-17.34)
N	4,670	4,670	3,965	3,965	3,401	3,401	2,264	2,264

Table 2.5: Pooled OLS: Absolute or tied majority shareholder – standard errors clustered at firm-by-year level

	Entire Sample		Trimmed 3%		Trimmed 5%		Trimmed 10%	
	Lev	Earn	Lev	Earn	Lev	Earn	Lev	Earn
Gender	4.615	1.851	-0.01	-0.00	0.00	-0.00	-0.00	-0.00
	(0.85)	(1.04)	(-0.48)	(-1.24)	(0.65)	(-0.44)	(-0.10)	(-0.76)
Size	-31.86***	-0.198	0.0600** *	0.0142***	-0.0346***	0.0757***	0.0930** *	0.0572***
	(-3.83)	(-0.12)	(17.32)	(22.86)	(-5.66)	(49.94)	(21.27)	(42.80)
Earnings	-0.7		-0.525***		-0.289***		-0.234***	
	(-1.11)		(-27.33)		(-24.58)		(-21.61)	
Fix Ass	-62.82*	2.241	0.383***	-0.146***	0.506***	-0.160***	0.374***	-0.0782***
	(-2.45)	(0.34)	(13.19)	(-20.51)	(26.35)	(-26.91)	(25.54)	(-14.82)
Intang	14.51	3.361	0.238**	-0.112***	0.300***	-0.114***	0.155***	-0.0498***
	(0.79)	(0.75)	(2.84)	(-5.16)	(4.63)	(-7.10)	(3.76)	(-3.55)
Lev		-0.0446		-0.0617***		-0.0633***		-0.0611***
		(-0.96)		(-24.62)		(-22.63)		(-20.59)
Const	279.0***	-5.414	0.264***	0.0177**	0.948***	-0.516***	-0.229***	-0.384***
	(4.5)	(-0.35)	(9.50)	(3.22)	(18.44)	(-40.10)	(-6.10)	(-34.33)
N	145,837	145,837	126,118	126,118	108,645	108,645	77,093	77,093

Table 2.6: FE: Absolute majority shareholder – standard errors clustered at firm level

	Entire Sample		Trimmed 3%		Trimmed 5%		Trimmed 10%	
	Lev	Earn	Lev	Earn	Lev	Earn	Lev	Earn
Gender	381.4	-8.635	-0.03	0.135**	0.0315	0.0963*	0.04	0.05
	(0.87)	(-0.52)	(-0.21)	(3.27)	(0.42)	(2.57)	(0.55)	(1.55)
Size	-5.759	7.9	0.0494**	0.0145***	-0.0146	0.0887***	0.0895**	0.0608***
	(-0.54)	(0.99)	(2.95)	(3.71)	(-0.44)	(7.33)	(3.23)	(5.55)
Earning	-0.827***		-0.409***		-0.357***		-0.235***	
	(-5.32)		(-4.80)		(-5.13)		(-3.45)	
Fix Ass	-65.21	-6.52	0.387**	-0.062	0.428***	-0.0923*	0.394***	-0.063
	(-1.39)	(-0.35)	(2.68)	(-1.28)	(3.74)	(-2.46)	(4.02)	(-1.36)
Intang	-32.98	-2.846	0.549*	-0.000262	0.470*	0.0382	0.611	0.0489
	(-0.68)	(-0.23)	(2.48)	(-0.00)	(2.34)	(0.47)	(1.83)	(0.54)
Lev		-0.0261		-0.0603***		-0.0929***		-0.0696***
		(-0.75)		(-3.38)		(-5.07)		(-3.35)
Const	-121.6	-65.09	0.381*	-0.113**	0.782**	-0.723***	-0.231	-0.466***
	(-0.39)	(-0.95)	(2.56)	(-2.66)	(2.69)	(-6.94)	(-0.97)	(-5.01)
N	4,670	4,670	3,965	3,965	3,401	3,401	2,264	2,264

Table 2.7: FE: Absolute or tied majority shareholder – standard errors clustered at firm level

2.7.4 Probit Results

If female owners are more risk averse, the 2008 financial crisis would have been the litmus test. We would expect that firms owned by female leaders are less likely to be underwater in 2008. Consequently, these firms would be less likely to be a part of the debt-relief program initiated by the Icelandic government and the IMF in 2009. So how do these expectations pan out?

In table 2.8, we run the probit regression for being distressed in 2008 on the first sample, where each firm has an absolute majority shareholder. In these probit regressions, industry fixed effect is included, and standard errors are clustered at the firm level. We see that across all truncated sub-samples, the gender effect is statistically insignificant – while the coefficients on the other control variables are highly significant.

In table 2.10, we run the probit regression for being distressed in 2008 on the first sample, where each firm have tied majority shareholders. We see that only the regression that was ran on the entire sample detects the gender effect. As soon as we start truncating the outliers, the gender effect goes away.

In table 2.9, we run the probit regression for participating in the write-off program on the first sample. Here, we do detect a gender effect: firms owned by a female majority shareholder is 8.3% less likely to be part of the debt write-down program. We repeat this

analysis on the second table 2.10, and the sign of the gender coefficient flipped, yet it is insignificant. Since it is not stable, we won't read too much into it.

	Entire Sample	Trimmed	Trimmed	Trimmed
Probit		0.03	0.05	0.1
Gender	0.01	0.01	0.03	0.06
	(0.36)	(0.49)	(1.26)	(1.94)
Size	-0.101***	-0.0907***	0.112***	0.184***
	(-40.13)	(-36.74)	(13.84)	(17.47)
Earnings	-0.00	-1.012***	-1.525***	-1.735***
	(-1.55)	(-26.38)	(-28.82)	(-18.37)
Fixed Asset	1.380***	1.521***	1.324***	1.325***
	(41.64)	(39.71)	(31.71)	(24.61)
Intangible	1.587***	1.412***	1.038***	1.146***
	(12.90)	(9.93)	(7.06)	(6.83)
Constant	0.08	-0.01	-1.867***	-2.787***
	(0.43)	(-0.07)	(-8.55)	(-10.59)
N obs.	18,257	15,975	13,574	9,684

Table 2.8: Probit: Probability of Being Distressed in 2008 – Absolute majority shareholder – industry dummies included, standard errors clustered at firm and year level

	Getting a Write Off	Size of Writeoffs
	Probit	OLS
Gender	-0.0831*	0.00
	(-2.46)	(1.06)
Earnings	0.0000421**	-0.00
	(3.07)	(-1.91)
Leverage	0.130***	-0.00
	(7.38)	(-0.50)
Size	0.617***	-0.00
	(13.39)	(-1.20)
Fixed Asset	1.166***	-0.00
	(9.21)	(-0.83)
Intangible	0.0000826**	0.00
	(3.25)	(0.31)
Constant	-2.913***	0.00
	(-9.69)	(1.17)
N	18,569	1,020

Table 2.9: Probit: Probability of Receiving a Write-Off in 2009 and an OLS estimation of the size of the write off, conditional on write off – Absolute majority shareholders – industry dummies included,

	Entire Sample	Trimmed	Trimmed	Trimmed
Probit		0.03	0.05	0.1
Gender	-0.978*	-0.74	-0.65	-0.72
	(-2.18)	(-1.49)	(-1.16)	(-0.96)
Size	-0.0788***	-0.0853***	0.137**	0.202**
	(-4.87)	(-4.83)	(3.00)	(2.85)
Earnings	-0.03	-1.146***	-2.329***	-2.325**
	(-1.30)	(-4.54)	(-5.46)	(-3.19)
Fixed Asset	1.107***	1.195***	0.979***	1.354**
	(5.93)	(5.31)	(3.92)	(3.25)
Intangible	1.722*	-0.581	-1.976	-3.092
	(2.56)	(-0.46)	(-1.20)	(-1.86)
Constant	4.621***	4.543***	2.986***	-1.573
	(13.02)	(11.72)	(5.7)	(-1.55)
Industry dummies	Included	Included	Included	Included
N	545	465	384	232

Table 2.10: Probit: Probability of Being Distressed in 2008 – Absolute or tied majority shareholders – industry dummies included

	Getting a Write Off	Size of Writeoffs
	Probit	OLS
Gender	0.629	-0.00
	(1.1)	(-0.14)
Earnings	0.00144***	-0.00
	(3.98)	(-0.74)
Leverage	0.275***	-0.00
	(4.88)	(-1.88)
Size	0.816**	0.00
	(2.60)	(1.22)
Fixed Asset	0.77	-0.00
	(1.16)	(-0.73)
Intangible	0.0456	-0.00
	(1.29)	(-0.33)
Constant	-8.305***	0.000104**
	(-11.87)	(3.75)
N	412	52

Table 2.11: Probit: Propability of Receiving a Write-Off in 2009 – Absolute or tied majority, industry dummies included, standard error clustered at the firm level

2.8 Instrumental Variables

2.8.1 Gender ratio is the only instrument that makes sense

We have two instrumental variables: gender of the firstborn child and the gender ratio of siblings. Needless to say for these IVs work, we're focusing our attention on the subsample of family firms.

A priori, the gender of the first-born child is our preferred IV, for reasons discussed in the identification strategy section above. However, upon a close inspection of the family firms sub-sample, we change our mind. We observe that an overwhelming majority of family firms (>80%) endow their children with exactly the same number of shares in their family firms. For this reason, we believe that the gender of the first-born is no longer the best IV choice. While the remaining firms did have the first born as the absolute majority shareholder, the number of observations would be too small. If we don't observe a significant gender effect, it is hard to say for sure whether it is due to the small sample, or the lack of gender effect.

Now if we're using the gender ratio of the children as our IV, one concern we mention in the identification challenge section is the exclusion restriction. Specifically, we were concerned that family that has a particular gender preference would keep having more children until they get the desired gender. How would this bias our IV estimate? Imagine there are two family firms: firm A and firm B. Suppose family A is gender neutral, and firm B prefers a boy. Suppose further that family A had two children, an older boy and a younger girl, and the gender ratio for them is 0.5. Suppose family B's first two children were both girls. They decide to have a third child, who turns out to be a boy. Their gender ratio would be 0.66. If we use the gender ratio as our IV in this case, we would have erroneously concluded that there's 66% chance that firm B has a second generation female majority shareholder. Suppose that the true data generating process has female majority shareholder being more risk averse than males, then our IV result would yield the opposite result, because we erroneously concluded that firm B had a higher chance of appointing a female majority shareholder.

In the jargon of the IV literature, these families are the defiers of our IVs: having more girls does not necessarily translate into a higher probability of having a female heir. But the summary of statistics on the family firms sub-sample greatly alleviates this concern. Intuitively, if these family firms were truly gender biased, they would not have endowed each child with equal number of shares; mechanically, when they endow their children with equal number of shares, having more girls automatically translate into greater female influence in corporate governance.

But for completeness' sake, we run and present all the IV regressions as originally planned, using both IVs. For each specification, we present yearly results for the entire sample and the 5% truncated sample.

2.8.2 IV Regressions

In table 2.12 and 2.13, we present the IV result on the 5% truncated sample, using gender ratio of the children as our IVs. We fail to detect gender effect in leverage ratios for any years in between 2008-2014; as for earnings ratio, firms with more females as majority shareholder had lower earnings ratio in 2008, but not for any subsequent years. For each regression, we conducted a weak instrument test, and all of them passed with a comfortable margin. For example, for the 2008 regression in Table 2.14, the Crag-Donaldson Wald F statistics is 497.6, the Kleibergen-Paap rk Wald F statistics is 660.62 while the Stock-Yogo weak ID test critical values are 16.38, 8.96, 6.66 and 5.53 for 10%, 15%, 20% and 25% maximal IV size respectively.

	2008	2009	2010	2011	2012	2013	2014
Outcome	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage
majority_gen	-0.032	-0.12	-0.038	0.0	0.016	-0.007	-0.10
	-0.10	-0.12	-0.11	-0.1	-0.12	-0.1	-0.11
log_totalAss_tr	0.03770	0.0249	0.0338*	0.01	-0.013	-0.05	-0.0467**
	-0.0254	-0.0279	-0.0205	-0.022	-0.023	-0.030	-0.023
ebitda_to_ass_tr	-1.211***	-0.257	-0.3	-0.753***	-0.950***	-0.611**	-0.400**
	-0.179	-0.2620	-0.207	-0.237	-0.2500	-0.254	-0.193
fix_ass_to_ass_tr	0.457***	0.630***	0.684***	0.689***	0.605***	0.675***	0.606***
	-0.120	-0.140	-0.111	-0.112	-0.116	-0.129	-0.106
intang_to_ass	0.805**	0.56	0.564**	0.5	1.098**	0.542	0.216
	-0.333	-0.378	-0.242	-0.31	-0.499	-0.626	-0.28
Observations	486	500	548	583	581	611	585
R-squared	0.119	0.069	0.09	0.095	0.103	0.078	0.073

Table 2.12: Gender Ratio as IV, Leverage as Dependent Variable – Industry dummies included – standard errors clustered

	2008	2009	2010	2011	2012	2013	2014
Outcome	Earnings	Earnings	Earnings	Earnings	Earnings	Earnings	Earnings
majority_gen	-0.128*	-0.0653	-0.082	-0.1	-0.081	0.023	0.10
	-0.07	-0.05	-0.06	-0.1	-0.06	-0.1	-0.16
lib_to_ass_tr	-0.184***	-0.0356	-0.0331	-0.01	-0.034	-0.139**	-0.112**
	-0.0450	-0.0289	-0.0804	-0.048	-0.049	-0.057	-0.049
log_totalAss_tr	0.0513***	0.0316**	0.0361**	0.0608***	0.0608***	0.0916***	0.0224
	-0.012	-0.0131	-0.015	-0.015	-0.0120	-0.022	-0.038
fix_ass_to_ass_tr	-0.031	-0.026	-0.059	-0.0104	-0.187*	-0.0205	-0.14
	-0.069	-0.056	-0.109	-0.083	-0.110	-0.092	-0.111
intang_to_ass	-0.004	-0.03	-0.264**	0.000627	-0.276	0.042	-0.796*
	-0.108	-0.096	-0.134	-0.13	-0.176	-0.197	-0.42
Observations	519	545	577	612	610	637	628
R-squared	0.143	0.025	0.02	0.025	0.059	0.097	0.020

Table 2.13: Gender Ratio as IV, Earnings as Dependent Variable

2.8.3 Robustness Checks

Tables 2.15-2.25 are the alternative specifications to 2.12 and 2.13 on different samples.

Here is the list for the different specifications is shown below in Table 2.14

Table	Sample	Tied Majority Allowed?	Instrumental Variable	Dependent Variable
2.15	All Family Firms	No	Firstborn Gender	Leverage Ratio
2.16	All Family Firms	No	Firstborn Gender	Earnings Ratio
2.17	Truncated at 5%	No	Firstborn Gender	Leverage Ratio
2.18	Truncated at 5%	No	Firstborn Gender	Earnings Ratio
2.19	All Family Firms	No	Gender Ratio	Leverage Ratio
2.20	All Family Firms	No	Gender Ratio	Earnings Ratio
2.21	Truncated at 5%	No	Gender Ratio	Leverage Ratio
2.22	Truncated at 5%	No	Gender Ratio	Earnings Ratio
2.23	All Family Firms	Yes	Gender Ratio	Leverage Ratio
2.24	All Family Firms	Yes	Gender Ratio	Earnings Ratio
2.26	Truncated at 5%	Yes	Gender Ratio	Leverage Ratio
2.27	Truncated at 5%	Yes	Gender Ratio	Earnings Ratio

Table 2.14: Robustness Checks for IV Regressions

Observe that table 2.15-2.20 are done on the sample of firms with an absolute majority shareholder. We observe that the number of observations are extremely small, which leads to unstable results and low R-square. Tables 2.23-2.24 are done on the sample where we allow

shared majority shareholding, without truncating the sample at 5%. The results are similar to what we present in our main results in tables 2.12-2.13.

2.9 Conclusion

Are female leaders more risk averse than males? This paper has reached a different conclusion than existing literature. Using national data from Iceland, we show that in a more gender equal society, there are no gender difference in risk taking behavior. This result is stable across many different specifications, on many slices of the samples.

Why do we reach such different conclusion? There are mainly two reasons: data and identification strategy. The Icelandic society currently ranks No. 1 in terms of gender equality on many international organization charts. Even in summary of statistics, we do not observe market gender difference in terms of leverage ratio. In terms of identification strategy, we depart from usual practice of running cross-country regressions, using shares of educated women as IVs. We believe using the gender of children in family firms provides better identification – for countries with lower shares of educated women often tend to have institutional governance problem. It may very well be the weak financial laws in these societies that is driving the higher leverage ratio.

More studies should be conducted using data from countries with high gender equality index. Meanwhile, scholars should refrain from concluding that female leaders are by nature more risk averse, as it can be highly detrimental to aspiring young female employees.

In this draft, our dataset is not 100% ideal. If we could obtain access to the DeCode data, we would be able to include a few more observations: specifically family firms that have only one child. As discussed before, the number of such observations are not expected to be very high, and thus unlikely to fundamentally alter our conclusion.

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	2008	2009	2010	2011	2012	2013	2014
Outcome	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage
majority_gen_dum	0.338	0.61	-2.278*	-3.562*	-2.328	-1.918	-4.232*
	-0.537	-0.852	-1.366	-1.852	-2.777	-1.912	-2.274
log_totalAss	-0.00919	-0.101	0.0741	0.0894	-0.397	-0.293	-0.307
	-0.0331	-0.0672	-0.0841	-0.106	-0.415	-0.186	-0.264
ebitda_to_ass	-0.896**	-0.666***	-2.961*	-0.357	-0.996***	-0.129	0.617***
	-0.377	-0.0301	-1.621	-0.348	-0.0268	-1.503	-0.233
fix_ass_to_ass	1.714***	2.148**	-2.054	0.593	-0.569	0.473	1.884**
	-0.576	-0.907	-1.931	-0.837	-1.917	-1.145	-0.916
intang_to_ass	2.299***	3.077***	-0.429	4.220**	8.069**	0.894	1.323
	-0.541	-0.823	-1.369	-1.71	-3.337	-1.668	-7.76
Observations	99	101	123	131	135	151	157
R-squared	0.142	0.744	0.07	0.002	0.812	0.019	0.546

Table 2.15: IV: All Family Firms, Absolute Majority, Firstborn as IV, Leverage Ratio as Dependent Variable.

	2008	2009	2010	2011	2012	2013	2014
Outcome	Earnings	Earnings	Earnings	Earnings	Earnings	Earnings	Earnings
majority_gen_dum	0.075	0.83	-0.028	0.0309	-0.914	-0.036	5.654
Standard errors	-0.096	-0.950	-0.075	-0.140	-2.226	-0.070	-3.598
lib_to_ass	-0.0297*	-1.062***	-0.00972***	-0.0005	-0.787***	0.000	0.915***
	-0.0161	-0.2650	-0.0033	-0.005	-0.134	-0.004	-0.165
log_totalAss	0.0147***	0.0211	0.0112	0.0464**	0.0468	0.0471***	0.00458
	-0.005	-0.0599	-0.007	-0.023	-0.3130	-0.014	-0.166
fix_ass_to_ass	0.148	2.258**	-0.179***	0.091	-0.071	-0.324***	-2.683**
	-0.105	-0.949	-0.068	-0.106	-1.445	-0.088	-1.203
intang_to_ass	0.0907	2.775***	-0.148	0.56	5.797*	0.086	-4.935
	-0.085	-0.940	-0.108	-0.48	-3.235	-0.122	-10.58
Observations	99	101	123	131	135	151	157
R-squared	0.080	0.719	0.10	0.076	0.809	0.243	0.550

Table 2.16: IV: All Family Firms, Absolute Majority, Firstborn as IV, Earnings Ratio as Dependent Variable

	2008	2009	2010	2011	2012	2013	2014
Outcome	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage
majority_gen_dum	-0.651	-1.31	-0.534	-0.445	-0.320	0.102	-0.256
	-0.462	-0.917	-0.686	-0.431	-0.311	-0.241	-0.274
log_totalAss_tr	-0.07060	-0.049	-0.0204	-0.1490	-0.090	-0.177*	-0.175***
	-0.1070	-0.0901	-0.0827	-0.099	-0.078	-0.104	-0.066
ebitda_to_ass_tr	0.0627	-0.541	-0.784	-0.835	-1.632**	0.980	0.221
	-0.874	-0.7590	-0.553	-0.689	-0.6700	-0.705	-0.558
fix_ass_to_ass_tr	1.283***	0.47	0.940**	1.094***	0.912***	1.419***	1.271***
	-0.395	-0.587	-0.409	-0.298	-0.307	-0.390	-0.330
intang_to_ass	0.917	3.930***	0.497	2.178**	3.050***	0.075	-0.161
	-1.526	-0.946	-0.781	-1.11	-1.086	-0.987	-0.62
Observations	48	54	70	78	84	99	94
R-squared	0.117	-0.042	0.14	0.225	0.274	0.202	0.198

Table 2.17: IV: Family Firms Truncated at 5%, Absolute Majority, Firstborn as IV, Leverage Ratio as Dependent Variable.

	2008	2009	2010	2011	2012	2013	2014
Outcome	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage
majority_gen_dum	0.296	0.51	-1.998*	-2.972*	-0.812	-0.969	-3.941**
	-0.403	-0.638	-1.188	-1.595	-1.875	-1.334	-1.997
log_totalAss	-0.00865	-0.100	0.0731	0.0925	-0.372	-0.304*	-0.308
	-0.0317	-0.0668	-0.0817	-0.105	-0.411	-0.178	-0.263
ebitda_to_ass	-0.891**	-0.668***	-2.877*	-0.311	-0.998***	0.041	0.616***
	-0.367	-0.0263	-1.563	-0.352	-0.0264	-1.503	-0.232
fix_ass_to_ass	1.714***	2.110**	-1.959	0.699	-0.493	0.405	1.851**
	-0.576	-0.829	-1.875	-0.747	-1.890	-1.153	-0.868
intang_to_ass	2.276***	3.045***	-0.318	3.702**	6.789**	0.234	1.201
	-0.462	-0.740	-1.296	-1.54	-2.920	-1.292	-7.67
Observations	99	101	123	131	135	151	157
R-squared	0.142	0.746	0.08	0.020	0.813	0.027	0.552

Table 2.20: IV: All Family Firms, Absolute Majority, Gender Ratio as IV, Leverage Ratio as Dependent Variable

	2008	2009	2010	2011	2012	2013	2014
Outcome	Earnings	Earnings	Earnings	Earnings	Earnings	Earnings	Earnings
majority_gen_dum	0.039	0.39	-0.059	-0.0529	-0.388	-0.063	5.897
	-0.084	-0.639	-0.064	-0.105	-1.550	-0.067	-3.601
lib_to_ass	-0.0286*	-1.048***	-0.0108***	-0.0017	-0.785***	0.000	0.914***
	-0.0159	-0.2660	-0.0032	-0.005	-0.135	-0.004	-0.167
log_totalAss	0.0152***	0.0242	0.0112*	0.0458**	0.0575	0.0472***	0.00326
	-0.005	-0.0553	-0.007	-0.022	-0.3260	-0.014	-0.165
fix_ass_to_ass	0.147	2.065**	-0.189***	0.077	-0.043	-0.320***	-2.709**
	-0.103	-0.809	-0.069	-0.099	-1.427	-0.088	-1.192
intang_to_ass	0.0681	2.593***	-0.158	0.63	5.345*	0.104	-5.035
	-0.076	-0.780	-0.105	-0.48	-3.058	-0.122	-10.45
Observations	99	101	123	131	135	151	157
R-squared	0.084	0.731	0.102	0.087	0.809	0.244	0.547

Table 2.21: IV All Family Firms, Absolute Majority, Gender Ratio as IV, Earnings Ratio as Dependent Variable

	2008	2009	2010	2011	2012	2013	2014
Outcome	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage
majority_gen_dum	-0.284	-0.44	-0.674	-0.820*	-0.344	-0.170	-0.39
	-0.412	-0.491	-0.549	-0.471	-0.308	-0.311	-0.425
log_totalAss_tr	-0.04180	-0.024	-0.0521	-0.148*	-0.081	-0.191*	-0.159**
	-0.0708	-0.0558	-0.0819	-0.088	-0.075	-0.101	-0.065
ebitda_to_ass_tr	-0.329	-0.724	-1.053**	-1.057	-1.659**	0.698	0.0868
	-0.708	-0.5690	-0.510	-0.660	-0.6590	-0.689	-0.552
fix_ass_to_ass_tr	1.286***	0.753*	0.923**	0.953***	0.835***	1.518***	1.300***
	-0.319	-0.418	-0.375	-0.286	-0.300	-0.394	-0.378
intang_to_ass	1.214	4.041***	0.502	2.081**	2.048	0.343	-0.271
	-1.426	-0.815	-0.749	-0.87	-1.401	-0.862	-0.61
Observations	72	71	93	97	103	122	119
R-squared	0.159	0.247	0.14	0.185	0.262	0.219	0.169

Table 2.22: IV: Family Firms Truncated at 5%, Absolute Majority, Gender Ratio as IV, Leverage Ratio as Dependent Variable.

	2008	2009	2010	2011	2012	2013	2014
Outcome	Earnings	Earnings	Earnings	Earnings	Earnings	Earnings	Earnings
majority_gen_dum	-0.0214	-0.194	-0.078	-0.117	0.0655	-0.0166	-0.199***
	-0.067	-0.137	-0.0814	-0.0742	-0.0538	-0.0514	-0.0757
intang_to_ass	0.064	0.997***	-0.350**	0.456***	0.0137	0.156	-0.246
	-0.258	-0.344	-0.15	-0.156	-0.258	-0.165	-0.163
lib_to_ass_tr	-0.0182	-0.0880*	-0.0309*	-0.0339*	-0.0642***	0.0342	0.00738
	-0.0308	-0.0469	-0.0161	-0.0202	-0.0202	-0.0253	-0.0256
log_totalAss_tr	-0.00623	0.00374	0.0319**	0.0258	0.0495***	0.0620***	0.0177
	-0.0137	-0.0194	-0.0151	-0.0231	-0.015	-0.0156	-0.0129
fix_ass_to_ass_tr	-0.0638	0.087	-0.158**	-0.0551	-0.135*	-0.220***	0.146*
	-0.0758	-0.141	-0.0657	-0.0716	-0.0709	-0.069	-0.0789
Observations	73	72	95	98	106	122	121
R-squared	0.011	-0.095	0.182	0.204	0.286	0.253	0.07

Table 2.23: IV: Family Firms Truncated at 5%, Absolute Majority, Gender Ratio as IV, Earnings Ratio as Dependent variable

	2008	2009	2010	2011	2012	2013	2014
Outcome	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage
majority_gen	7.406	-41.79	213.600	-41.0	115.400	-35.710	-11.97
	-15.84	-41.04	-264.10	-47.4	-102.50	-30.1	-54.02
log_totalAss	-6.08300	-17.24*	-54.4800	-15.88	-20.620	-10.71	-21.86**
	-4.6030	-10.4500	-39.4500	-10.750	-16.070	-9.310	-10.810
ebitda_to_ass	-1.815***	0.0630***	-273.6	-7.069***	-0.936***	-2.845	-20.3400
	-0.412	-0.0061	-289.800	-1.649	-0.0489	-2.070	-14.960
fix_ass_to_ass	-2.127	1.697	122.900	-32.99*	-21.13	-23.98	-43.55
	-6.739	-10.830	-147.700	-17.340	-16.940	-18.190	-28.050
intang_to_ass	-6.553	53.66	185.800	54.2	37.500	29.500	74.640
	-30.300	-49.210	-209.900	-62.55	-61.830	-52.390	-72.82
Observations	633	655	718	738	737	770	777
R-squared	0.021	0.034	0.10	0.046	0.252	0.017	0.206

Table 2.24: IV: All Family Firms, Absolute or Tied Majority, Gender Ratio as IV, Leverage Ratio as Dependent Variable

	2008	2009	2010	2011	2012	2013	2014
Outcome	Earnings	Earnings	Earnings	Earnings	Earnings	Earnings	Earnings
majority_gen	-0.316**	-82.260	0.063	0.710	-19.0400	-0.6690	-1.97
	-0.160	-62.010	-0.3840	-0.7030	-15.8300	-0.7180	-1.8150
lib_to_ass	-0.002	0.0805	- 0.000327***	-0.00272	-0.2500	-0.00141*	- 0.00897**
	-0.002	-0.088	(1.37e-05)	-0.002	-0.263	-0.001	-0.004
log_totalAss	0.0299	-5.906	0.0335	0.293*	0.615	0.1990	0.08610
	-0.0427	-4.4680	-0.0262	-0.1750	-1.2840	-0.1550	-0.2130
fix_ass_to_ass	0.47700	-59.64000	0.138	0.8680	2.847	0.825	-0.4300
	-0.3620	-53.2500	-0.3380	-0.7760	-5.802	-0.8570	-0.5310
intang_to_ass	-0.0939	-0.536	-0.0386	0.2400	-3.955	0.0138	-1.919
	-0.2980	-19.500	-0.1980	-0.9140	-7.6630	-0.706	-2.1260
Observations	633	655	718	738	737	770	777
R-squared	0.002	0.014	0.098	0.047	0.238	0.015	0.19

Table 2.25: IV: All Family Firms, Absolute or Tied Majority, Gender Ratio as IV, Earnings Ratio as Dependent Variable

	2008	2008	2008	2008	2008	2008	2008
Outcome	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage
majority_gen	-0.032	-0.12	-0.038	0.0	0.016	-0.007	-0.10
	-0.10	-0.12	-0.11	-0.1	-0.12	-0.1	-0.11
log_totalAss_tr	0.03770	0.0249	0.0338*	0.01	-0.013	-0.05	-0.0467**
	-0.0254	-0.0279	-0.0205	-0.022	-0.023	-0.030	-0.023
ebitda_to_ass_tr	-1.211***	-0.257	-0.3	-0.753***	-0.950***	-0.611**	-0.400**
	-0.179	-0.2620	-0.207	-0.237	-0.2500	-0.254	-0.193
fix_ass_to_ass_tr	0.457***	0.630***	0.684***	0.689***	0.605***	0.675***	0.606***
	-0.120	-0.140	-0.111	-0.112	-0.116	-0.129	-0.106
intang_to_ass	0.805**	0.56	0.564**	0.5	1.098**	0.542	0.216
	-0.333	-0.378	-0.242	-0.31	-0.499	-0.626	-0.28
Observations	486	500	548	583	581	611	585
R-squared	0.119	0.069	0.09	0.095	0.103	0.078	0.073

Table 2.26: IV: Family Firms Truncated at 5%, Absolute or Tied Majority, Gender Ratio as IV, Leverage Ratio as Dependent Variable.

	2008	2009	2010	2011	2012	2013	2014
Outcome	Earnings	Earnings	Earnings	Earnings	Earnings	Earnings	Earnings
majority_gen	-0.128*	-0.0653	-0.082	-0.1	-0.081	0.023	0.10
	(0.07)	(0.05)	(0.06)	(0.1)	(0.06)	(0.1)	(0.16)
lib_to_ass_tr	-0.184***	-0.0356	-0.0331	-0.01	-0.034	-0.139**	-0.112**
	-0.0450	-0.0289	-0.0804	-0.048	-0.049	-0.057	-0.049
log_totalAss_tr	0.0513***	0.0316**	0.0361**	0.0608***	0.0608***	0.0916***	0.0224
	-0.012	-0.0131	-0.015	-0.015	-0.0120	-0.022	-0.038
fix_ass_to_ass_tr	-0.031	-0.026	-0.059	-0.0104	-0.187*	-0.0205	-0.14
	-0.069	-0.056	-0.109	-0.083	-0.110	-0.092	-0.111
intang_to_ass	-0.004	-0.03	-0.264**	0.000627	-0.276	0.042	-0.796*
	-0.108	-0.096	-0.134	-0.13	-0.176	-0.197	-0.42
Observations	519	545	577	612	610	637	628
R-squared	0.143	0.025	0.02	0.025	0.059	0.097	0.020

Table 2.27: IV: Family Firms Truncated at 5%, Absolute or Tied Majority, Gender Ratio ad IV, Earnings Ratio as Dependent Variable

Chapter 3

The Wages of Failure: Executive Compensation at the failed Icelandic Banks

3.1 Introduction

Corporate governance, incentive pay, litigation and market competition are widely considered to be the main tools to discipline managers of corporations. Talley & Johnsen (2005) show how their mutual relationship and interactions predict that, as share of incentive pay in total salary rises, the likelihood of litigation increases, hence misreporting and manipulation on part of management becomes more likely. These results were confirmed by Röell & Peng (2008). Establishing how variable salary components evolve as a share of total compensation can therefore be an important early warning sign and aid in the timing of potential executive misbehavior.

It's been over forty years since Jensen & Meckling (1976) pointed out that separation of ownership and control called for optimal contracting aligning the incentives between management and shareholders. Jensen in co-operation with Kevin Murphy published another paper on the topic in 1990, detecting little evidence of the optimal contract being enforced as CEOs' own wealth increased only by \$3.25 as they begot wealth for their principals of \$1,000. Jensen & Murphy declared that CEOs had been remunerated like bureaucrats, ever since first measured in 1935, calling for a more market oriented approach to compensation. Since the publication of Jensen's and Murphy's paper in 1990, there has been a growing and widespread use of incentive pay, combining CEOs' fixed salary with components such as bonuses, stock options, stock grants, and other instruments thought to be linked to firm's own performance.

Despite the widespread use of incentive pay for CEOs of listed firms, since Jensen & Murphy (1990) published their influential paper, the problem of asymmetric information persists between agents and principals. A myriad of papers borne out in this field have not been able to ascertain that shareholders indeed manage to align their own interests with their agents, not least due to the measurement and identification problems that are particularly difficult for researchers to overcome, Frydman and Jenter, (2010). These difficulties arise not least due to the largely hidden design of employment contracts and lack of access to data on compensation of employees below the most senior ones (the so-called C-level staff). Among the hurdles are also the profound endogenous nature of recruitment and confounding factors that lie e.g. in differing bargaining positions, dynamic interplay between market conditions and the CEOs' control over them, the level of competition, possible negative externalities of

the firm's production, risk sharing and moral hazard, the moving target of what constitutes as the performance of the firm, make it exceptionally hard to pinpoint the shape and form of the optimal contract in practical terms. Many logical questions arise such as to whom should the contract be optimal, and for how long does it need to last? Can the optimal contract ever be reached when agents have a room to bargain? Even when following shareholder primacy, the principal is still up against the measurement problem, which can lead to inappropriate actions or even value destroying behavior on the part of the agent. This is particularly pertinent in the financial industry, where agents' performance is measured in financial terms, through valuation of assets that vary over time and often, by a judgment call on appropriate yields and discount factors, can dramatically change in value.

Scholars have revealed managers' tendency to manipulate the disclosure of information around CEO option awards, delaying the release of good news and accelerating the disclosure of bad news (Aboody & Kasznik 2000; Yermack 1997). Several studies have also documented a positive correlation between CEOs' equity incentives and earnings manipulation (Cheng & Warfield 2005; Bergstresser & Philippon 2006; Burns & Kedia 2006; Efendi et al. 2007; Johnson et al. 2009).

In the case of banks, their high leverage magnifies the effects of changes in asset values and that lead to higher profits (or losses) relative to unleveraged positions in the event of price movements. Noted by Minsky (1986), bank managers rewarded through stock options have strong incentives to expand the balance sheet of their institutions and increase leverage. Paradoxically, this state of affairs in bank management is not helped by the use of managerial 'disciplining' devices, including stock options, takeover threats, or board monitoring of managerial performance, each of which increases the likelihood of higher leverage, according to (Berger et al 1997).

In the absence of any downside risk, sanctions for failure or deferral/claw-back mechanisms relating to compensation, bank management has strong incentives to increase leverage to chase profits. Those incentives are particularly emboldened where markets show signs of over-exuberance and unsustainable rises in price levels (often referred to as 'bubbles'). A considerable body of research demonstrates links between asset prices and the supply of credit (Borio & Lowe 2002; Detken & Smets 2004). There is also empirical links between increases in risk-taking by banks and the various stages of the leverage cycle, during which banks' capital structures become less robust, thanks to bankers' and investors' expectations of future price increases which appear to justify lower collateral demands (Bhattacharya et al 2011; Geanakoplos 2010). An indirect implication of this phenomenon – that increasing bank leverage may cause asset price inflation (Fostel & Geanakoplos 2013) – is that leverage that drives an asset bubble also feeds into the size of stock-based compensation for bank executives (Cullen 2014). Bolton et al (2005) further demonstrates

that compensation contracts encourage risk-taking to profit from *speculative* stock price rises, providing managerial incentives to increase the speculative component of stock prices in the hope of increasing short-term returns. On the basis of these findings, it is perhaps to be expected that the higher the stock-option wealth within financial firms the higher the bankruptcy risk of that firm (Armstrong & Vashishtha 2012) and that asset write-downs during the GFC were more strongly related to asset volatility in highly leveraged financial institutions (Chesney et al. (2011). In contrast, where top bankers receive a greater proportion of their remuneration in fixed salary and bonuses rather than stock options, (Palia & Porter 2004) show that they are less likely to take high risks.

Whilst the executive compensation literature is rich in explaining the ways in which remuneration may encourage excessive risk taking, it is not clear from where the motivation to do so originates, given the uncertain path that is by that taken. Akerlof and Shiller (2015) and Akerlof and Romer (1993) show, however, that moral hazard exist for firms to “go broke for profit at society's expense (to loot) instead of to go for broke (to gamble on success).” In environment where lax regulation or accounting practices persists or low individual penalties dominate, owners are granted an incentive to pay themselves more than their firms are worth and then default on their debt obligations. This implies that bankruptcy for profit is especially likely in the presence of government guarantees – either explicit or implicit – of financial institution liabilities. Under such circumstances bankruptcy for profit can easily become an attractive strategy for owners of the firm rather than maximizing economic value, as it increases the extractable rents available. Other motivations to gamble beyond compensation incentives (especially in the banking sector) include tight margins as a result of extreme competition, career concerns and shareholder risk aversion, each of which places limits on the effectiveness of compensation reforms in isolation to reduce excessive risk-taking, as pointed out by Avgouleas & Cullen (2015).

Compensation arrangements are associated with a large number of observable and unobservable variables, derived from both firm and employee characteristics. This makes it very difficult to interpret any observed correlation between executive pay and firm performance as evidence of a causal relationship. CEO pay and firm performance may be correlated because compensation affects performance, because firm performance affects pay, or because an unobserved firm or CEO characteristic affects both variables. Hence, the jury is still out on whether and how shareholders can achieve incentive compatibility, Frydman and Jenter, (2010).

It is therefore invaluable when academics and independent investigators get access to proprietary data, to ascertain whether aspects of theory can be revealed by the application through history.

Bebchuk, Cohen and Spamann (2010), provide important case studies which show how top level management of Lehman and Bear Stearns cashed out prior to the troubled times, hence securing their own wealth while the shareholders lost out on theirs, in many cases. However, Fahlenbrach, R. & Stulz, R.M. (2011) found that banks with higher option compensation for their CEOs did not perform worse during the crisis than the once offering a larger fraction of compensation in cash bonuses. Bank CEOs did not reduce their holdings of shares in anticipation of the crisis or during the crisis. Consequently, they suffered extremely large wealth losses in the wake of the crisis, according to Fahlenbrach & Stulz (2011). Looking at 117 financial firms from 1995-2008, Balachandran, Kogut & Harnal (2010) find that equity-based pay increased probability of their default, while non-equity pay decreased it. The comment made by the Financial Crisis Inquiry Committee of the US House of Representatives is a representative assessment of the effect of compensation schemes made by all the major official investigations looking into the cause of the crisis²:

“Compensation systems—designed in an environment of cheap money, intense competition, and light regulation—too often rewarded the quick deal, the short-term gain—without proper consideration of long-term consequences. Often, those systems encouraged the big bet—where the payoff on the upside could be huge and the downside limited”

This chapter builds on the narrative and data published along with the Report of the Parliamentary Special Investigation Commission (2010), looking into the causes and events leading up to the failure of the three Icelandic banks; Glitnir, Landsbanki and Kaupthing. It provides a detailed description of stylized facts regarding compensation arrangements in the failed banks in October 2008. Guided by corporate theory of agency cost predicting misaligned incentives, where ownership diverges from control,³ evidence of misreporting performance to meet bonus targets was found alongside evidence of large scale market manipulation, which had the effect of bringing incentive pay, in the form of stock and options, in the money. Furthermore, evidence was uncovered of management manipulating key financial strength indicators, such as equity ratios and performance indicators. As time

² Special Investigation Commission (SIC), Pall Hreinsson et. al. (eds.), *The Causes and Events Leading up to the fall of the Icelandic Banks* [original title: Rannsóknarnefnd Alþingis, *Aðdragandi og orsakir falls íslensku bankanna og tengdir atburðir*] (Reykjavik, 2010), vol. 7, pp. 222-227; Ministry of Industry, Business and Financial Affairs; ‘The Financial Crisis in Denmark – Causes, Consequences and Lessons’ in Jesper Rangvid (ed.), Copenhagen (2013) p.32, em.dk/english/publications/2013/13-09-18-financial-crisis; The Financial Crisis Inquiry Commission, P. Angelides et al. (eds.) *The Financial Crisis Inquiry Report* (U.S. Government Printing: Washington, DC, 2011) p. 61; Nyberg Report, *Misjudging Risk: Causes of the Systemic Banking Crisis in Ireland* (2011), p. 31.

³ Jensen & Meckling (1976). Under the Jensen & Meckling’s definition, agency costs include problems of hidden actions, hidden information, influence costs, and the costs of implementing institutional structures to deal with them.

progressed, loan portfolios in the three failed banks were marked by excessive risk taking while evidence of large scale tunneling of funds was found through lending facilities to related parties, including the largest owners of the banks, directly to members of banks' management teams and special purpose vehicles' (SPV's) in ownership of the members of management teams, with little or no collateral-backing, Johnsen (2014), SIC (2010).

This chapter is organized in the following way: Section II describes the data underlying the analysis, Section III shows how wage distributions within the three banks evolved from 2004-2008, Section IV focuses on CEO compensation, Section V describes how incentive schemes contributed to fraudulent behavior and market manipulation, and Section VI contains conclusions. All salary figures are presented in monthly figures in thousands of ISK in current prices, in figures, graphs and main text. A translation into US dollars monthly and or annual salary figures are provided, intermittently, in the text at the average exchange rate of ISK/USD at 68.14 during the period under investigation from January 2004 - October 2008.

3.2 Data

On the grounds of a Parliamentary Special Investigation in Iceland and its legal provisions stipulated act 142/2008 on Special Investigation Commissions (hereafter SIC (2010)) a data warehouse was constructed including data on all salary and incentive pay of all employees working to support the banking operations at the parent companies of Glitnir, Kaupthing and Landsbanki from January 2004-October 2008. The data was collected from payroll officers who handed over the raw databases of their HR payroll systems. Payment records of all staff who worked at the parent companies of the banks during 2004-2008 were delivered to the SIC in June 2009. For the purposes of the investigation, looking into the structure of incentive pay and the effects it had on bankers' behavior, the support staff, maintenance, security, physical therapists, chefs and other service staff, which were not directly involved in maintaining the banking operations, were excluded from the dataset. If a job title was not available for an individual during one year, the job title of the year prior or the year after was adopted. Salary distributions are reported as average monthly salary of individuals. To attempt unbiased and comparable monthly observations for all employees, different monthly salary components were summed up and divided by the number of months in the year in which the employee served at the company. Part-time employees were inflated to a full time employee for comparison. The number of compensation components varied between banks, from 77 different components to 271 components. They were therefore simplified and categorized into four main components:

- 1) Base salary; all fixed monthly salary, all fixed payments such as car benefits, fixed fringe benefits such as telephone expenses, food and clothing benefits and all other cash layouts that were not performance related.
- 2) Bonus pay: performance related cash payments paid out for performance of the previous year, bonus payments due to employment anniversaries, or other payments geared towards retaining employees.
- 3) Profit from exercised options, i.e. taxable income from exercised options. If the employee retains the shares, the profit from exercising the option is recorded as income.
- 4) Pension payments; co-payments of the employer into private and/or mandatory pension fund of the employee.

Data was collected on nominal amounts of options granted at their strike price. Restricted stock grants have not been taken into account here, since that form of compensation was not available, apart from a hybrid type of call options used by Glitnir to retain valuable employees, which had certain characteristics of restricted stock grants. Only realized payments are reported on in time series, i.e. payments that had been delivered to the employees accounts via the payroll of each bank.

Table 3.1

Number of employees in data set						
Only those employees who directly supported the banking operation; security officers catering staff, physical therapists and other support staff are excluded.						
	2004	2005	2006	2007	2008	Total
Glitnir	1179	1243	1250	1619	1530	6821
Landsbankinn	1272	1349	1549	1723	1750	7643
Kaupþing	1220	1270	1334	1502	1387	6713
Total	3671	3862	4133	4844	4667	21177

The dataset includes 21,117 observations. Although the banks reported fewer full-time employees in their annual accounts at year end, the dataset at hand may include a higher number of employees, as it includes all turnover of employees, including summer interns. Number of employees in dataset are provided in Table 3.1, however number of full-time employees as reported at the consolidated level in the banks as full-time employees at year end in their annual accounts are to be found in Table 3.2.

Table 3.2.

Total number of full time employees of the banks on consolidated basis

	Glitnir	Landsbankinn	Kaupthing	Total
2004	1,126	1,121	1,501	3,748
2005	1,216	1,725	2,318	5,259
2006	1,392	2,117	2,553	6,062
2007	1,976	2,640	3,109	7,725
2008	1,976	2,640	3,256	7,872

All compensation data is reported in 2008 prices according to Icelandic CPI index of October 2008 unless otherwise indicated. When individual employment contracts are cited, salary numbers are reported in current prices, to correspond with the documents cited.

3.3 Wage distributions in the three banks 2004-2008

Soon after the privatization of the three Icelandic banks in 2003, the wage distributions in Glitnir and Landsbanki were comparatively narrow. The 10% highest earners divided among themselves roughly 30% of total salary outlays of the firms, whereas the same 10% cohort in Kaupthing received 45%. Kaupthing's wide wage distribution was consistent throughout the period under investigation (2004-2008), as the 10% highest earners received 45-51% of all compensation extended out by the bank. Kaupthing's trend caught on. By the year 2007, Landsbanki had 53% of labor cost fall unto the 10% highest earners, but 30% in the year 2004, while Glitnir's 10% highest earners received 43% of the bank's salary payouts in 2007, see figures 1-3.

The income components also varied over time, as Panel I shows. It is easy to see that cash bonuses became more prevalent as means of compensation among the top 1 percent, as time passed. It is noteworthy that middle management of Kaupthing, those in the 95th-99th percentile, received the largest share of their total income via cash bonuses in the year 2008, when performance for half the year 2007 and half the year 2008 were being compensated, and the operational performance of Kaupthing was relatively the poorest, see table 3.3.

Kaupthing offered the most generous terms for its employees out of the three banks. It was consistently the highest bidder in the labor market, with employees in the 95th percentile receiving but up to three times that of the same percentile in the rival banks. Comparing the top 1 percent earners (99th percentile), the ones in Kaupthing received the largest salary checks throughout the period, apart from 2007, when Landsbanki awarded its highest earners 8.6 million ISK (126 thousand USD) in total compensation, on average a month, annual salary closing in on 1,5 million USD. Kaupthing paid its 1% highest earners above 6 million (88 thousand USD) on average a month (1 million USD annually), while the highest earners of the rival banks received from 2 million to 6 million (350K-1,0 million USD, annual salary) on average during the same period, see Panel II, figures 4-18.

Panel I - Figures 3.1 – 3.3: Wage distributions within banks 2004-2008

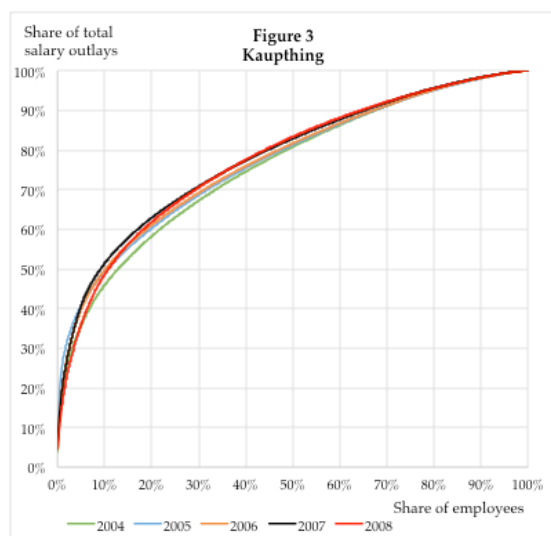
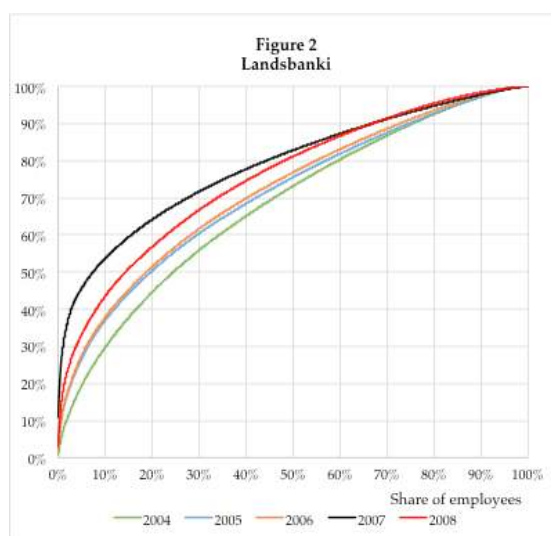
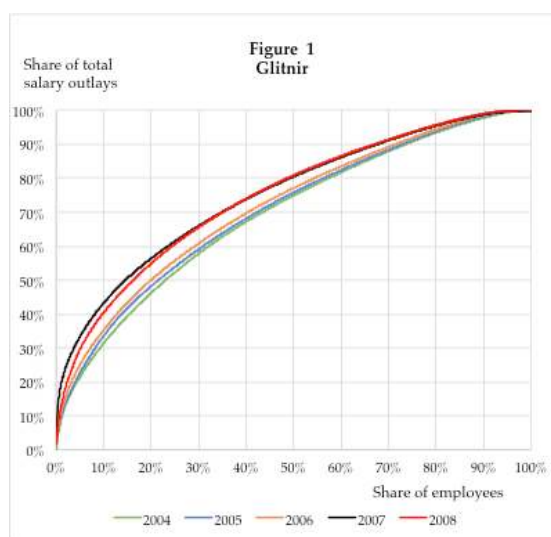


Table 3.3

Reported Annual Return on Equity (%) for Icelandic and other Nordic Banks

	2003	2004	2005	2006	2007	2008- June ¹
Glitnir	19.83	22.75	22.54	26.16	16.27	6.73
Kaupthing	17.22	12.22	26.29	26.72	20.6	8.02
Landsbanki	13.74	34.33	22.73	27.87	22.19	14.87
Icelandic Mean	16.93	23.1	23.85	26.92	19.69	9.87
Nordea Bank AB	12.24	16.41	17.56	20.64	18.32	8.05
Danske Bank	15.36	13.97	17.22	14.24	14.25	5.54
Skandinaviska Enskilda Banken	11.77	14.28	14.86	18.8	17.83	6.23
Swedbank AB	15.13	22.52	22.8	18.43	17.84	9.29
Svenska Handelsbanken	14.28	16.07	17.31	19.82	20.82	6.86
DnB NOR Bank	12.77	14.36	17.67	18.39	20.49	6.25
Nordic Mean	13.59	16.27	17.90	18.39	18.26	7.04

Source: Flannery, Mark. "Iceland's Failed Banks: A post mortem"

SIC Report, Volume 9, Appendix 3, pp. 94

Panel II – Composition of bankers' total income by deciles

Figure 4. Glitnir 2004

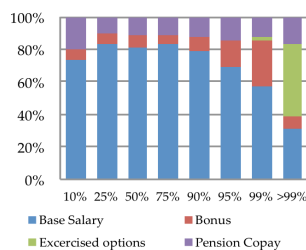


Figure 5. Landsbanki 2004

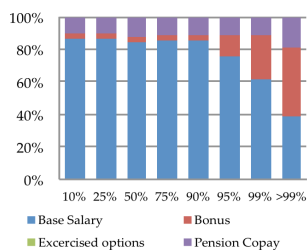


Figure 6. Kaupthing 2004

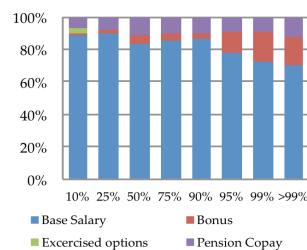


Figure 7. Glitnir 2005

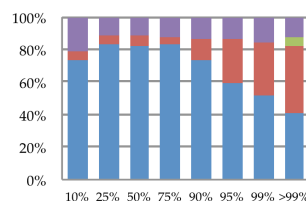


Figure 8. Landsbanki 2005

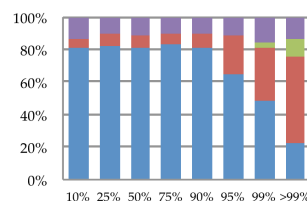


Figure 9. Kaupthings 2005

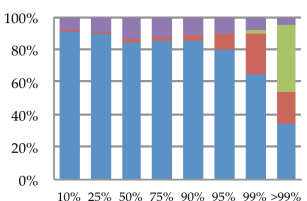


Figure 10. Glitnir 2006

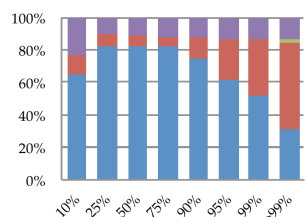


Figure 11. Landsbankinn 2006

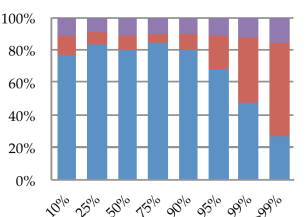


Figure 12. Kaupthing 2006

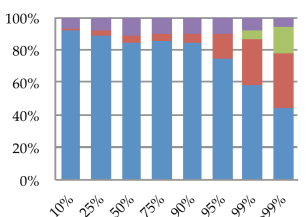


Figure 13. Glitnir 20



Figure 14. Landsbankinn 2007

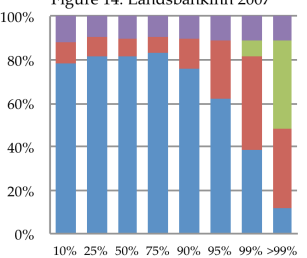


Figure 15. Kaupthing 2007

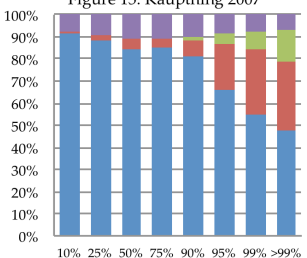


Fig. 16a Glitnir 2008

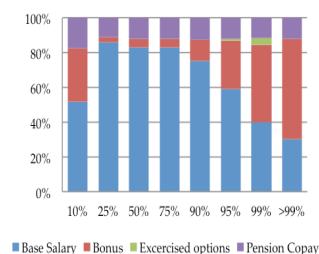


Fig. 16b Landsbankinn 2008

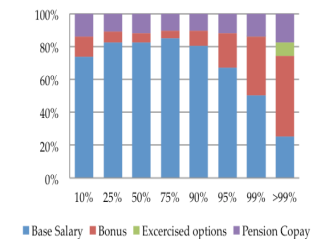
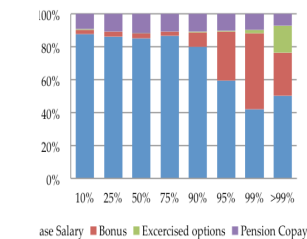
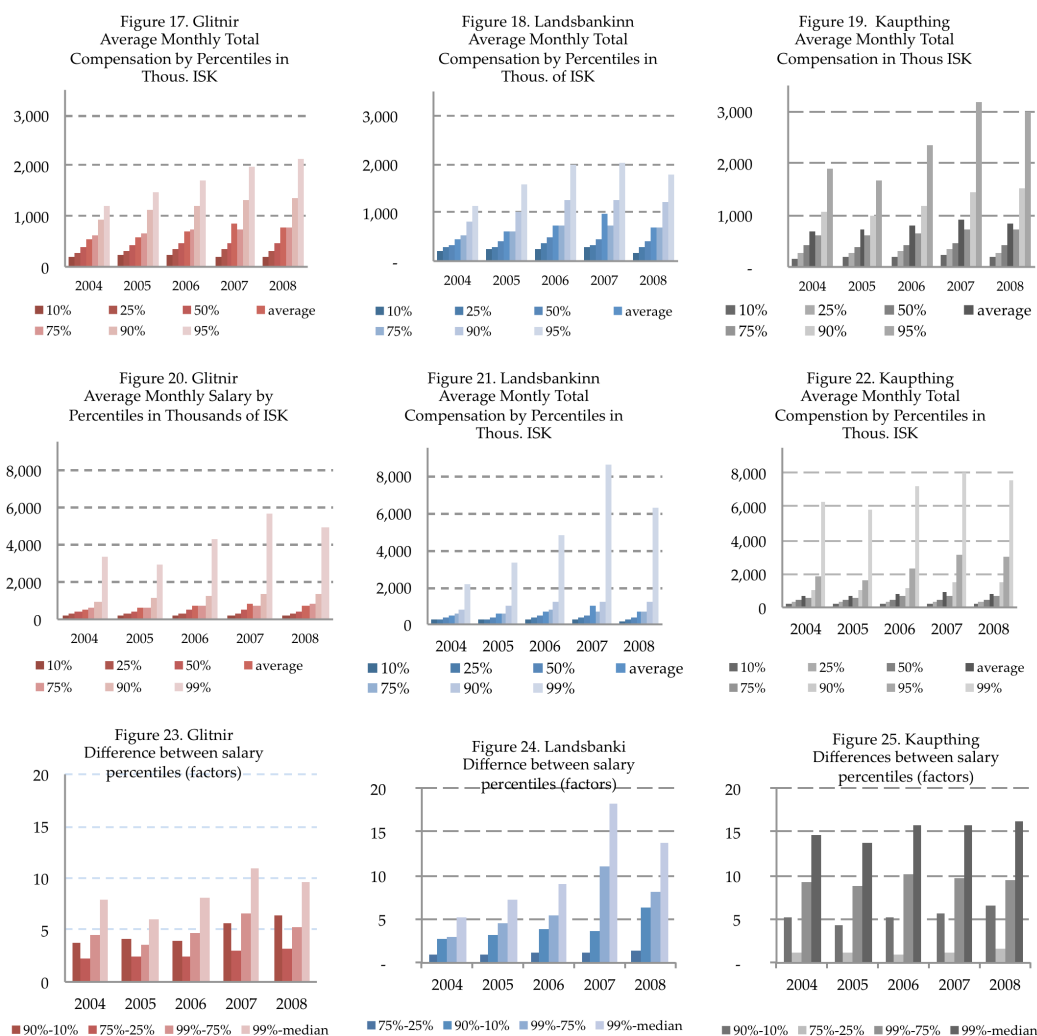


Fig. 16c Kaupthing 2008



Panel II Wage distributions within the three banks compared – by percentiles and factors of median salary figures below: 17-25



Consistently with the largest wage distribution of the three banks, Kaupthing's staff in the 99th percentile received 15 times the median wages in the bank, while Glitnir, which had the narrowest of the wage distributions, compensated its 1% highest earners with 8 to 10 times the salary of the median worker, see figures 23-25.

Figure 26 shows how base salary as a share of total pay, on average, evolved over time among CEOs in all three banks. Landsbanki's CEO, Arnason's incentive pay grew to be over 80% of the total take home pay of the CEOs, which would have reached even to a higher level if the CEO, Mr. Arnason, had exercised his options according to his contract, as further discussed in Section IV. Salary figures, however, do not tell the whole story, as top

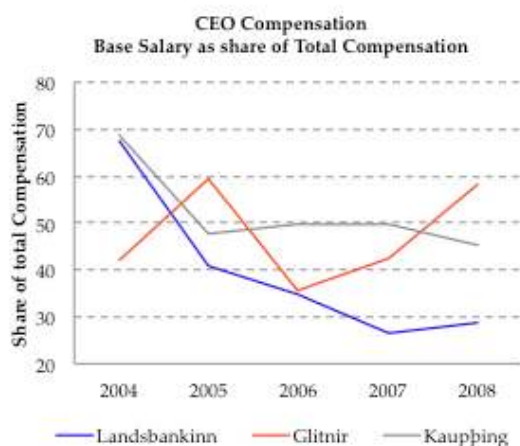


Figure 26. CEO Base salary as share of total compensation

management in Glitnir and Kaupthing were consistently being allowed to borrow heavily against stocks in the firms, at exclusive terms, as part of their compensation, yet not counted in their salary figures. Kaupthing management received the largest amounts borrowed at the bank to buy shares in Kaupthing, reaching 5.8 billion ISK (88 million USD) for the CEO, Hreidar Mar Sigurdsson and the Chair of the Board, Sigurdur Einarsson, 7.8 billion ISK (114 million USD) and 7.2 Million USD for other investments.

3.4 CEO Total Compensation

Decision makers in the banks were among the top 1% highest earners, the so-called C-level staff along with occasional traders. Figures 27-29 - Panel III show how compensation was constructed *on average* in this group. Landsbankinn lagged behind the other two rivals in terms of total pay, less than 5 million ISK (73 thousand USD) average monthly pay from 2004-2006, but overshot even Kaupthing's top 1% in the year 2007, with average total pay exceeding 25 million ISK a month (4,4 million USD, annually).

Panel III – Income of 1% highest earners, on average, 2004-2008

Figure 27

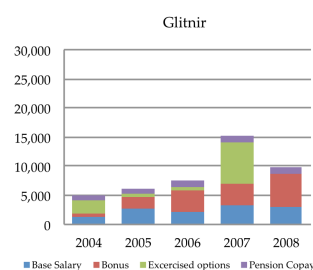


Figure 28

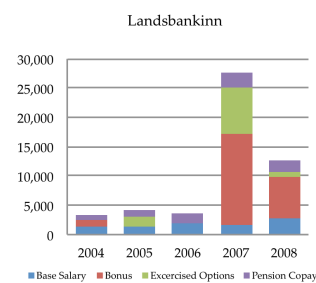
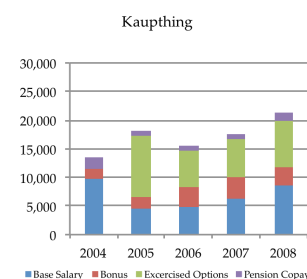


Figure 29



The income components varied also across the three banks – with Kaupthing's staff members consistently getting their largest proportion of total compensation in the form of exercised

options, while Glitnir's and Landsbanki's decision makers mainly cashed out on the stock market success in 2007. This was partly explained by the fact that remuneration committees of both Glitnir and Landsbanki had given its leaders allowance to postpone the exercising of their options indefinitely as in the case of Sigurjon Arnason, who reported to the SIC that he did not intend to cash out on his options until the day he left the job as CEO⁴. Mr. Arnason further reported to the SIC that his decision was heavily influenced by the public outcry over executive pay taking place each year as the Icelandic Business Magazine, *Frjals Verslun*, reported on the highest earners in Icelandic society each year.⁵

Hreidar Mar Sigurdsson, Kaupthing's CEO, was the highest salaried bank executive during the period 2004-2008, with total compensation of 2.5 billion ISK (36.68 million USD) for the entire period, while the runner-up, Bjarni Armannsson, CEO of Glitnir, received roughly 1 billion (14.67 million USD), see table 3.4. After the crash, Mr. Armannsson, voluntarily refunded the bankrupt estate of Glitnir 370 million ISK (5.42 million USD)⁶, i.e. the amount he received as a bonus and golden parachute-payment as he left the bank in 2007. Salary figures for the executive chairman of the board of directors at Kaupthing, Mr. Einarsson, are not available. His salary was paid out by an special Kaupthing branch located in the UK. The branch was set up exclusively to pay salary and fringe benefits to the chairman and his assistant. This branch was not subject to any supervision by the Icelandic Financial Supervisory Authorities, and had never been audited specifically by Kaupthing's external or internal auditors. The internal auditor of Kaupthing did not have any knowledge of the branch's existence until the SIC asked questions about it during the investigation.⁷ The SIC did not receive the requested documents from the branch, in spite of several attempts of the commission and Kaupthing's resolution committee's staff. The total salary cost of the branch is reported in the SIC Report as being 157 million ISK (2.3 million USD) in 2008, 263 million ISK (3.86 million USD) in 2007, 161 million (2.36 million USD) in 2006, and 177 million (2.6 million USD) for May till December 2005. Sigurdur Einarsson and his personal assistant were the only two employees on payroll in this branch, hence it is fair to assume that Mr. Einarsson received the bulk of the 759,7 million ISK (11.15 million USD) salary cost of that branch during those roughly four years on record.⁸

⁴ SIC Report, Volume 3, Chapter 10, pp. 39 & 59

⁵ SIC Report, Volume 3, Chapter 10, pp. 59

⁶ Morgunblaðið-news paper, 5. Jan. 2009, on-line article available at:
https://www.mbl.is/vidskipti/frettir/2009/01/05/endurgreiddi_370_milljonir/

⁷ SIC Report, Volume 3, Chapter 10, pp. 92, testimony of Internal Auditor of Kaupthing, Mrs. Lilja Steinhorsdottir, before the SIC on September 7th 2009, pp. 14.

⁸ SIC Report, Volume 3, Chapter 10, pp. 92

The UK branch had numerous costs, including household goods for the Chairman's private residence in London for more than 9 million ISK (130 thousand USD).⁹

Table 3.4

CEO Pre-tax Total Compensation Per Annum (ISK - Current Prices)		
Base Salary, Bonuses, Profits from Exercised Options, and Pension Co-pay		
Glitnir	Bjarni Ármannsson	Lárus Welding
2004	80,057,080	
2005	137,467,312	
2006	230,881,360	
2007	570,844,544	387,661,792
2008	11,149,876	35,823,212
Total	1,030,400,172	423,485,004
Landsbankinn	Halldór J. Kristjánsson	Sigurjón Þ. Árnason
2004	33,775,376	42,089,283
2005	262,887,573	112,820,768
2006	143,907,850	218,169,279
2007	105,839,025	234,332,638
2008	133,638,686	355,180,856
Total	680,048,510	962,592,824
Kaupthing	Hreiðar Már Sigurðsson	Sigurður Einarsson*
2004	141,786,672	not available
2005	310,321,289	
2006	822,697,408	
2007	811,961,856	
2008	458,917,504	
Total	2,545,684,729	

Source: SIC Report, Volume 8, Appendix 1, pp. 43

Sigurður Einarsson's salary was paid out of a Kaupthing Branch located in the UK

the SIC did not receive detailed salary data from that branch in spite of several attempts. (SIC Report, Volume 3, Chapter 10, appendix

3.4.1 Short term incentive pay and performance targets

Again, drawing on the work of Talley & Johnsen (2005) and Roell & Peng (2008) who predict that, as share of incentive pay of total compensation increases, so does the likelihood of litigation against the firm; litigation risk increases by 3% for each 10% increase in incentive pay as a share of total pay, at the median point. In case of the Icelandic banks, as the proportion of base salary in CEO total compensation reduced, the temptation to manipulate performance indicators became more poignant. In 2004, incentive pay was a

⁹ SIC Report, Volume 3, Chapter 10 pp. 91.

relatively modest component of total CEO compensation both in Landsbanki and Kaupthing, 20-36%. Although Glitnir stood out in terms of volatility of this factor, the trend is quite clear; base salary gradually became a less important factor, dropping to a low level of 9% in case of Mr. Arnason, CEO of Landsbanki, in the year 2007, as performance pay reached as high as 80%. Variable pay of each one of the bank executives in the three banks reach 80% as share of total salary at some point during the years in the run up to their collapse. Hence, variable pay dependent on performance became a significant reference point that was hard to ignore in decision making of the CEOs as the banks' operations neared to the edge of the cliff.

Base salary as share of total compensation varied quite a bit between rival banks, but also within banks. In Landsbanki, the two CEOs were compensated in quite a different manner, reflecting the different bargaining position of the two executives. The underlying targets for their incentive pay even differed between the two.¹⁰ Halldor J. Kristjansson's, bonus targets rested on a target return on equity of 9% above risk free rate. If the bank yielded 5% above the target return-on-equity pre-tax (ROE), the CEO was to receive a cash bonus equivalent to three months salary, increasing linearly so that reaching 10% above target ROE would yield a bonus of extra 8 months salary. No bonus was to be paid out if ROE was under target and no clawbacks were required if the bank suffered a loss. Sigurjon Arnason, the other CEO of Landsbanki, got a 12 month salary in bonus, however, for pre-tax ROE that reached 3% above their target rate which was 6% + the risk free rate. The bonus was a linear function of the pre-tax ROE and could not exceed three years salary, if ROE exceeded 15% above the risk free rate. No clawback was requested if the bank suffered a loss. That way one CEO would receive *36 months salary* in cash bonus if the ROE of the bank exceeded 15% beyond the risk free rate, but the other would receive *10,6 months of his base salary* in bonus, yet both of them were placed at the same level in the company's hierarchy, as Chief Executive Officers; employees of the board of directors.¹¹

According to the employment contract of Sigurdur Einarsson, the executive chair of Kaupthing, from 2003, his cash bonus would be 2% of the companies total profit if ROE exceeded 15% but capped at annual salary, or 50% of total compensation. Einarsson's monthly base salary amounted to 3 million ISK.¹²

Hreidar Mar Sigurdsson, CEO of Kaupthing, bonus pay amounted to 2% of the bank's profit, if the bank turned a profit of 15% return on equity or more. The bonus payment was capped at the amount of his annual salary.

¹⁰ SIC Report, Volume 3, Chapter 10 pp. 52.

¹¹ SIC Report, Volume 3, Chapter 10 pp. 52.

¹² SIC Report, Volume 3, Chapter 10, pp. 92

Bonus pay for staff members of Kaupthing, according to insights gained at SIC, was decided at the discretion of the CEO, Chairman of the board, and the Managing Director of each division. The SIC failed to find or identify a formal incentive pay system based on predetermined performance metrics and levels. An example of this is provided by the Commission's discovery of an email correspondence between the Chairman of the board of Kaupthing, and the Managing Director of Kaupthing, Luxembourg, where the chairman initiated discussion on the bonus pay for the MD: „Hi Magnus. We haven't settled on a bonus figure for last year. I propose 1 million Euros, Rrgds. Se“. The MD's answer was short „Thanks More than enough ☺“¹³

At the middle management level in Kaupthing, the largest bonuses during the year in the run up to the collapse of the bank were paid out in the year of the banking failure itself, 2008. Bonuses awarded among staff in middle management increased from 1.3 million ISK on average a month, in 2007, to 2.1 million in 2008, when the bank was battling a liquidity crisis, the stock price was depressed (yet being manipulated at the orders of Kaupthing's upper management)¹⁴ and return on reported equity was the lowest during the four years under investigation. For the CFO, CRO and Chief Executive of the Treasury, bonuses increased from 15 million a month on average in 2007, to 25 million on average for the first six months in 2008, while earnings per share were reported 34.6 króna per share in 2007 but 21.5 per share in 2008.¹⁵

In Glitnir, bonuses were decided upon three different benchmarks, 1) a so-called, EVA-system¹⁶ (Economic Value Added) induced the incentives of those in corporate advisory, proprietary trading, and at the executive level from 2004-2006, when the so-called ROE-system took over (ROE: Return on Equity). The EVA-system was built on benchmarks in absolute krona terms instead of relative numbers such as ROE, decided by the CEO. Upholding the same profit in EVA terms from the year before, would leave the employee with one third of two months base salary, paid out directly. Two thirds of the bonus was delayed by a year and paid out if targeted EVA was upheld the following year. If realized profit went below the EVA target, the delayed bonus pool would be linearly deducted before it would be paid out as deferred bonus. Given the successful delivery of targeted profit net of shareholders opportunity cost, EVA, the bonus payments would grow, linearly, with profit beyond the set target. 2) Framtak-system was set up for support staff, back office, bank's treasury & finance department, 3) Ad-hoc bonus payments were also allowed based on good

¹³ SIC Report, Volume 3, Chapter 10, pp. 86

¹⁴ Supreme Court Ruling: Special Prosecutor vs. Kaupthing management in several cases including nr. 145/2014

¹⁵ SIC Report, Volume 3, Chapter 10, pp. 87

¹⁶ Economic Value Added = $R - K * C$; R – profit after interest and tax, K – Cost of Equity Capital based on CAPM, C - Total Equity of the Bank.

performance of the staff member, his/her individual performance independent of firm performance, as deemed by the supervisor.

As risk appetite by major shareholders increased, a new incentive scheme was introduced in 2006. Instead of the EVA-benchmark, ROE, return on equity, became the major barometer, demanding significant increase in risk taking and subsequent reward, with much higher levels of bonus pay in the play. Although the bonus targets were set at the department level, and even down to individual level, a full bonus could not be reached unless the overall return on equity of the bank reached 25%, for each percentage below or beyond that the bonus pay changed by 8%, hence no bonus was to be paid if the bank return on equity was below 12.5%.

Mr. Bjarni Armannsson, initially followed the EVA bonus program, like other staff members in Glitnir bank. He, however, managed to bargain for ad-hoc bonus payments in addition to bonuses according to the EVA system that were paid into his retirement fund. In 2005, the CEO negotiated additional bonus pay, doubling his bonus from the previous year, whilst shareholders' earnings per share increased by 33%. As Armannsson stepped down, he exercised options that had expired and negotiated a golden handshake of 370 million, being paid out in 2007 and 2008. The financial accounts of 2007 only revealed the 100 million ISK payment due in 2007, but did not disclose the company's contractual commitment to pay him additional 270 million the year after, according to documents revealed by the SIC.¹⁷

Larus Welding was hired to Glitnir as CEO, in May 2007. The same misreporting took place regarding the company's commitments regarding Welding's employment in the bank's financial accounts. Welding negotiated a signing bonus of 300 million ISK (4.4 million USD) in 2007 for 12 month service, apart from base salary of 5.5 million monthly and arbitrary bonus pay according board resolution. Another 300 million ISK where to be paid to the CEO if he stayed on the job at the company for additional 12 months, from February 2008-February 2009. Glitnir's financial accounts for 2007 results did not disclose the firm's contractual commitment in this regard, misreporting its salary cost and liabilities by that amount as well as commitments relating to Mr. Armannsson departure, of 270 million ISK. On top of base salary, bonus payments, sign on bonus and options awards, the CEO, Larus Welding, negotiated an arbitrary payment of 250 million ISK (3.6 million USD), with installments timed according to Mr. Welding's needs during the duration of his employment contract. Regular bonus payments based on the decision by the board, were capped at 70 million (roughly 13 months base salary).¹⁸ The 300 million ISK retainer, due in February 2008, was never paid out as salary. Instead, on March 31st 2008, the CEO borrowed 177

¹⁷ SIC Report, Volume 3, Chapter 10, pp. 39

¹⁸ SIC Report, Volume 3, Chapter 10, pp. 42

million ISK at REIBOR flat (+0 bps) for one year, and pledged as a collateral against the loan, his contract stipulating the 300 million salary payment that was postponed by one year. In addition, Mr. Welding released the bank's obligation to honor the roughly 5,1 billion ISK option grant, on the same day, which was exercisable in equal installments over the following five year period. When a staff member inquired whether indeed the CEO was rejecting the payment, the CEO answered: „it will be paid next year“, the staff member kept on inquiring: „Can we then say that the payment is being postponed by one year?“, the CEO replied: „I need to get this into the accounts that I am presenting tomorrow, is that clear? What are the effects?“ The following day Mr. Welding introduced first quarter results of 2008 to the board, with a slightly improved bottom-line between quarters.¹⁹

3.4.2 Stock Ownership and leveraged stock purchases of CEOs

Stock ownership among the CEOs of the three banks varied significantly. The CEO of Landsbanki, Sigurjón Þ. Arnason, on record, didn't own any stock in Landsbanki. However, he had earned a significant amount in unexercised but vested options, which effectively had no predetermined vesting date. That means *de facto* that he owned the shares and not options, yet did not formally hold the voting rights associated with them and did not receive dividends as the options remained unexercised. SIC estimated that Sigurjon owned options to buy 140 million shares in the bank when it failed or 1,25% of outstanding shares in Landsbanki after only 5 year service to the bank. The same applied to the CEO of Glitnir 2007- 2008, Lárus Welding, who had negotiated 150 million shares in options as he got hired to the job. Sigurdur Einarsson, Executive Chairman of the board of directors at Kaupthing, on the other hand, personally owned stocks whose market value reached as high as 6.3 billion ISK (92.5 million USD) at year end 2007, but Kaupthing took over the funding of those stocks in 2006, leaving Mr. Einarsson only responsible for 10% of the nominal amount, in a twist to change a put option that the bank had issued to the chairman, which would call for deducting the entire amount from the equity base of the bank. Does this mean that his own skin was in the game by that amount? As it turned out, Mr. Einarsson was personally liable for the 10% and could not pay these loans back when the bank went under. He declared bankruptcy in Icelandic court in 2016, the largest bankruptcy of any individual in Iceland, with claims amounting to 254 billion ISK (2.5 billion USD in 2016 dollar terms) against his estate²⁰. Hreiðar Már Sigurðsson, CEO, on the other hand moved all his stock holdings in Kaupthing over to a Special Investment Vehicle, wholly owned by him, along with all liabilities funding the stock purchases. He was not per forma personally liable and escaped bankruptcy, but was however

¹⁹ SIC Report, Volume 3, Chapter 10, pp. 43

²⁰ Logbirtingarbladid, the Icelandic Legal Gazette, January 14th 2016

found guilty of insider trading fraud in a district court for having moved the stocks away from his personal liability over to his own limited liability company at the prevailing market price, which he had helped manipulate, sending a false signal to the market, as he knew the prevailing market price did not reflect the true value of the stock.²¹

Table 3.5

Stock Ownership of CEOs at year end* (ISK – Current Prices)				
Personal Assets as well as Assets through Holding Companies 100% owned by the CEOs				
Glitnir	Bjarni Ármannsson		Lárus Welding	
	No. Shares	Market Value	No. Shares	Market Value
2004	176,584,354**	2,478,812,758	-	-
2005	315,641,330**	6,861,589,225	-	-
2006	234,050,732**	5,452,637,266	-	-
2007	573,256**	12,448,219	-	-
2008	21,560	338,492	-	-
Landsbanki	Halldór J. Kristjánsson		Sigurjón Þ. Arnason	
	No. Shares	Market Value	No. Shares	Market Value
2004	1,833,745	22,188,315	-	-
2005	10,808,487	273,454,721	-	-
2006	10,808,487	286,424,906	-	-
2007	10,808,487	383,701,289	-	-
2008	11,106,164	255,997,080	-	-
Kaupthing	Hreiðar Már Sigurðsson		Sigurður Einarsson	
	No. Shares	Market Value	No. Shares	Market Value
2004	2,005,091	886,250,222	2,511,979	1,110,294,718
2005	2,799,239	2,088,232,294	3,744,423	2,793,339,558
2006	5,423,239***	4,560,943,999	6,368,423	5,355,843,743
2007	6,235,239***	5,487,010,320	7,180,423	6,318,772,240
2008	6,235,239***	4,676,429,250	7,180,423	5,385,317,250

*Ownership in 2008 is recorded during mid-year, end of June 2008

**More than 99% of stocks were held in the CEO's various holding companies

*** All shares owned by a holding company in 100% ownership of the CEO

Source: Bank's Annual Reports, SIC Report, Icelandic Stock Market Registry and ICEX

Halldor J. Kristjansson, CEO of Landsbanki, was the only one of the six colleagues, that indeed had placed own capital into the bank where he worked when buying shares. Mr. Kristjansson exercised options and held on to the shares, free and clear, until the bank went

²¹ District Court of Reykjavik, State Prosecutor vs. Hreidar Mar Sigurdsson and Z, nr. S-705/2016

under. Table 3.5 and figures 31-32 show stock ownership of the bank executives of Glitnir, Landsbanki and Kaupthing and the corresponding leverage against them.²² Although loan agreements provided for margin calls at loan-to-value (LTV) 80%, LTV of Hreidar Mar Sigurdsson's²³ and Sigurdur Einarsson's positions reached as high as 125% and 145% at mid-year 2008. A quick turn-around from the favorable LTV of 77% and 56% six months earlier, or at year end 2007, respectively. The margins were not called upon.

Staff borrowing to fund stock purchases in Kaupthing was part of the bank's incentive program. The total borrowed amount due to this reached close to 60 billion ISK (880 million USD) in 2008. Twenty five employees borrowed more than 500 million ISK each, for these purposes from the bank, and their debt grew from 15 billion in 2006, when the stock purchase plan was first implemented, to 30 billion in 2008 (440 million USD). The management team of Kaupthing never meant to attach any personal liability or downside risk with the stock ownership onto the employees, planning to issue put options for all leveraged shares bought by top management under the program. The personal liability was added to the contract after the external auditor pointed the finger to an IFRS accounting standard that clearly states that all put options should be deducted from the equity base.²⁴ In response to this the management team decided against the put options but added the 10% personal liability to the loan agreement to appease the external auditors. No further collateral or equity was required. The board of Kaupthing issued a board resolution lifting the 10% personal liability pertaining to funding of staff stock purchases on September 25th 2008, only days before the bank went under.²⁵ This resolution was later deemed illegal and reversed by Kaupthing's resolution committee.

Bjarni Armannsson had virtually no ownership in Glitnir after the year, yet his debt with the bank had not been paid up. No further inquiry was made into which investments of Mr. Armannsson were being funded, after he had sold his shares in Glitnir.

Despite the fact that a relatively small amount of capital had been wagered by the CEOs towards their holdings in the banks, they did enjoy the fruit of their positions of the full amount, through dividends from the levered stocks, which became part of their net worth, see table 3.6. Bjarni Armannsson received 153 million ISK (2.25 million USD) during the four years 2004-2007 in the form of dividends. That is a roughly 15% add-on to his one billion ISK (14.67 million USD) total compensation he received on the job (minus 370 million ISK Mr. Armannsson refunded the Glitnir estate in 2009).

²² SIC Report, Volume 3, Chapter 10, pp. 86

²³ SIC Report, Volume 3, Chapter 10 pp. 93-94, and Employment Contract Between Kaupthing Bank and Mr. Sigurdsson from 2006

²⁴ SIC Report, Volume 3, Chapter 10, pp. 78

²⁵ SIC Report, Volume 3, Chapter 10, pp. 86

Fig. 31 Stock ownership and level of leverage
Glitnir
Bjarni Armannsson*

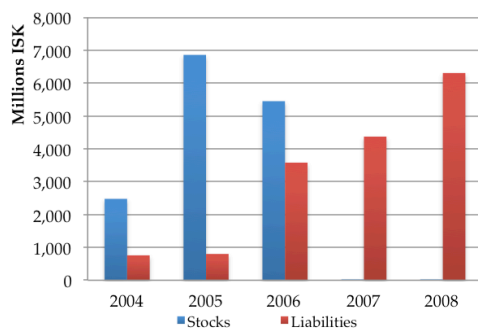


Fig. 32 Stock ownership and level of leverage
Landsbanki
Halldór J. Kristjánsson*

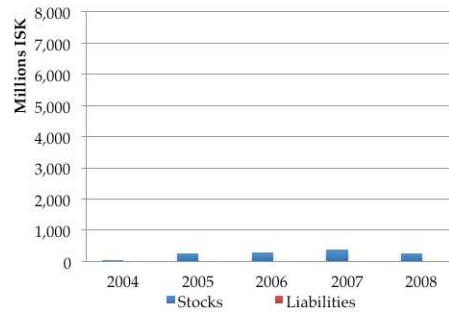


Fig. 33 Stock ownership and level of leverage
Kaupthing
Hreiðar Már Sigurðsson*

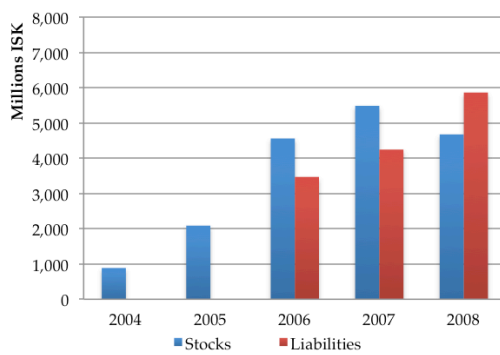
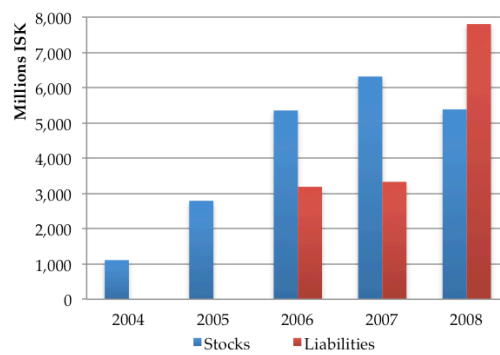


Fig. 34 Stock ownership and level of leverage
Kaupthing
Sigurður Einarsson*



Hreiðar Már Sigurðsson received 238 million (3.49 million USD) in dividends for the same period, a roughly 10% add-on to his 2.5 billion ISK (36.68 million USD) salary for the same years. Sigurður Einarsson received, however, roughly 280 million (4.11 million USD) in dividends, see table 3.6.

Table 3.6

Dividend Payments Earned (ISK – Current Prices)			
Due to stock ownership of the CEO			
Glitnir	Bjarni Ármannsson	Lárus Welding	Dividend Payment Per Share
2004	33,054,721		0.35
2005	31,214,072		0.38
2006	88,729,634		0.38
2007	204,128		0.37
2008	-		-
Total	153,202,554		
Landsbanki	Halldór J. Kristjánsson	Sigurjón Þ. Arnason	
2004	1,833,745		0.2
2005	10,808,487		0.3
2006	10,808,487		0.3
2007	10,808,487		0.4
2008	-		-
Total	34,259,207		-
Kaupthing	Hreiðar Már Sigurðsson	Sigurður Einarsson	
2004	10,025,455	12,559,895	5
2005	27,992,390	37,444,230	10
2006	75,925,346	89,157,922	14
2007	124,704,780	143,608,460	20
2008	-	-	-
Total	238,647,971	282,770,507	

Source: Annual Reports of Glitnir (Islandsbanki prior to 2006), Landsbankinn & Kaupthing

No payments were being made towards the principal of the loans that funded the stock holding positions, nor did the CEOs pay any interest during the lifetime of the loans, hence the dividends ended entirely in the pockets of the bank executives forming their personal wealth, see Panel IV, figures 31-34. Attempts to collect the loans from Kaupthing executives have been made without any success by the resolution committees of the bankrupt estates of Kaupthing, and the dividends were not clawed back. The Supreme Court revoked the board resolution to abolish the 10% personal liability made by the board of directors of Kaupthing on September 25th, 2008.

3.5 Falsification of Equity through Incentive Pay

Glitnir

On top of the bonus pay, Glitnir's management initiated an extensive operation to hold onto valuable employees already in 2003. Various contracts were made with the employees or a holding company in 100% ownership of each employee, which borrowed significant amounts of money at favorable rates (sometimes below the risk free rate) from Glitnir to purchase stocks in the bank on the market, only pledging the purchased stocks. Glitnir did not deduct this lending from its equity base as is required by law and IFRS standards. This total amount extended in such credit reached 17% of the bank's equity base, hence equity ratios were misreported by at least this amount.²⁶

Making only a correction for this, Glitnir would not have met the authorities' minimum capital adequacy ratio a year before it collapsed.²⁷ Presumably, enough for administrative actions to be taken against the bank to force restructuring.

Kaupthing

With extensive borrowing programs for the Kaupthing bankers and favored customers who got the same deal, Kaupthing itself, had funded more than 25% of its own equity base (up to 40% of the banks' stocks were pledged to Kaupthing itself), in breach of IFRS standards and article 84, paragraph 5, on financial undertakings nr. 161/2002. Regulatory capital adequacy ratio (CAR) was misreported as 11.18% in the bank's half year financial statement, but was in fact 8.13%, only accounting for this misrepresentation of the bank's funding structure, close to the legal minimum of 8% CAR. Staff holding of equity, funded by the bank itself, accounted for a third of that misreporting (total of 60 billion ISK, 880 million USD) as the bank failed in October 2008.²⁸

Landsbankinn

Same falsification of equity occurred in Landsbanki – through an option award program. Options were issued in the amount of 13.4% of total outstanding shares during the course of 2001-2008. Instead of issuing new shares when the options vested, management engaged in a complex twist through a perceived need to hedge the firm against the exposure of having to deliver on the options down the road. In the early days, 2001, Landsbanki set up off shore trusts on Guernsey and The Isle of Man. The Bank would issue options awarded to staff, and subsequently the off shore trusts borrowed funds from the bank to buy the equivalent amount of shares and hold the shares until the options vested. Landsbanki set up forward contracts

²⁶ SIC Report, Volume 3, Chapter 10, pp. 34

²⁷ SIC Report, Volume 3, Chapter 9, pp. 18

²⁸ SIC Report, Volume 3, Chapter 9, pp 19-20

with the trusts, pledging to buy back the same amount of shares when it had to deliver on the options when vested, at an elevated price to match the lending costs of the trusts. Landsbanki set up at least 8 such trusts, in the British Virgin Islands, Panama and Luxembourg in addition to those in Guernsey. Combined assets of the eight trusts amounted to the second largest shareholder of Landsbanki, but never reported as such, but rather each trust held less than 5% shares in the bank. Going beyond 5% would mean that all trades of those firms in Landsbanki shares would have to be reported on the stock exchange. A shareholder that held more than 10% in the bank needed vetting and approval by the FME - the Financial Supervisory Authority in Iceland. Later the funding of those shares was taken over by the rival banks, but Landsbanki funded their equivalent types of trusts in control of their rival banks (or sister banks such as Straumur Burdaras, a small boutique bank in the same controlling ownership as Landsbanki) in return. Irrespectively, the forward contract between Landsbanki pledging to buy back own shares made it so that the risk of the shares never left the balance sheet of Landsbanki, hence should have been deducted from its equity base. Accounting for this breach alone, the bank would have gone below the legal limit of capital adequacy ratio a year before it collapsed.

Intentionally or not, by choosing this arrangement of hedging options via off-shore and off-balance sheet entities, the management and controlling shareholders of Landsbanki avoided dilution of their own control and ownership, which would otherwise have happened as 13.4% of the bank was deemed to be held by the bank's staff. At the outset, the controlling shareholder who bought 45,8% of the shares in the bank during the privatization phase, had gotten an exemption from the authorities from the mandatory takeover rule (at 40%, and later was lowered to 33%). Had the options vested and new shares been issued, this arrangement could have come into question, and the mandatory take-over rule potentially been enforced.²⁹

The incentive schemes of the three banks involving funding of own shares in staff ownership, where equity risk of those shares stayed with the banks in question, lead to the banks becoming increasingly more dependent on their own share prices. The CEOs of Glitnir, Landsbanki and Kaupthing, were found to have endangered the funds of the banks by extending credit into investment vehicles to buy shares in the banks, with no assets or collateral apart from the pledged shares in the banks themselves, by that signaling false demand for the said shares to other investors in the stock market. The Supreme Court declared Kaupthing's management guilty of the market manipulation and stated in its judgment: „[T]hese breaches were extensive, carefully organized and committed in collaboration with unambiguous intent. These crimes were committed against the whole of the Icelandic public and the country's financial market at the same time. The direct and

²⁹ SIC Report, Volume 3, Chapter 10, pp 68

indirect damages they inflicted will never be fully assessed. These breaches are among those most serious economic crimes ever to come before Icelandic courts.³⁰ Five members of Glitnir management were found guilty for similar breaches in the District Court in Reykjavik in March 2018, for creating false demand for the bank's stocks, by extending credit into 14 special purpose vehicles in 100% ownership of staff members within the bank itself without any other assets or collateral pledged apart from the funded shares.³¹ Their cases have yet to be heard by the Supreme Court of Iceland.

3.6 Conclusion

One of the most universally accepted culprits of the great financial crisis is incentive pay for bankers. Public investigations have uniformly declared incentive pay as one of the main causes of reckless risk taking, as they offered huge upsides for bankers with limited accountability for the downside. Policy responses to these findings have been mixed. While European legislation has responded without hesitation to lessons derived from the crisis by capping banker's variable pay at 50% of total pay, the US has not passed any such legal constraints, despite the Dodd-Frank legislation promises to do so.

This chapter has described the executive compensation arrangements of the failed Icelandic banks and how incentive schemes led to misreporting of profits and equity levels, embezzlement of the funds of publicly owned companies and massive market manipulation, keeping the promises of the incentives schemes alive for bankers, whilst the investing public was defrauded and financial supervisors derailed with false market signals.

Considering the threat of value destruction through managerial misreporting, the case of the Icelandic banks adds further insights into the need for policy makers to set limits to banker's incentive pay. Without constraints there will be heightened risk of management engaging in complex economic criminal activities. This is especially prevalent in the financial industry, where executives have means to engage in complex trades whose criminal aspects are both expensive and difficult to prosecute, opening up to impunity on part of bankers that operate under extensive public insurance. If the CEO may find himself/herself not reaching targets set before him/her by incentive pay schemes, the incentive to misreport arises. Incentive pay can therefore not be assigned in isolation. Resources will need to be spent on monitoring the contract. But as resources are limited, chances are that the CEO will manage to shirk, deceit and/or induce litigation against himself/herself or the firm going forward. In the case of the Icelandic bankers, their bet-for-life sentiment led to erosion of the quality of the banks' loan books, fraudulent business practices and breaking of the banks' own internal

³⁰ Supreme Court of Iceland case nr. 495/2016

³¹ District Court of Reykjavik case nr. S-193/2016

rules. The CEOs of Landsbanki, Glitnir and Kaupthing along with several of their other upper management staff, were found guilty of the most extensive economic crimes whose judgment has ever been passed by the Supreme Court of Iceland. The systemic consequences of banking failure do not allow for policy makers' complacency in containing banker's temptations to defraud, which inevitably will rise with the promise of exorbitant wealth of bank executives that otherwise pledge little or no capital of their own to the successful operations of the bank nor bare the cost of the downside.

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RÉSUMÉ

Cette thèse explore le risque de crédit au niveau de l'entreprise, en ce qui concerne les structures de propriété de l'entreprise, le sexe de son propriétaire et la manière dont les dirigeants de banque ont été incités à allouer du crédit dans la perspective de la grande crise financière. Il compare le risque de crédit associé au financement de groupes d'entreprises par rapport à des entreprises indépendantes. Il vérifie si l'effet de levier, la rentabilité des entreprises et la probabilité de défaillance au niveau de l'entreprise peuvent être attribués au sexe du dirigeant de l'entreprise. Enfin, il décrit en détail comment les dirigeants des banques islandaises ont été incités à allouer des crédits au cours d'un épisode de croissance rapide du crédit menant à la faillite des banques.

MOTS CLÉS

Le risque de crédit, Prêts aux entreprises, L'Aversion au risque de sexe, Banques, systèmes d'incitation, historique de la crise financière

ABSTRACT

This dissertation explores credit risk at the corporate level, with respect to corporate ownership structures, gender of the corporate owner and how bank executives were incentivized to allocate credit in the run up to the Great Financial Crisis. It compares credit risk associated with funding of business groups versus stand alone firms. It tests whether leverage, firm profitability and probability of default at the firm level can be attributed to the gender of the firm leadership. Lastly, it provides a detailed account of how bank executives in the Icelandic banks were incentivized to allocate credit during a rapid credit growth episode leading up to the failure of the banks.

KEYWORDS

Credit risk, Business Group Lending, Gender Risk Aversion, Banks, Incentive Schemes, Financial Crisis History